

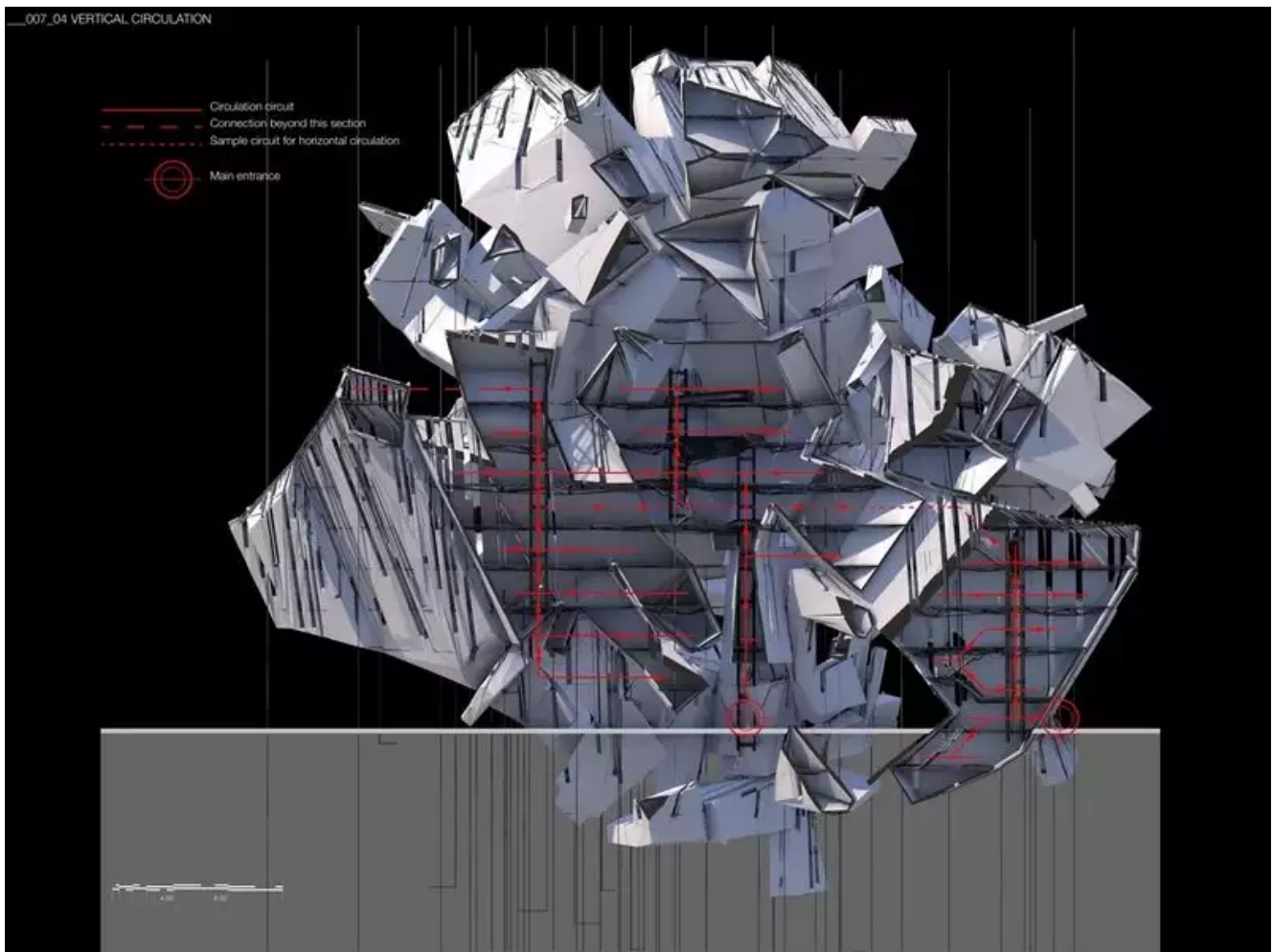


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Nucleus



[Ralf Bliem \(website\)](#)

[TU Wien \(Vienna University of Technology\) Faculty For Architecture Theory](#)

[Master's Thesis / Studio Manfred Berthold](#)

Faculty: [Manfred Berthold \(website\)](#), [Cuno Brullmann \(website\)](#), [Dörte Kuhlmann](#)
[2015](#)

Nucleus; romantic scientific novel about architecture in a dystopian urban future.

The intention of this architectural work was to react on climatic changes and, along with this, environmental changes on our planet.

The scenario is set in an dystopian future where resources getting short and cities begin to decay. The “Nucleus Project” should be seen as a new starting point to vanquish climatic and resource crisis. The aim is to create architecture that is able to develop itself in various surroundings with varying environmental influences.

To obtain this Nucleus adheres close to nature, its base code is leant on a chemical reaction which is transformed into digital, driven by parameters of the „host environment“. The fractal appearance tries to simulate the natural behavior of cells, membranes and their growing properties.

The architectural process itself starts with gathering information about the site. Since Nucleus could be placed everywhere on this planet, grabbing information is vital. With this information about specific parameters of the site [e.g. density, headroom, pollution, still existing infrastructure] Nucleus is able to develop itself in decent directions. This development process is leant on state of the art mechanical and biomechanical apparatuses which are specifically designed for this intend.

Nucleus literally acts as a single „cell“ which could be placed in e.g. a decaying building. From the time of the placement the building [and site] acts as a host for the growing Nucleus. A multi-axis drone inside Nucleus is liable for the [bio]me- chanical development process via printing units. Feeding this system is inalienable, so the Nucleus nutrition system gathers nourishment from its surroundings. It is connected to its site by a vein like pipe system, driven by mechanical cutterheads. This ducted system feeds Nucleus by chemically dissolving construction material and moving it towards the cell.

To react at a fast changing environment this architectural sequence is able to change its appearance during a lifetime cycle. By the provided information of its surrounding, Nucleus is able to react similar to a Taxis in nature.

E.g. if the lighting situation is changing radical during the development process the growing Nucleus is able to change its faces, openings in the faces and alignment of the extrusion to the light source. This is provided by steady lightning analysis during the recursive growing process.

The created architectural environment is stable in all conceivable surreal, hostile, contaminated, earthquake prone or desert alike peripheries. Its created space gives human kind host and shelter. The fractal design of the outside reflects to the inside of the object and offers a vast amount of layouts for all different needs of human residence. Because of the ongoing development and growing process human needs could be easily implemented into the architectural program of a object.

Architecture designed around life.



Nucleus_003

von pixelkompressor

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Nucleus_004

von pixelkompressor

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Nucleus_001

von pixelkompressor

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Nucleus_002

von pixelkompressor

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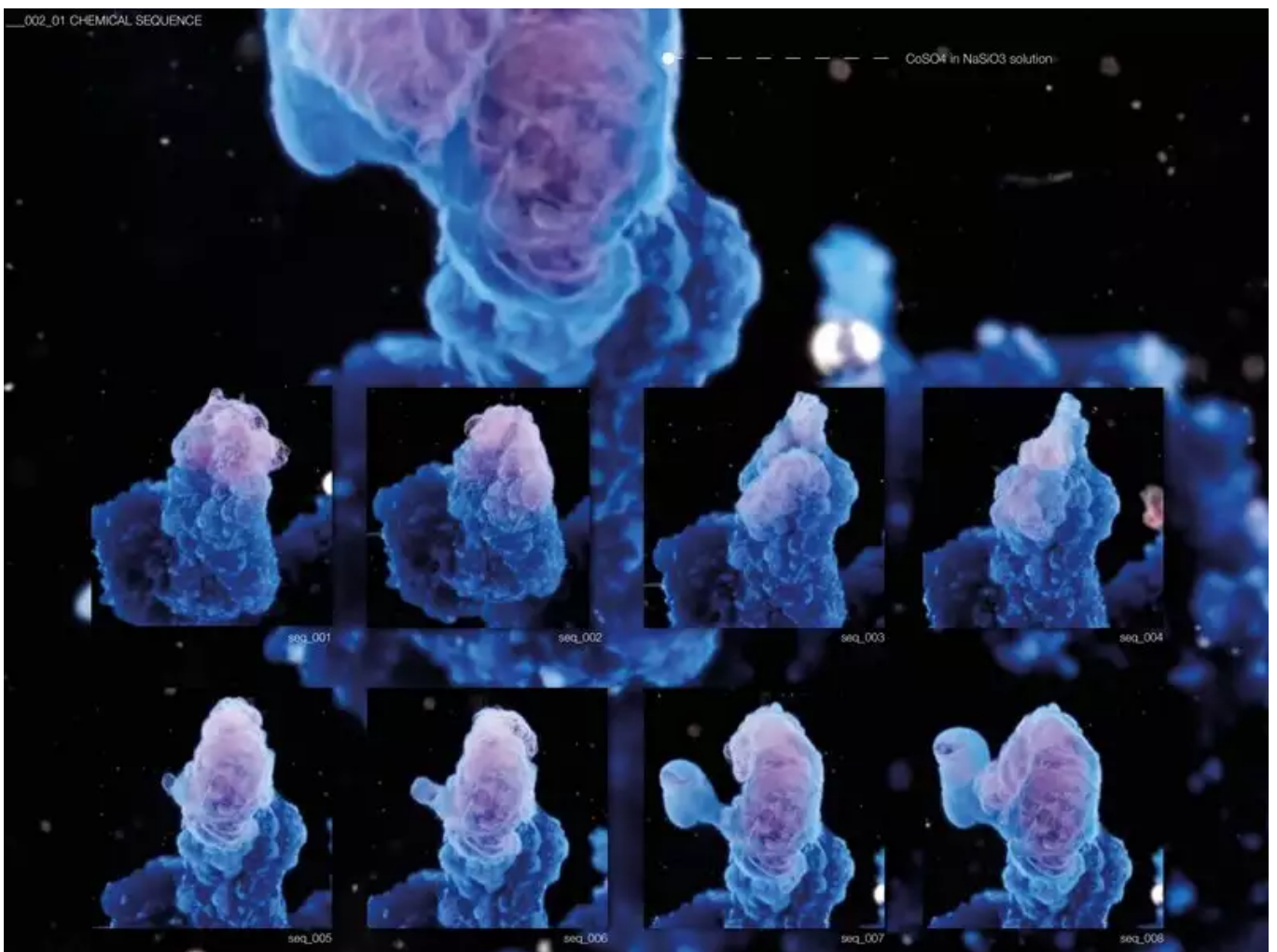


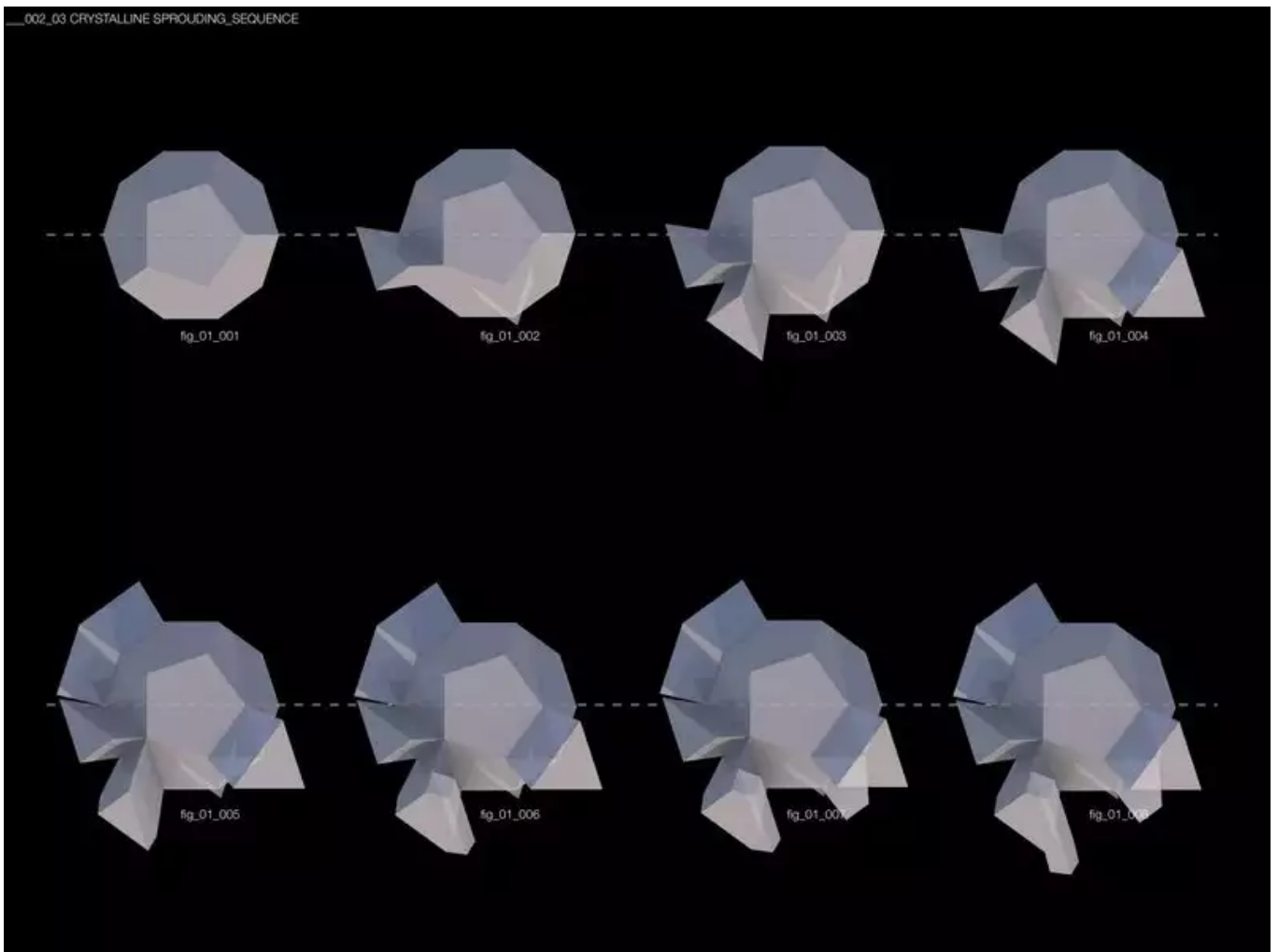
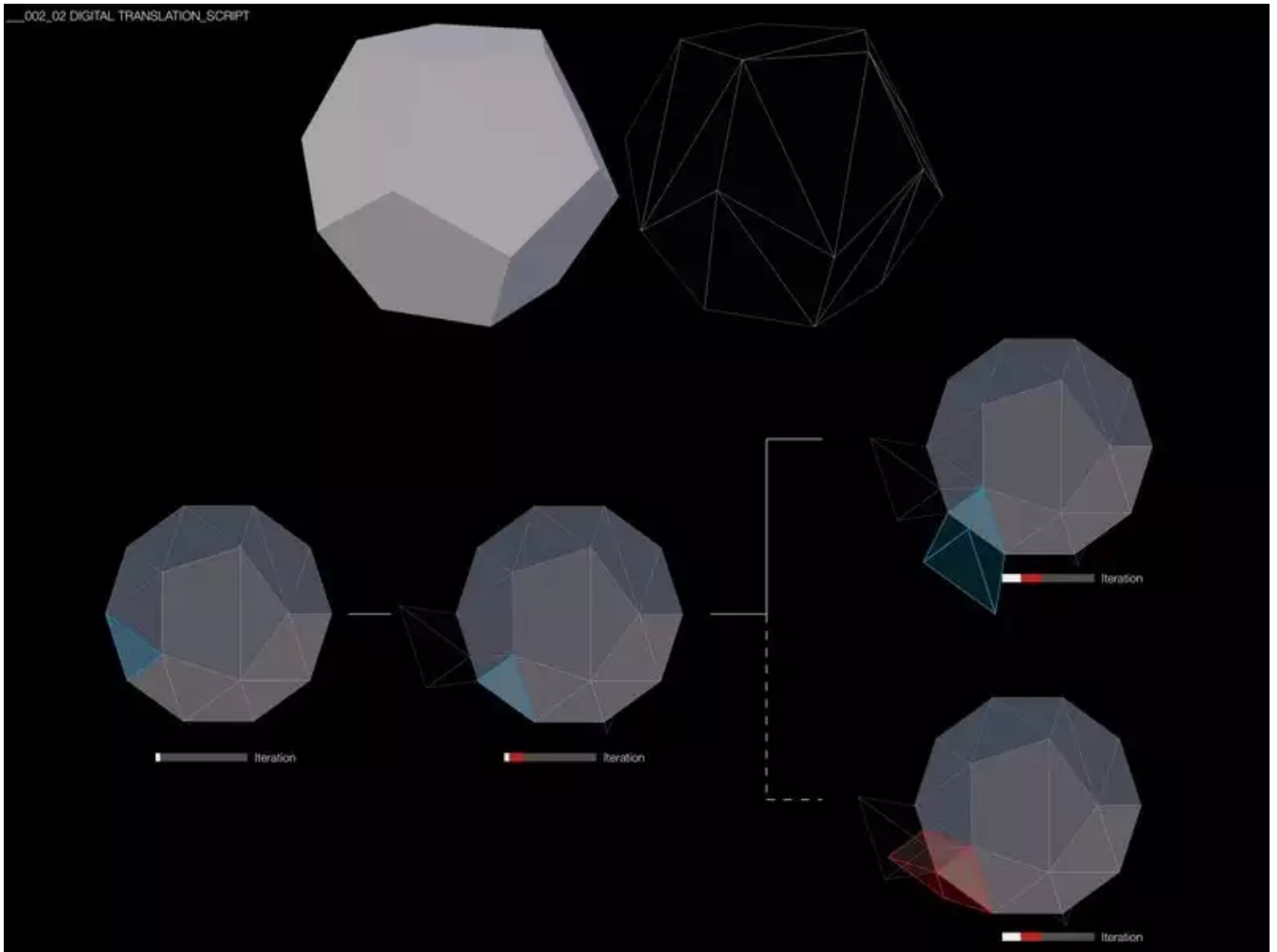


