Rule-based Design

DM II Week 2

DES 212| Winter Term 2 | 2026 | 3 Credits
Instructor: Xun Liu
GTAs: Lea Papillon, Wylie Moorman

Content

Foundations of Rule-based Systems (General Theory)

Contemporary Implementations

Assignment 1

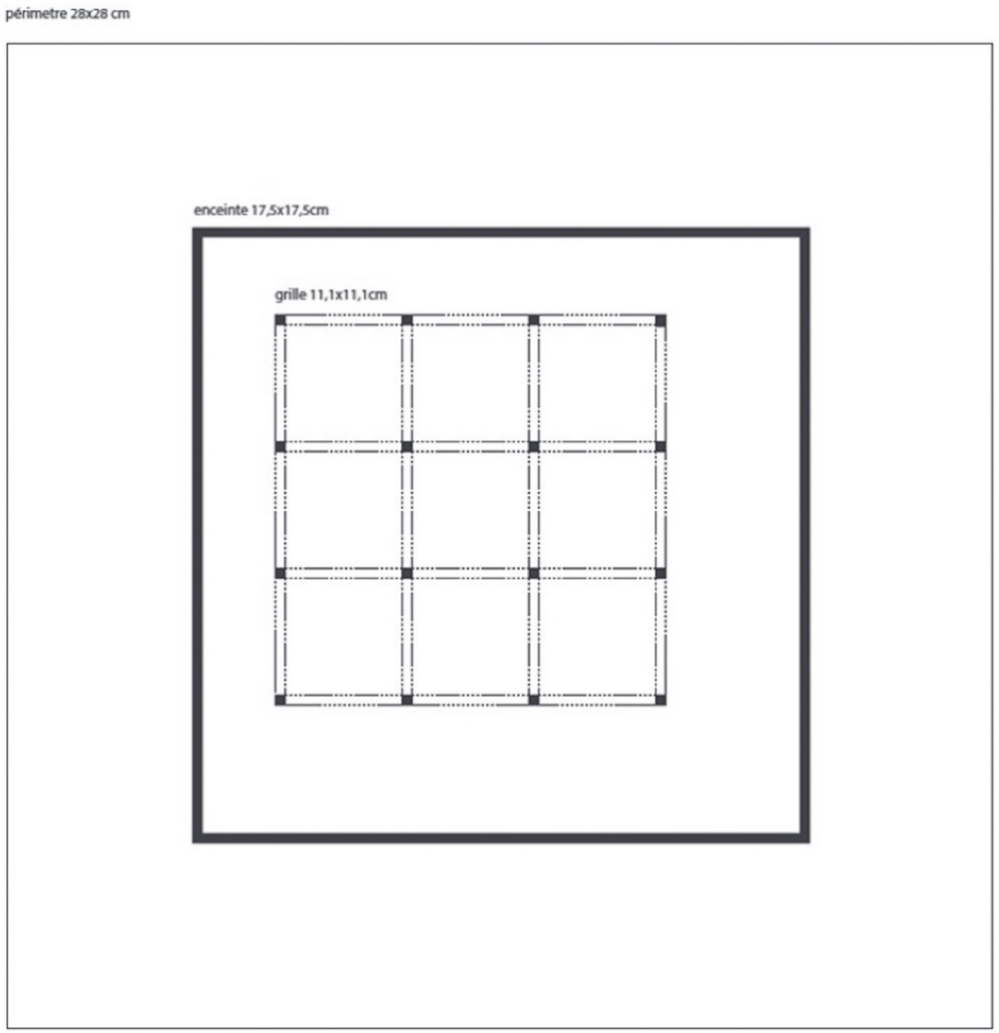
Theoretical Foundations

