

# The Architecture-Nature Analogy

An Architectural Intervention in a New Babylonian Society

# The Architecture-Nature Analogy

An Architectural Intervention in a New Babylonian Society

Societal Background

Research Questions

Glasgebouw

Program

Functional Distribution

Morphogenesis

Structure

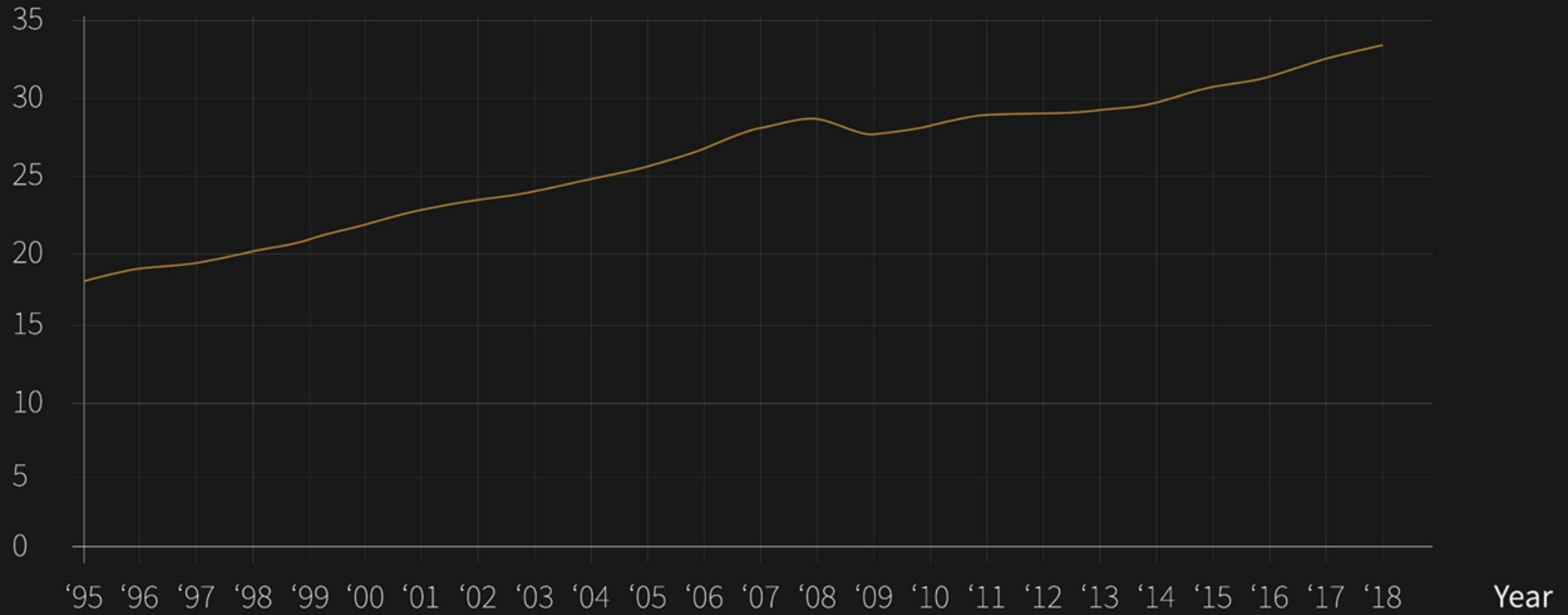
Climate

Construction

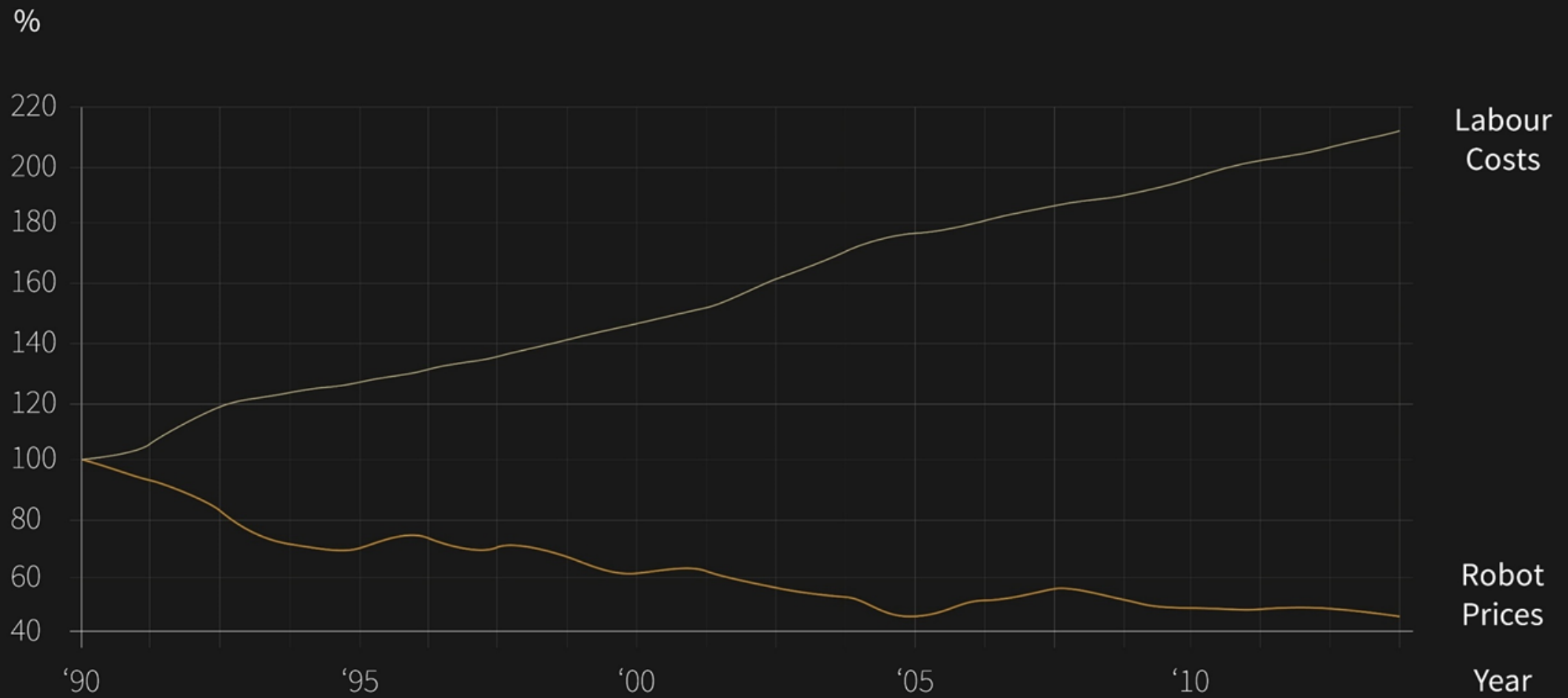
Node

Conclusion

GDP  
per capita  
x1000

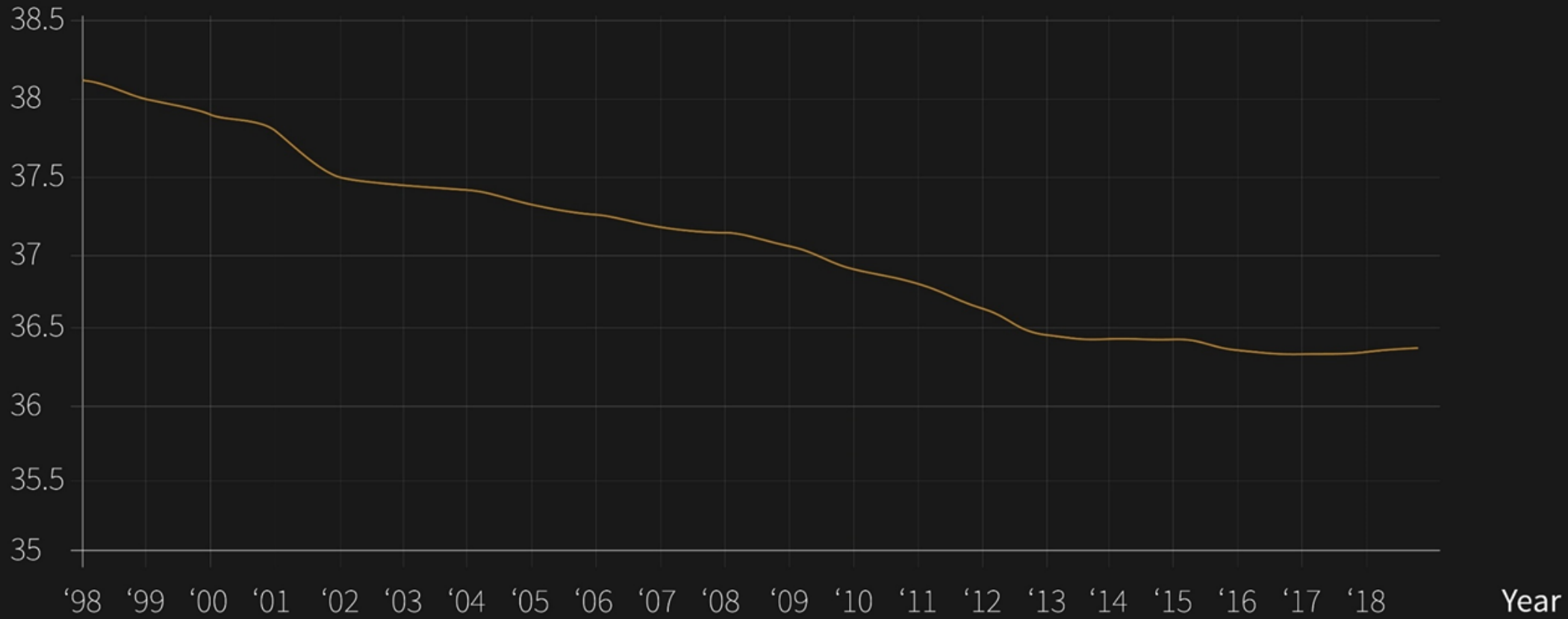


Source: Eurostat



*Source: McKinsey&Company, 2017*

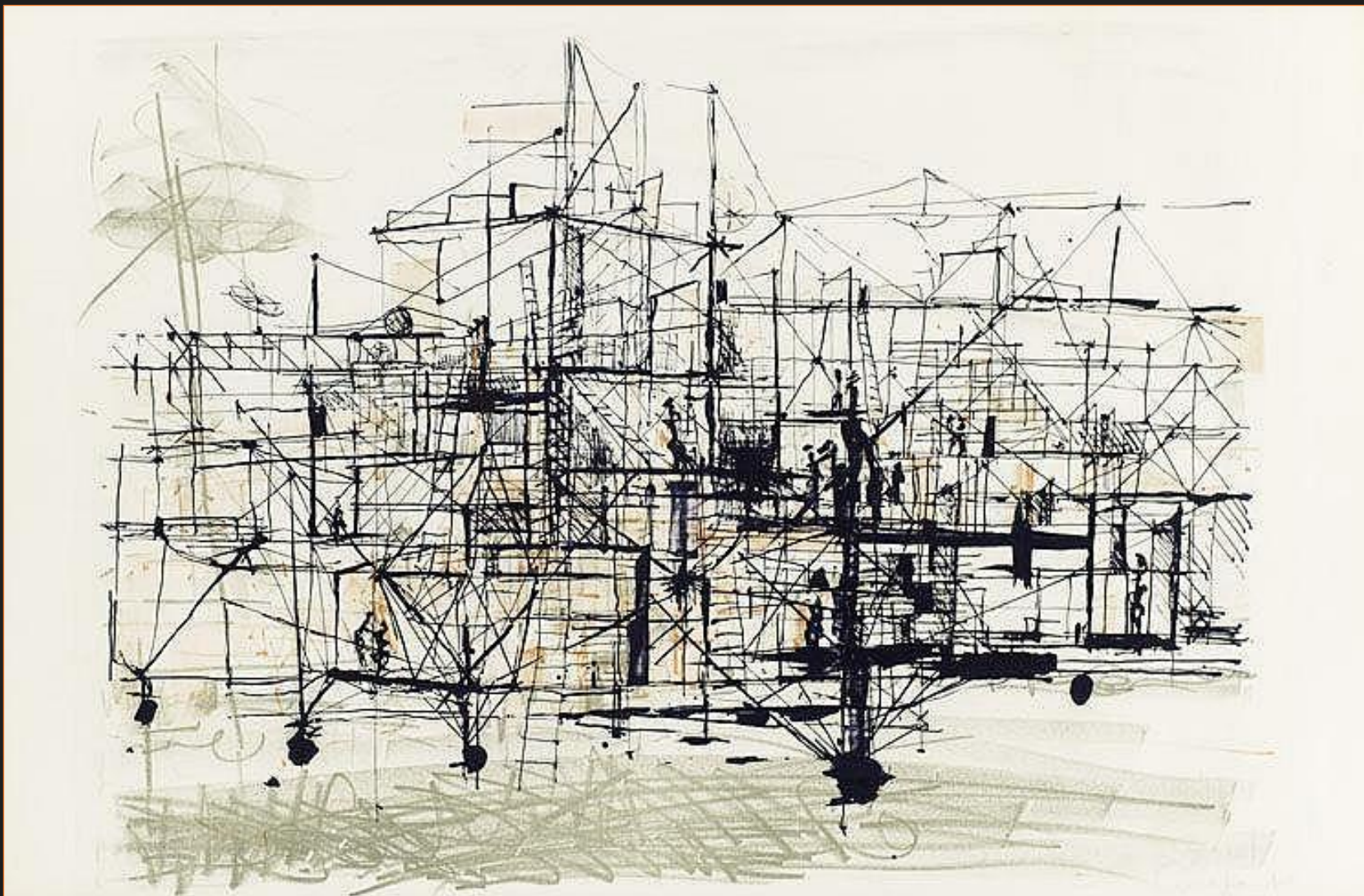
# Avg. Weekly Working Hours



Source: Eurostat

# New Babylon

Constant



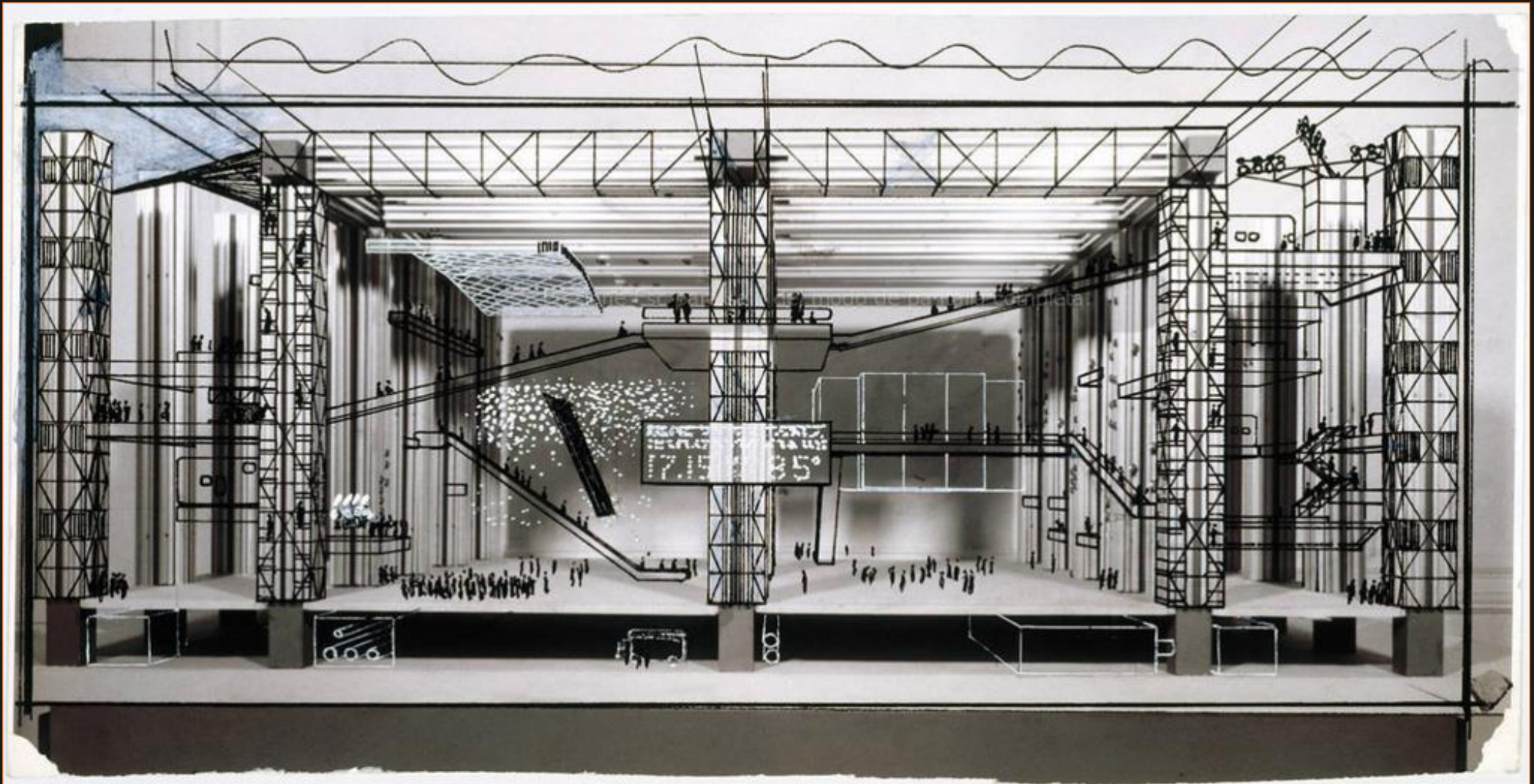
# New Babylon

Constant



# Fun Palace

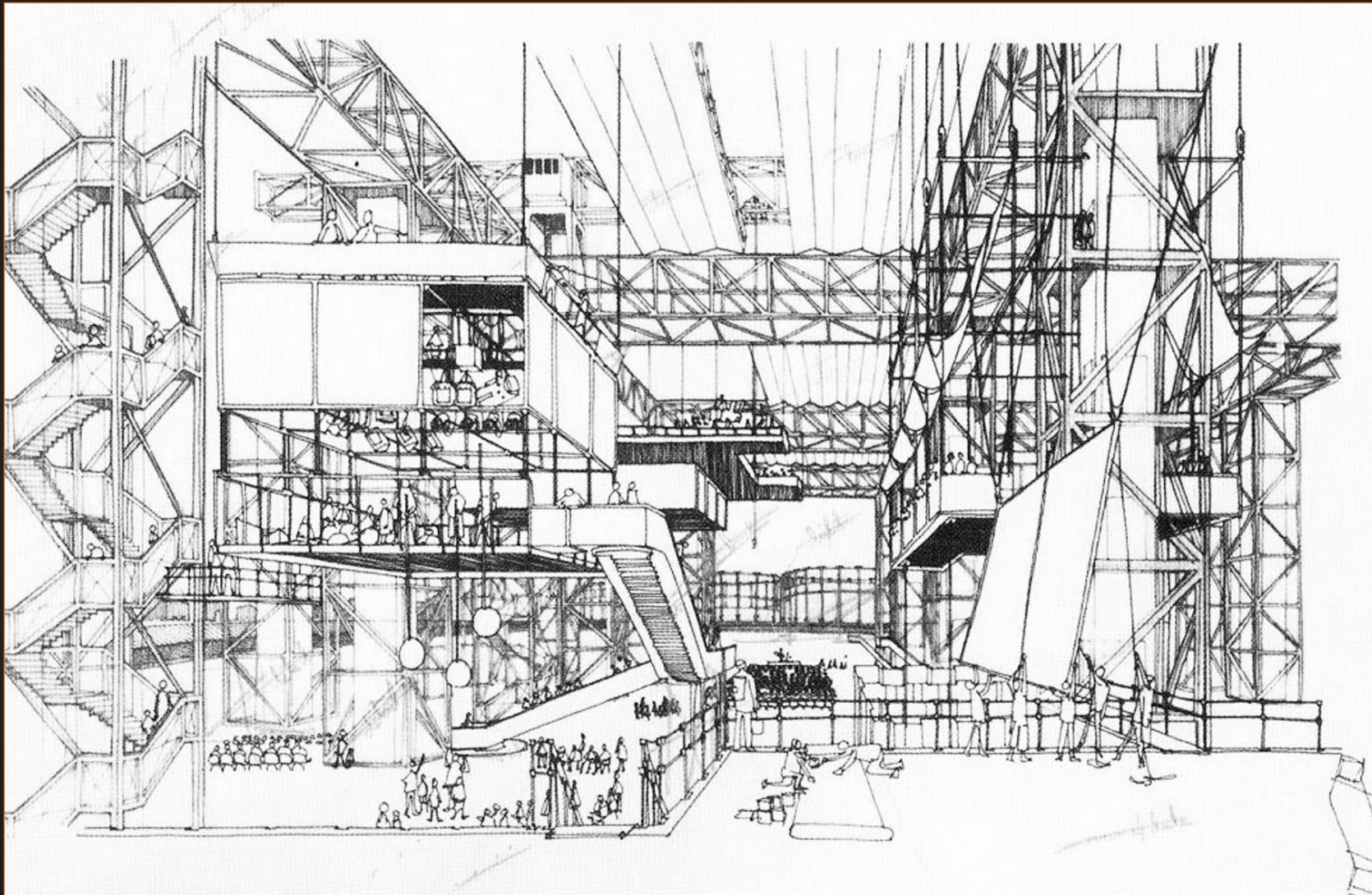
Cedric Price





# Fun Palace

Cedric Price



# Research Question

Design

How can an architectural intervention transform an existing building in order to integrate in such new kind of society?