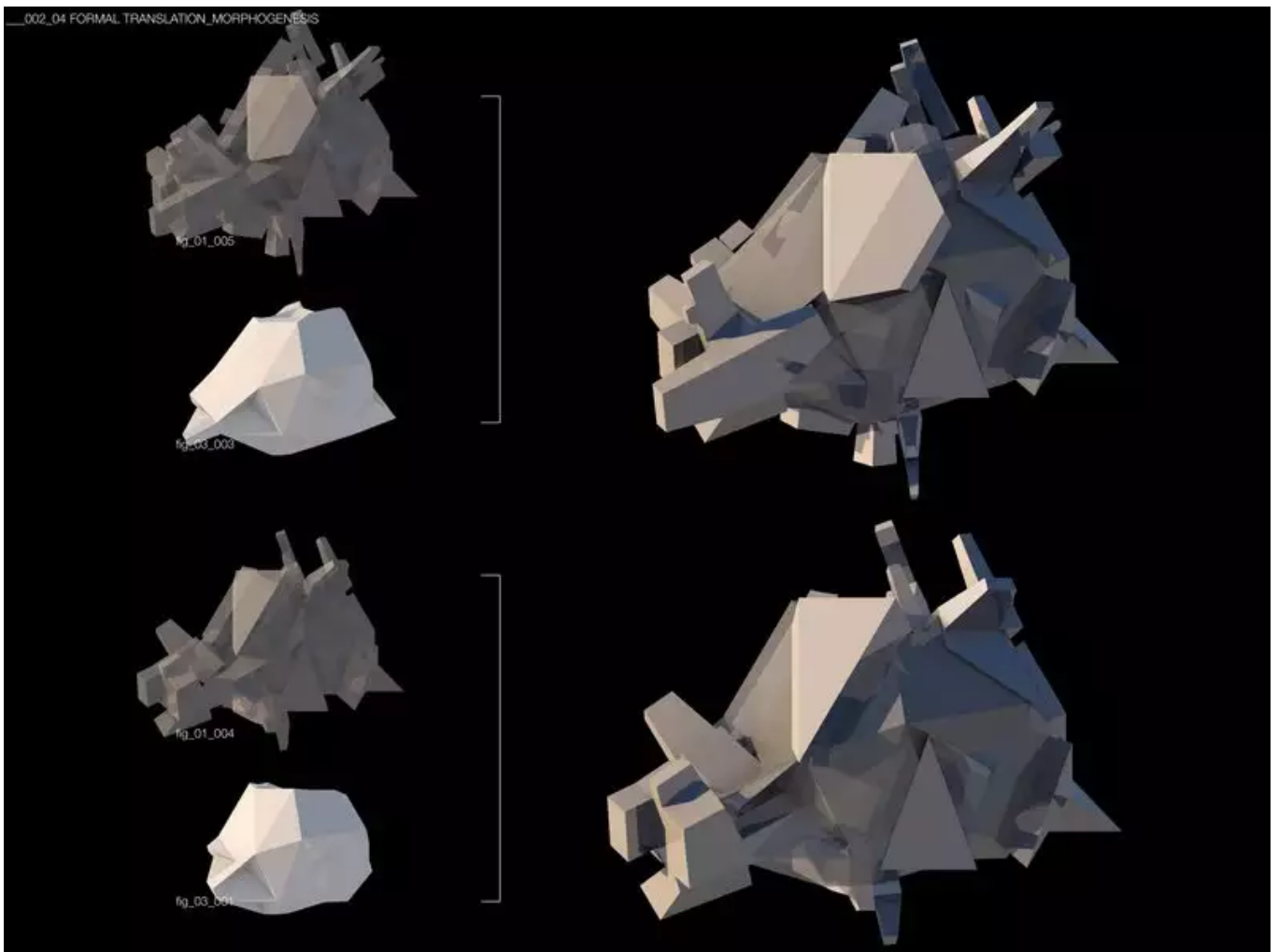
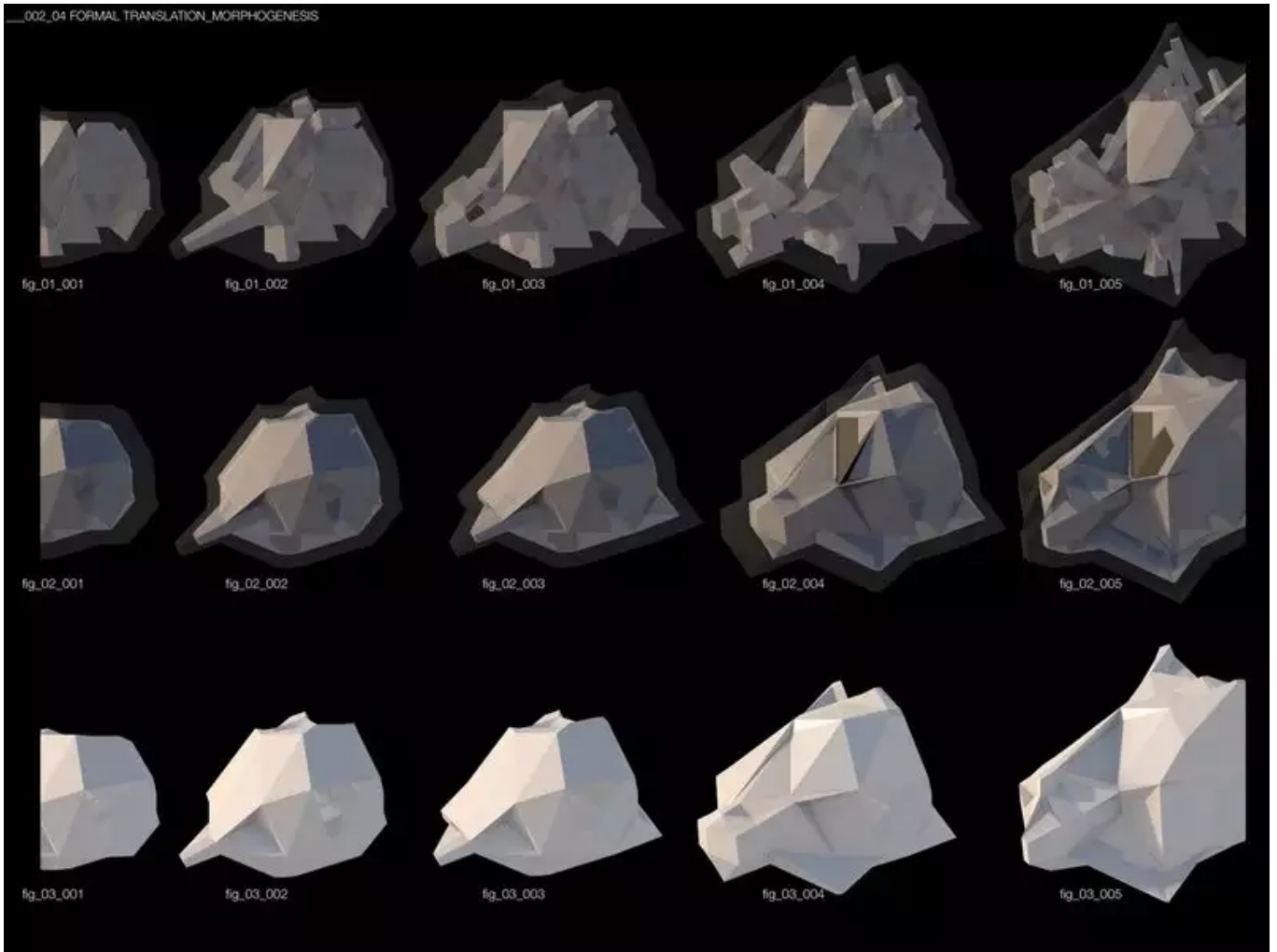
Nucleus_005
von pixelkompressor

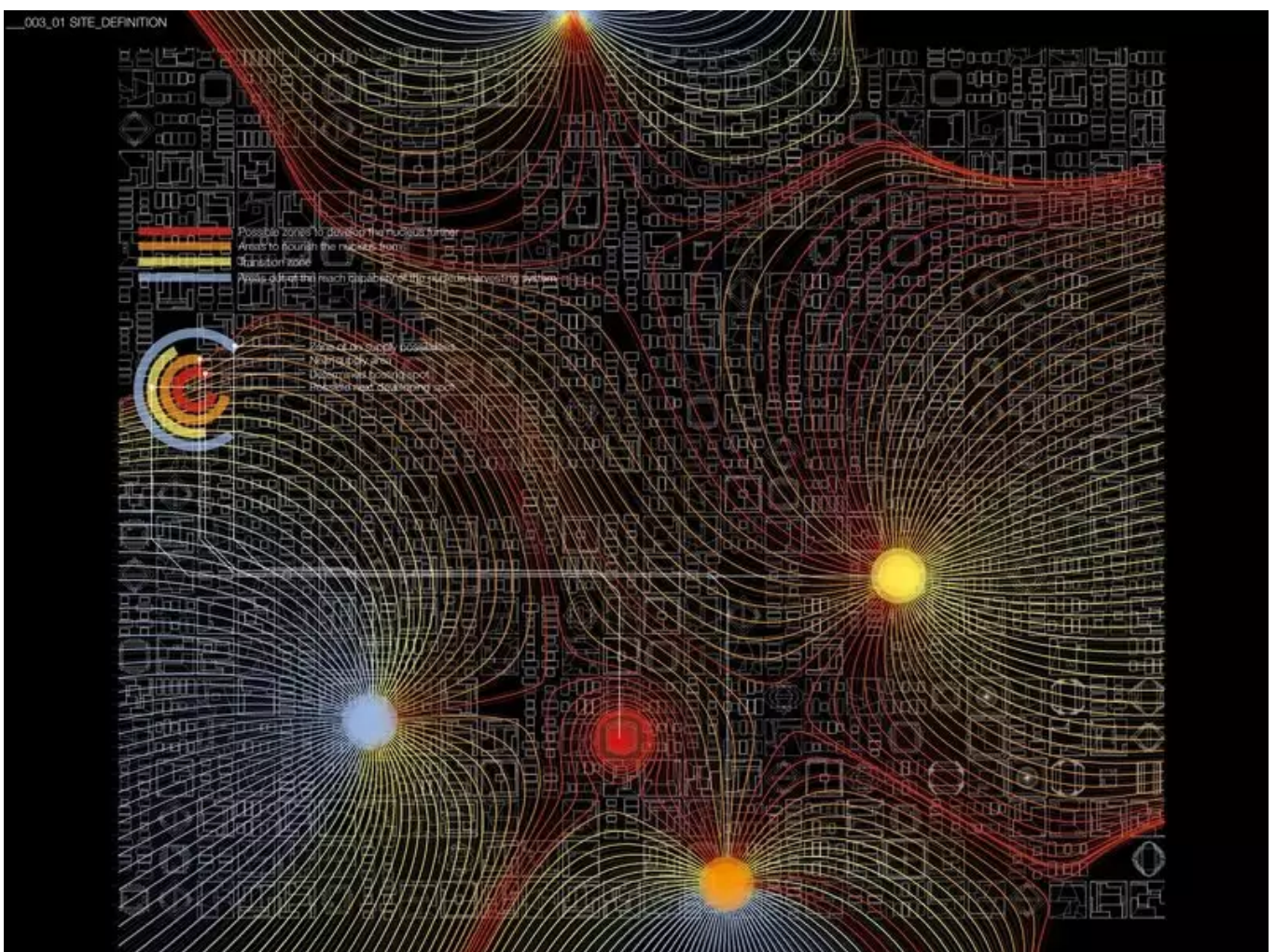
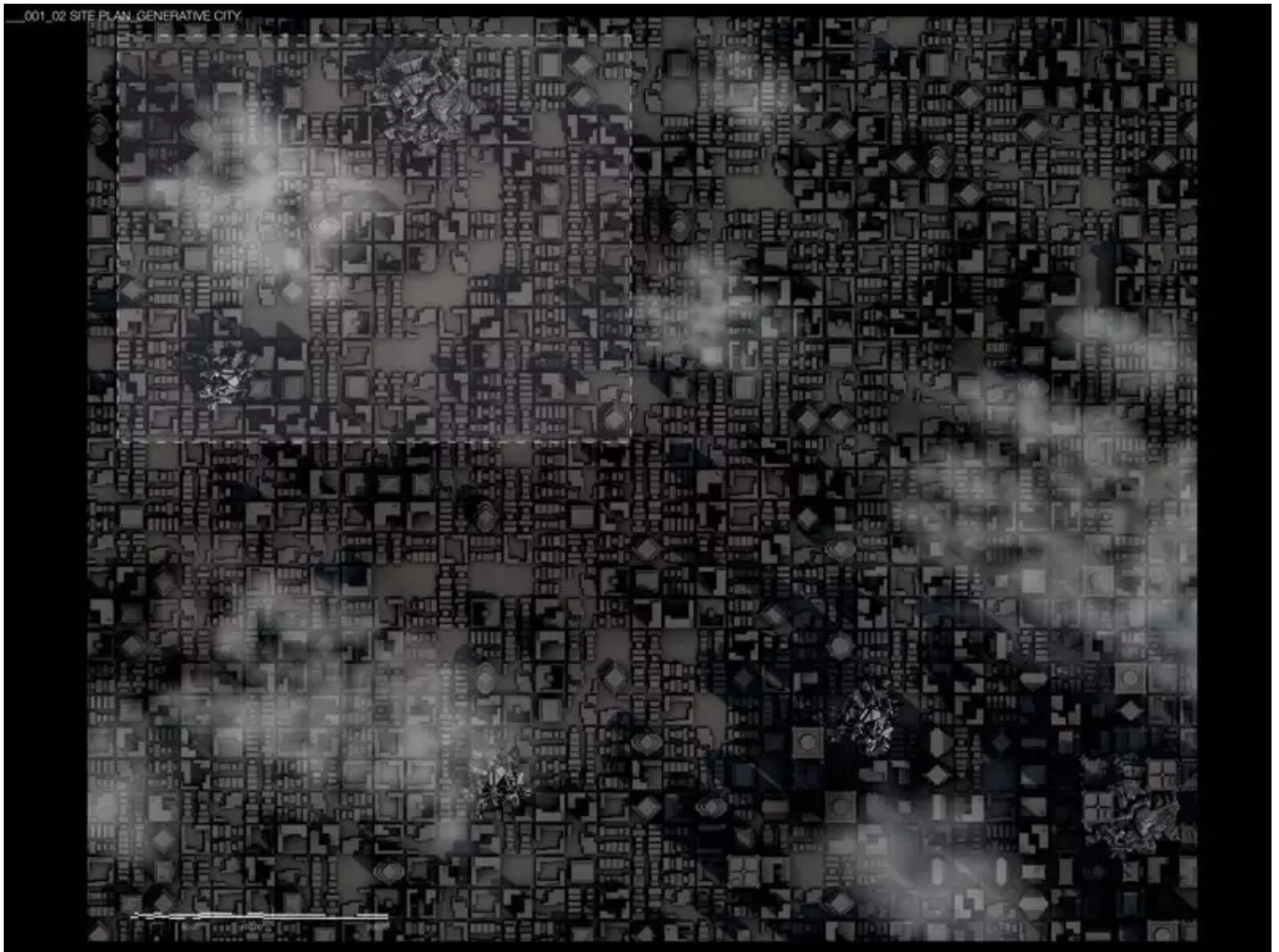
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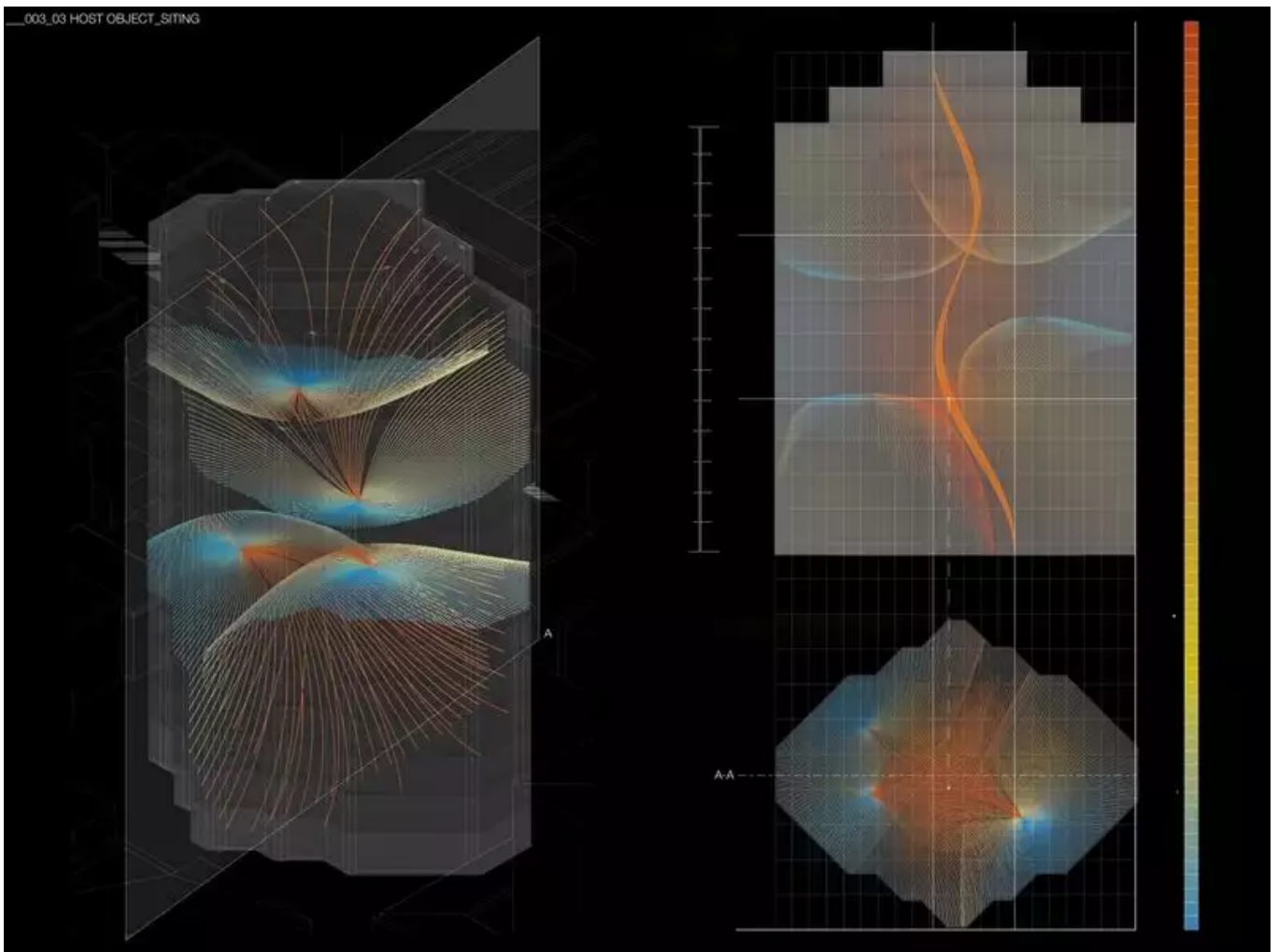
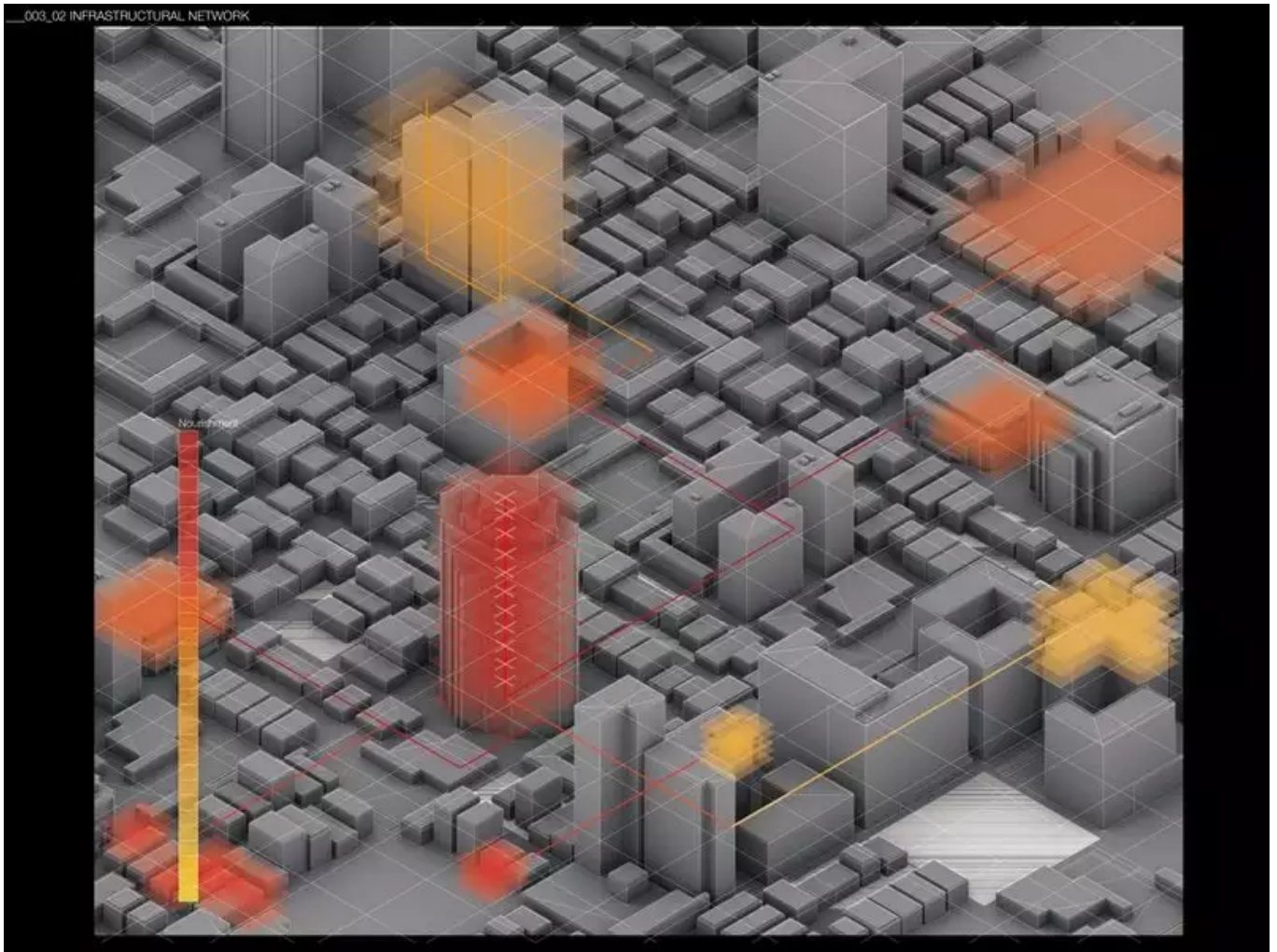