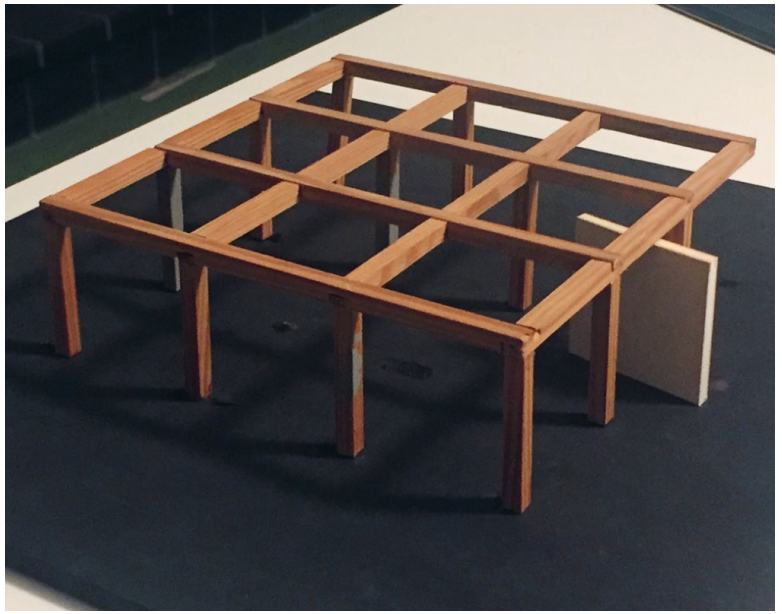
Theoretical Foundations

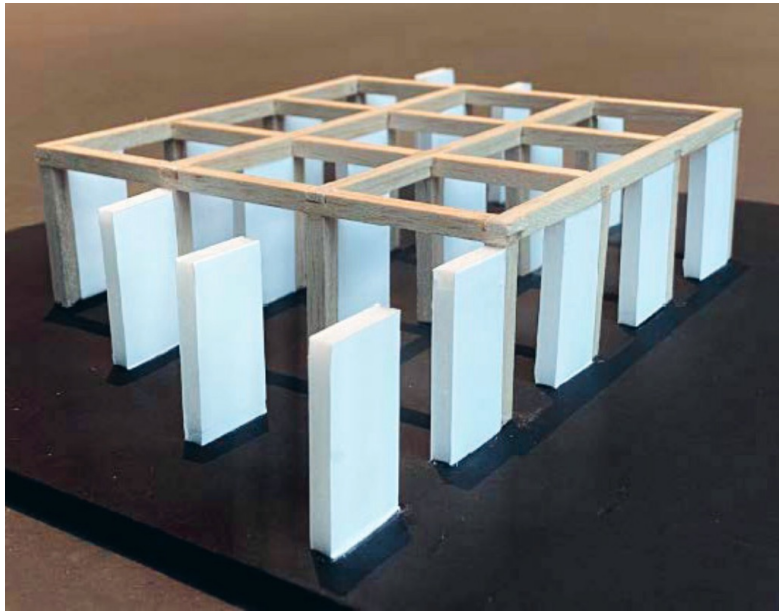
Constitutional Logic

The Grid as a

Generative Matrix







Nine Square Grid

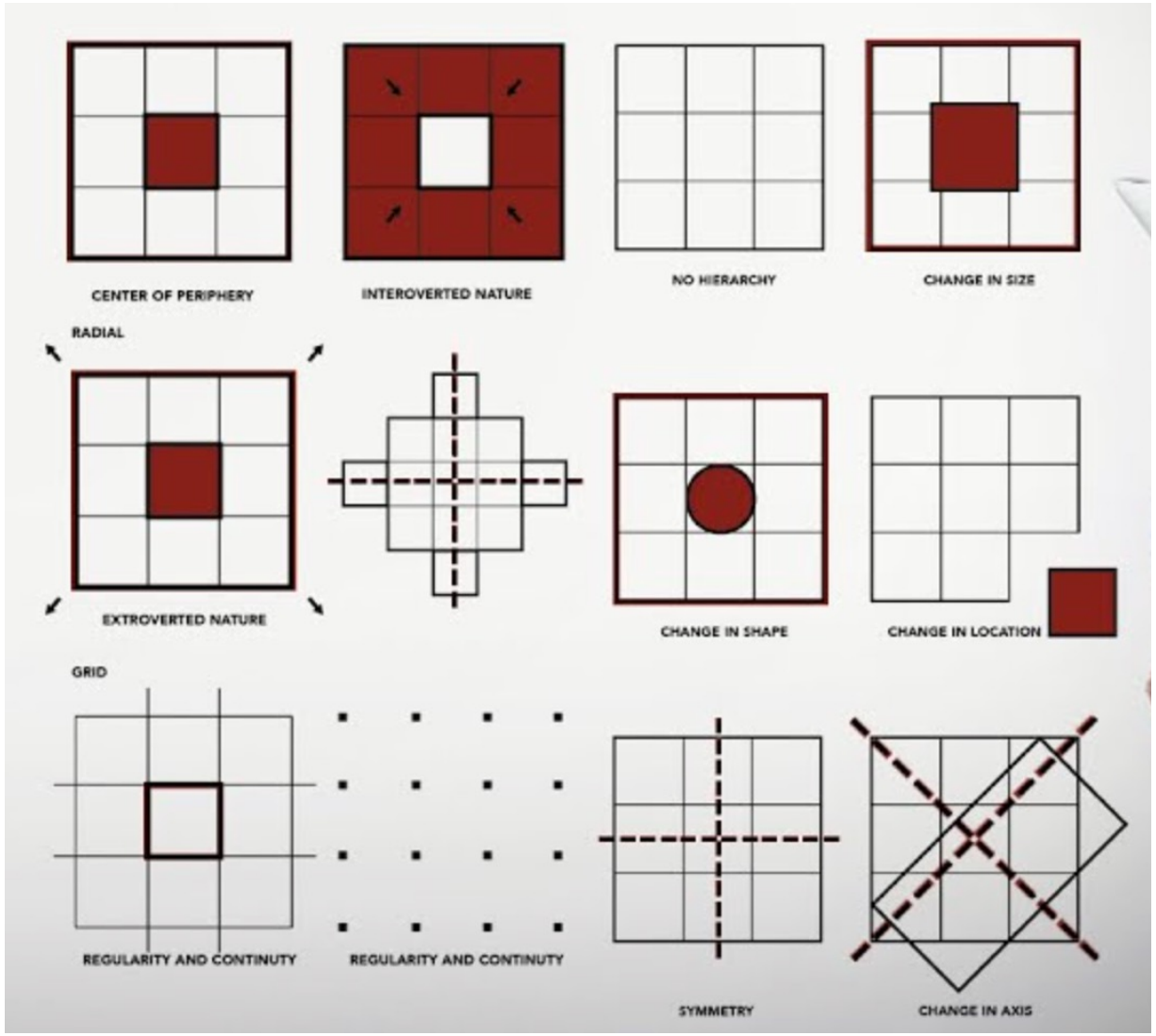
John Hejduk, 1954

Theoretical Foundations

Constitutional Logic

The Grid as a

Generative Matrix