# Research Question

Research

How can certain natural processes be abstracted and translated in simple rules in order to use them in computational tools in the design process?

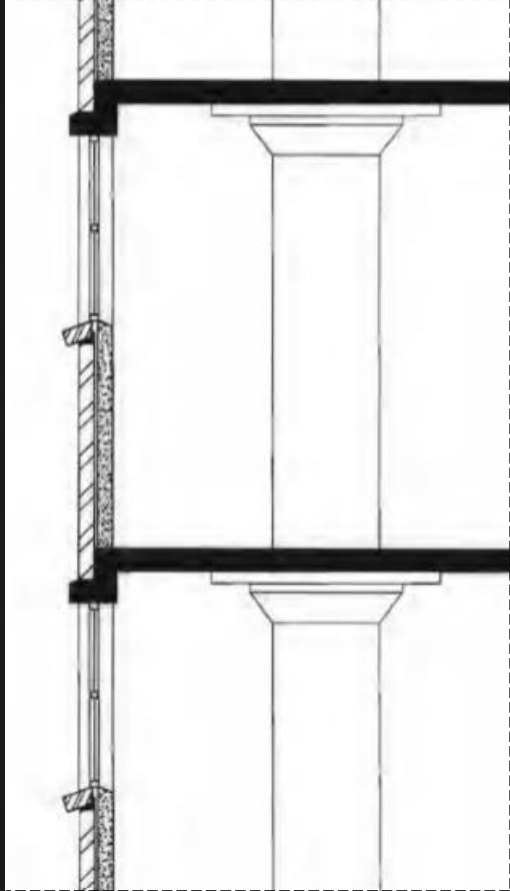
# Glasebouw

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Strijp S - Eindhoven







Societal Background

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**Glasebouw**

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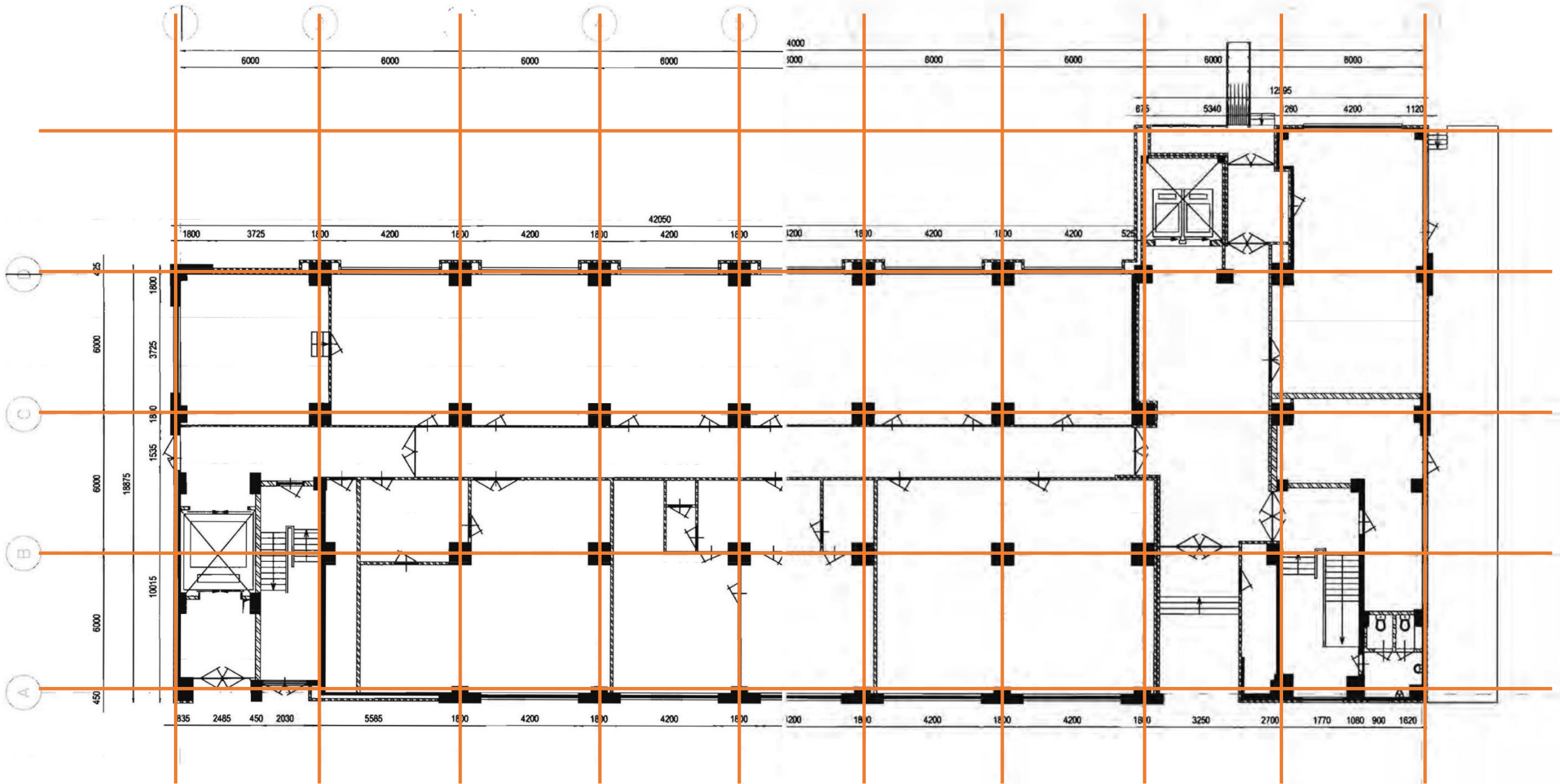
Structure

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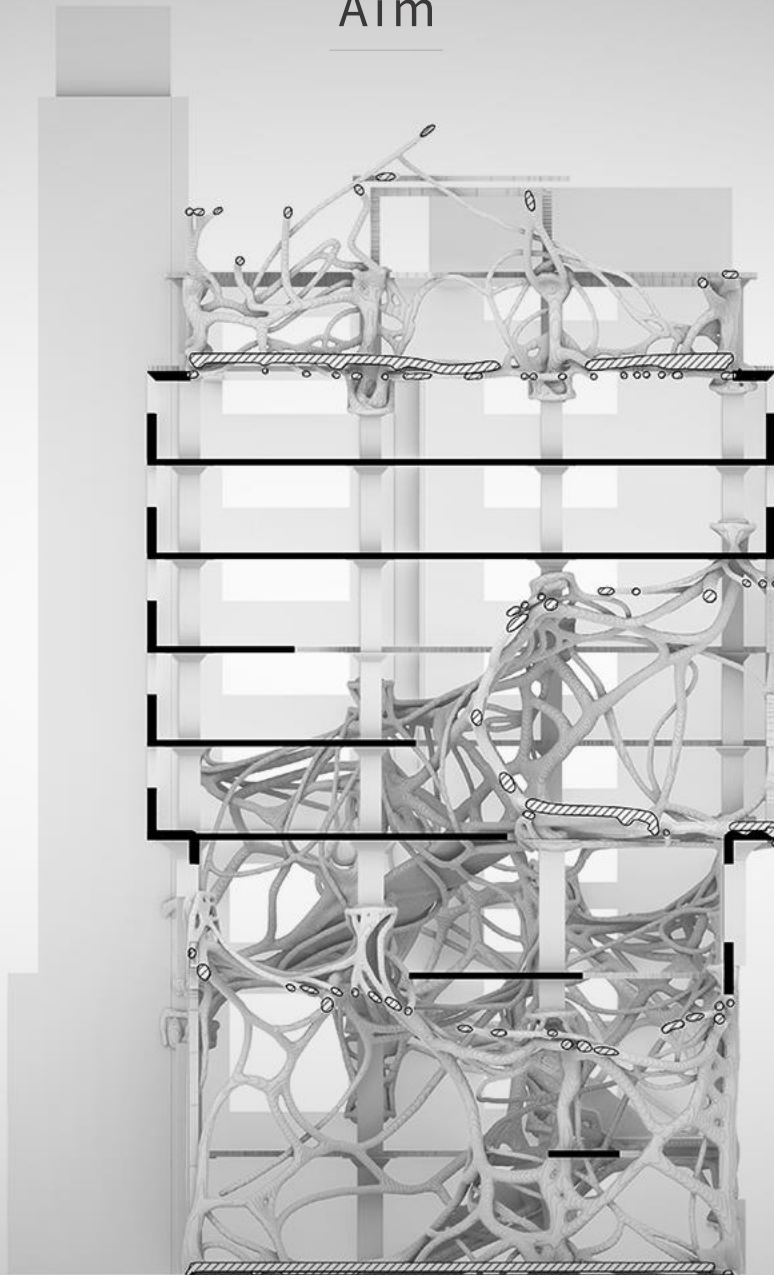
Climate

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# Aim





# Program

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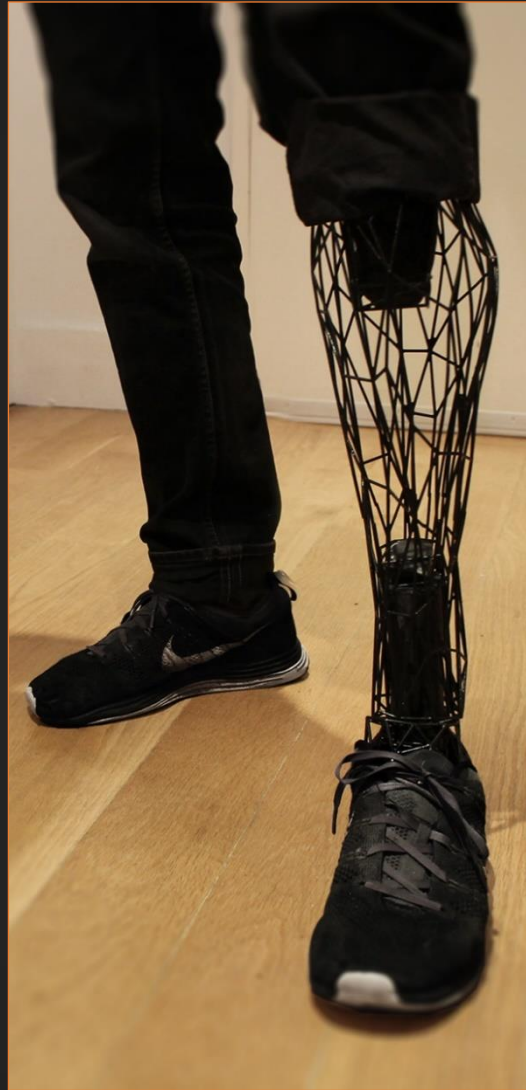
Conclusion

# Additive Manufacturing

## Technological Advancements



Iris van Herpen



Willam Root



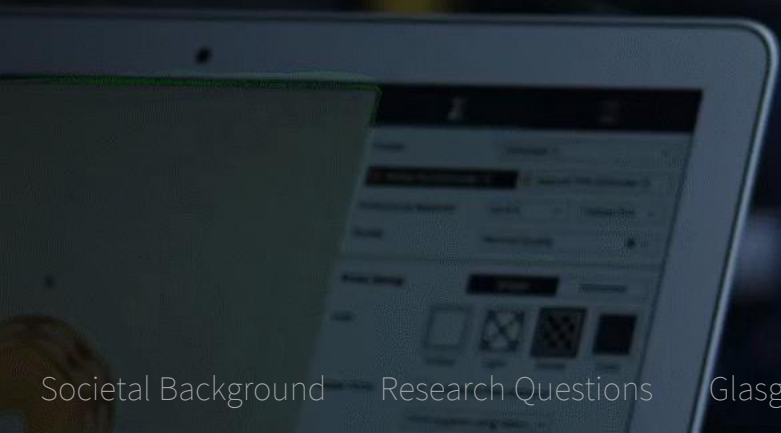
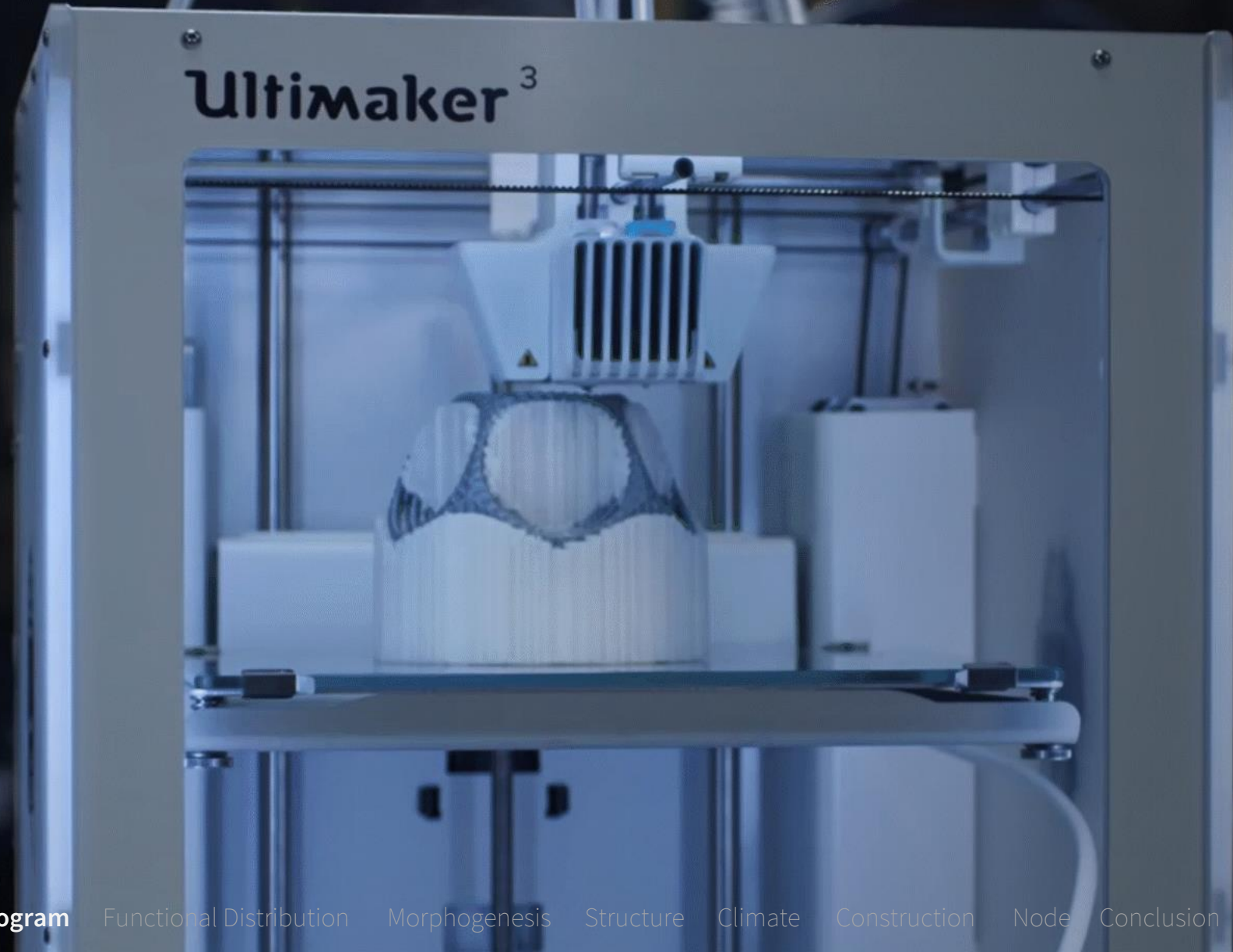
Rice University