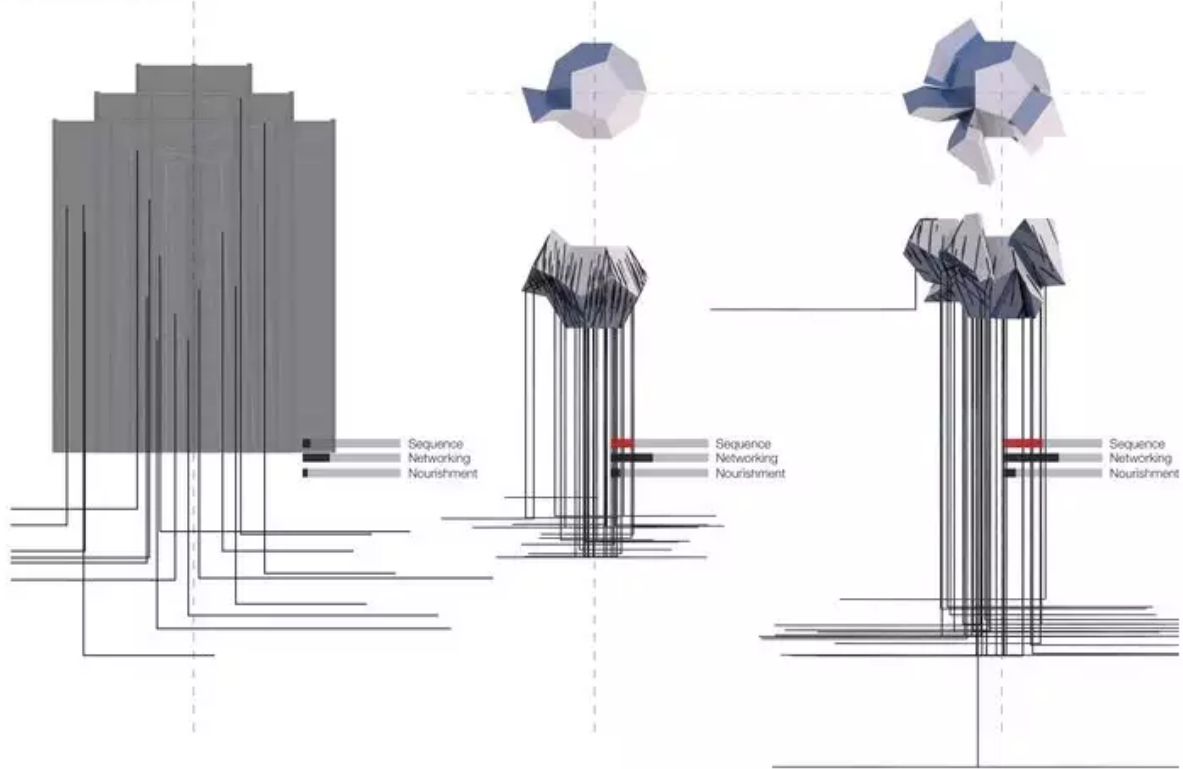








__004_01 NOURISHMENT_NETWORKING



The nucleus needs a solid support structure to develop itself. The infrastructural network which is gathered around the nucleus connects it to the surrounding buildings and infrastructure to support the chemical process with nourishment.

The more existing connections available the more viable the building gets for the nucleus.

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With each sequence the biomechanical nucleus is developing itself on base of the [chemical script] and on base of the nourishment it gets from its surrounding and it gathers from its environment.

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When proceeding through the chemical and mechanical sequences the nucleus tries to digest its host building to drive its developing sequences.

This digest process goes alongside with a sprouting network system between the nucleus and its near environment. The sprouting passes very subtle and infests every building which fits in the preceding analysis.

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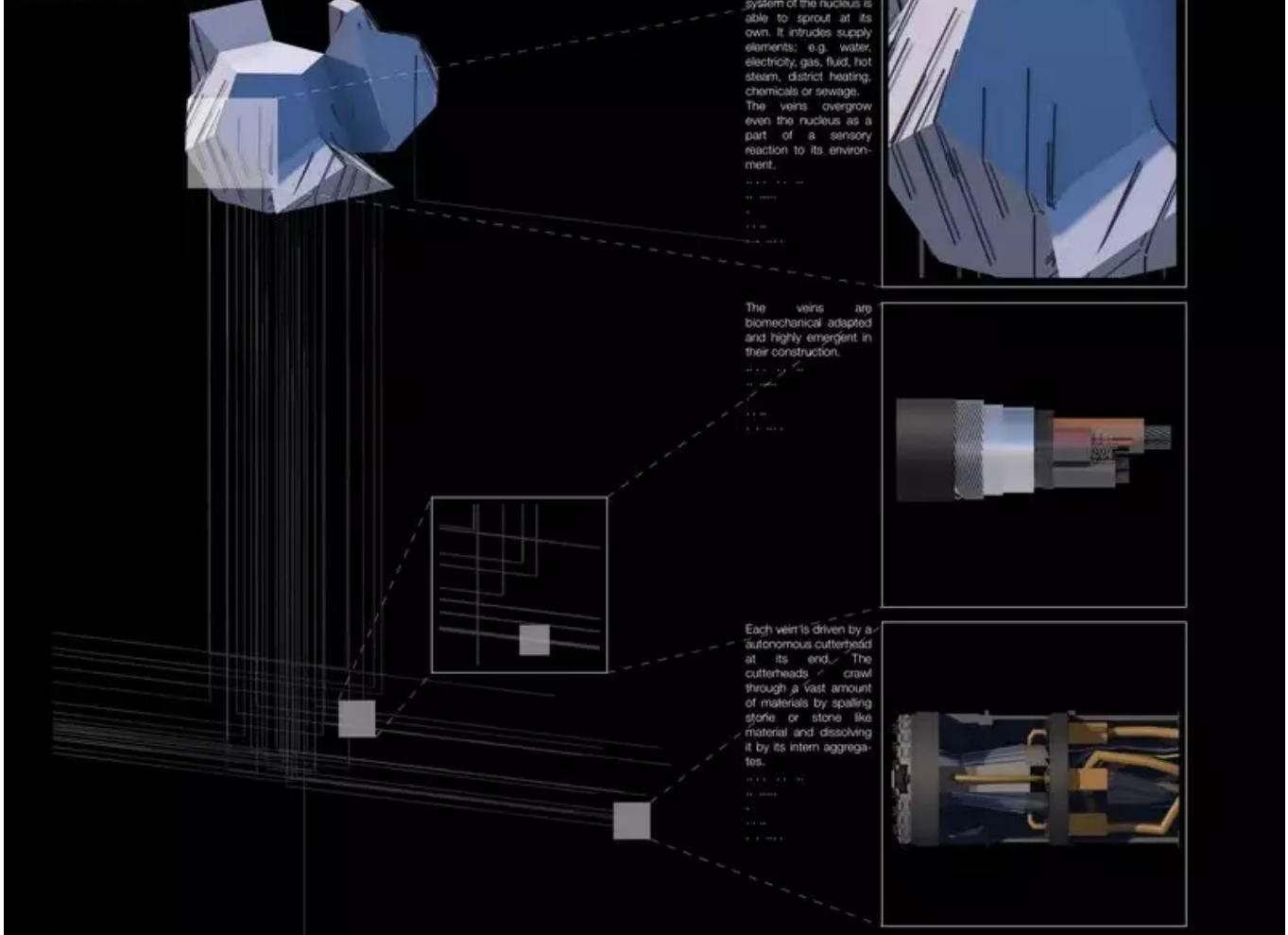
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__004_01 NOURISHMENT_NETWORKING



The biomechanical-ven system of the nucleus is able to sprout at its own. It intrudes supply elements; e.g. water, electricity, gas, fluid, hot steam, district heating, chemicals or sewage. The veins overgrow even the nucleus as a part of a sensory reaction to its environment.

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The veins are biomechanical adapted and highly emergent in their construction.

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Each vein is driven by a 'autonomous cutterhead' at its end. The cutterheads crawl through a vast amount of materials by spalling stone or stone like material and dissolving it by its intern aggregates.