Nine Square Grid

John Hejduk, 1954

https://www.youtube.com/watch?v=kWktD4qS2dI

Theoretical Foundations

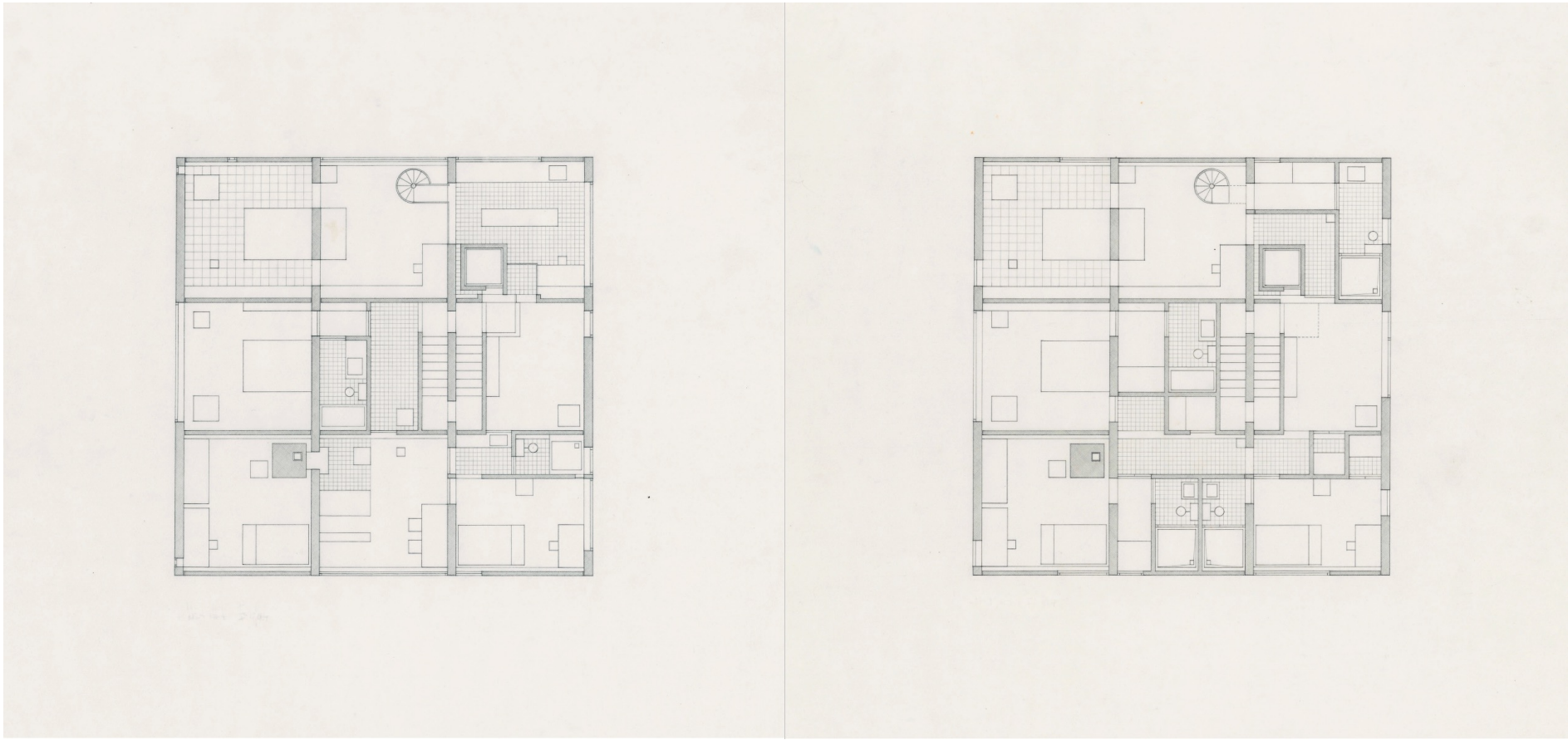
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John Hejduk, 1954

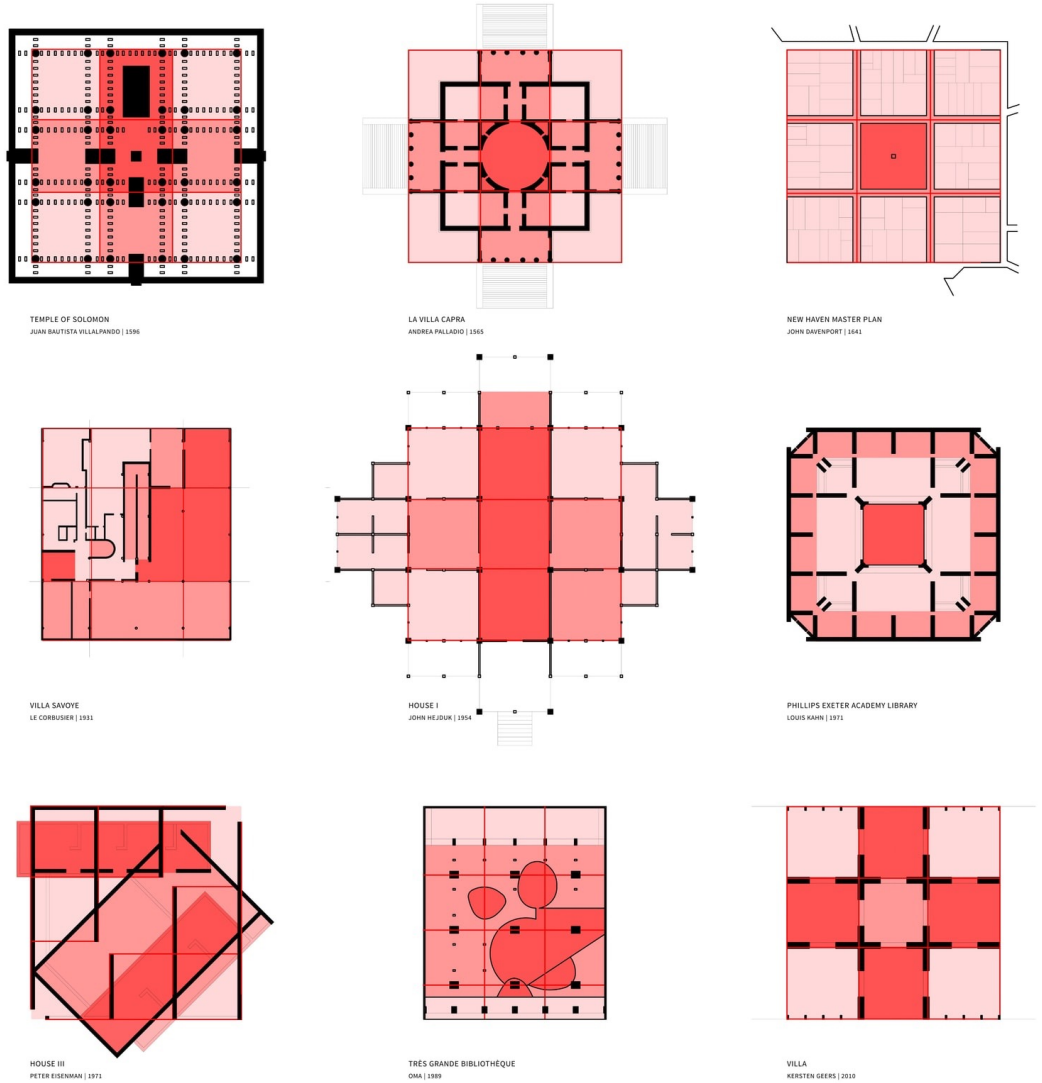


John Hejduk, Plan for Texas House 7(1953-1963)