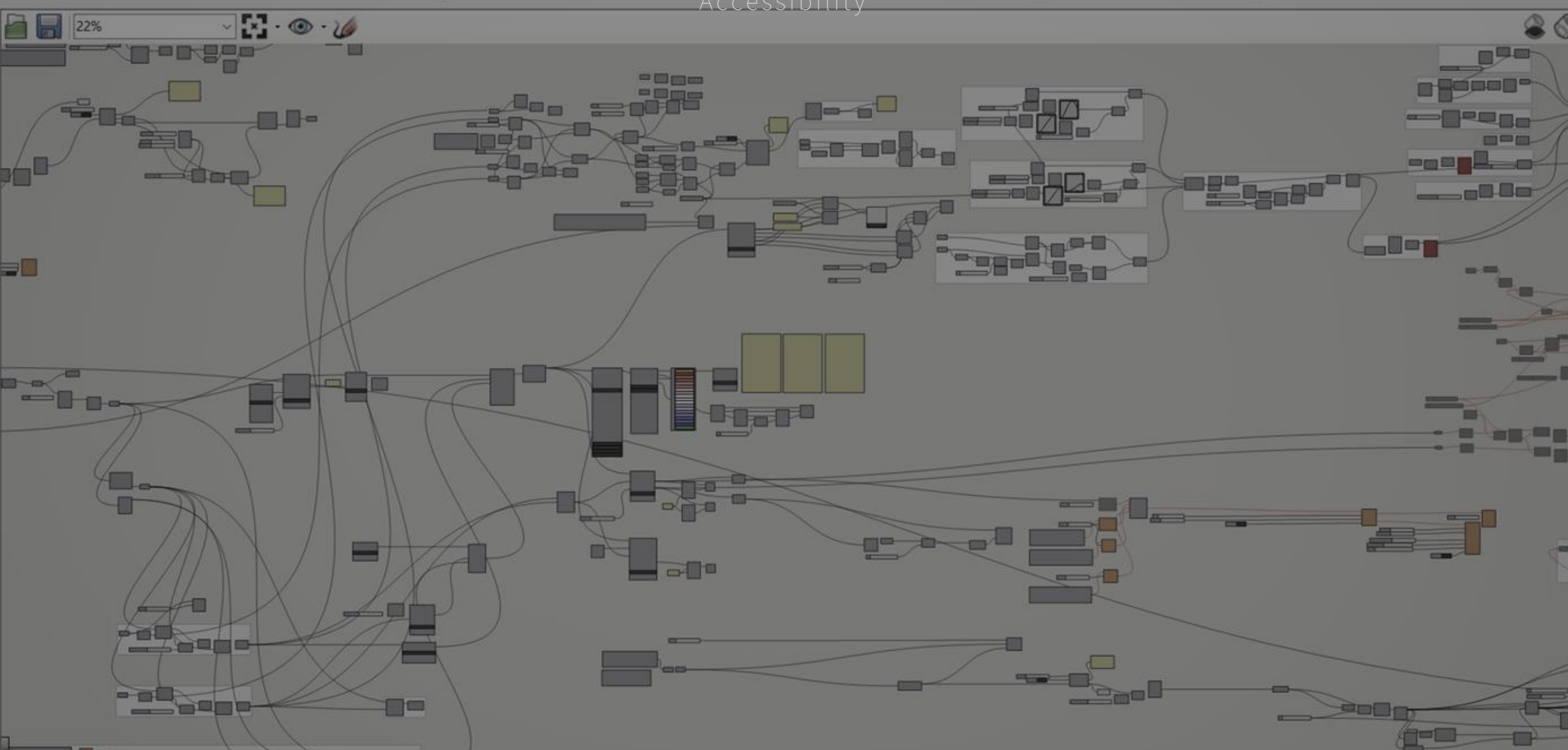
Novameat

# Additive Manufacturing

Accessibility



# Additive Manufacturing Accessibility



# Additive Manufacturing

UI and H-R Collaboration

Societal Background

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**Program**

Functional Distribution

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Conclusion

# Functional Distribution

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# Functional Distribution

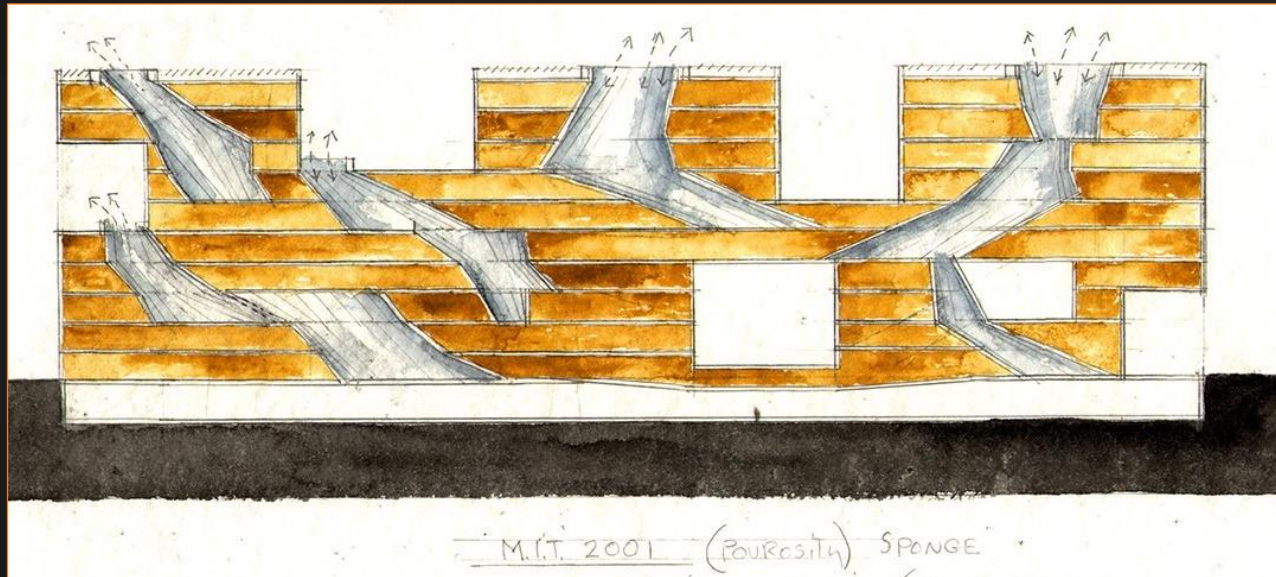


# Morphogenesis



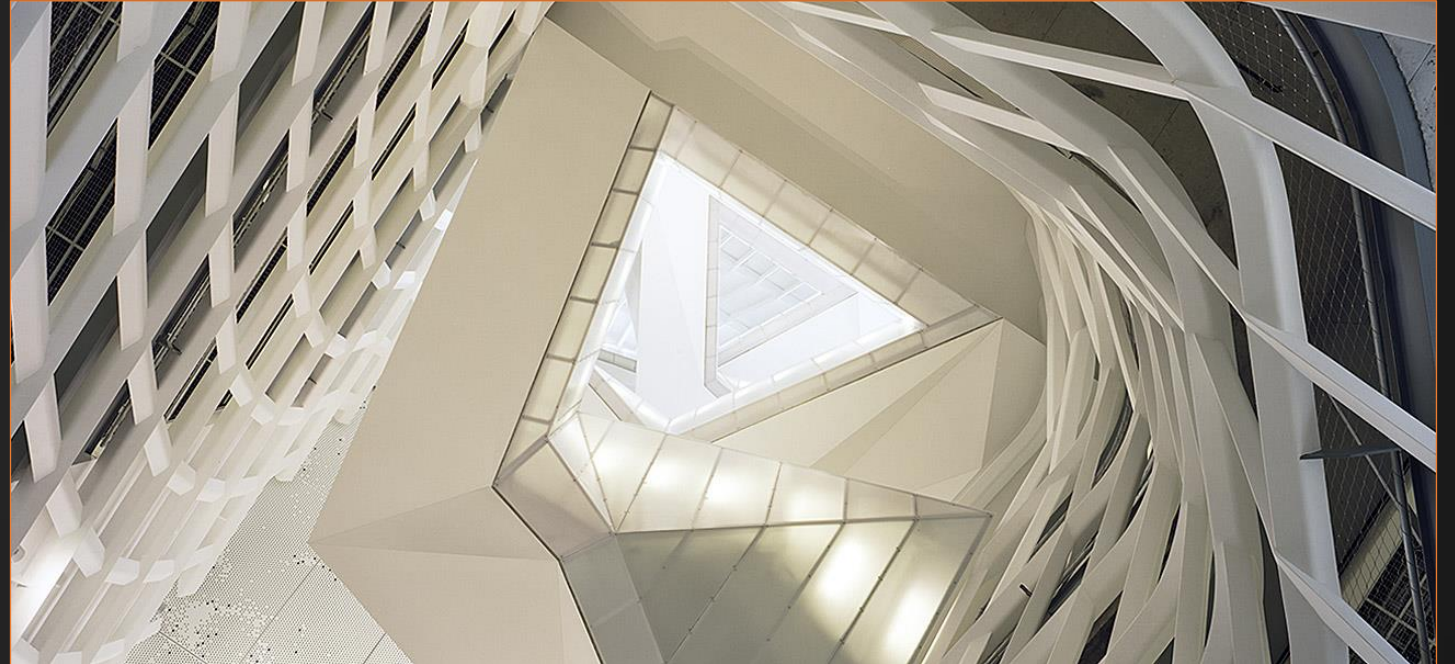
# MIT Simon's Hall

Steven Holl



# Cooper Union

Morphosis



# Morphogenesis

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Sources: - Jan van Ijken – Becoming  
- Science Magazine; youtube.com

Societal Background

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Functional Distribution

**Morphogenesis**

Structure

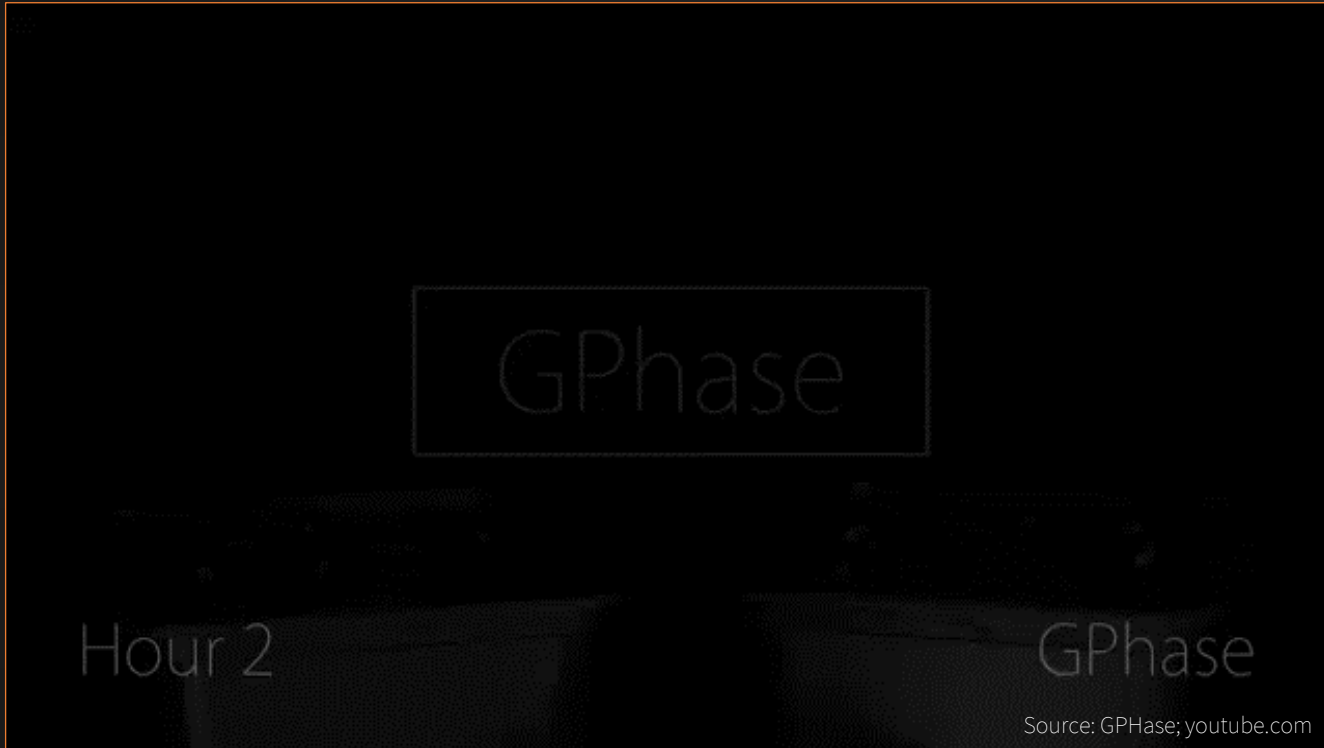
Climate

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Node

Conclusion

# Gravitropism



Negative



Negative + Positive

# Phototropism



Positive

# Thigmotropism



Positive

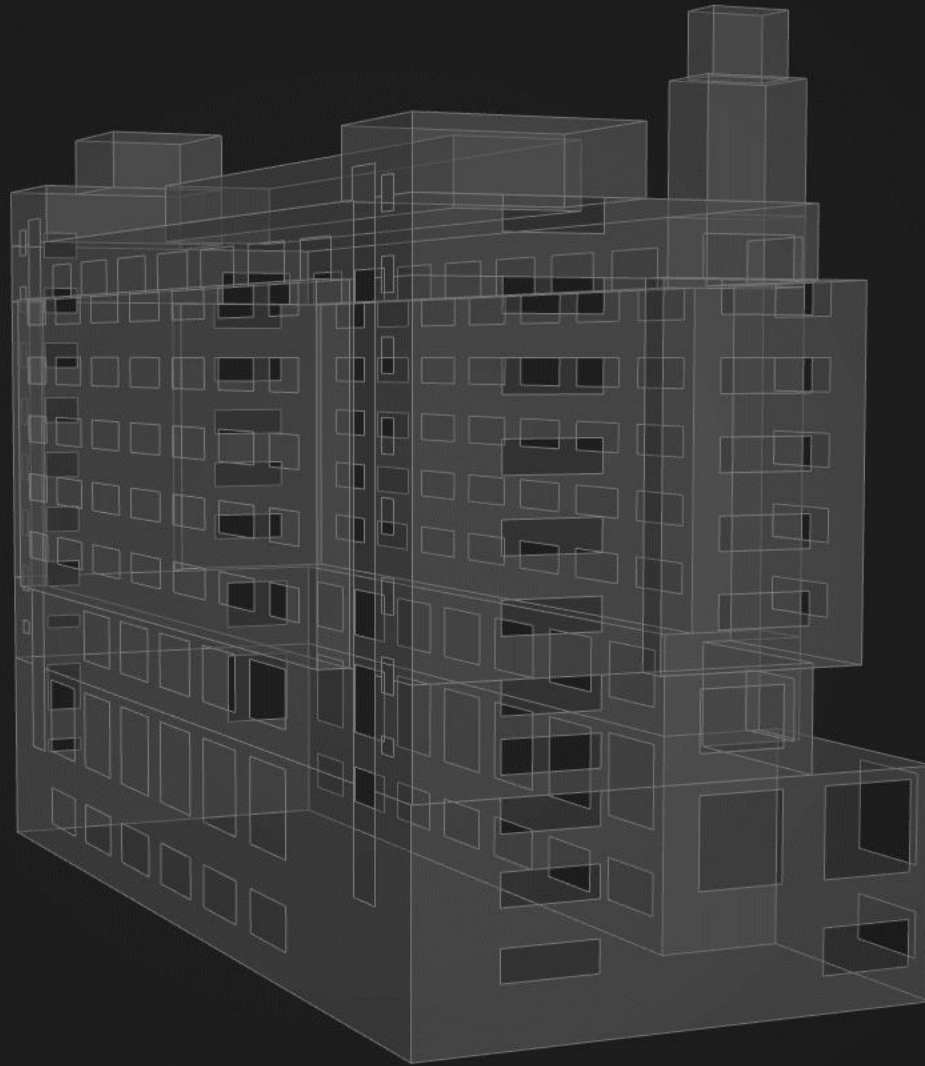


Negative

Source: [u/urgublah; reddit.com](#)

# Morphogenesis

Tool



# Morphogenesis

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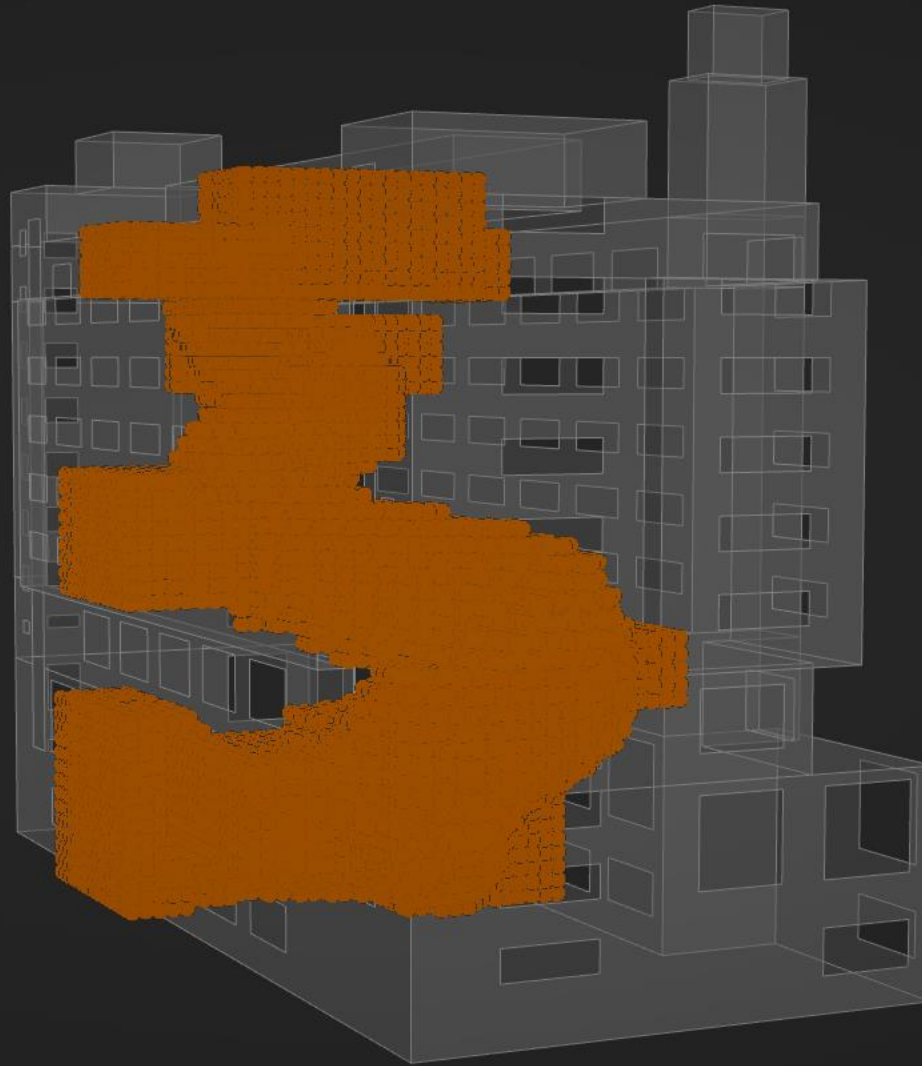
Tool