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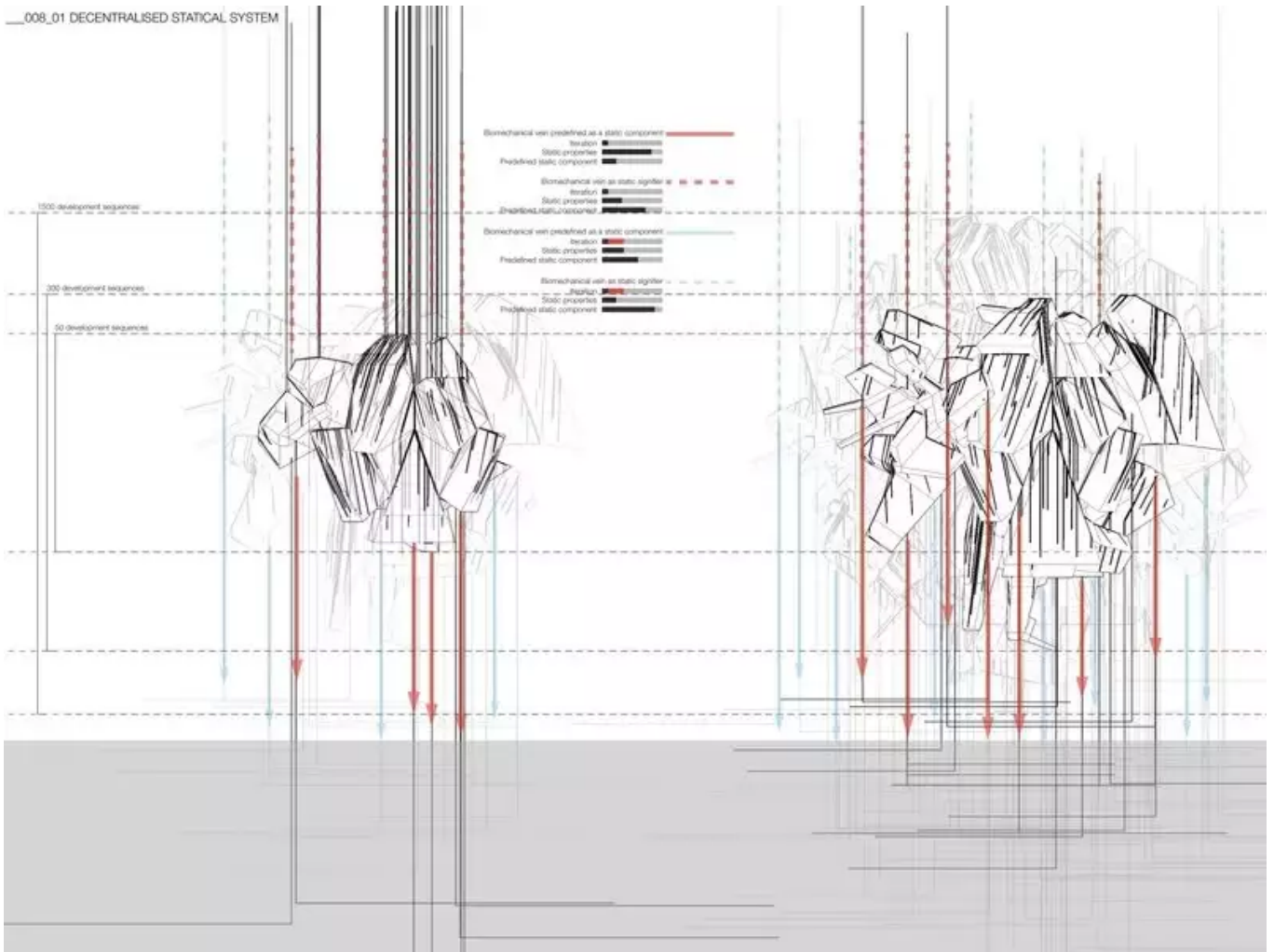
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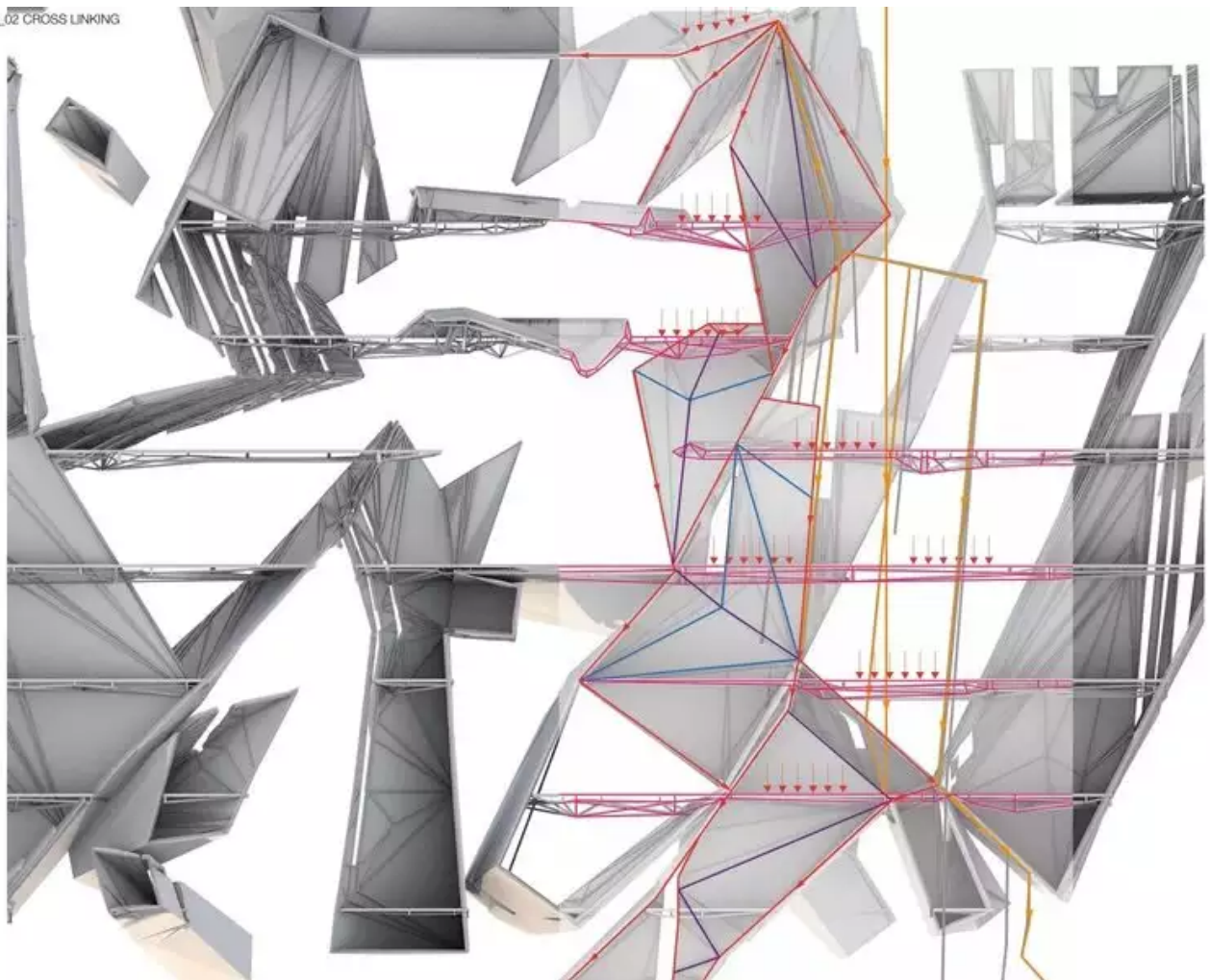
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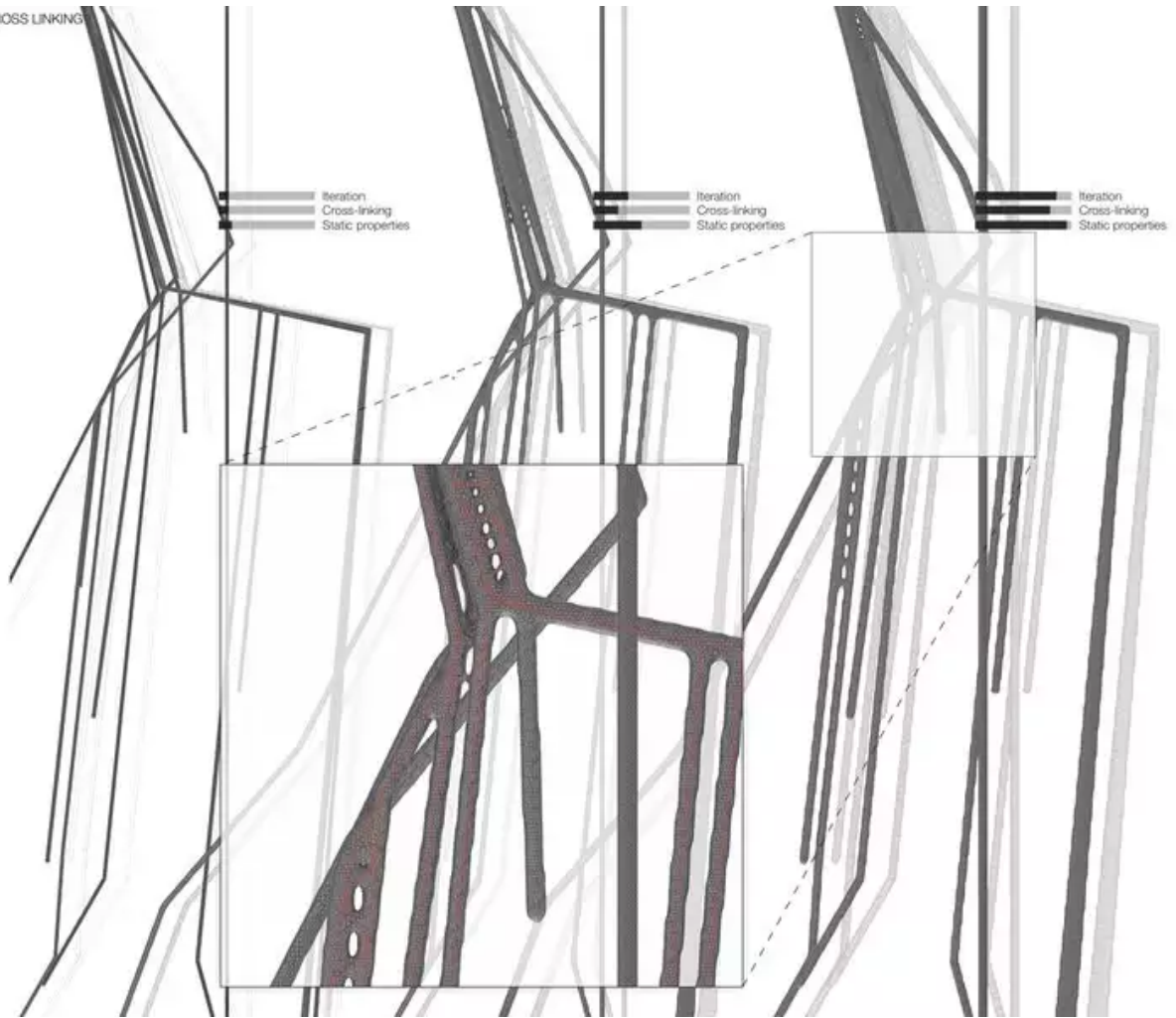
__008_01 DECENTRALISED STATICAL SYSTEM



__008_02 CROSS LINKING



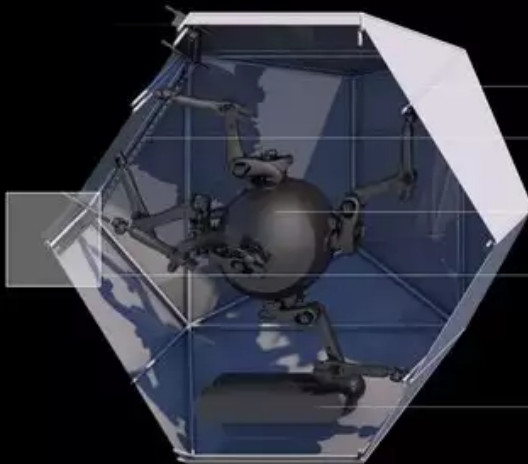
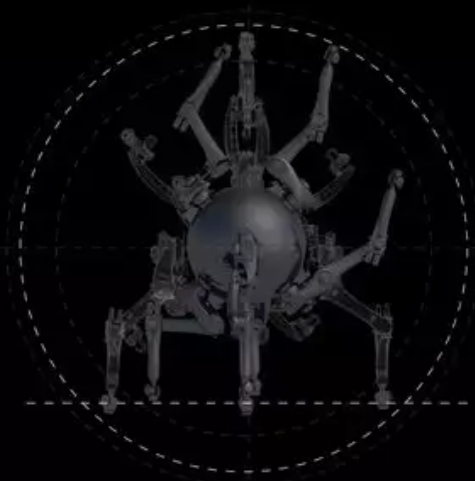
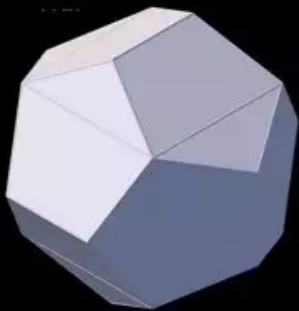
__008_02 CROSS LINKING



_005 AUTOMATA

Initial nucleus outside. The structure is a multi layered shell with a compound structural frame.

SAGU (Spherical Autonomous Grab Unit) in mobile position. This unit is placed inside the nucleus and drives a main part of the mechanical process during the nucleus development.



Multi layered shell

Biomechanical development unit

SAGU

Nourishment cache and reprocessing unit



__006 TAXIS

The biomechanical organism could be told as a digital Taxis. The nucleus responds to several stimulus from the outside and tries to arrange or move itself in reference to this stimuli.

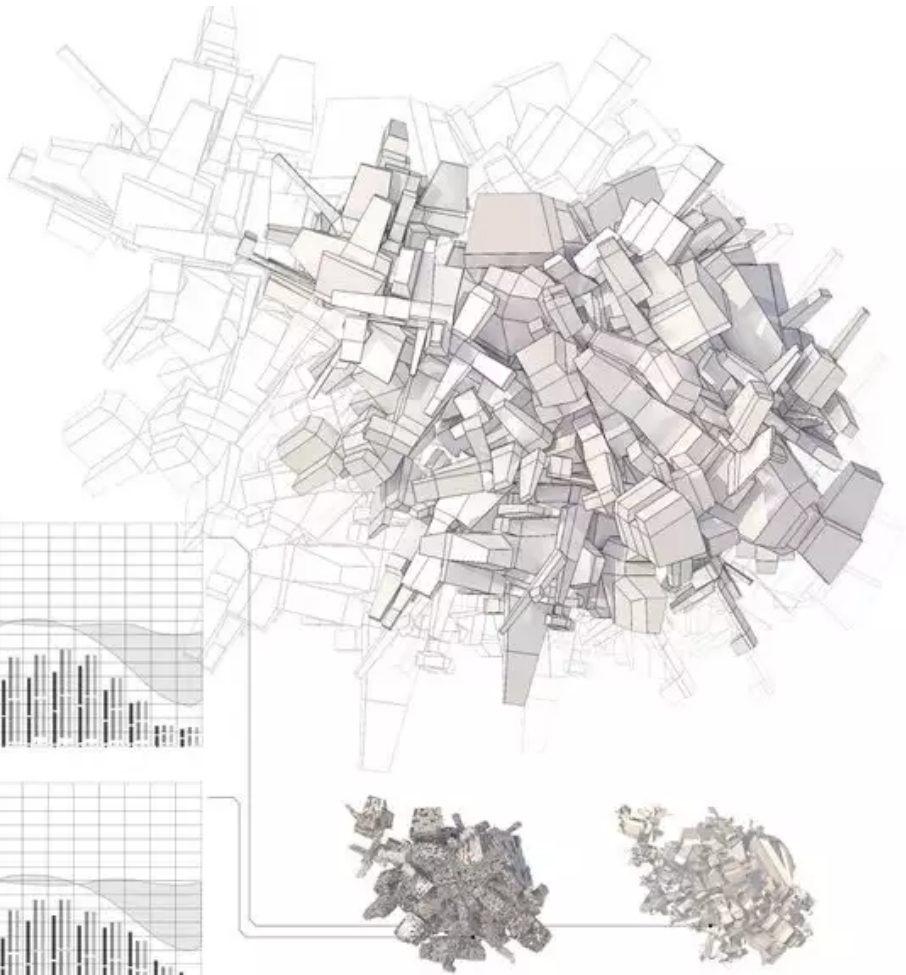
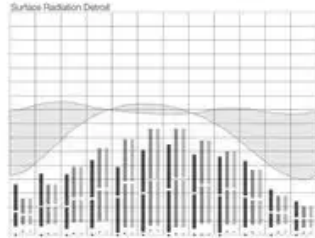
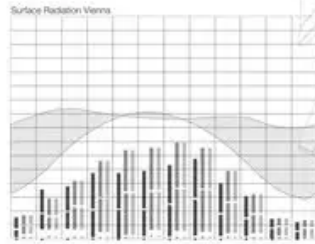
Starting with the first iteration of its development process the nucleus and furthermore the organism scans and recognizes its environment it is set in. Based on this parameters the SAGU controls the development in a decent direction and with a decent shape. During the development process there is always a loop between feeding the nucleus unit with information from the outside and the outcome of the growing process. The loop could be told as a closed loop because every change in information causes a change in the growing process.

This behavior allows the biomechanical organism to spread in a vast amount of environments and ensure a life friendly habitat in every surrounding condition.