Constitutional Logic

The Grid as a

Generative Matrix



Nine Square Grid

John Hejduk, 1954

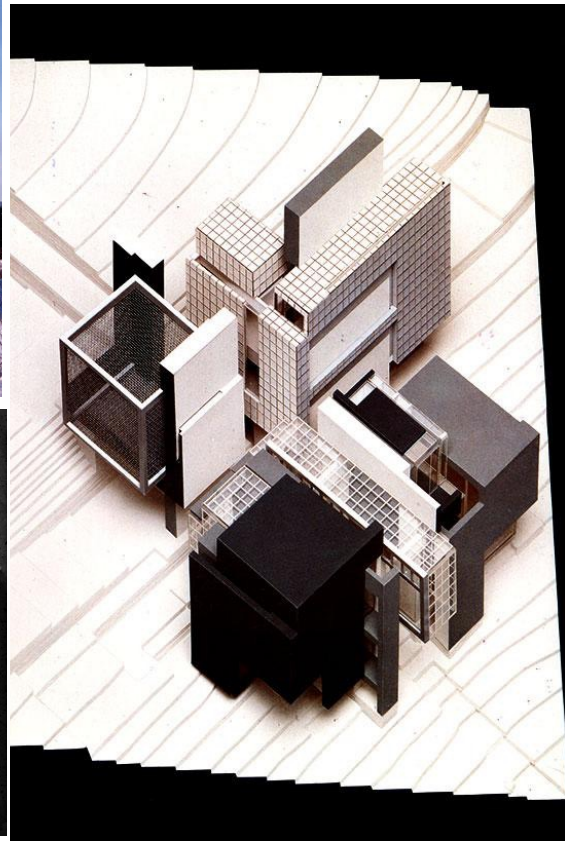
Transformational Logic

“Process Log”