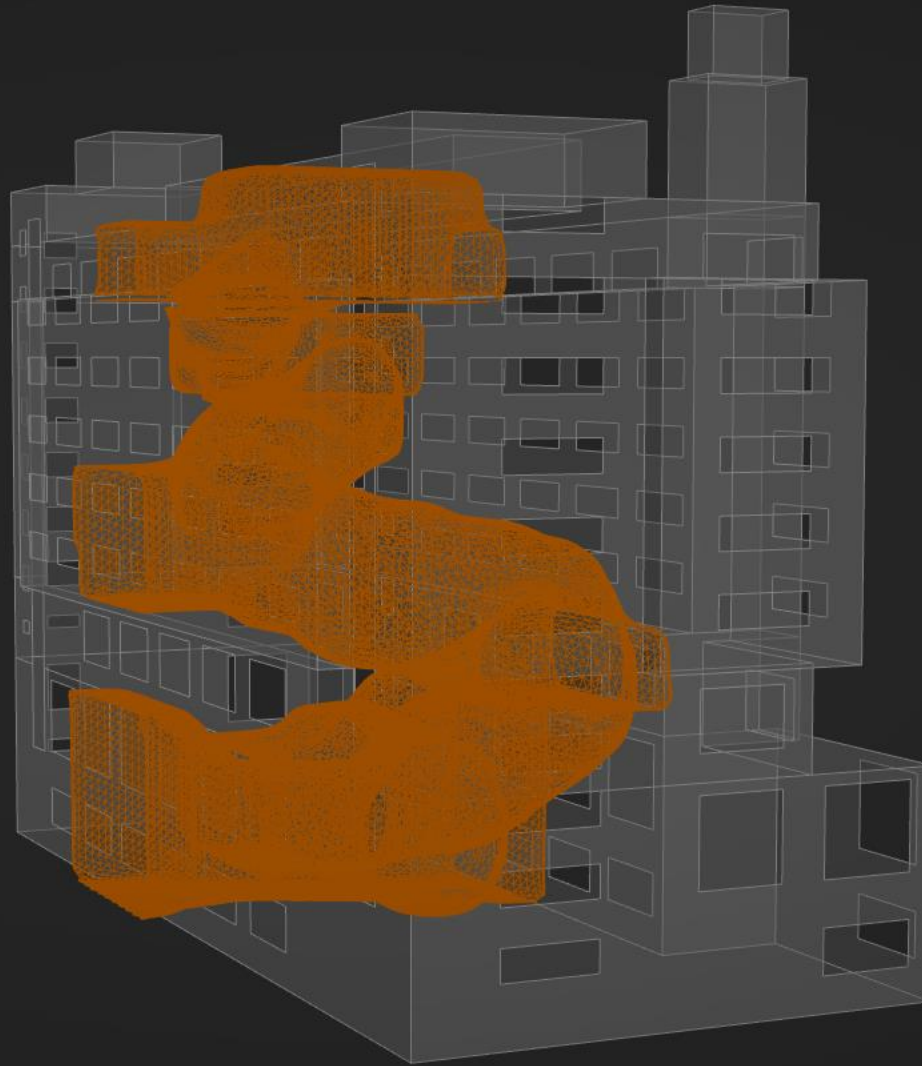
# Morphogenesis

Decision



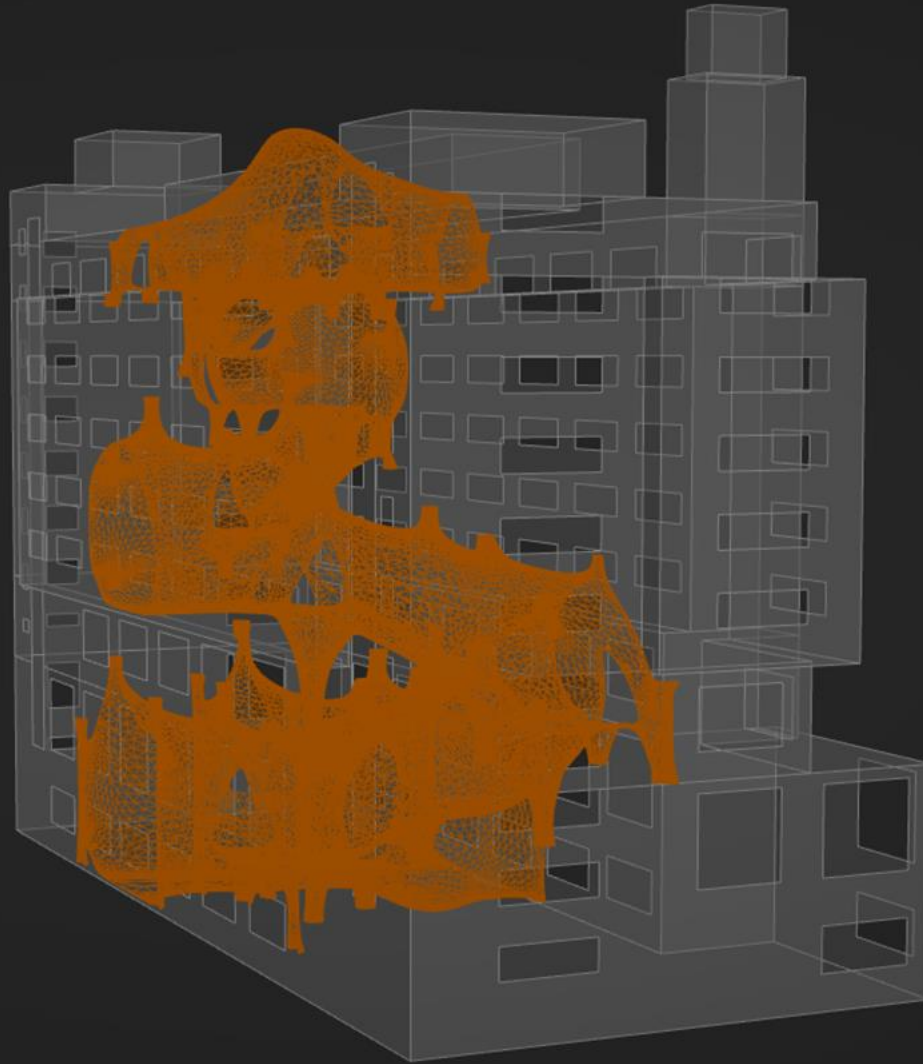
# Morphogenesis

## Geometry



# Morphogenesis

Geometry Edit



# Structure

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Conclusion

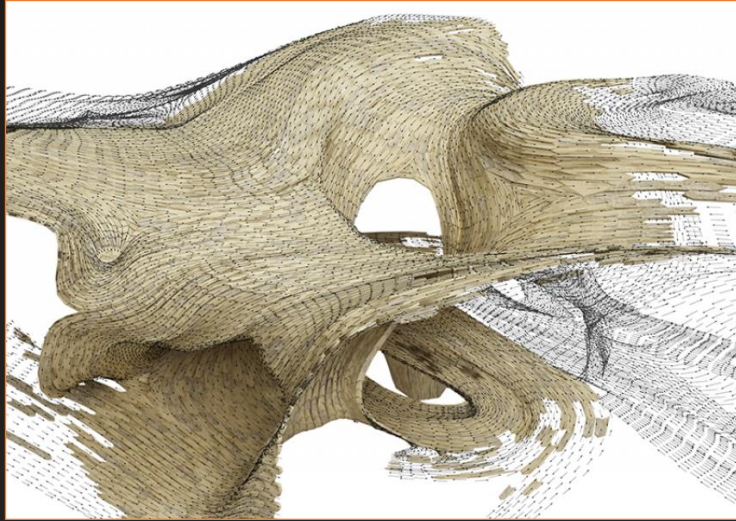
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Natural Reference

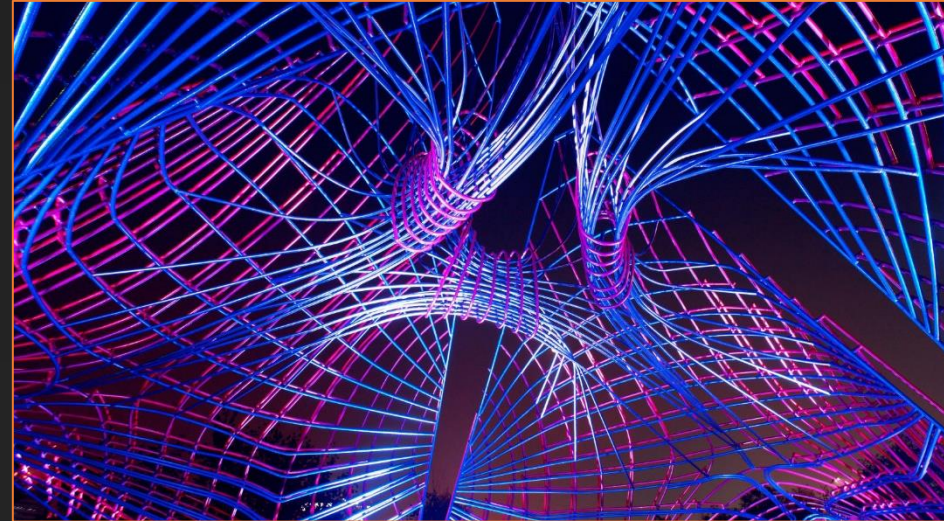


# Structure

## Architectural Reference



Robert Stuart Smith – Helsinki Public Library



Zaha Hadid Architects – CIAB Pavilion



Zaha Hadid Architects – Volu Pavilion



MX3D Bridge

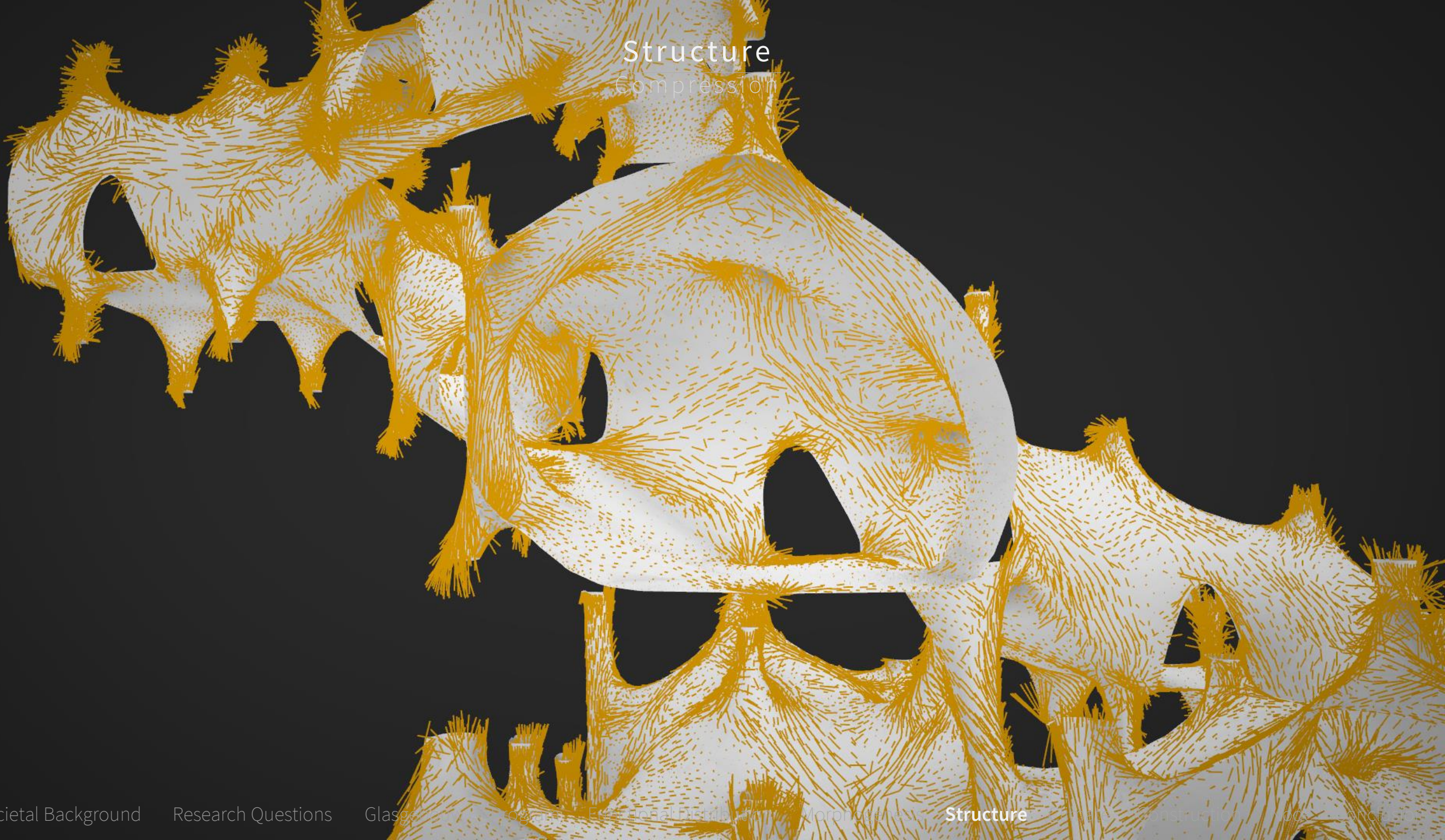
# Structure

## Stress Lines



# Structure

## Compression





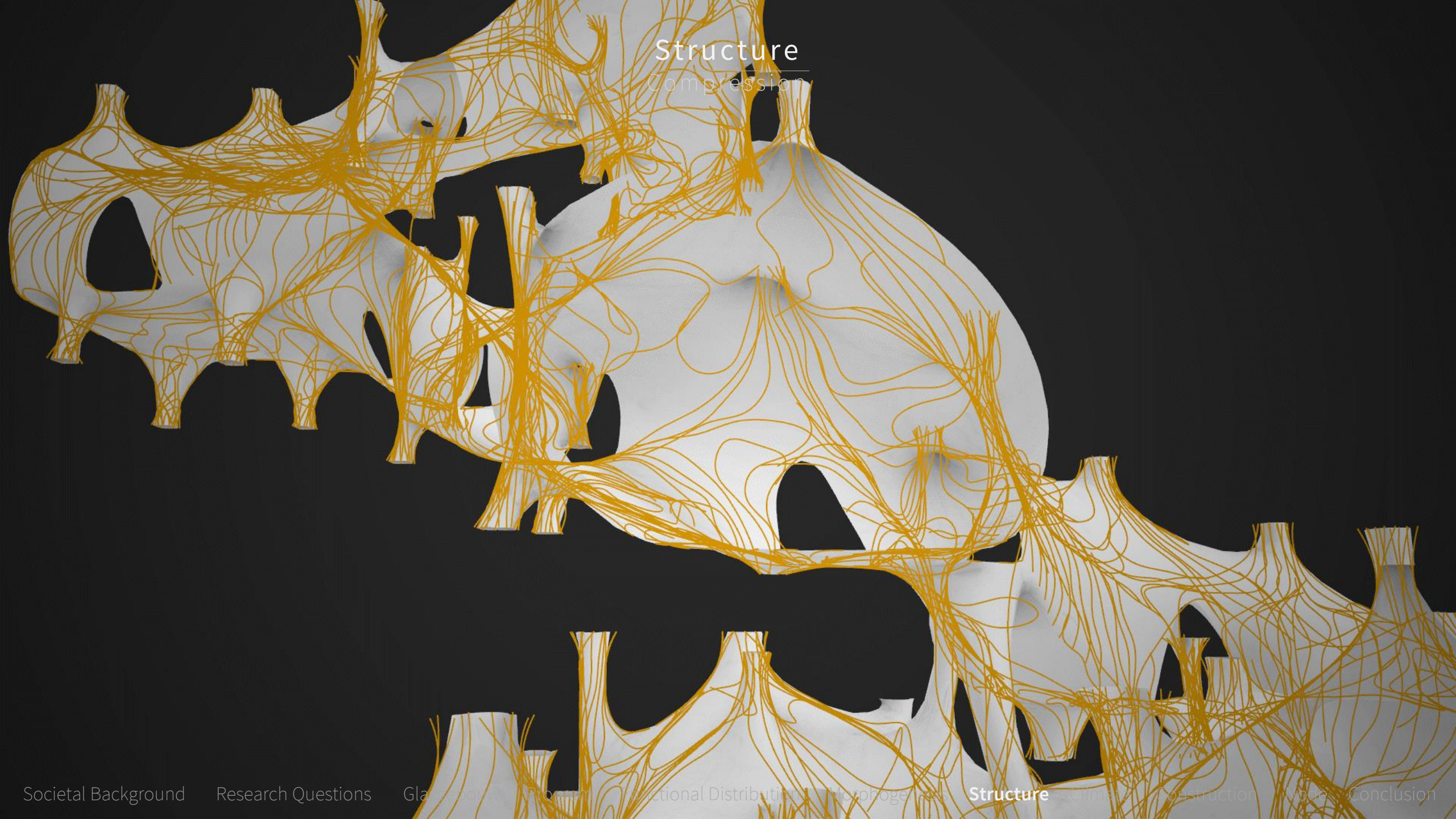
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## Compression