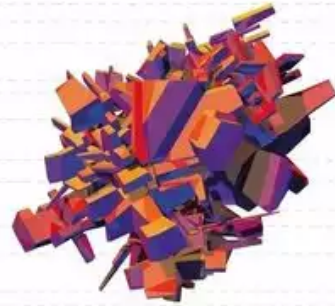
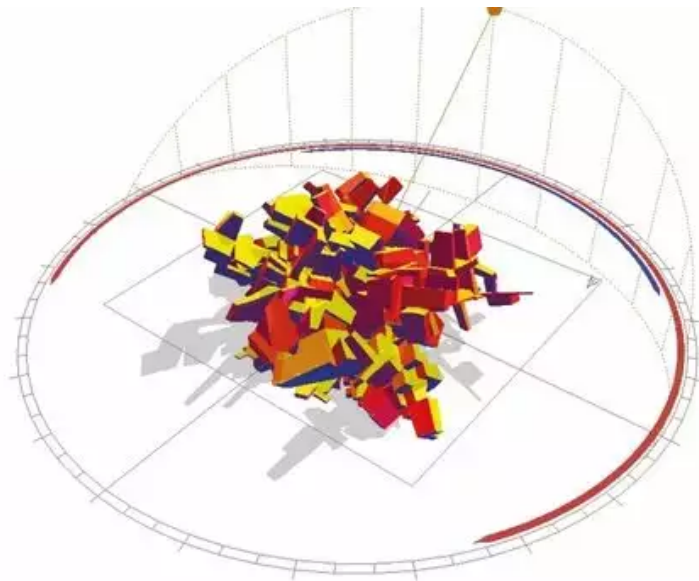
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Surface Radiation Input

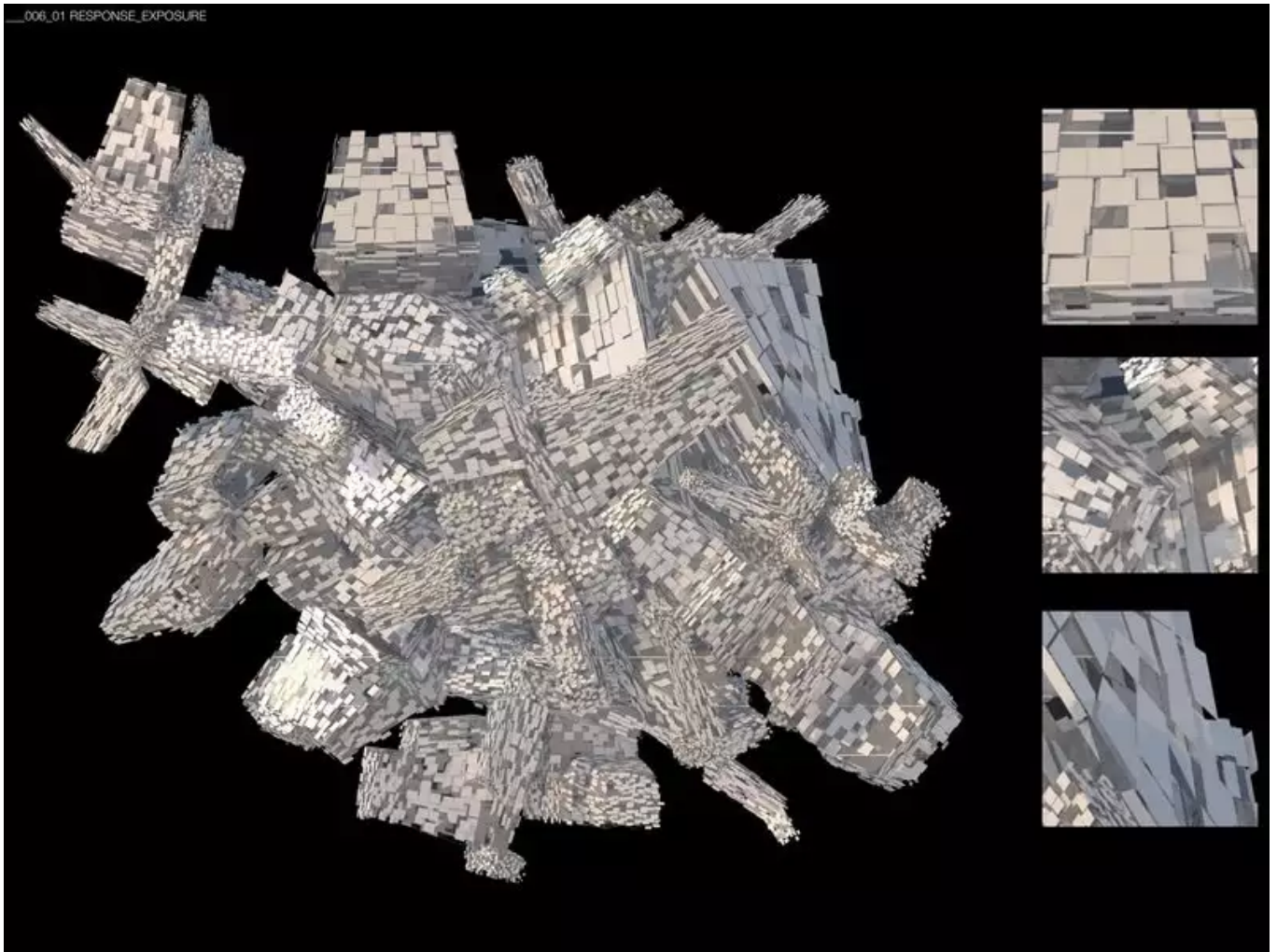
- Theoretical
- Direct Normal
- Global Horizontal
- Total Surface
- Average High
- Mean
- Average Low



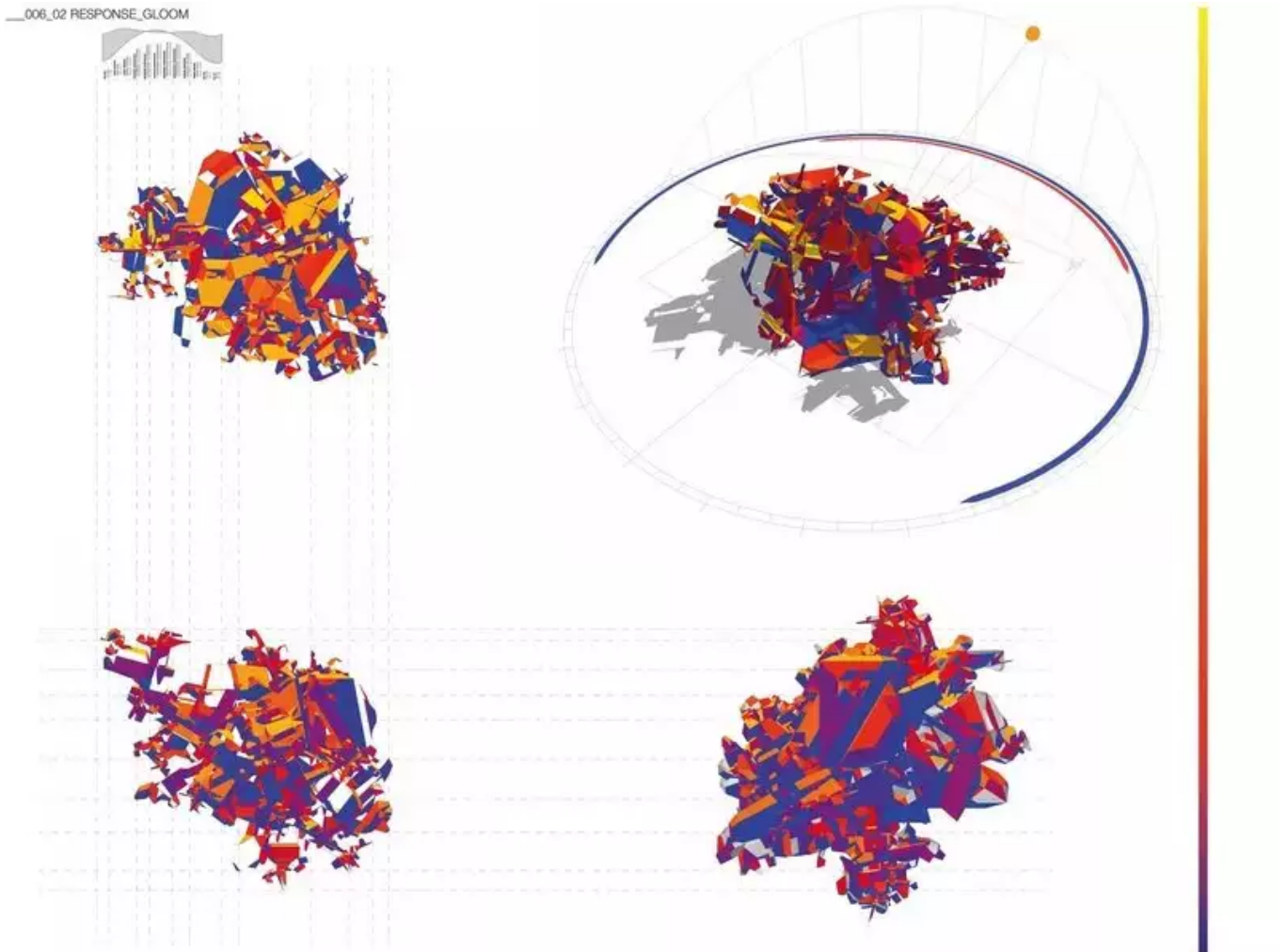
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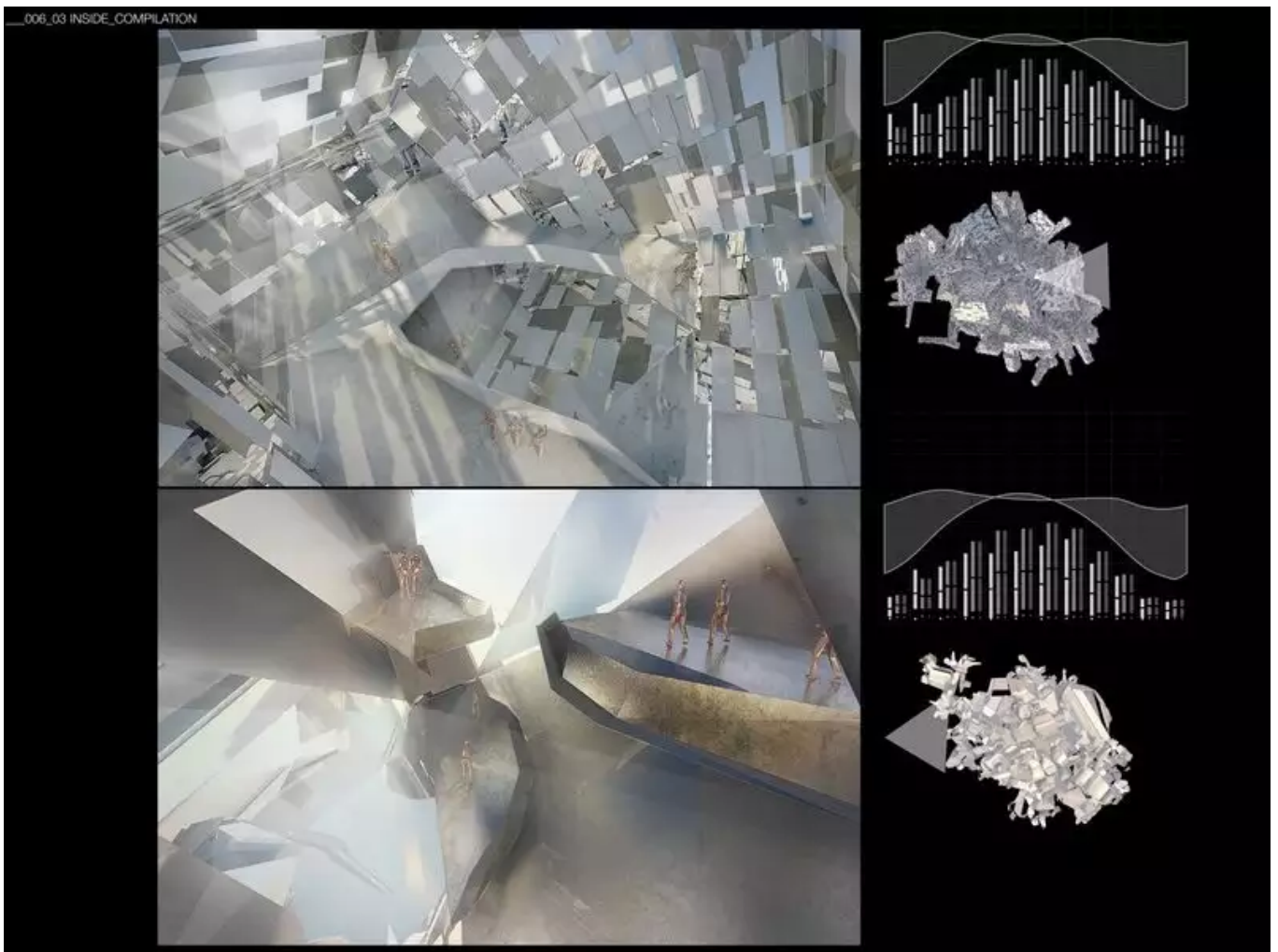
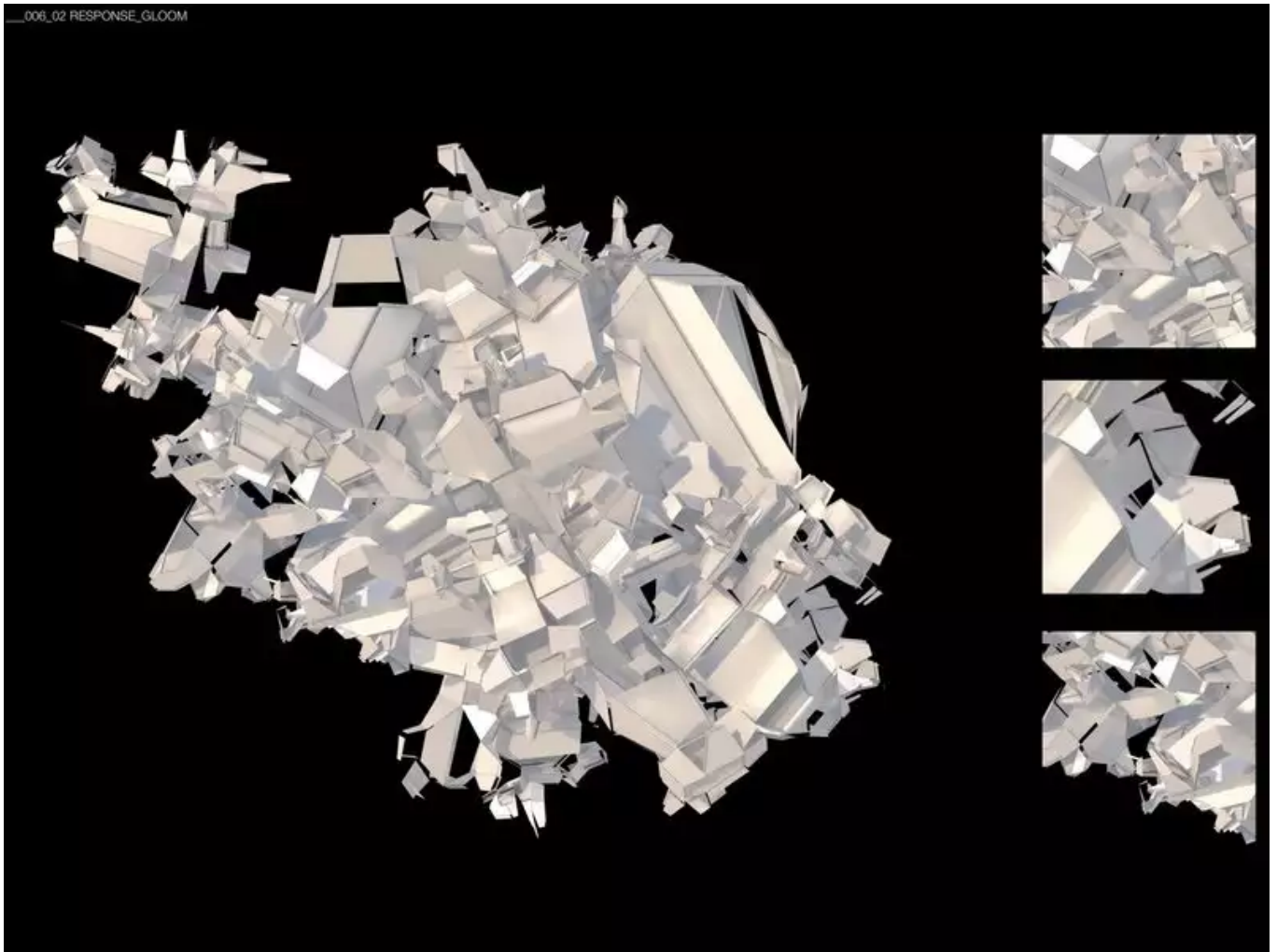