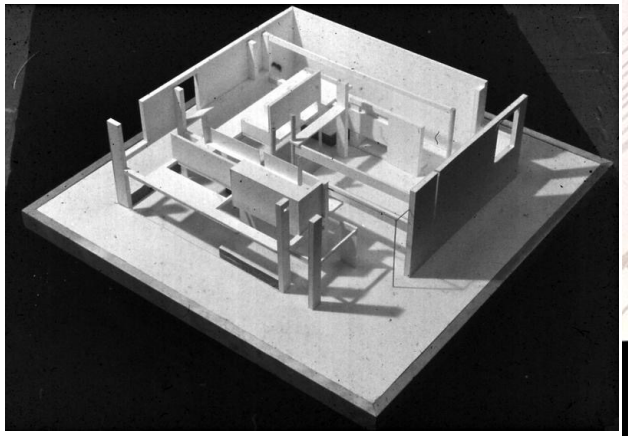
Cardboard Architecture











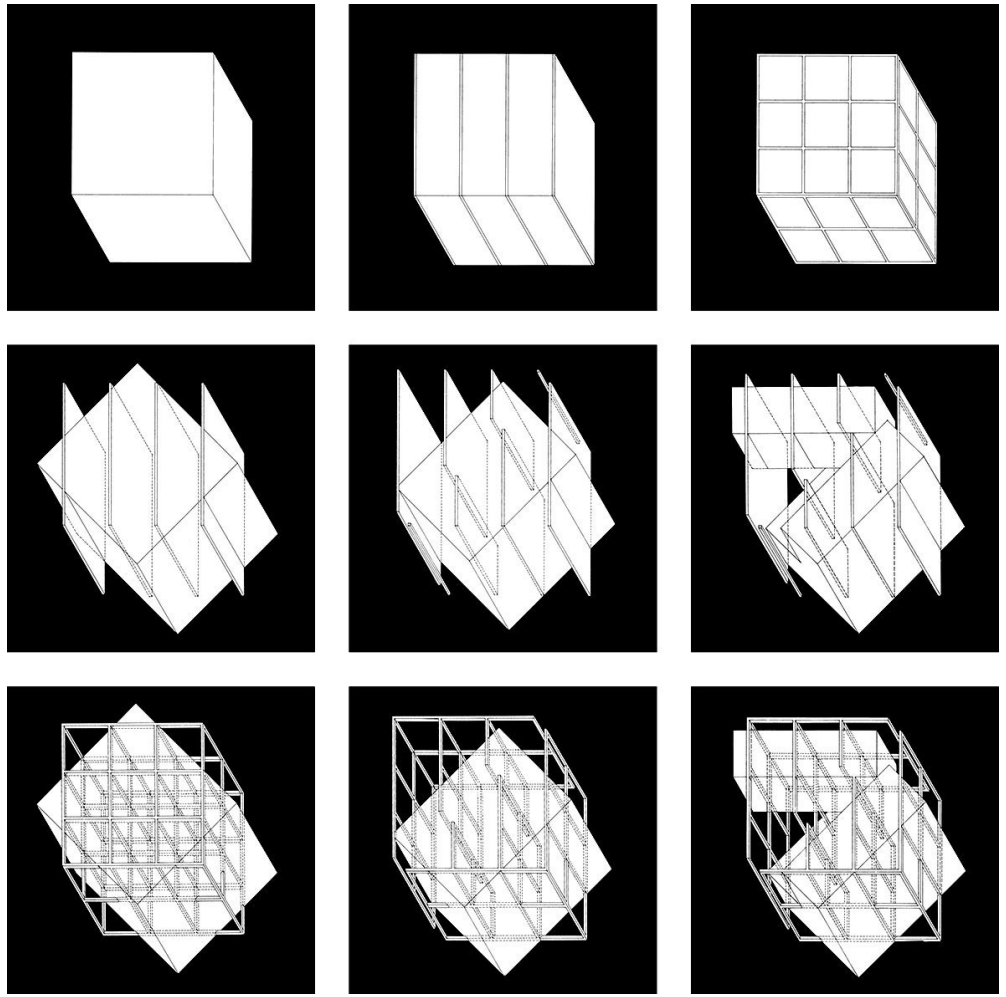
House series

Peter Eisenman, 1968–1974

Transformational Logic

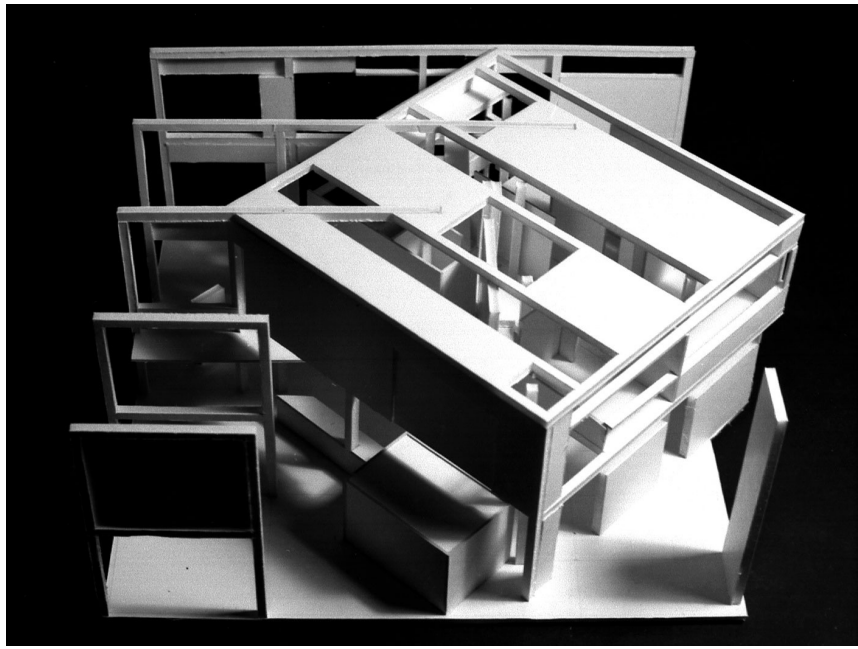
“Process Log”

Cardboard Architecture



House series

Peter Eisenman, 1968–1974

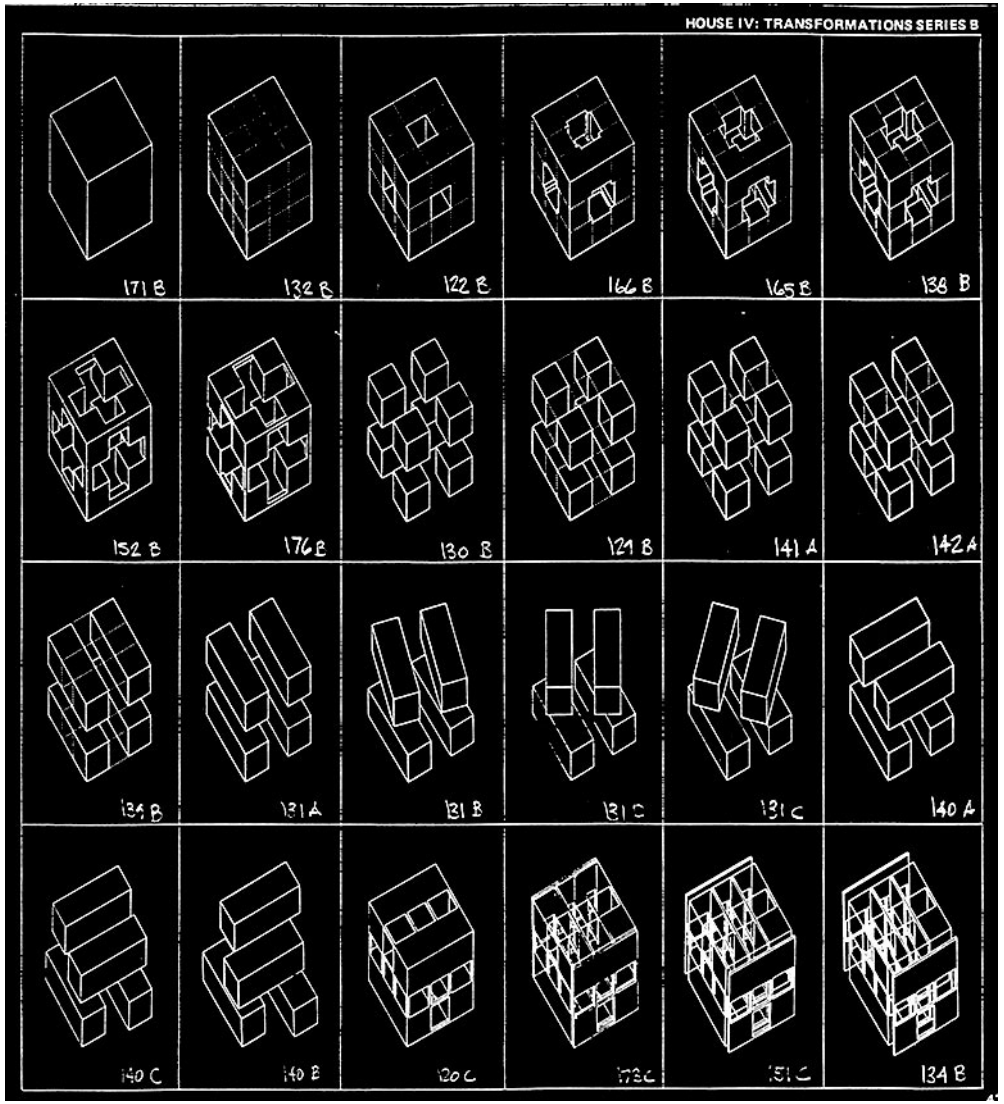


House III

Transformational Logic

“Process Log”