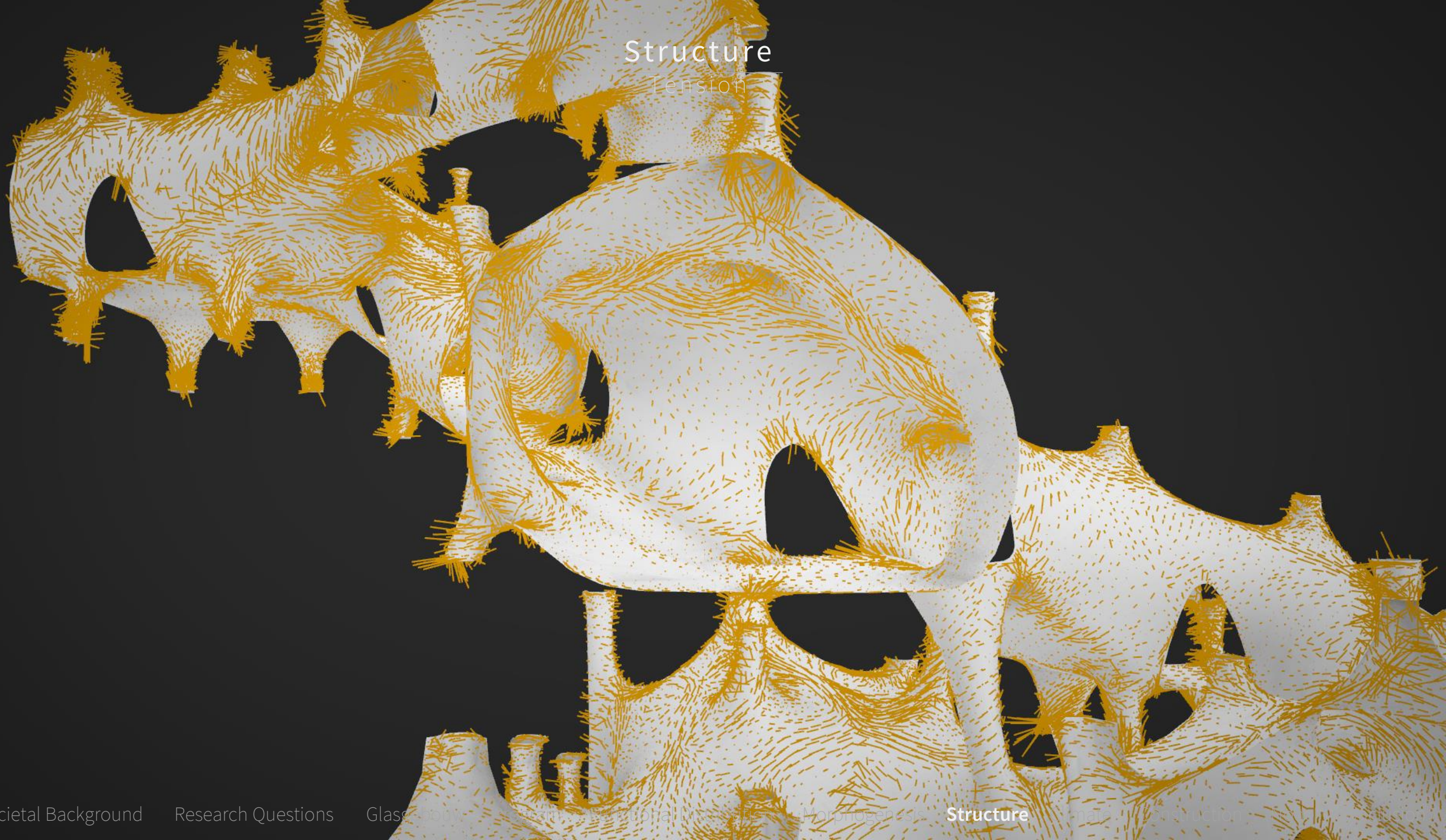
# Structure

Compression



# Structure

Tension





# Structure

Tension

# Structure

Version

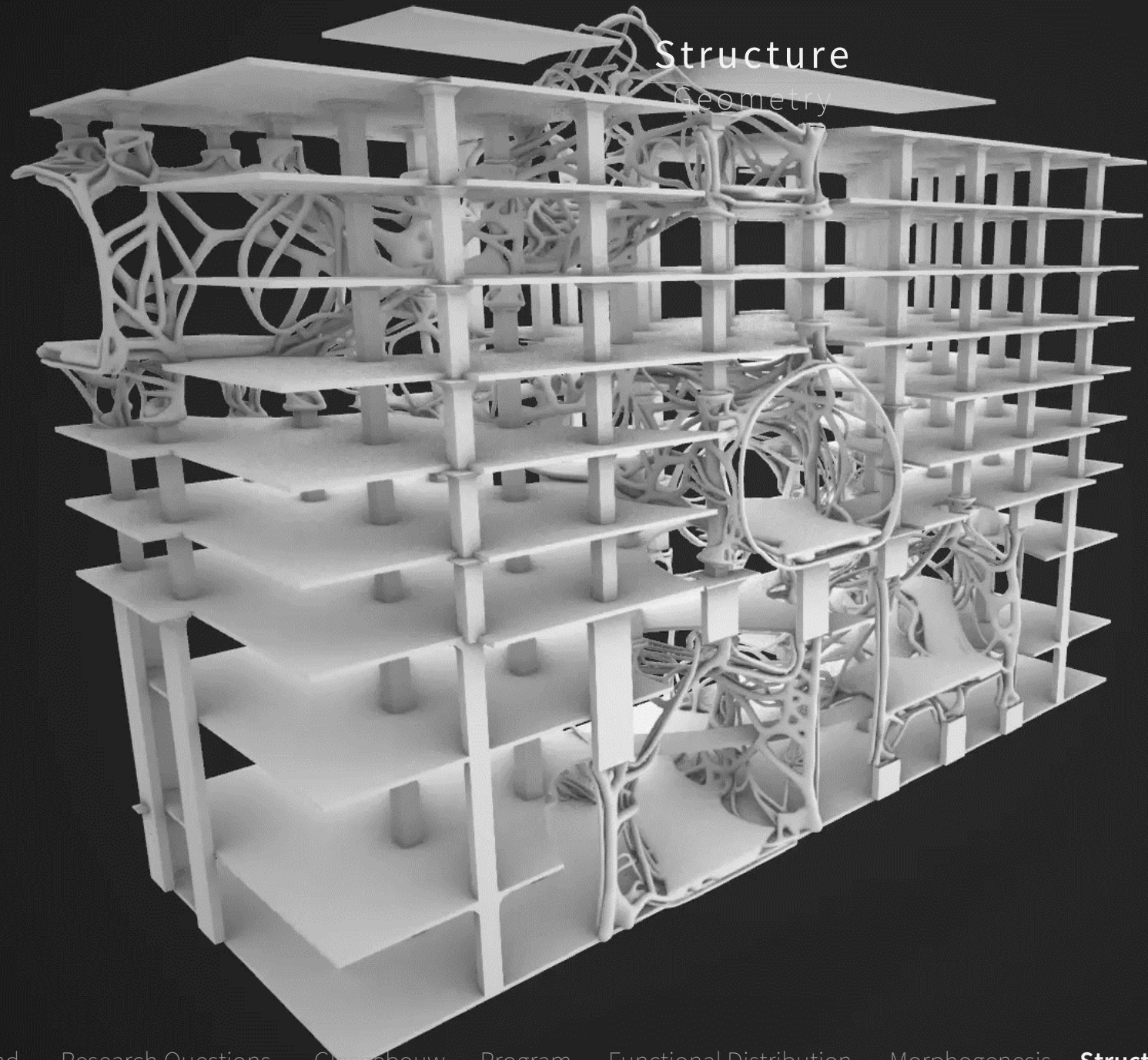




Structure  
Geometry



Structure  
Geometry

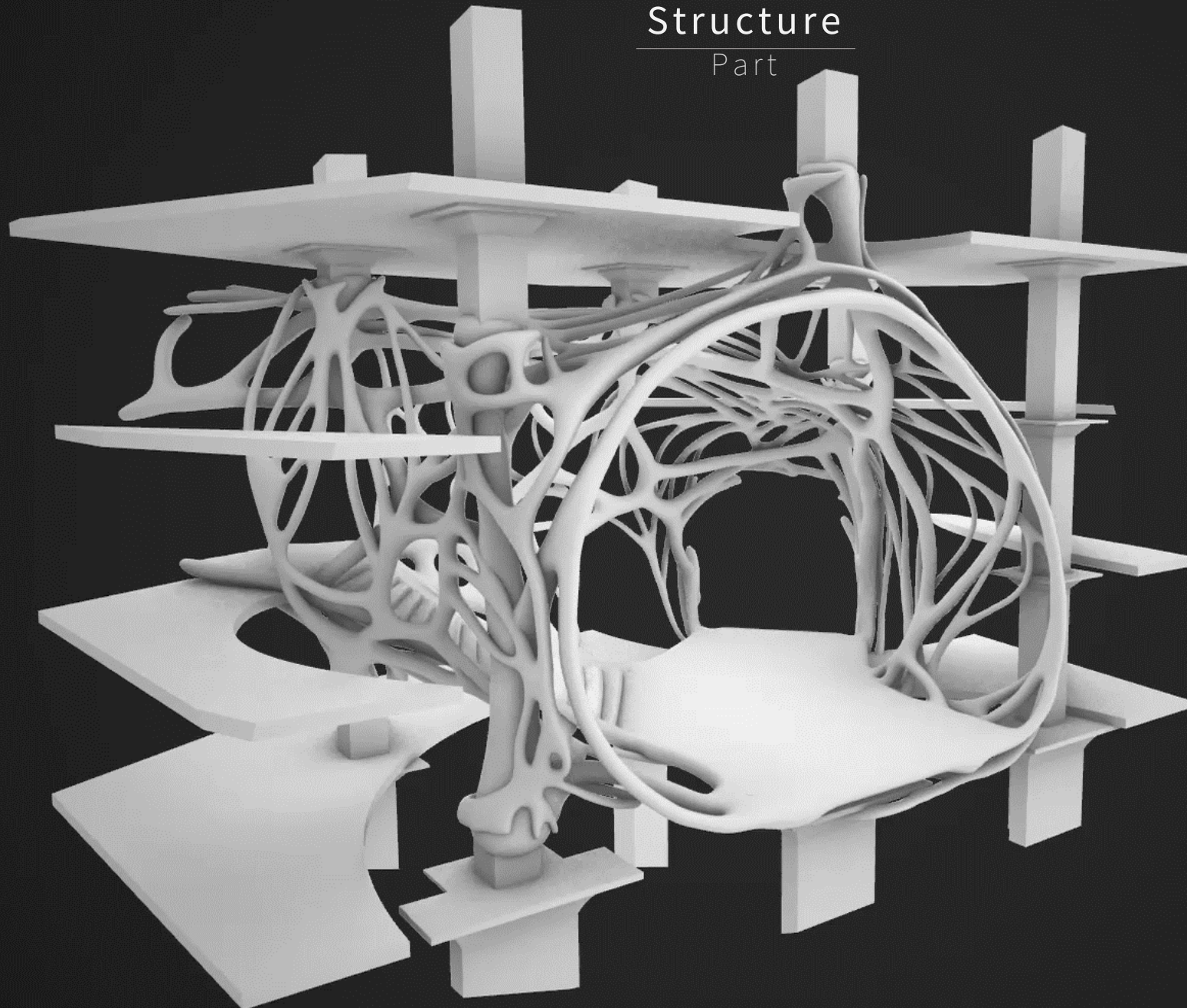


Structure  
Geometry



# Structure

Part



Societal Background

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Climate

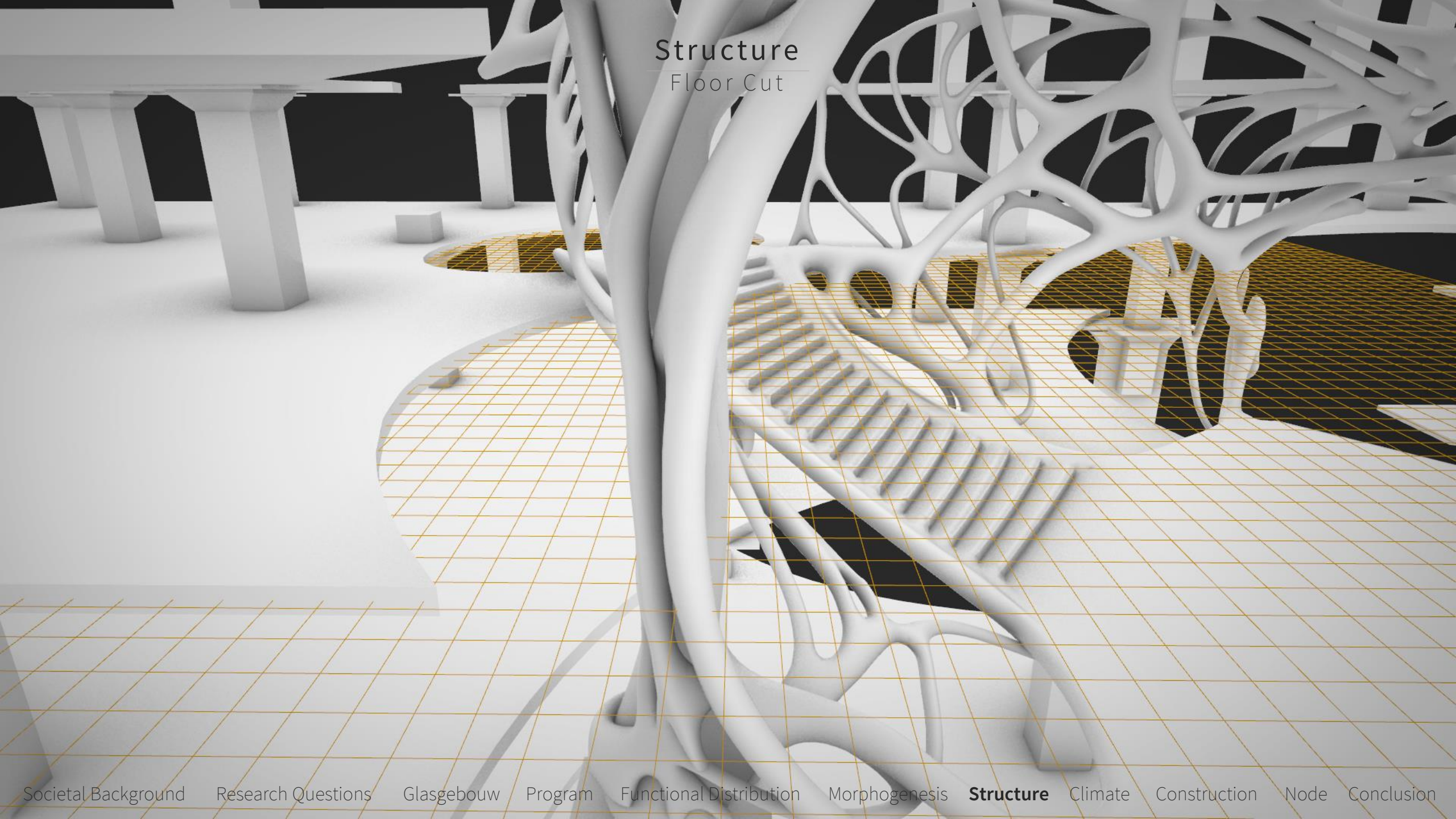
Construction

Node

Conclusion

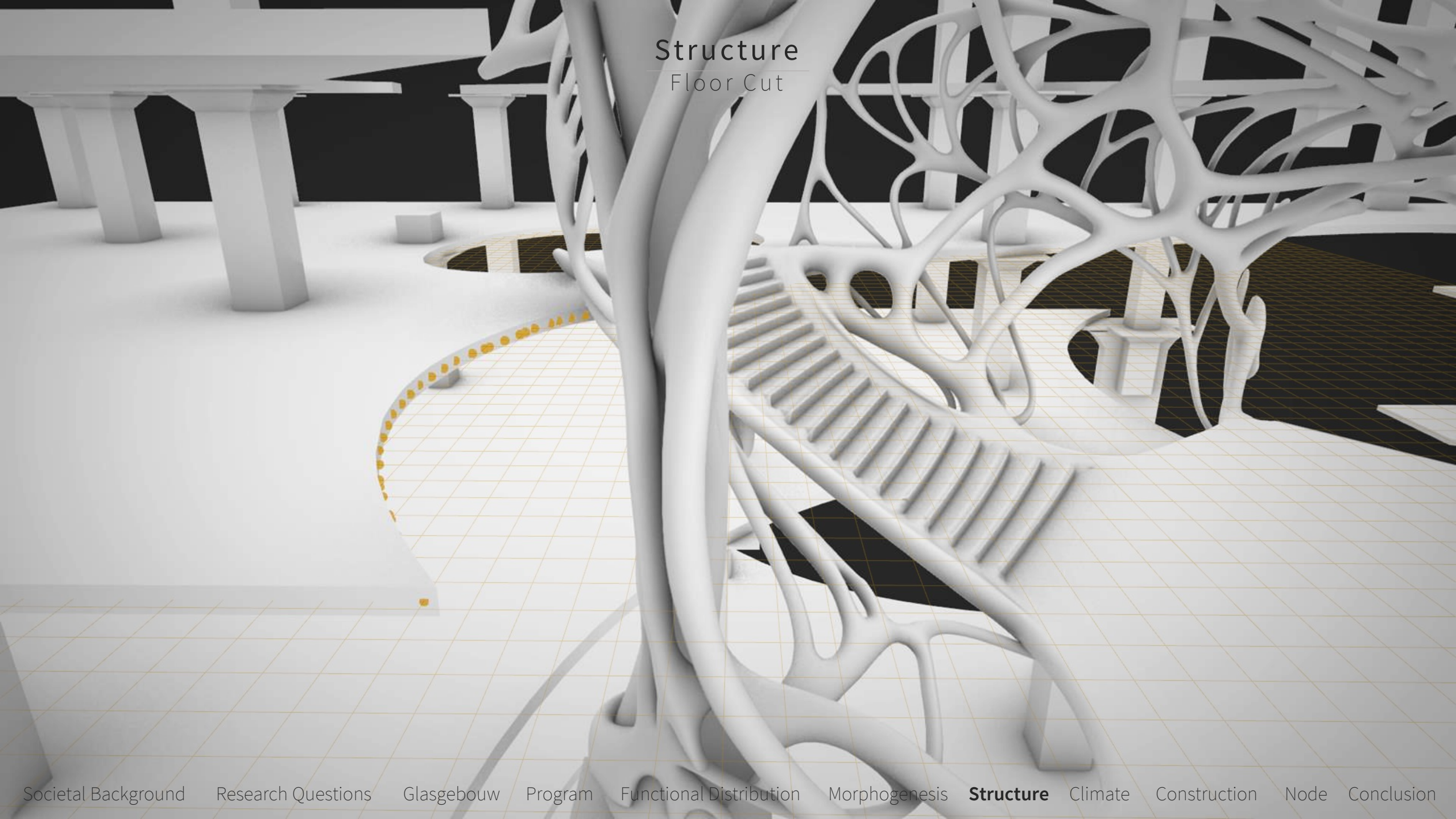
# Structure

## Floor Cut



# Structure

## Floor Cut





Structure  
Floor Cut



# Structure

## Floor Cut



# Structure

## Floor Cut



# Structure

Cross Section



Structure  
Cross Section





# Structure

## Cross Section



Structure  
Railing



Structure  
Railing



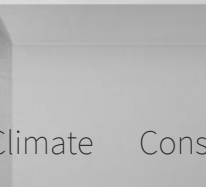
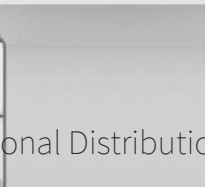
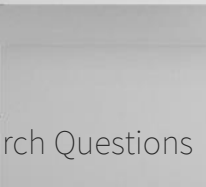
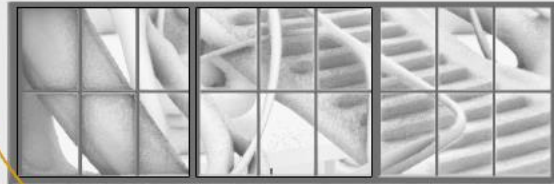
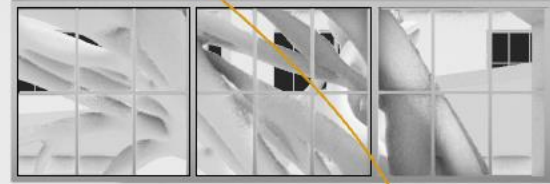
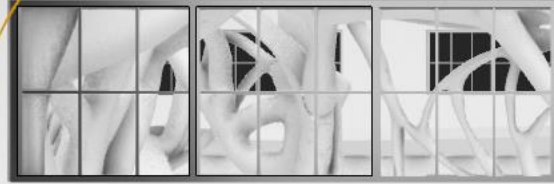
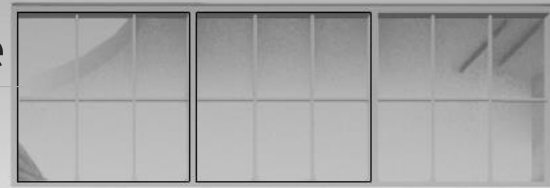
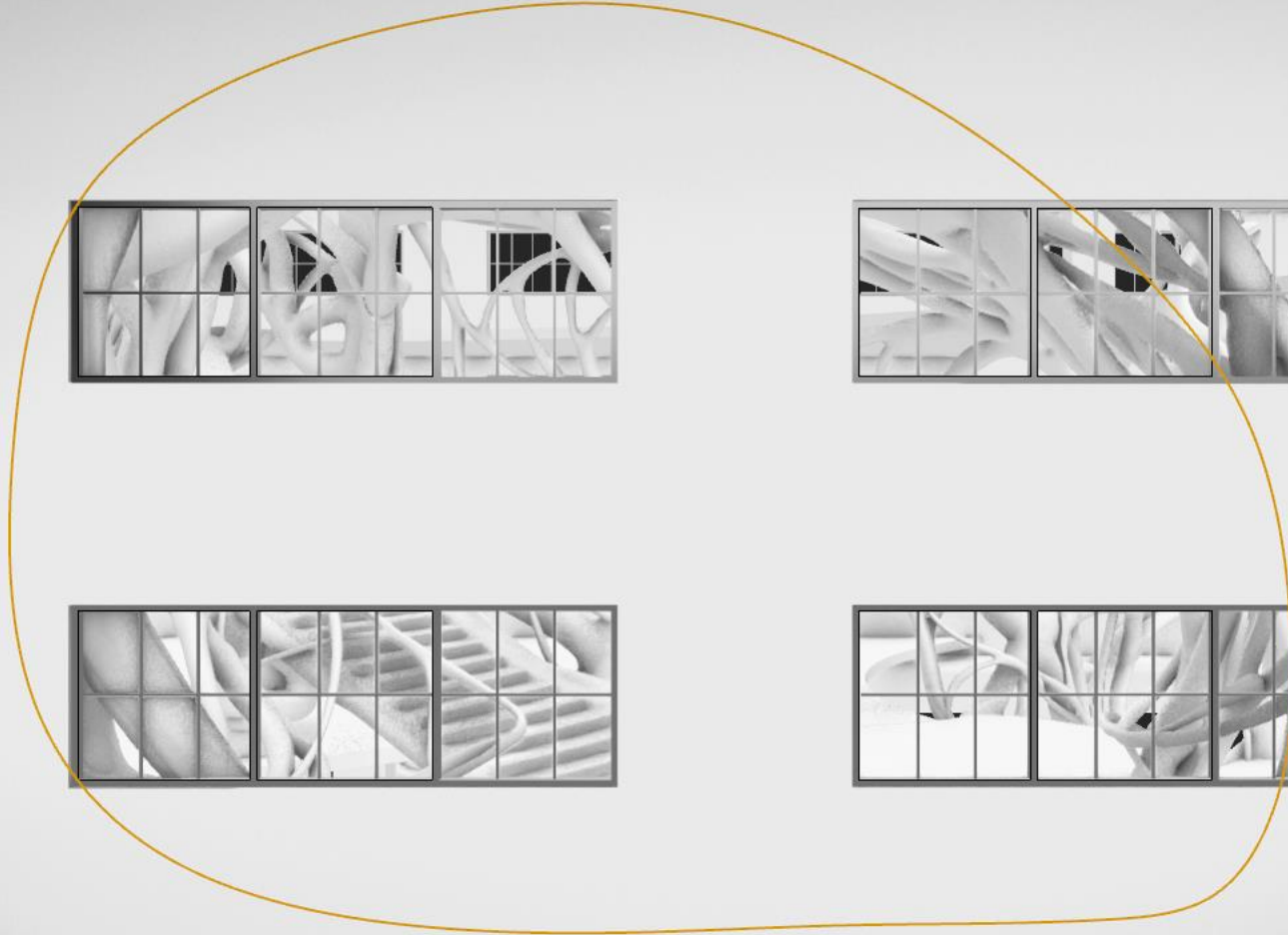
# Structure

## Railing



Structure  
Facade

Structure  
Facade



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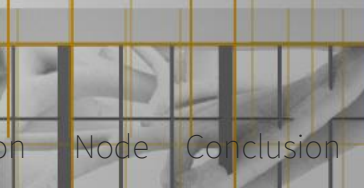
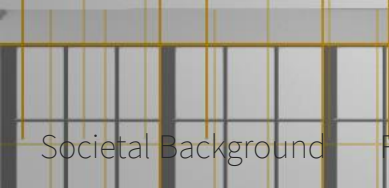
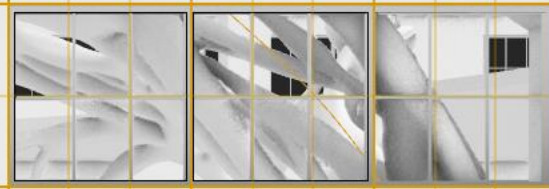
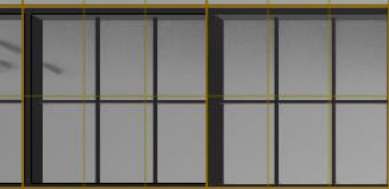
Construction