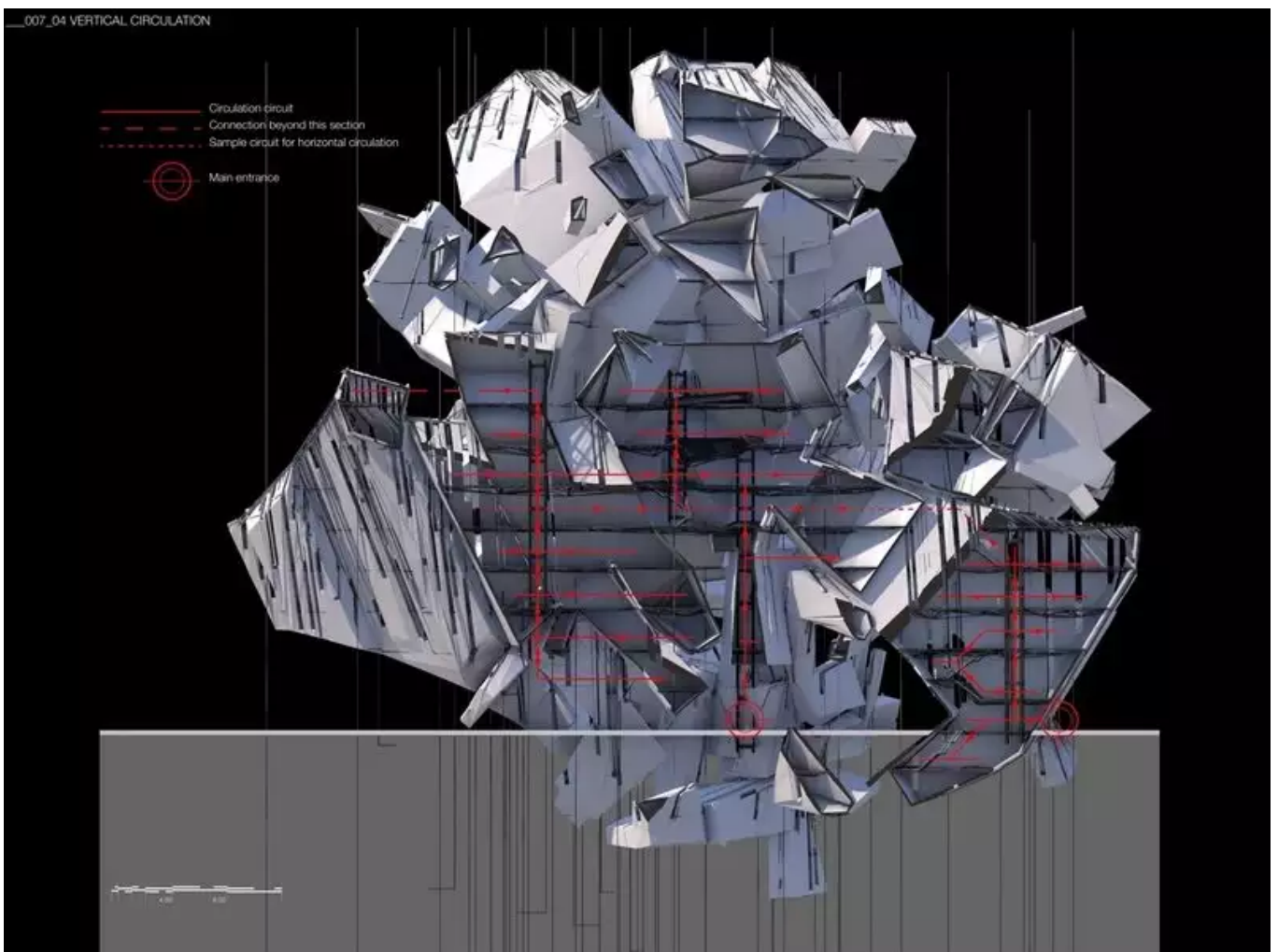
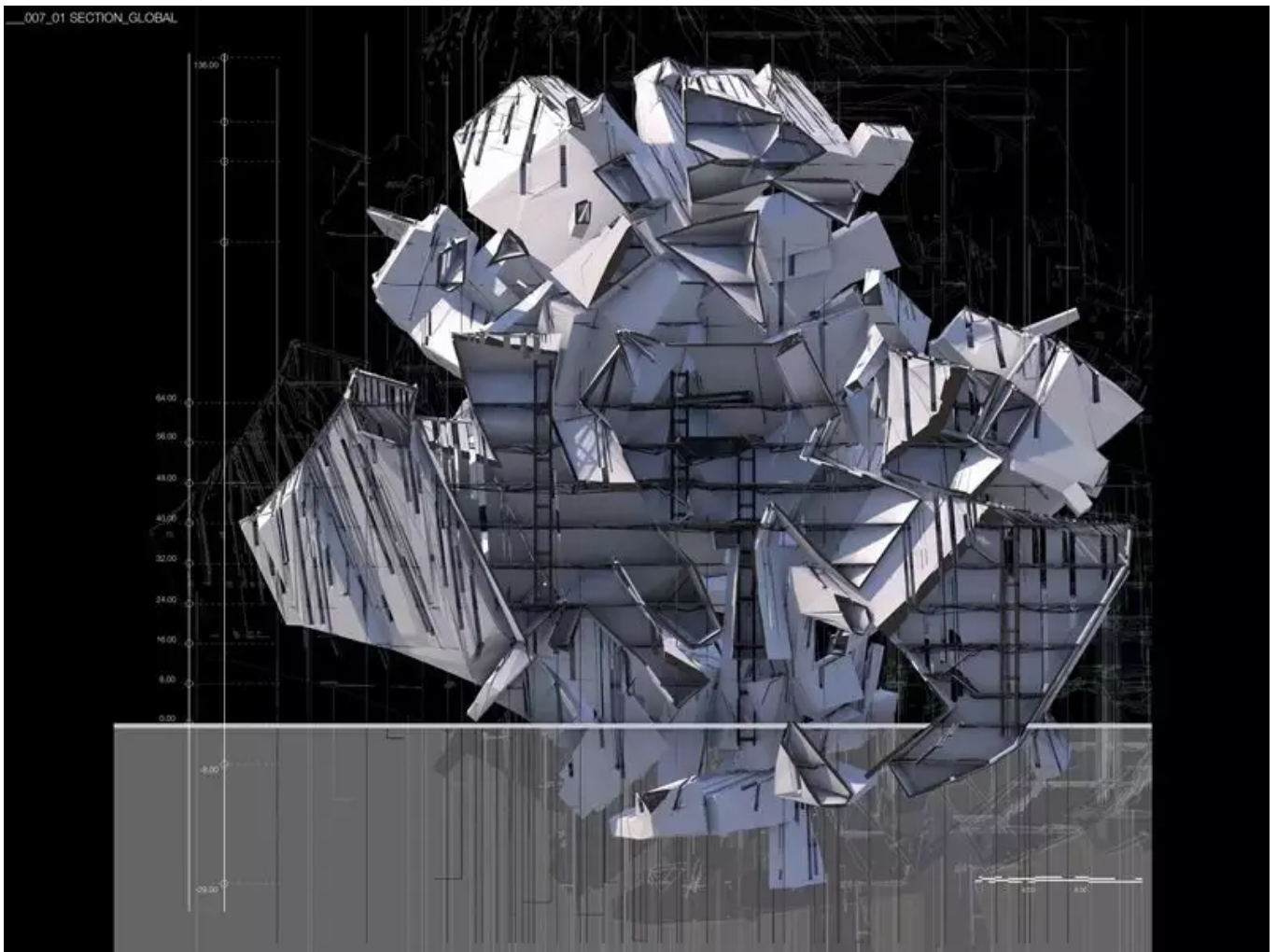
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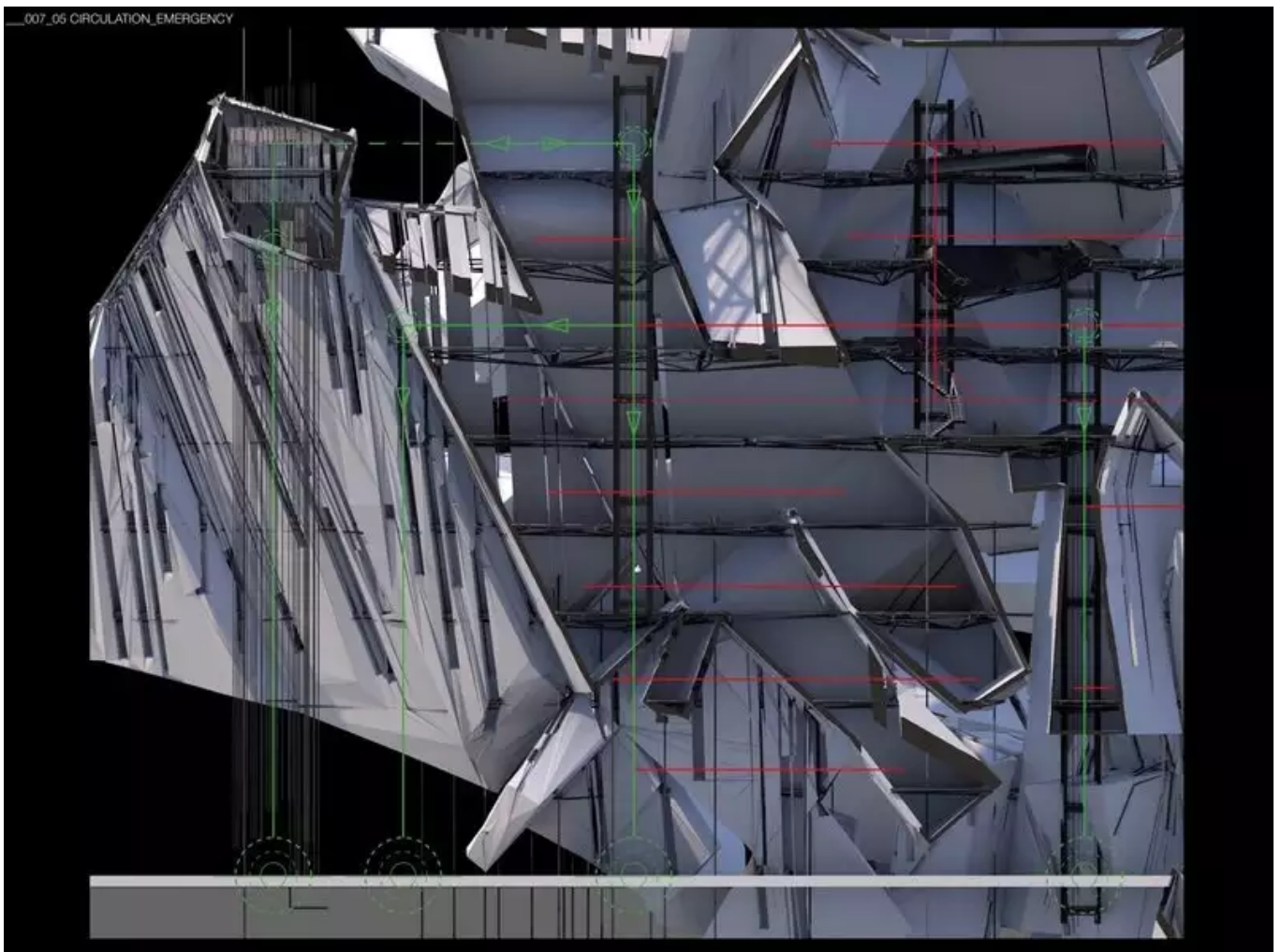
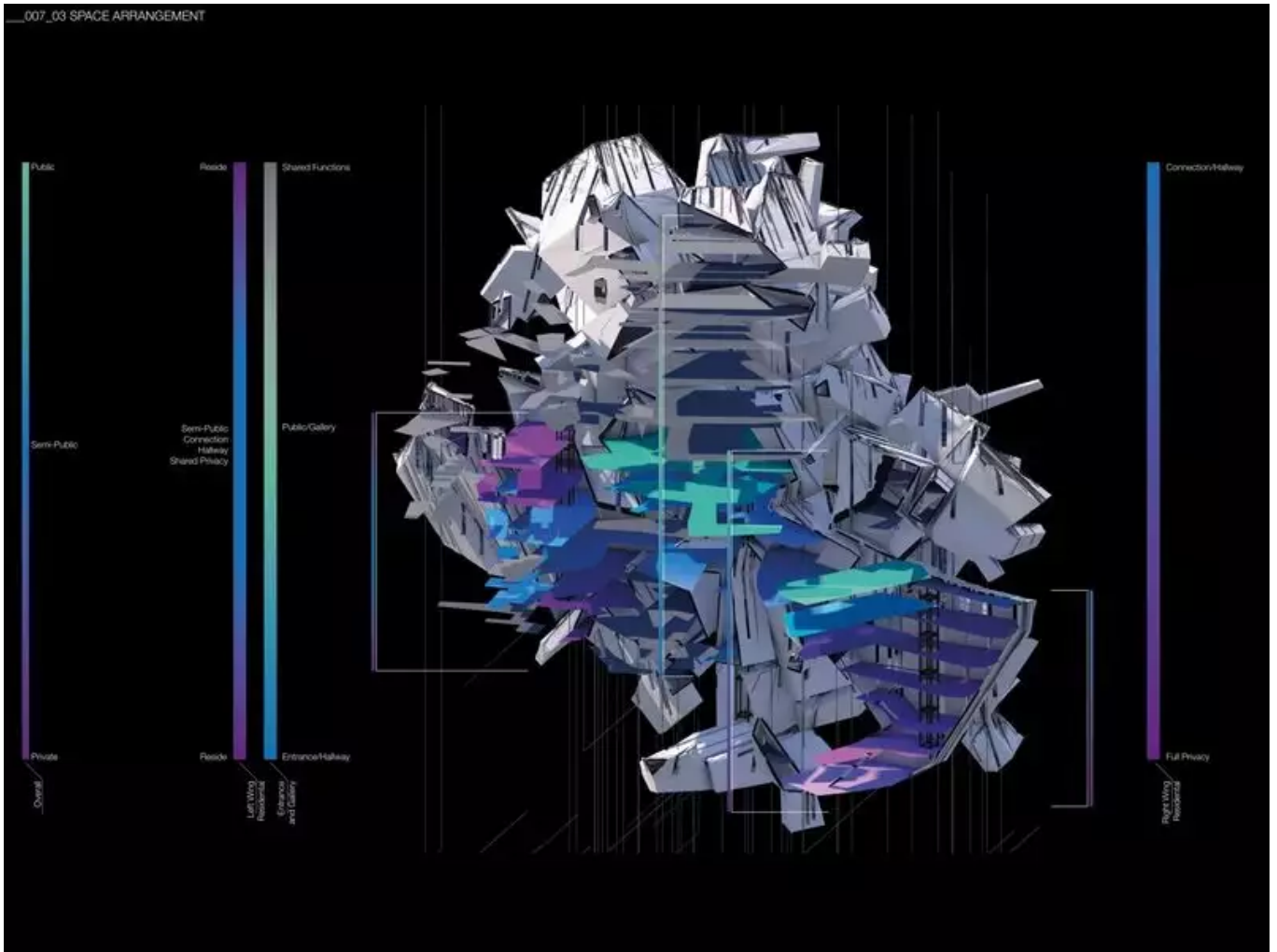