Cardboard Architecture



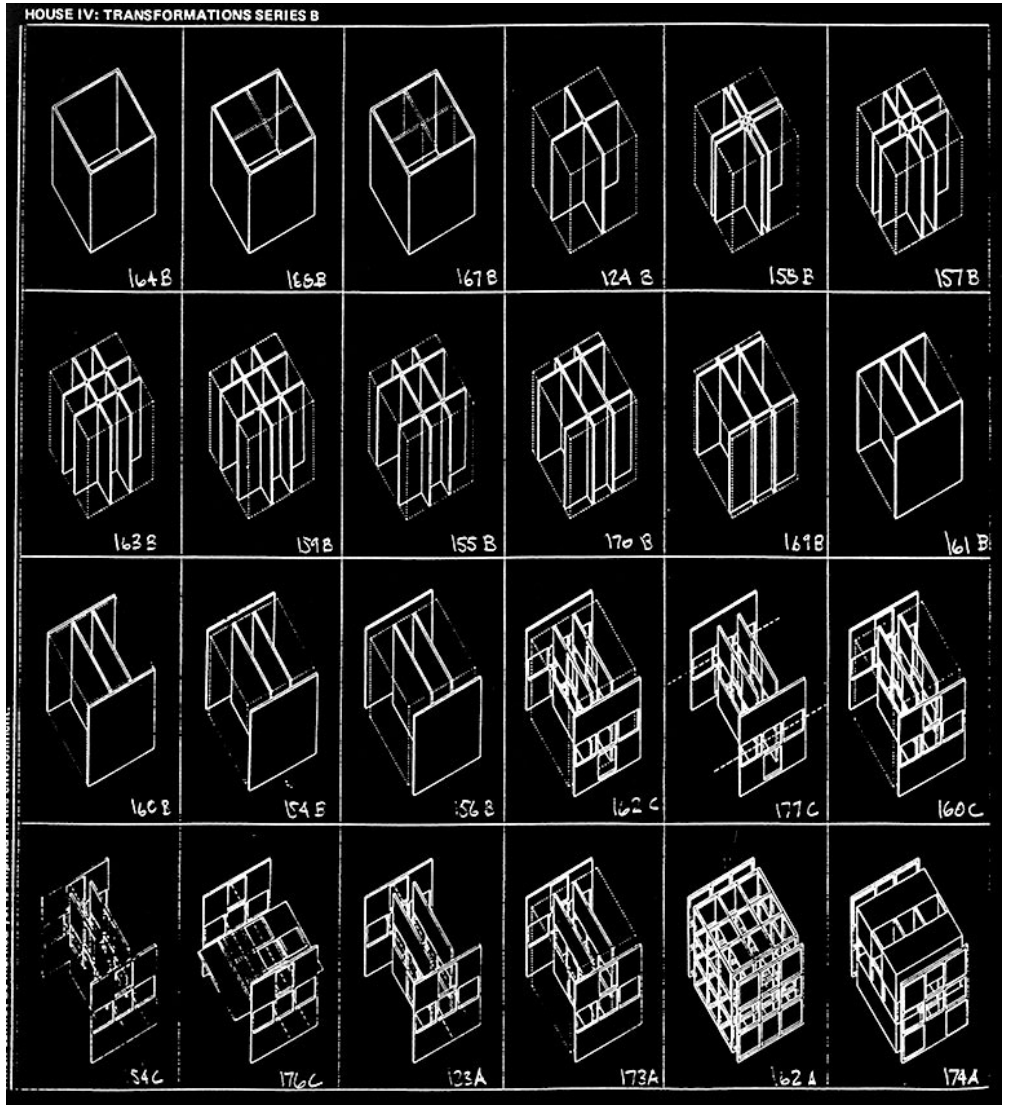
House series

Peter Eisenman, 1968–1974

Transformational Logic

“Process Log”