Node

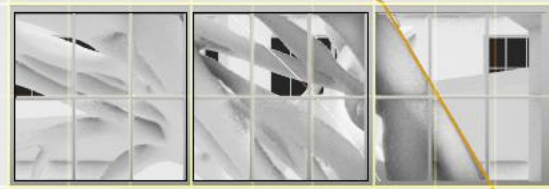
Conclusion

# Structure

## Facade

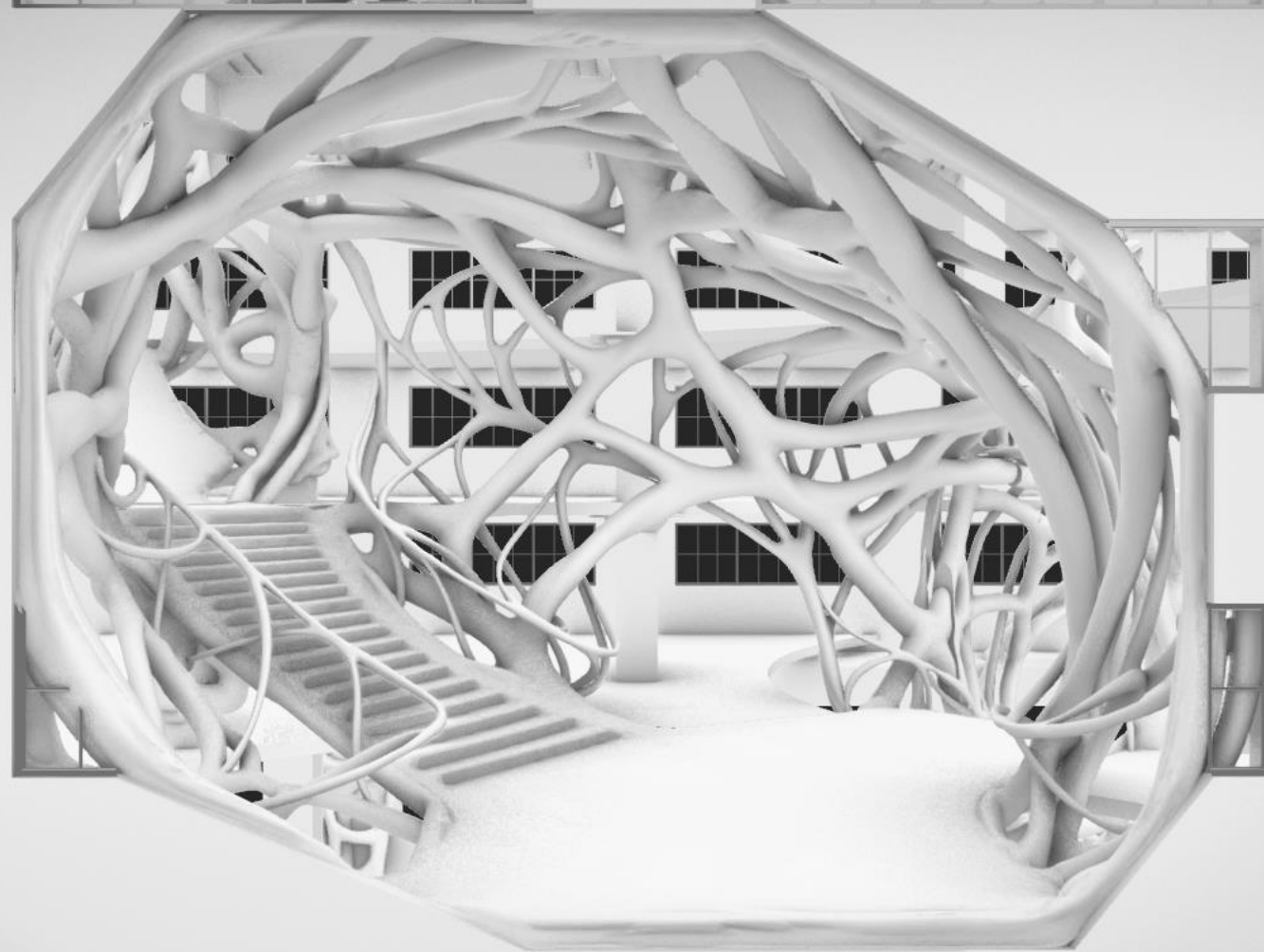


Structure  
Facade

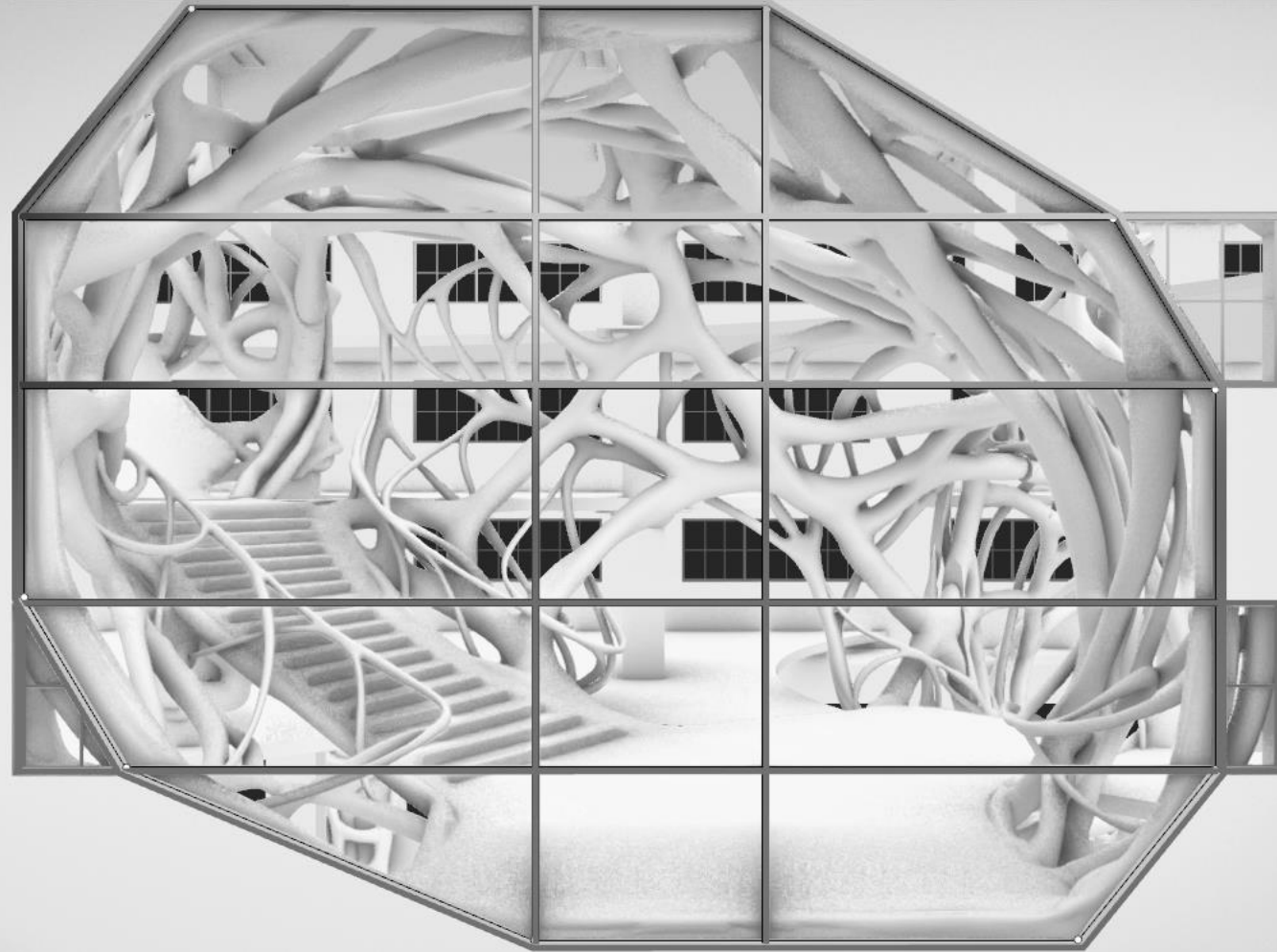




Structure  
Facade



# Structure Facade



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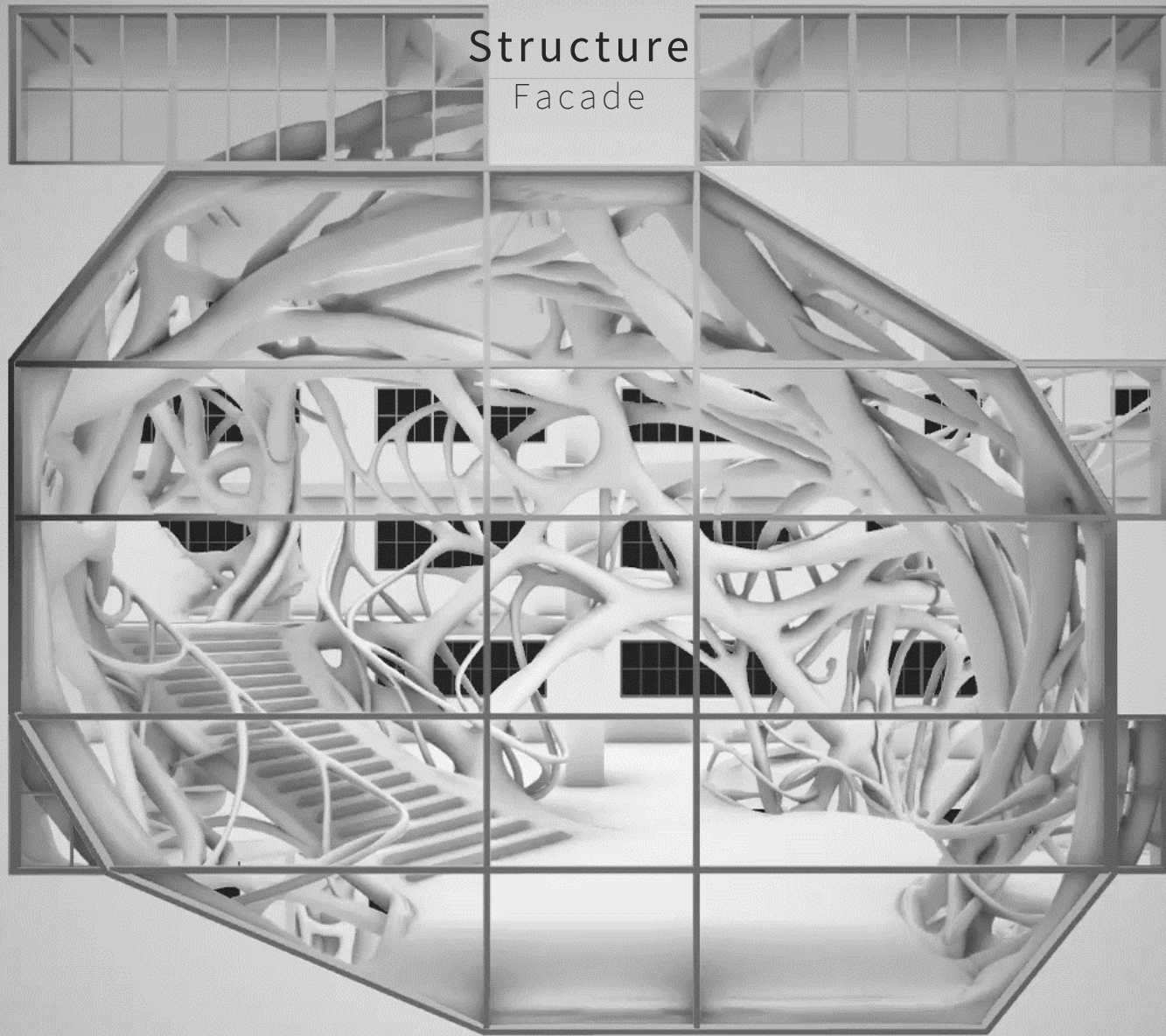
Climate

Construction

Node

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Structure  
Facade



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# Structure Facade

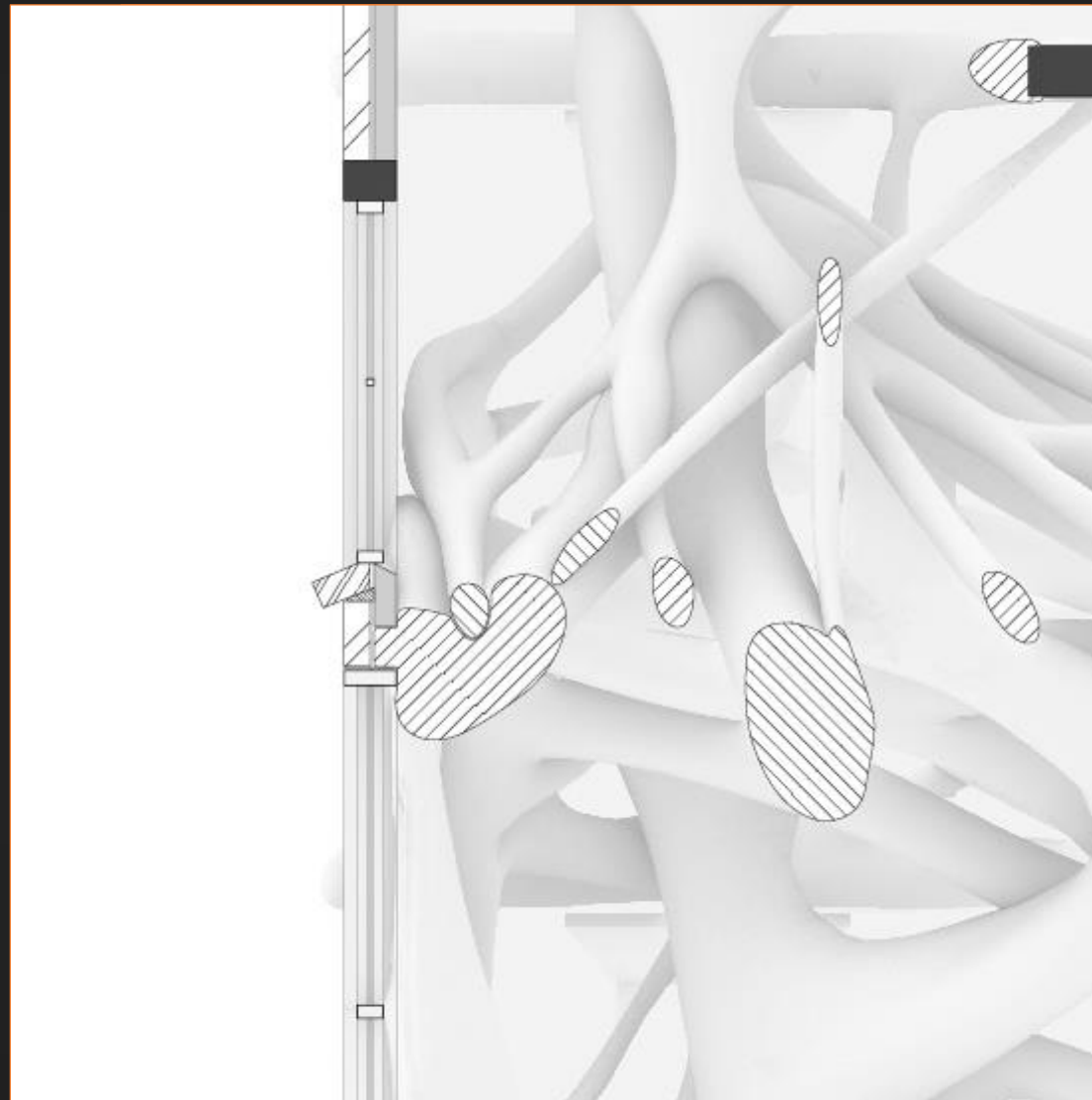




Structure  
Facade

# Structure

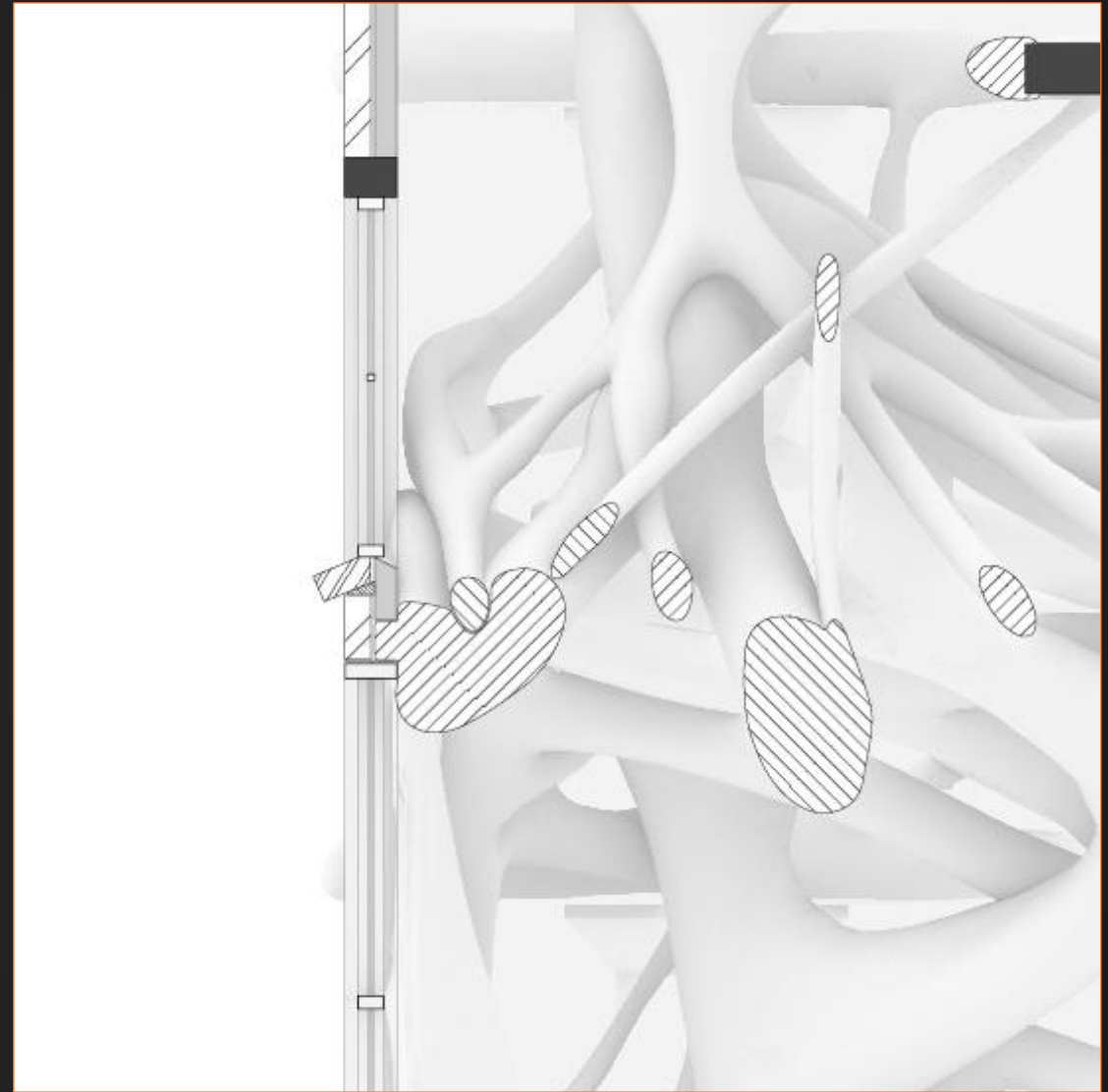
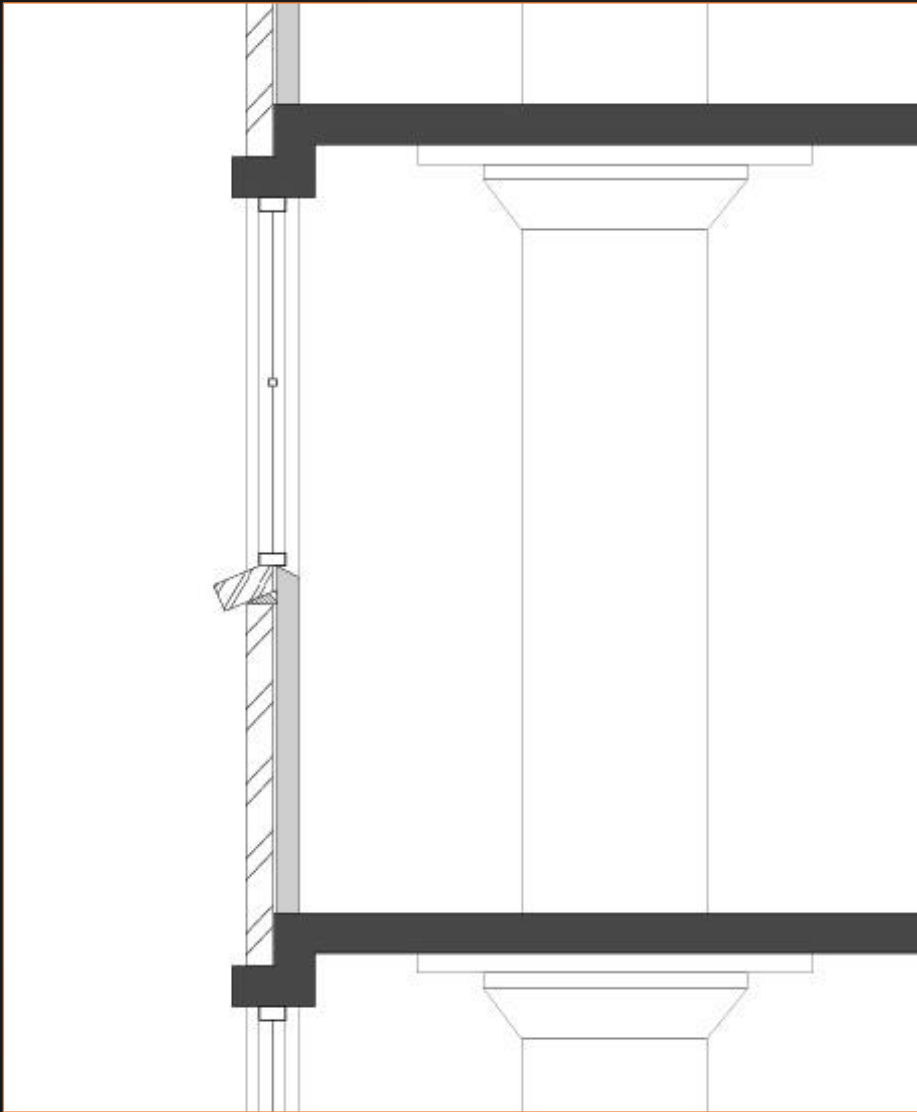
## Facade