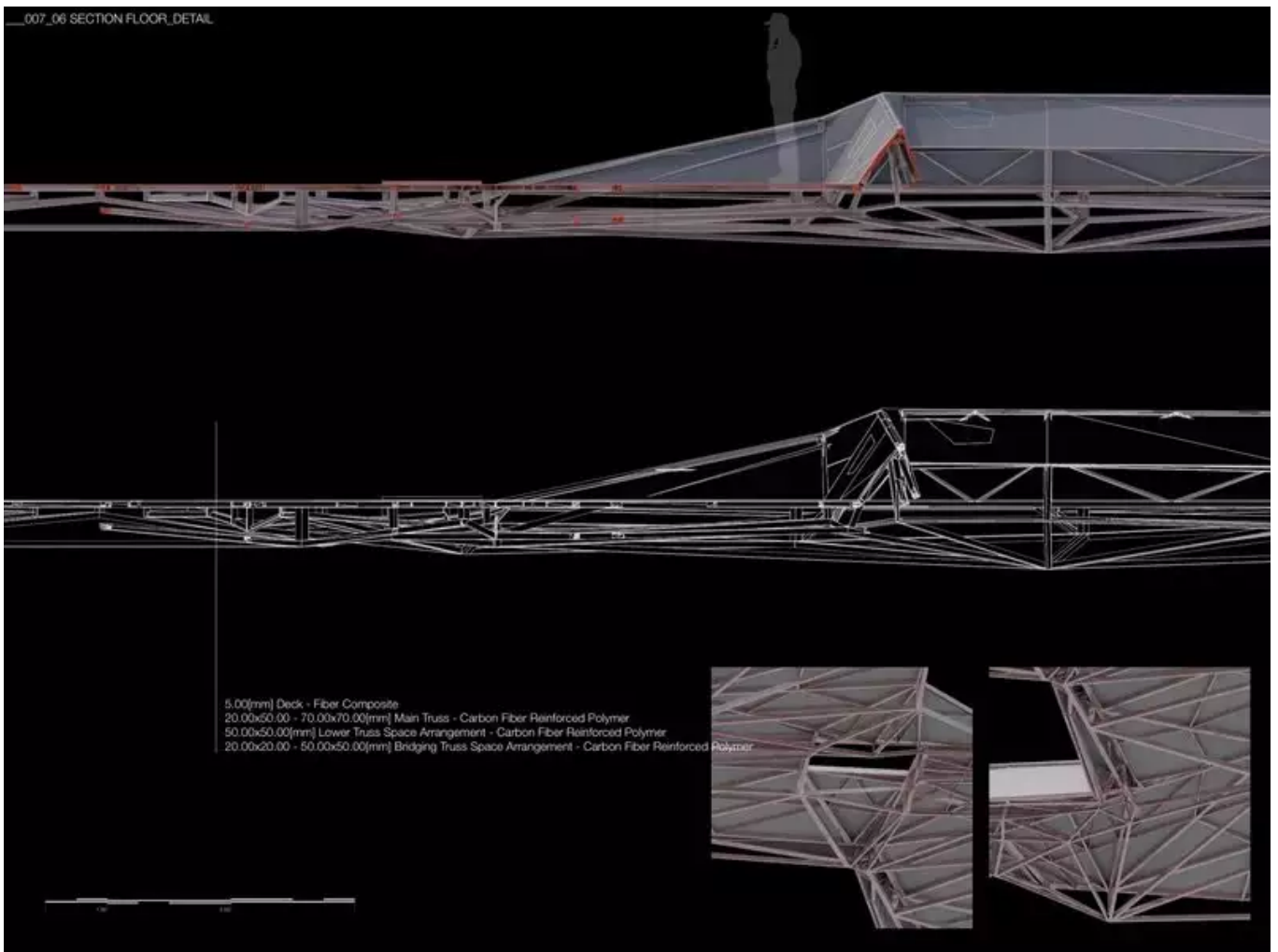
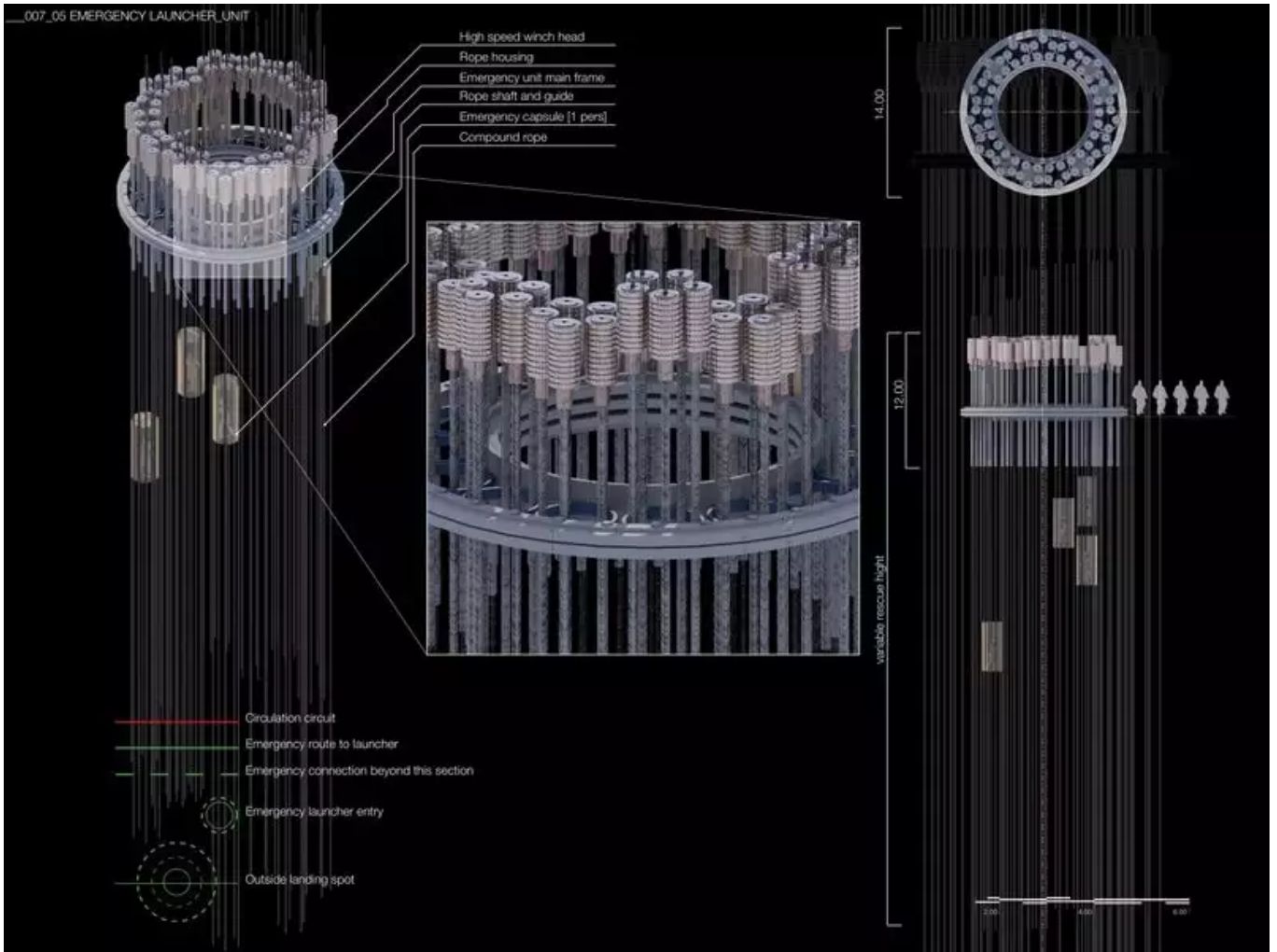
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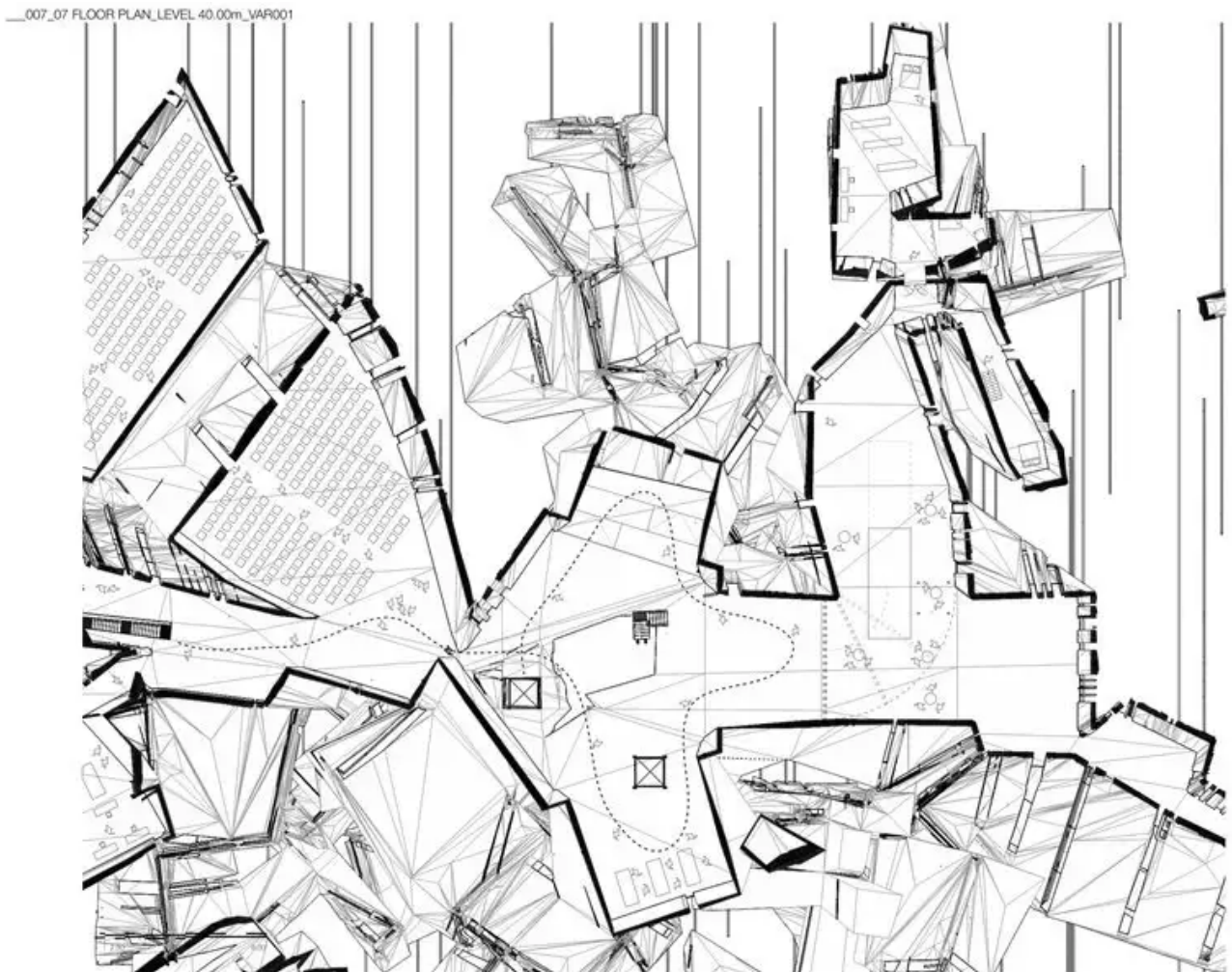
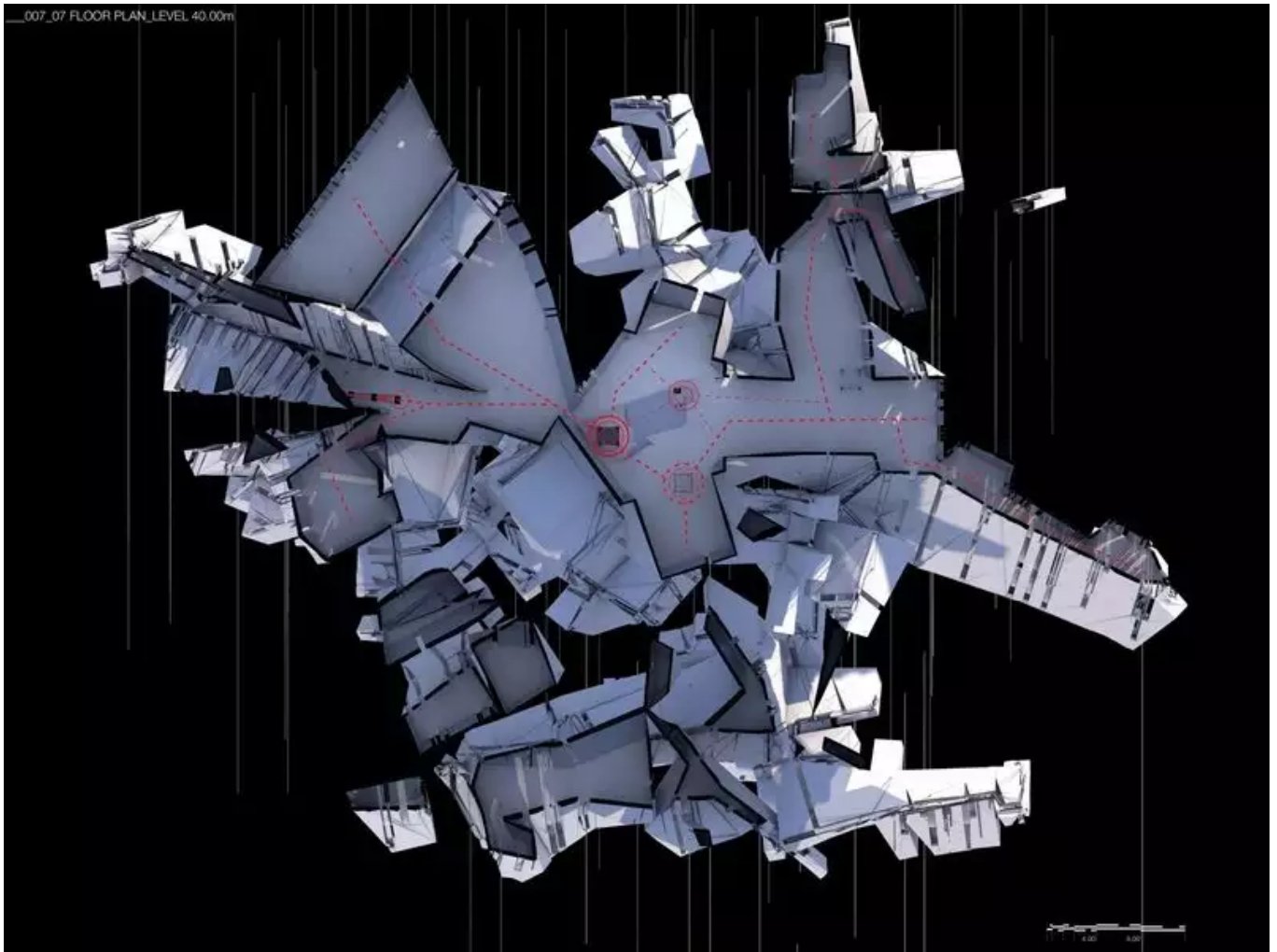