Cardboard Architecture



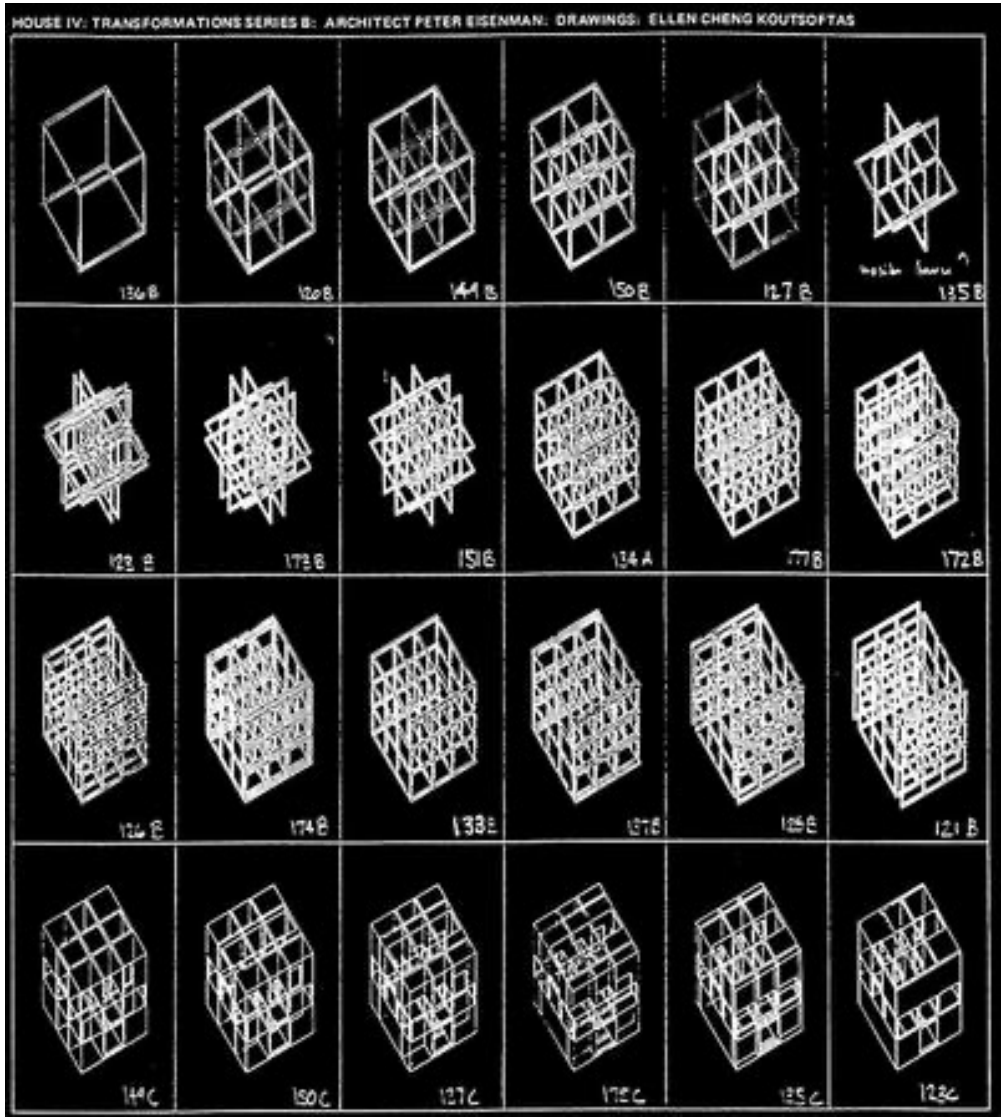
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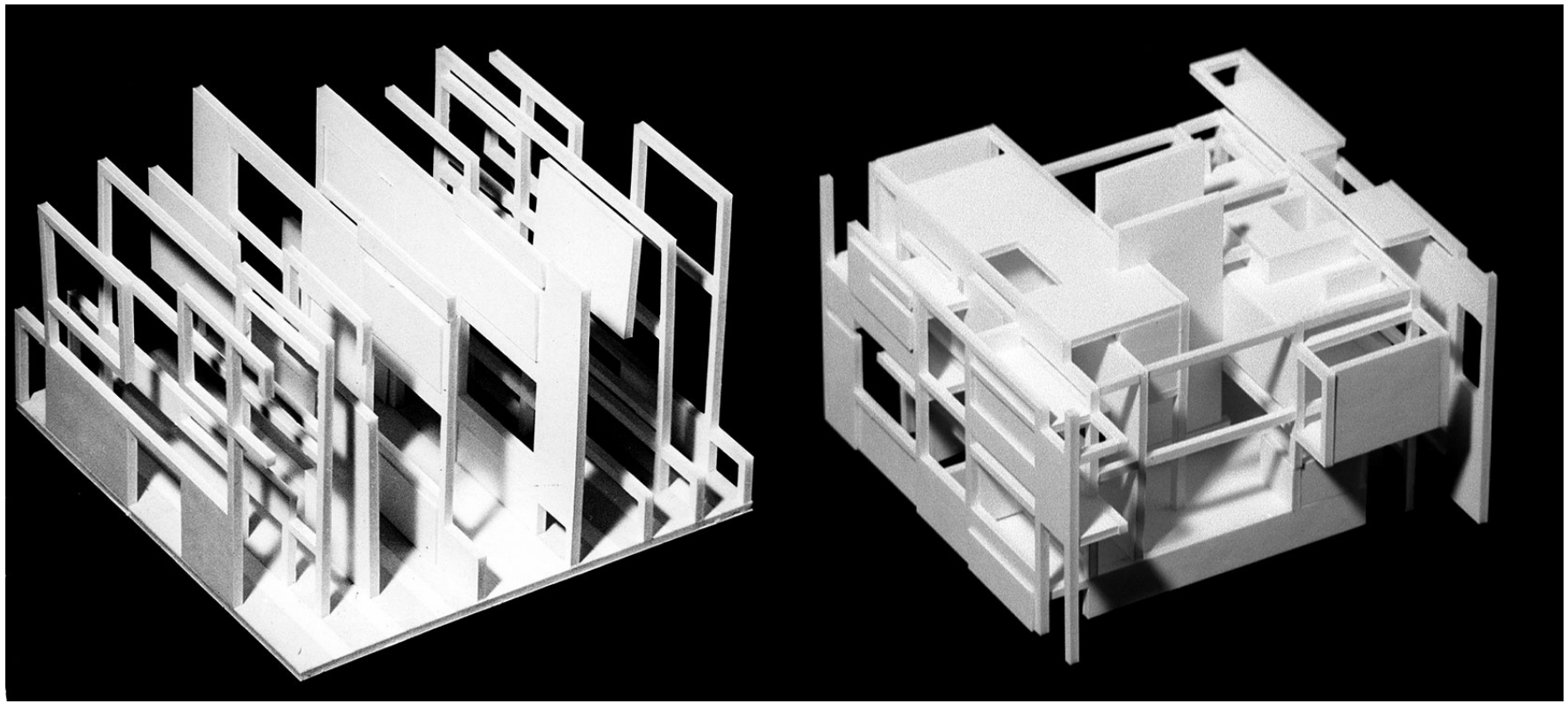
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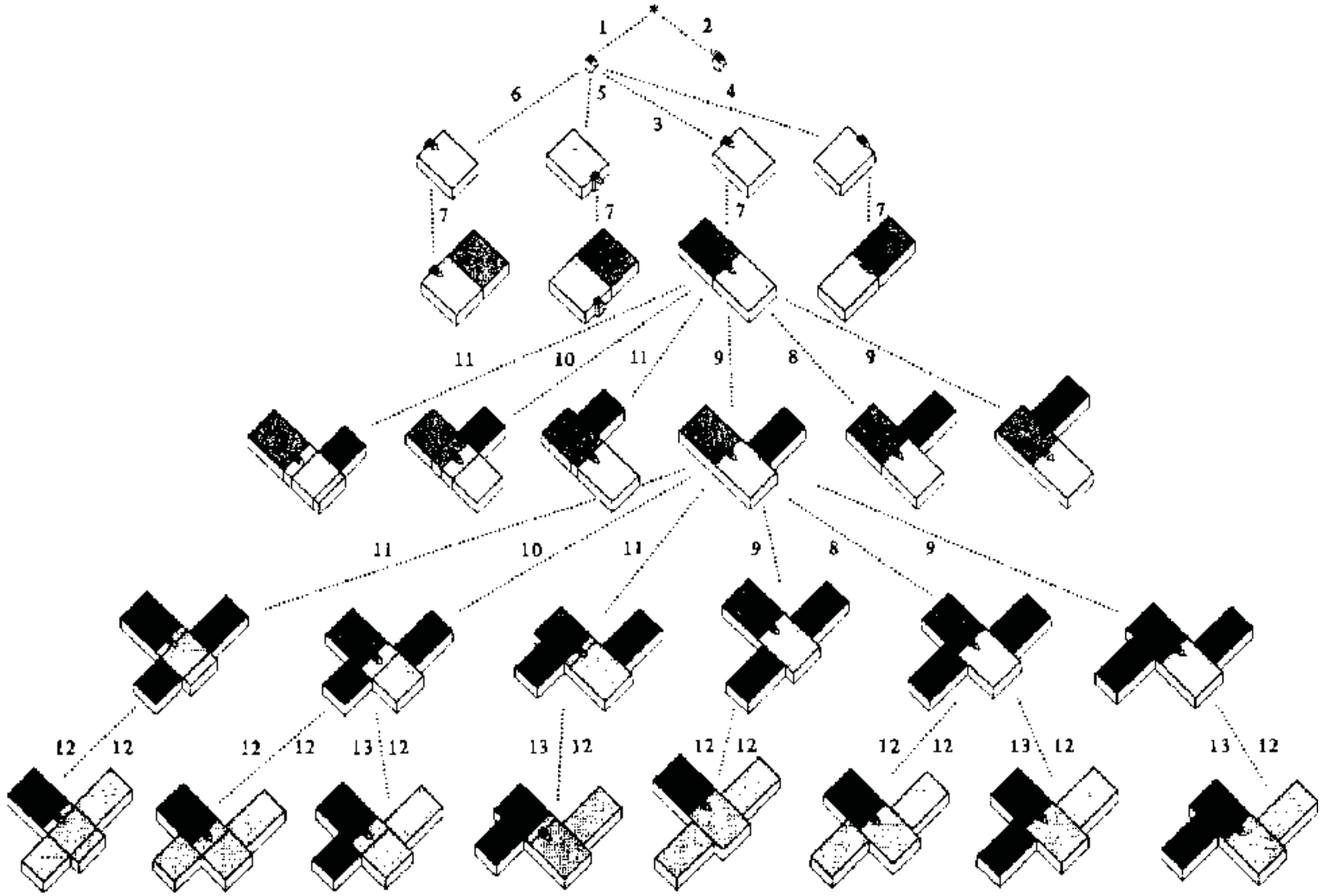
Cardboard Architecture