# Climate

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## Detail



# Climate Convection





# Construction

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Climate

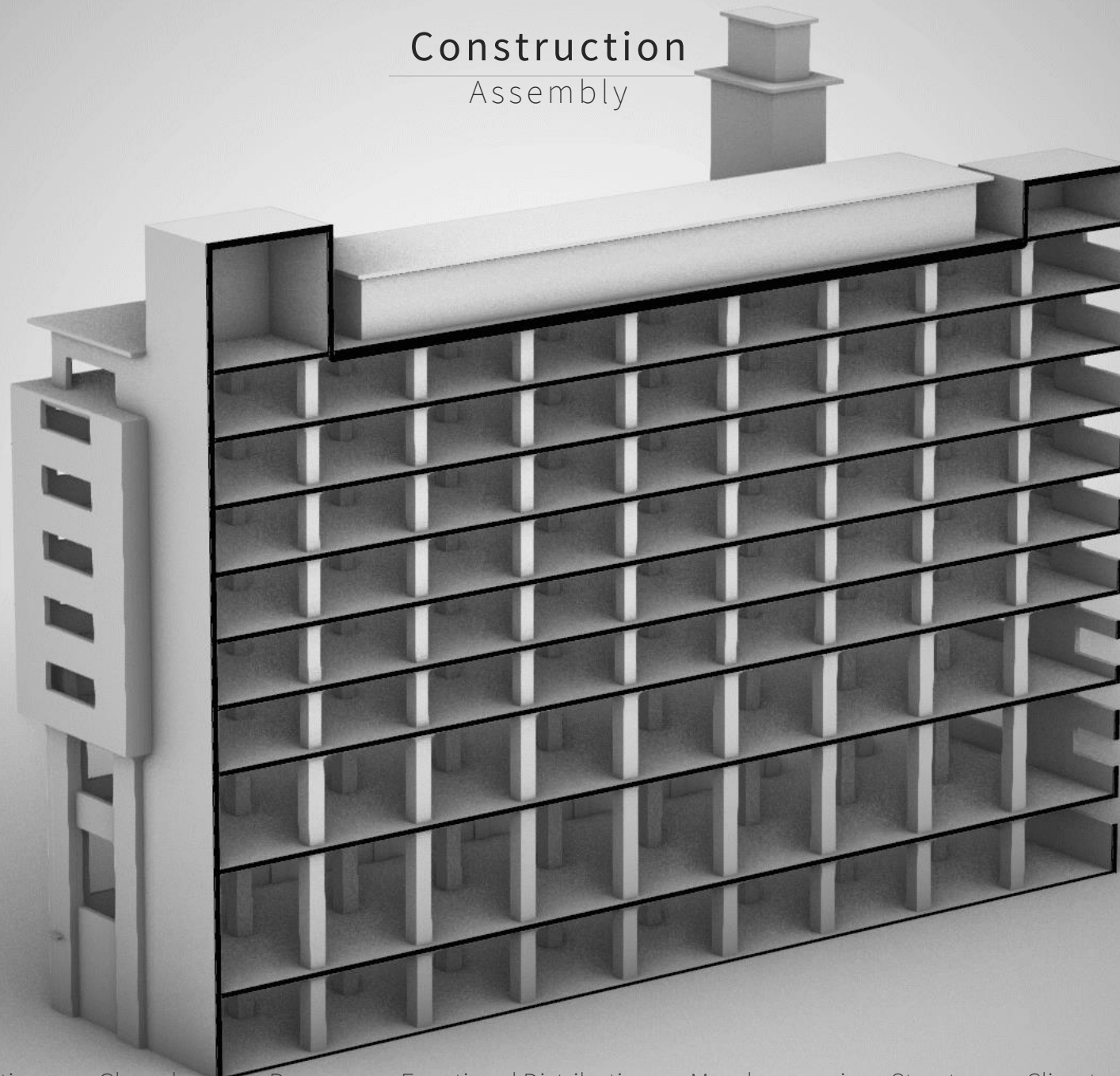
**Construction**

Node

Conclusion

# Construction

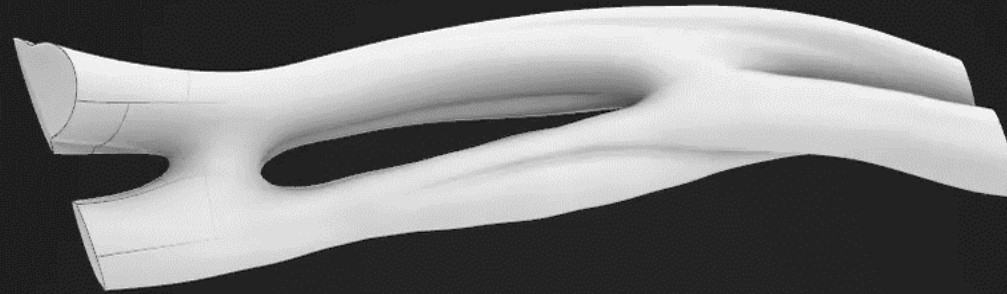
Assembly



# Construction

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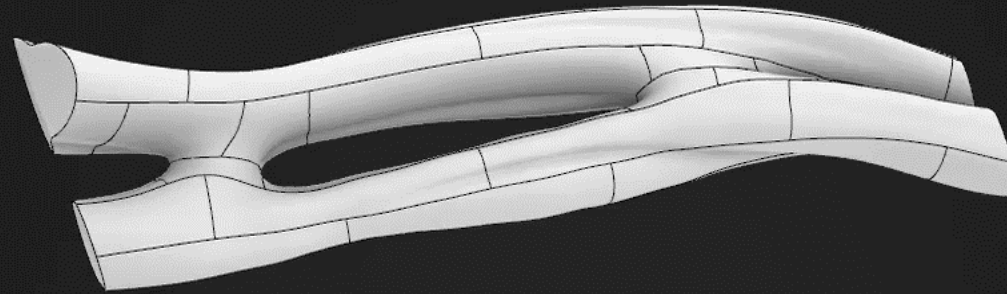
## Robotic Manufacturing



# Construction

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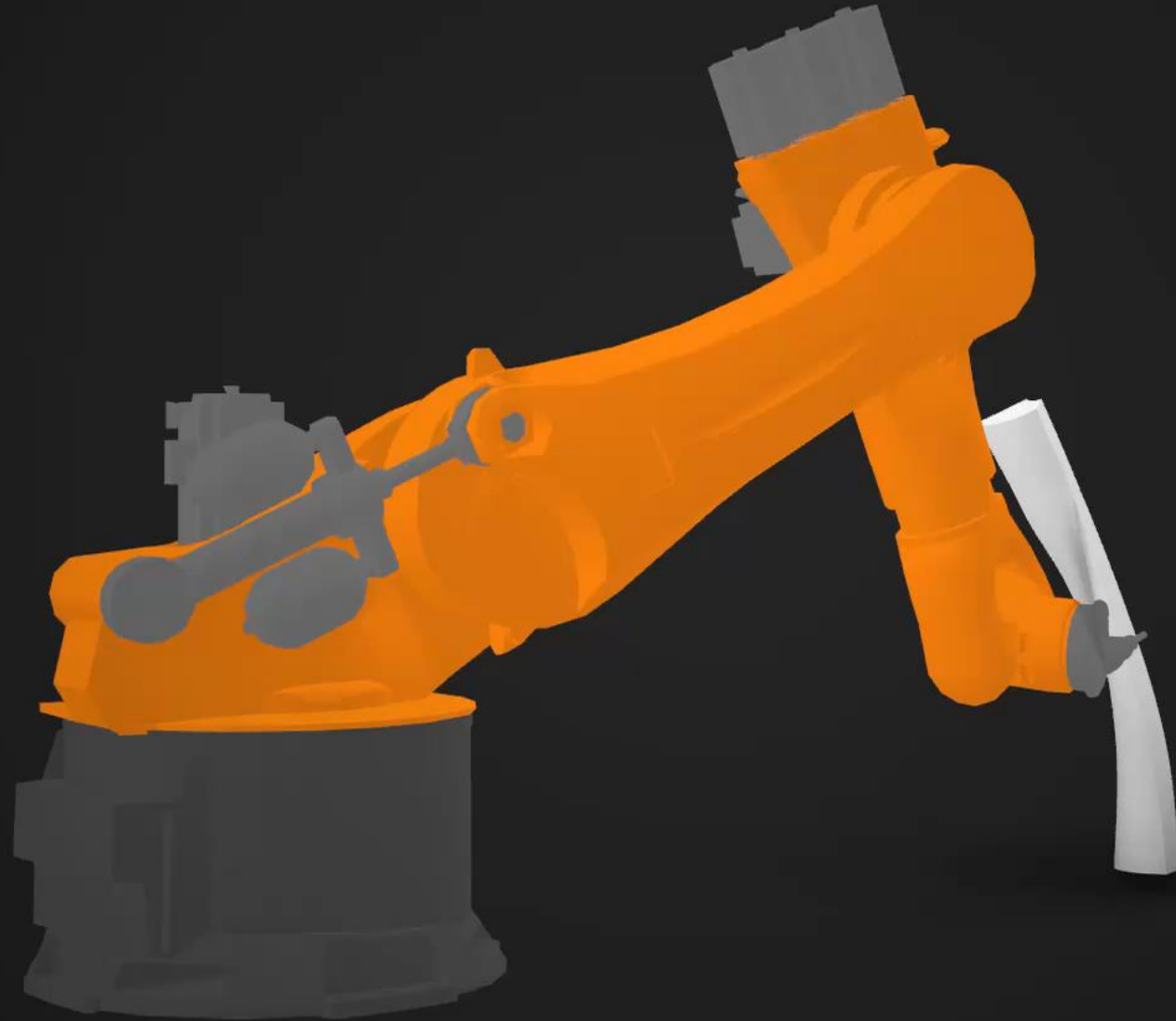
## Robotic Manufacturing