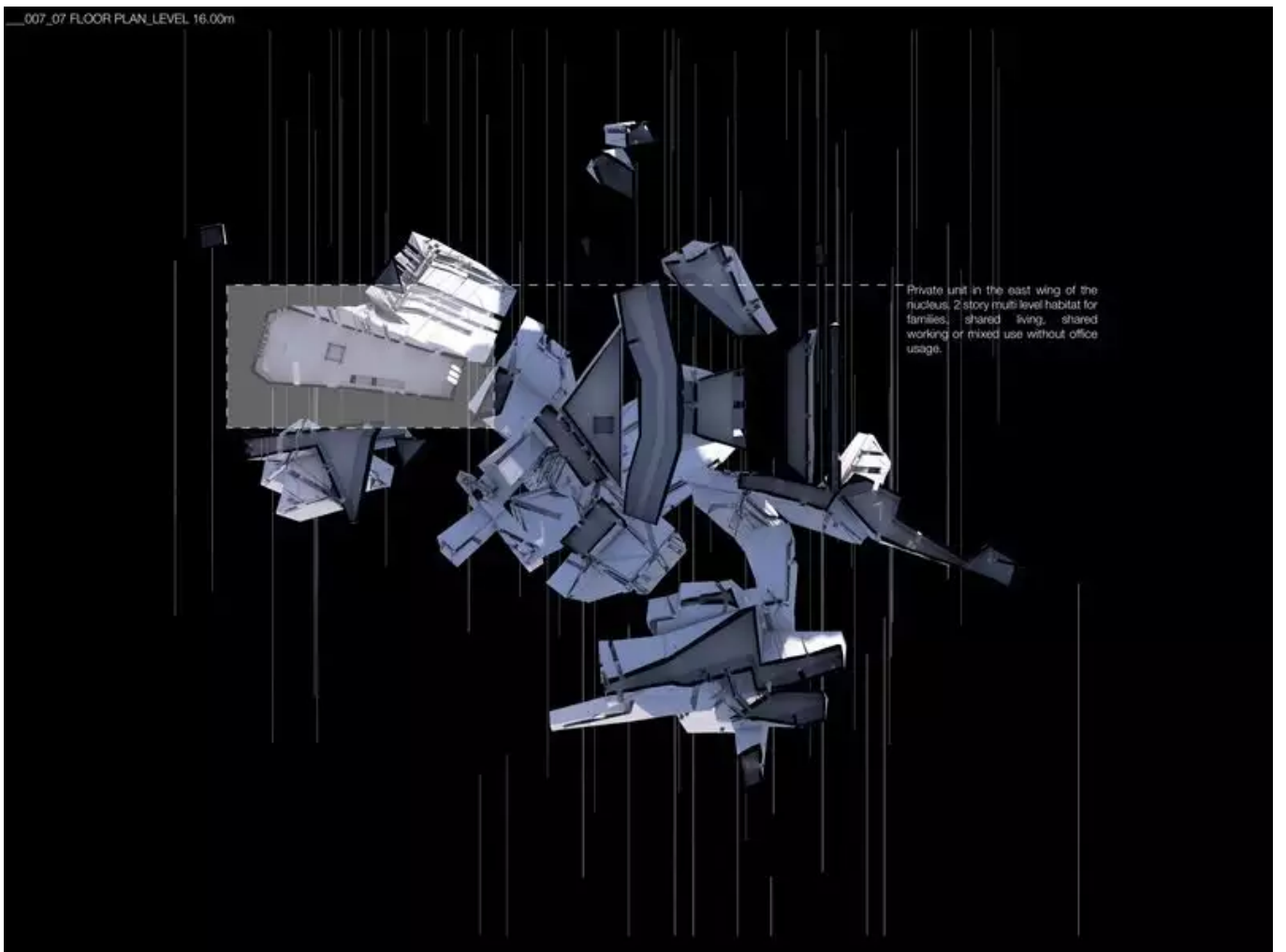




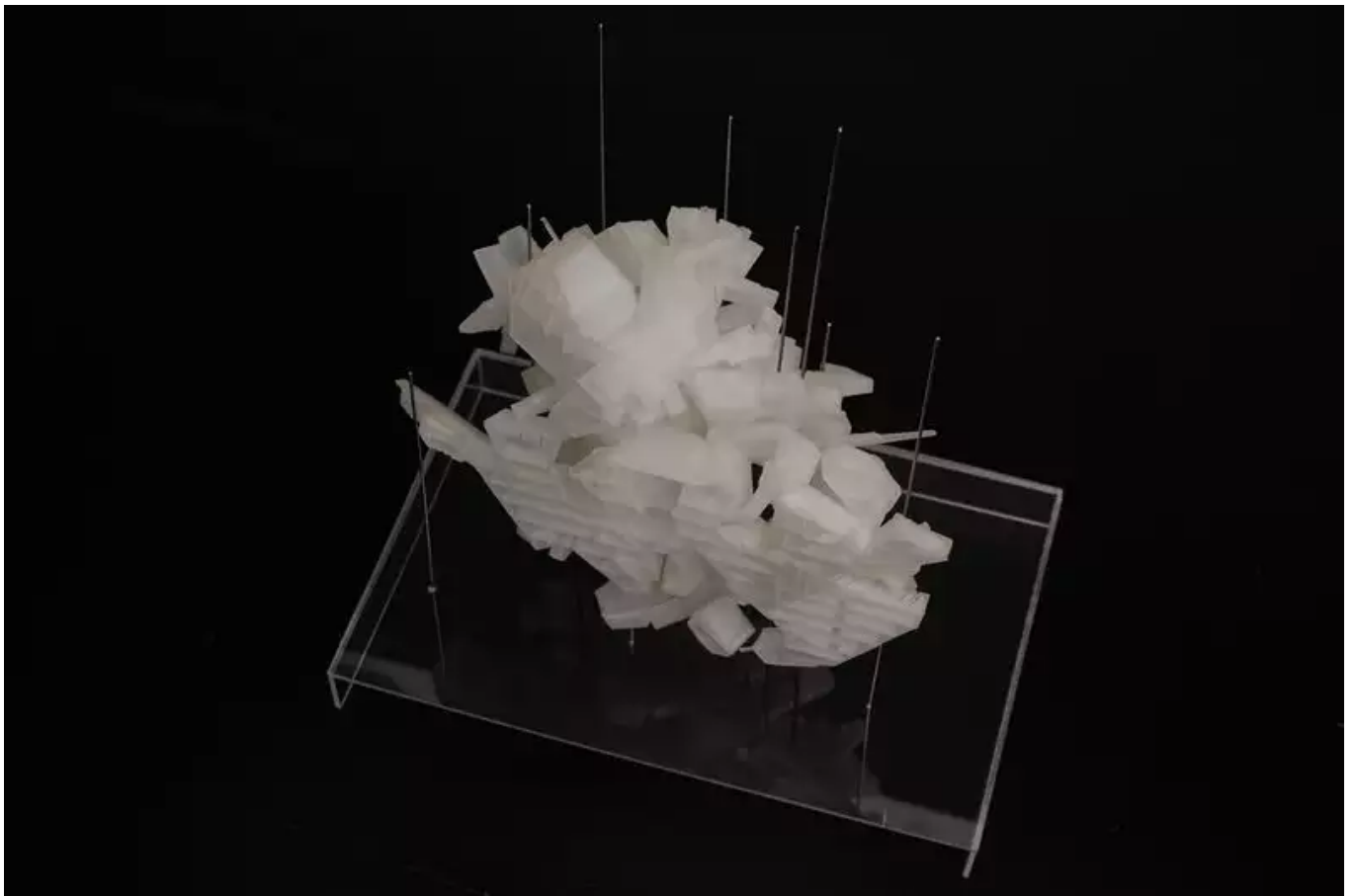
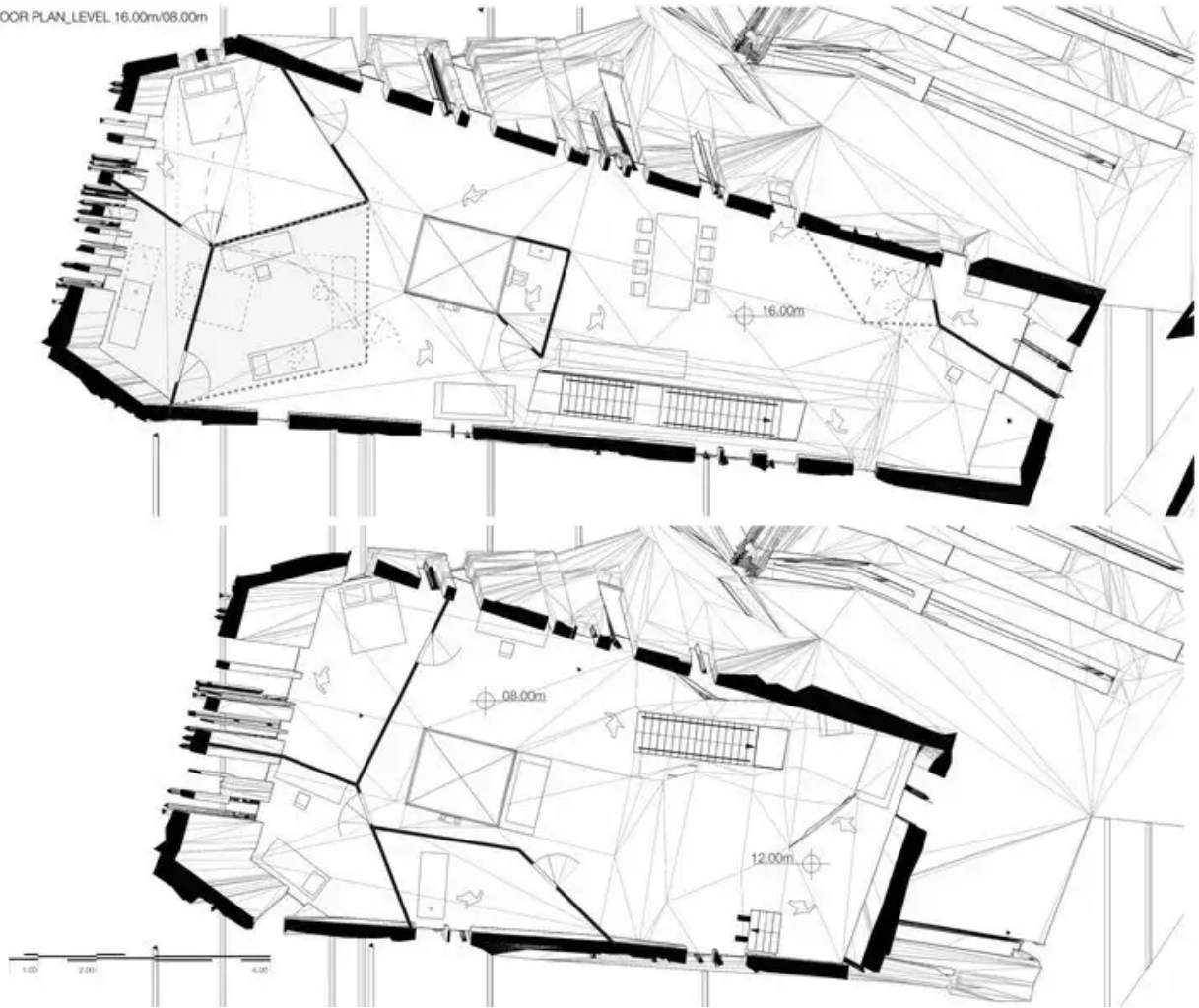
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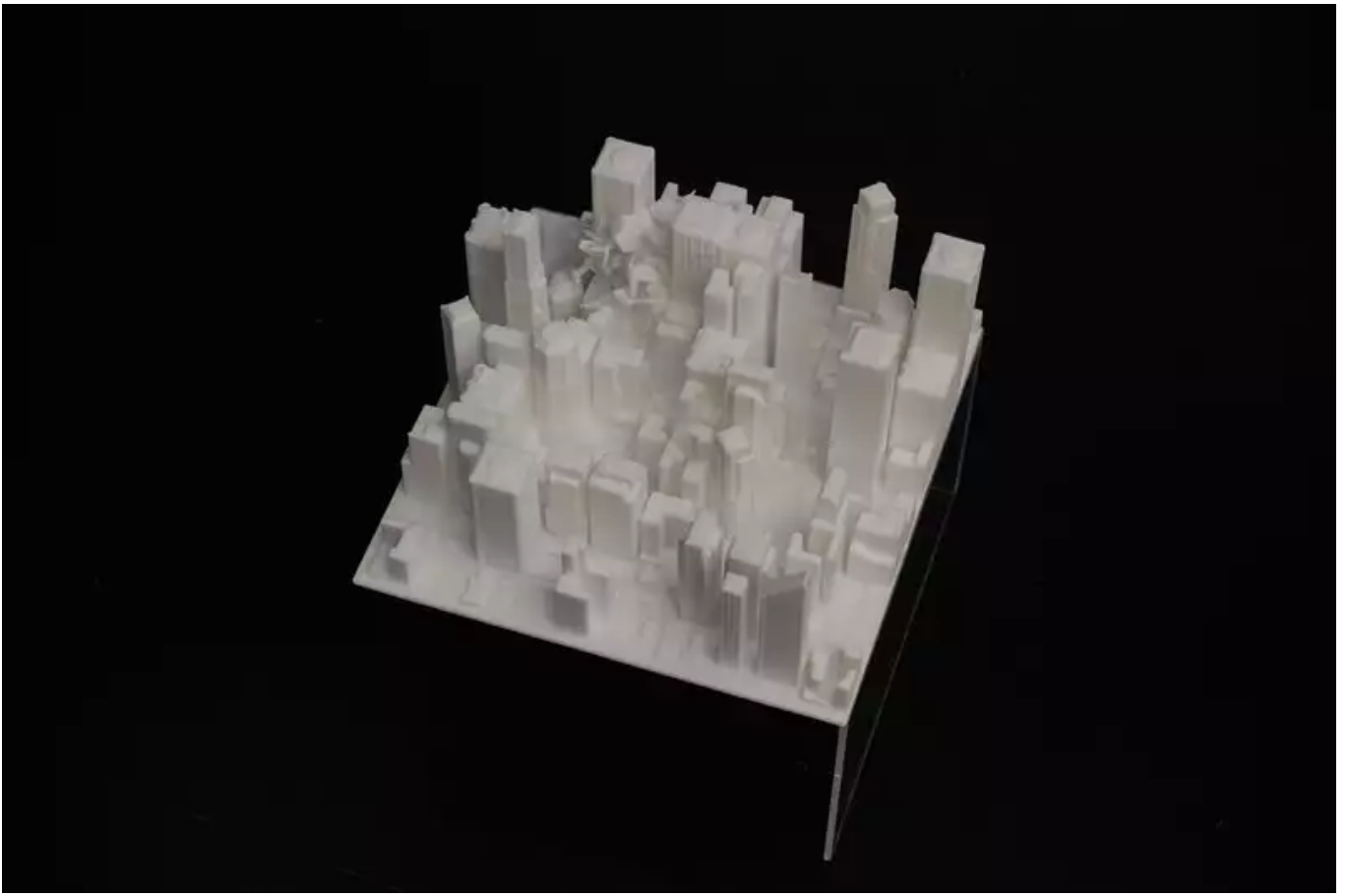


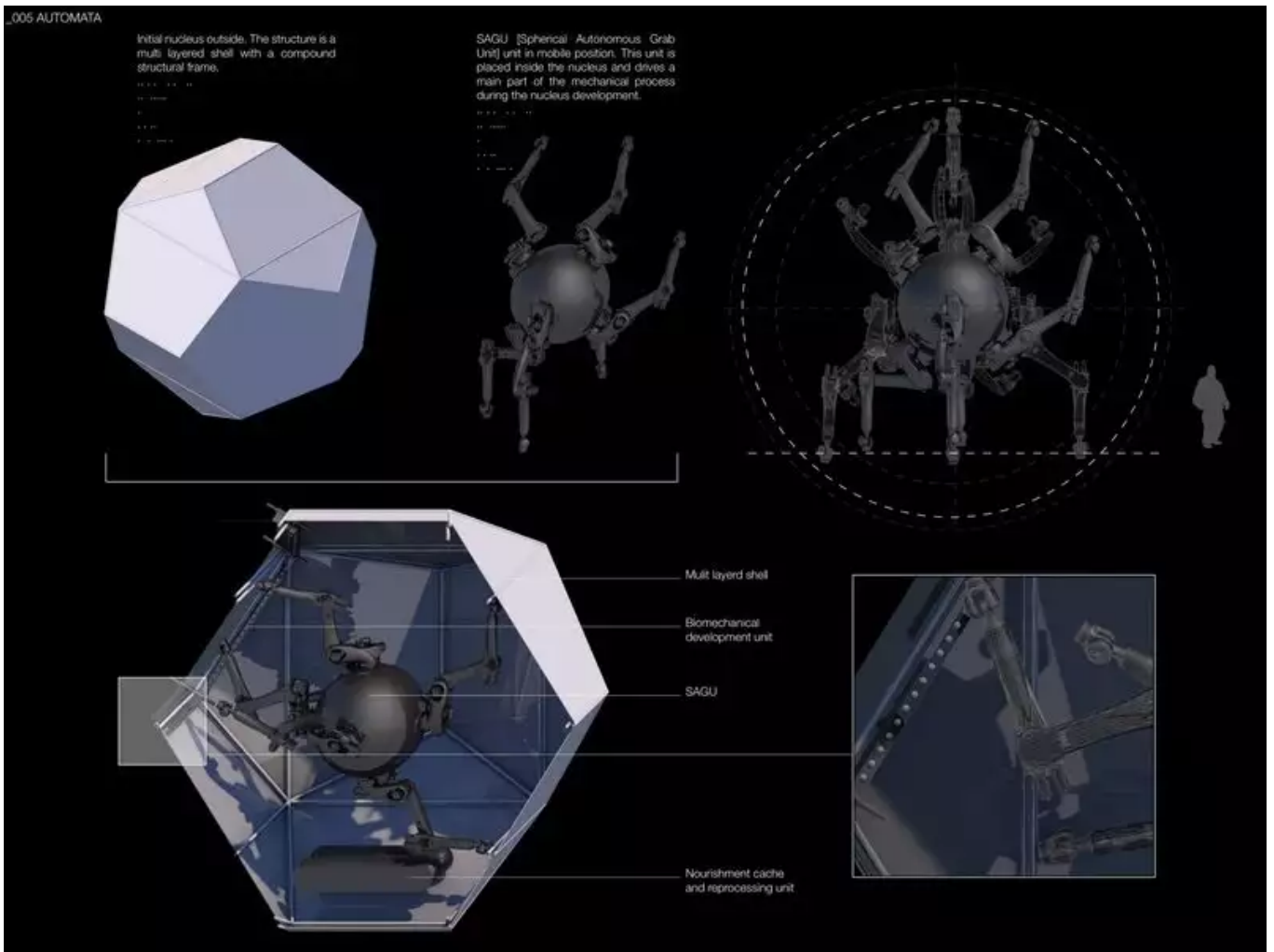
___007_07 FLOOR PLAN_LEVEL 16.00m



___007_07 FLOOR PLAN_LEVEL 16.00m/08.00m







📁 2015, Cuno Brullmann, Dörte Kuhlmann, Manfred Berthold, Project, TU Wien (Vienna University of Technology)

👤 ralf bliem, thesis

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