# Construction

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## Robotic Manufacturing



# Workshop

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Erik Bakker

Leander Bakker

Arav Kumar

# Node

# Workshop

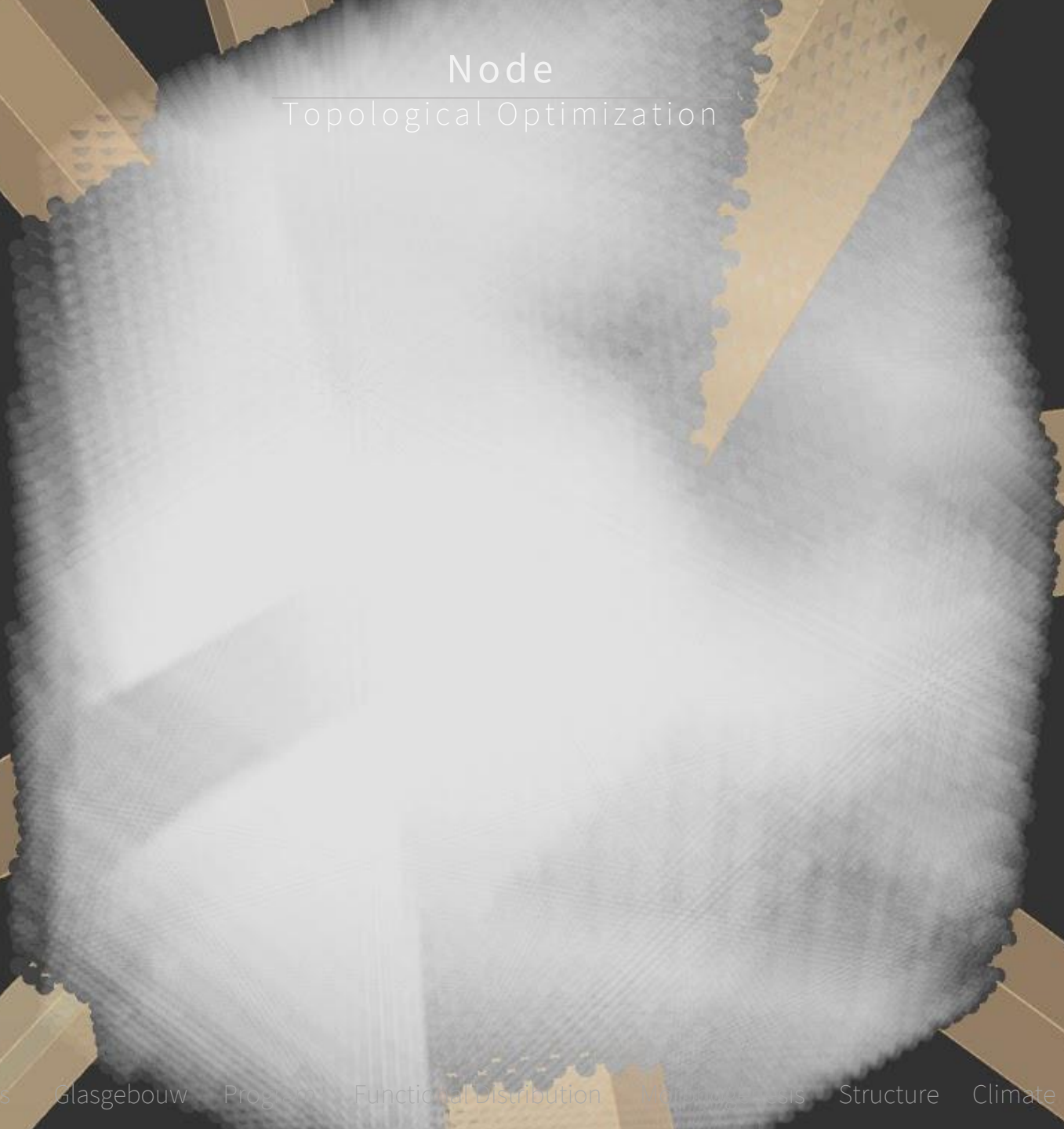
with Erik Bakker

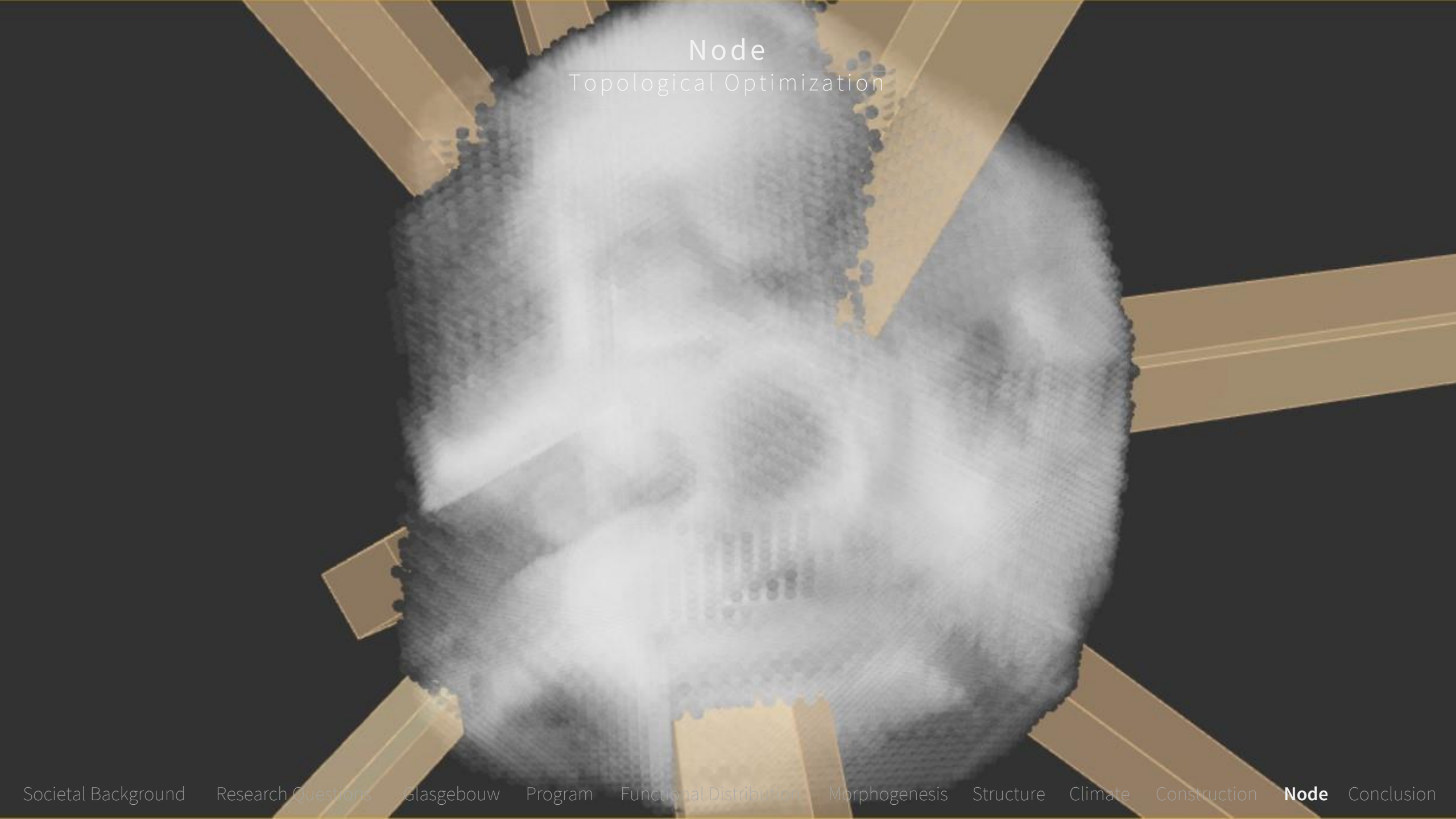




# Node

## Topological Optimization





Node  
Topological Optimization

# Node

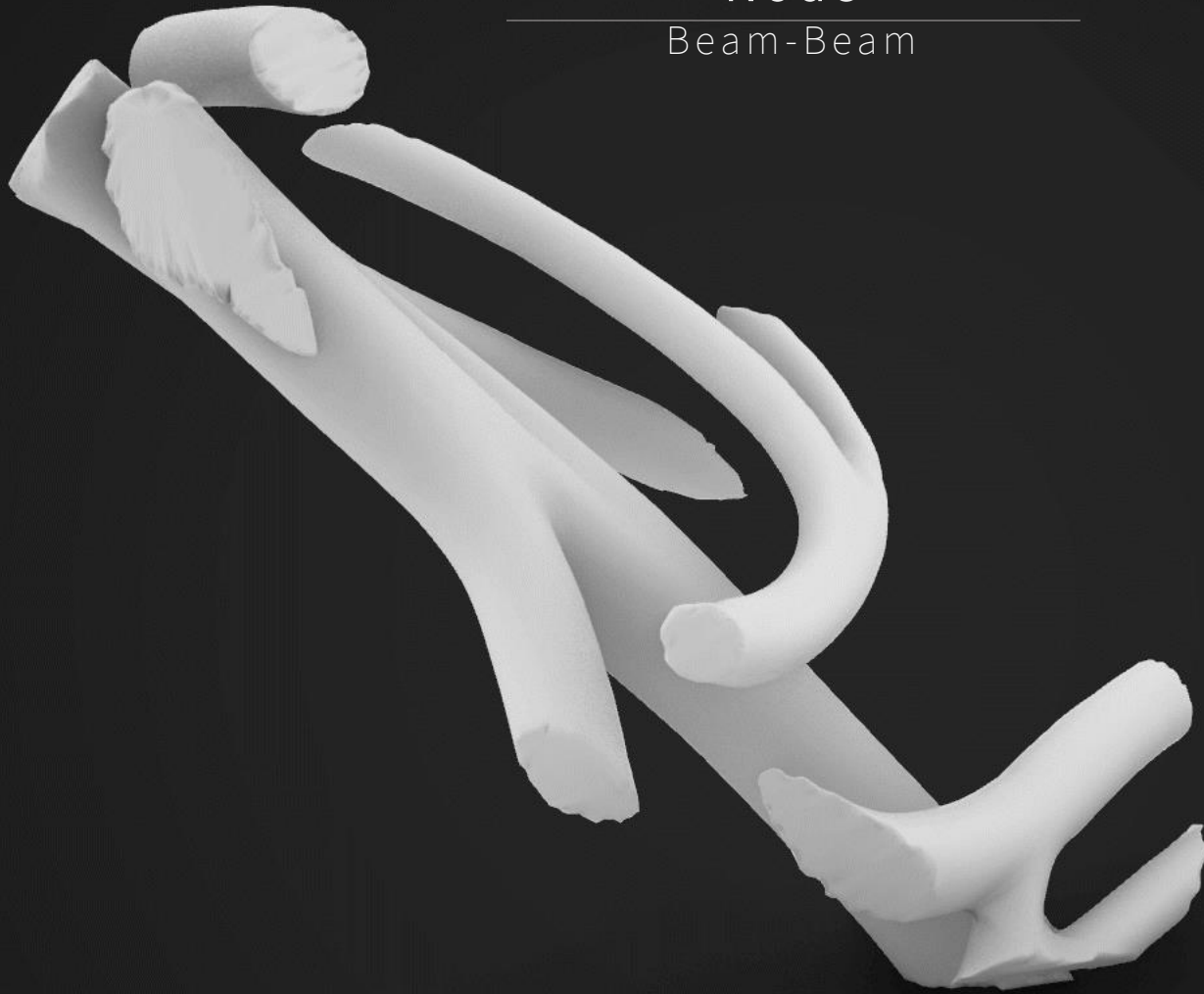
Topological Optimization

# Node

Topological Optimization

# Node

Beam-Beam

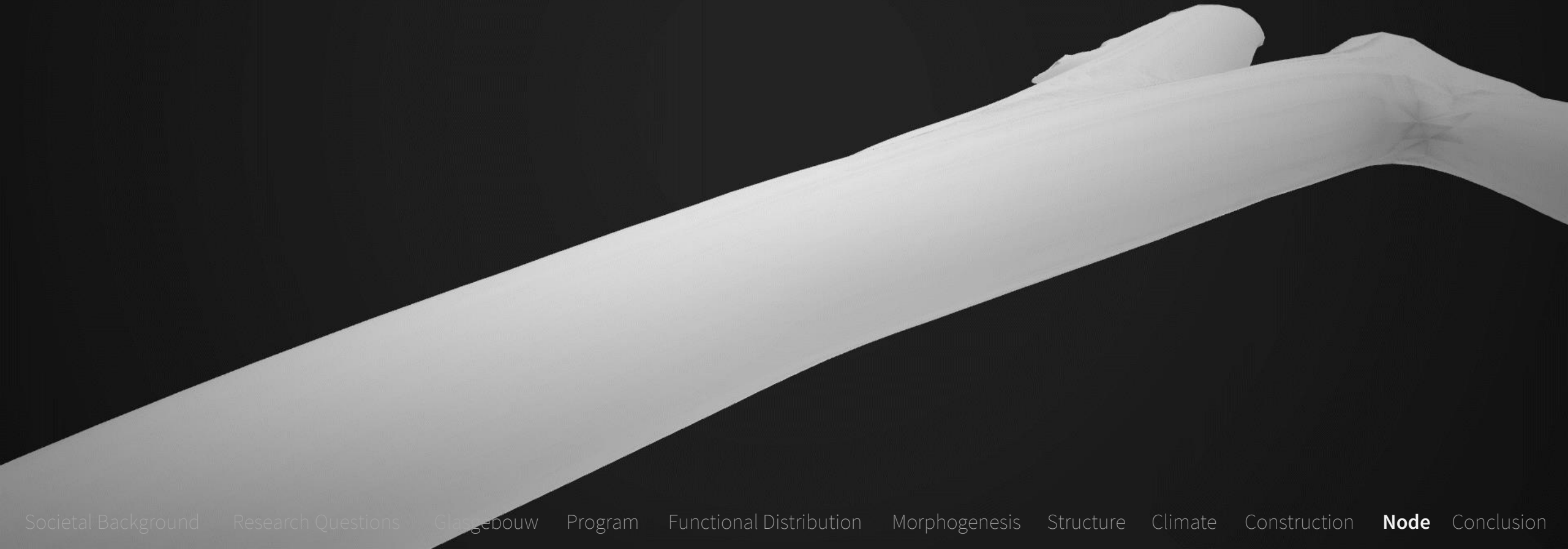


# Node

Beam-Beam

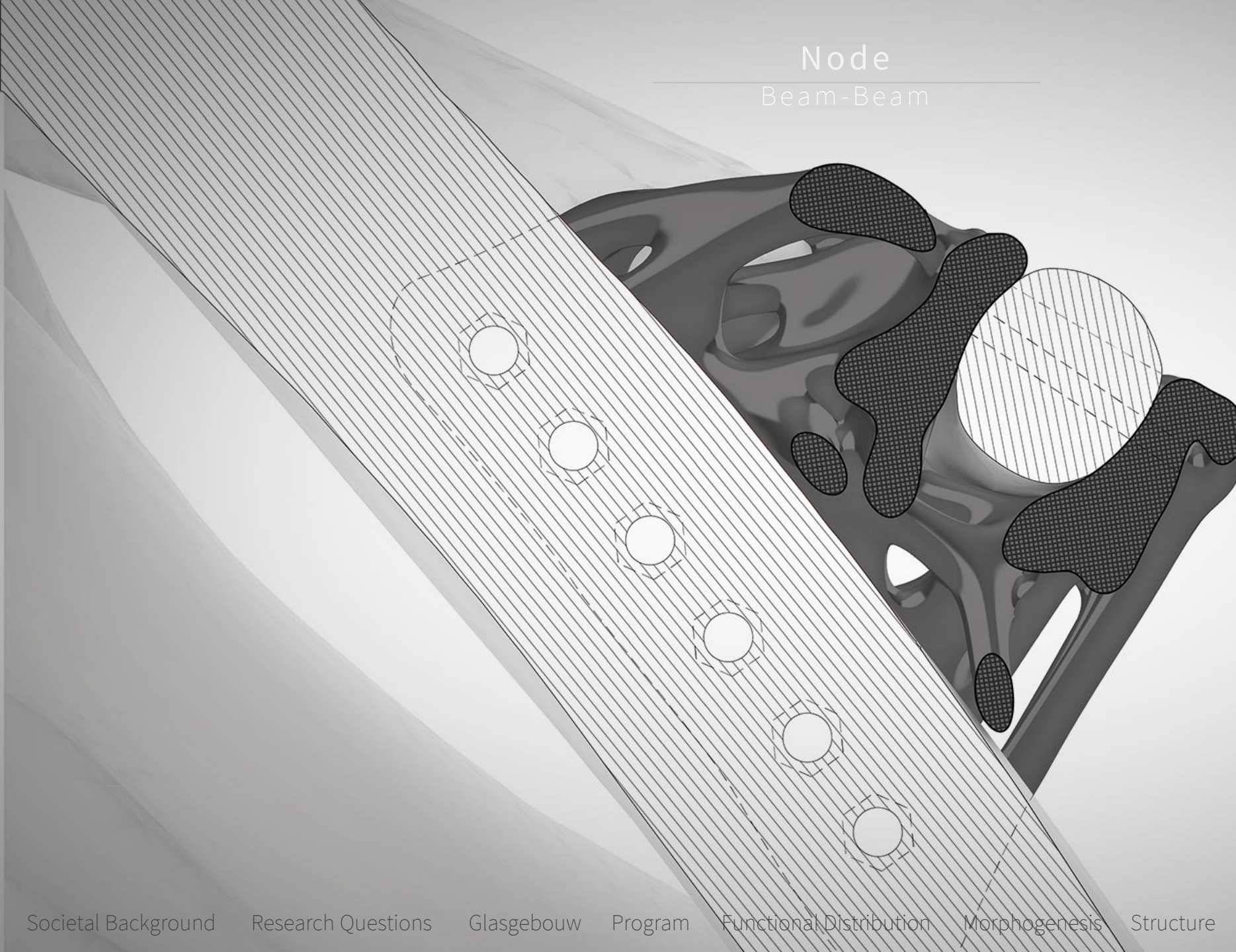
# Node

Beam-Beam



# Node

Beam-Beam





# Node

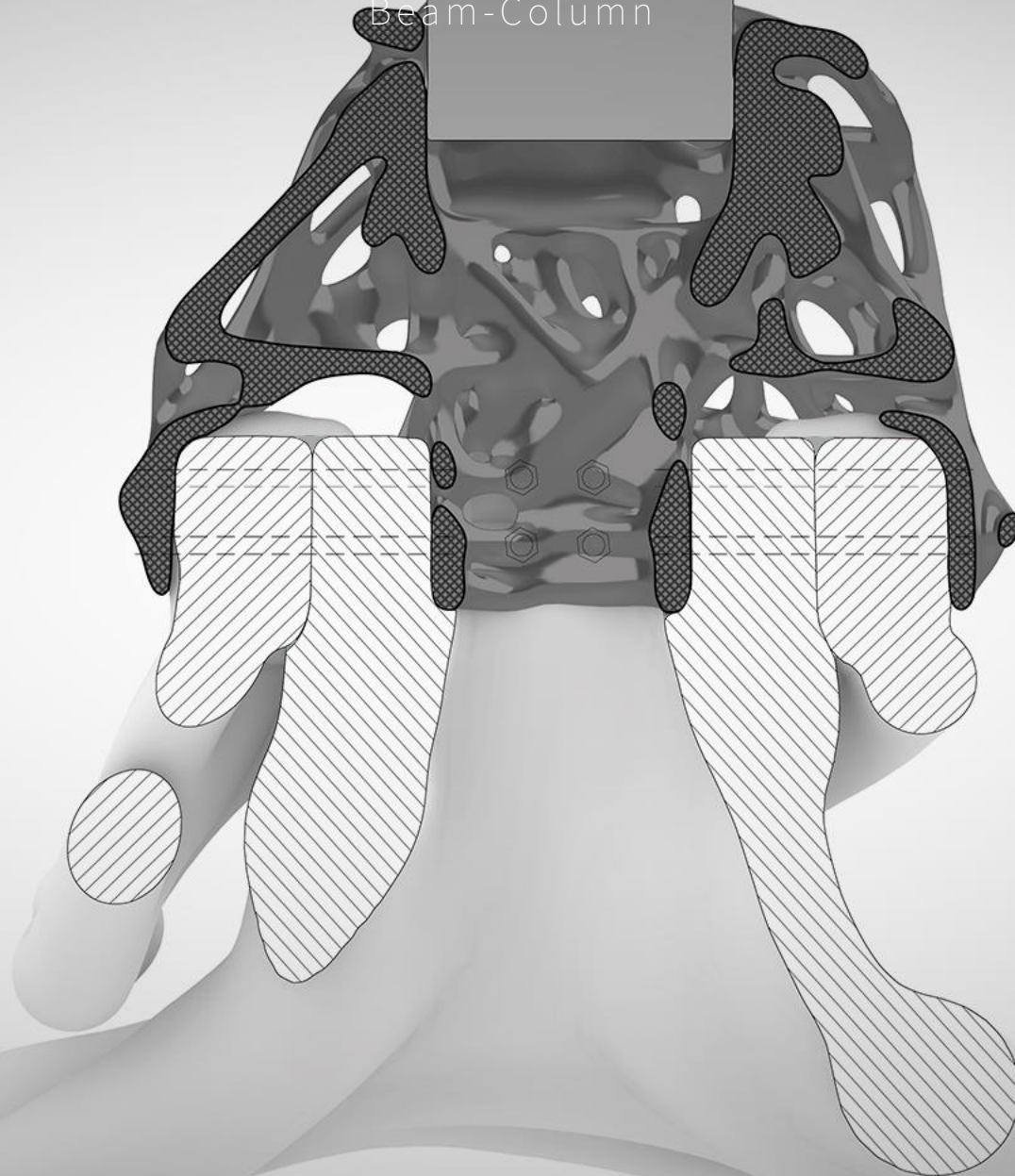
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Beam-Column



# Node

Beam-Column





# Node

Beam-Column

# Node

DMLS Printing

# WAAMPeller

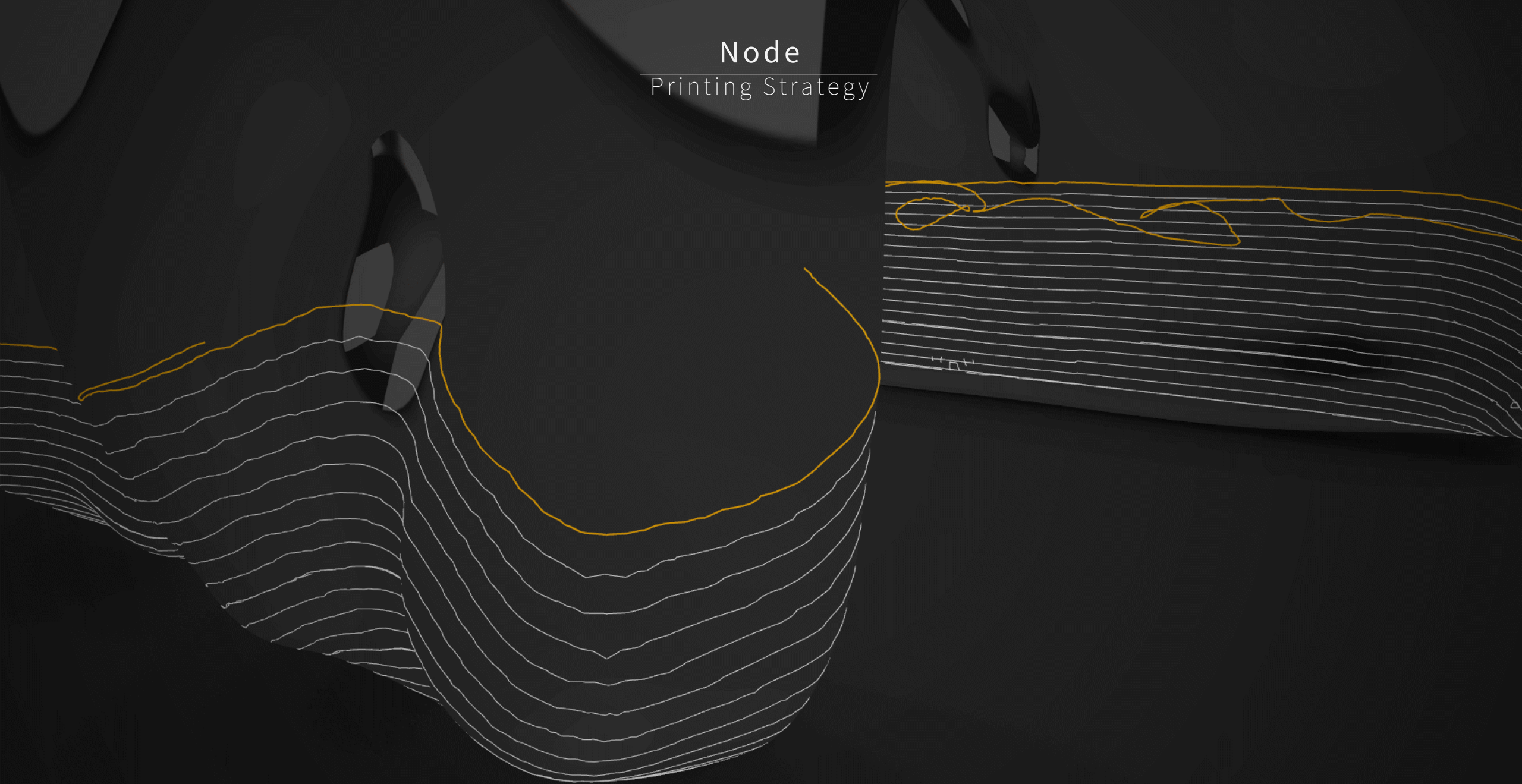
RAMLAB



# Node

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## Printing Strategy



# Node

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## Printing Strategy

# Node

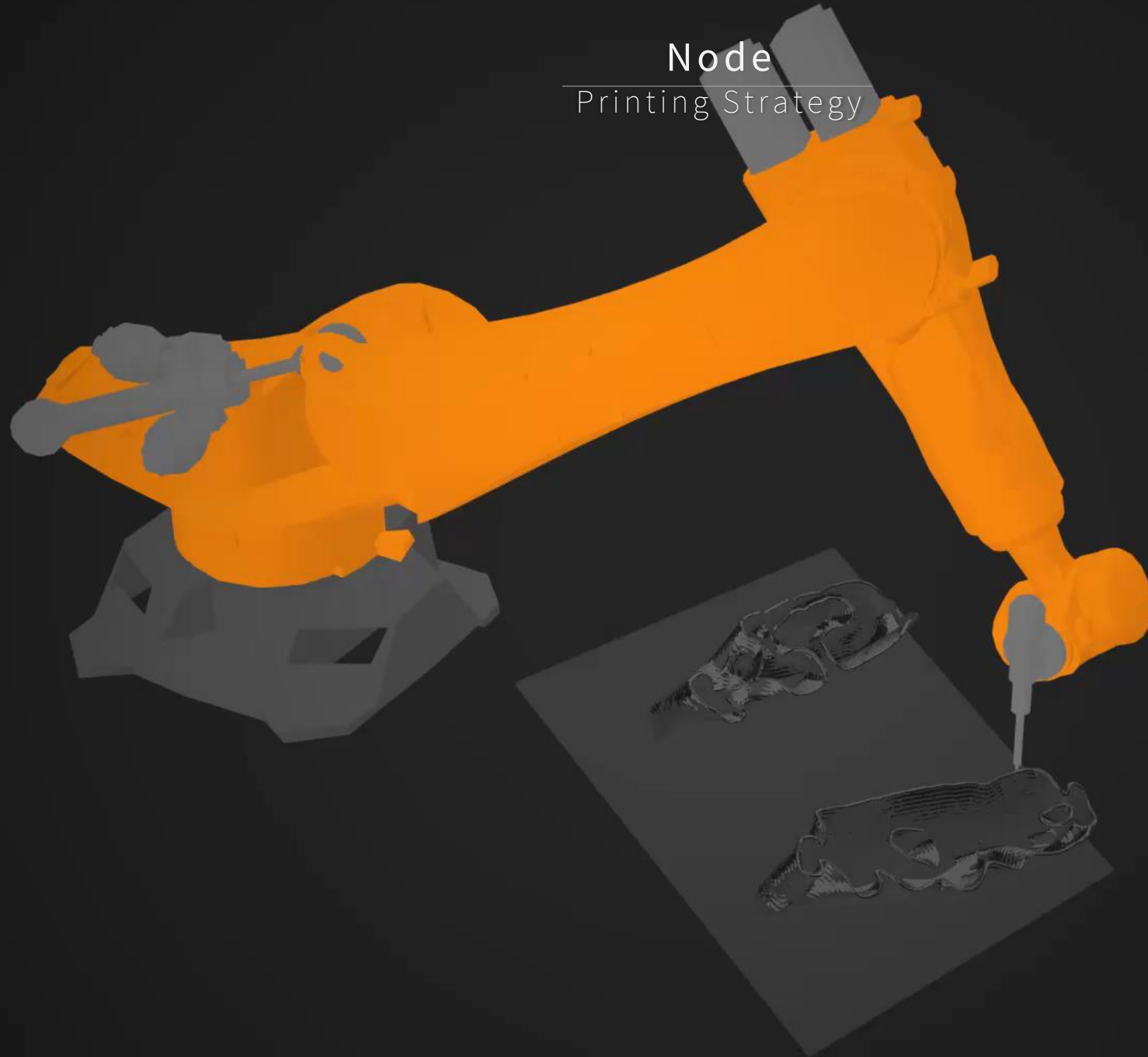
Printing Strategy





# Node

Printing Strategy



# Conclusion

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Architectural

# Conclusion

Stylistic

# Conclusion

Research



# Material Usage

Approximation

## Applied

Wooden Structure

606 m<sup>3</sup>

424 x10<sup>3</sup> kg

## Removed

Concrete Floors and Columns

551 m<sup>3</sup>

13232 x10<sup>3</sup> kg

## Difference

Volume: +55 m<sup>3</sup>

Mass: -899 x10<sup>3</sup> kg