House series

Peter Eisenman, 1968–1974

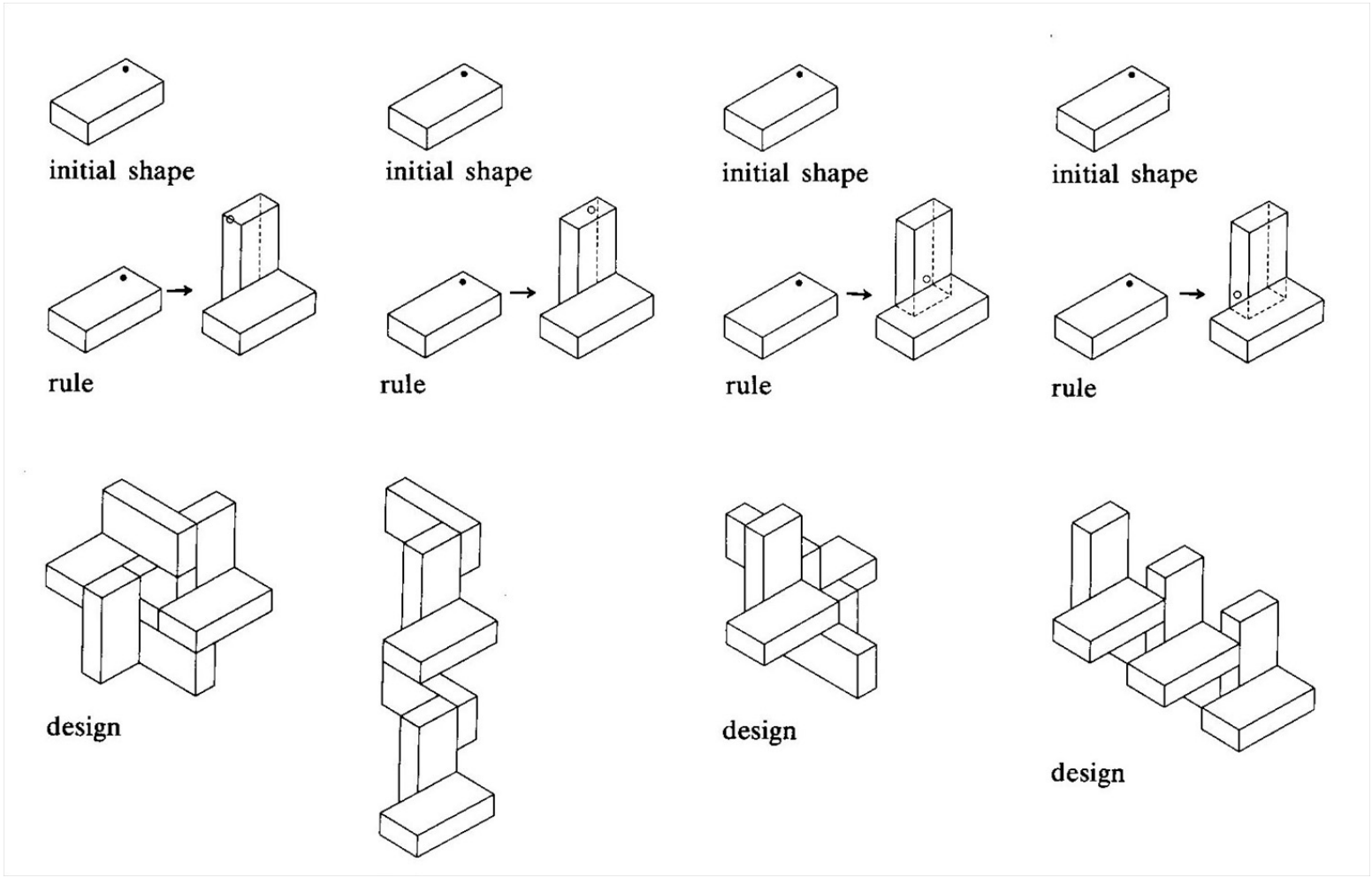
Recursive Logic



Shape Grammar

George Stiny & James Gips,1971

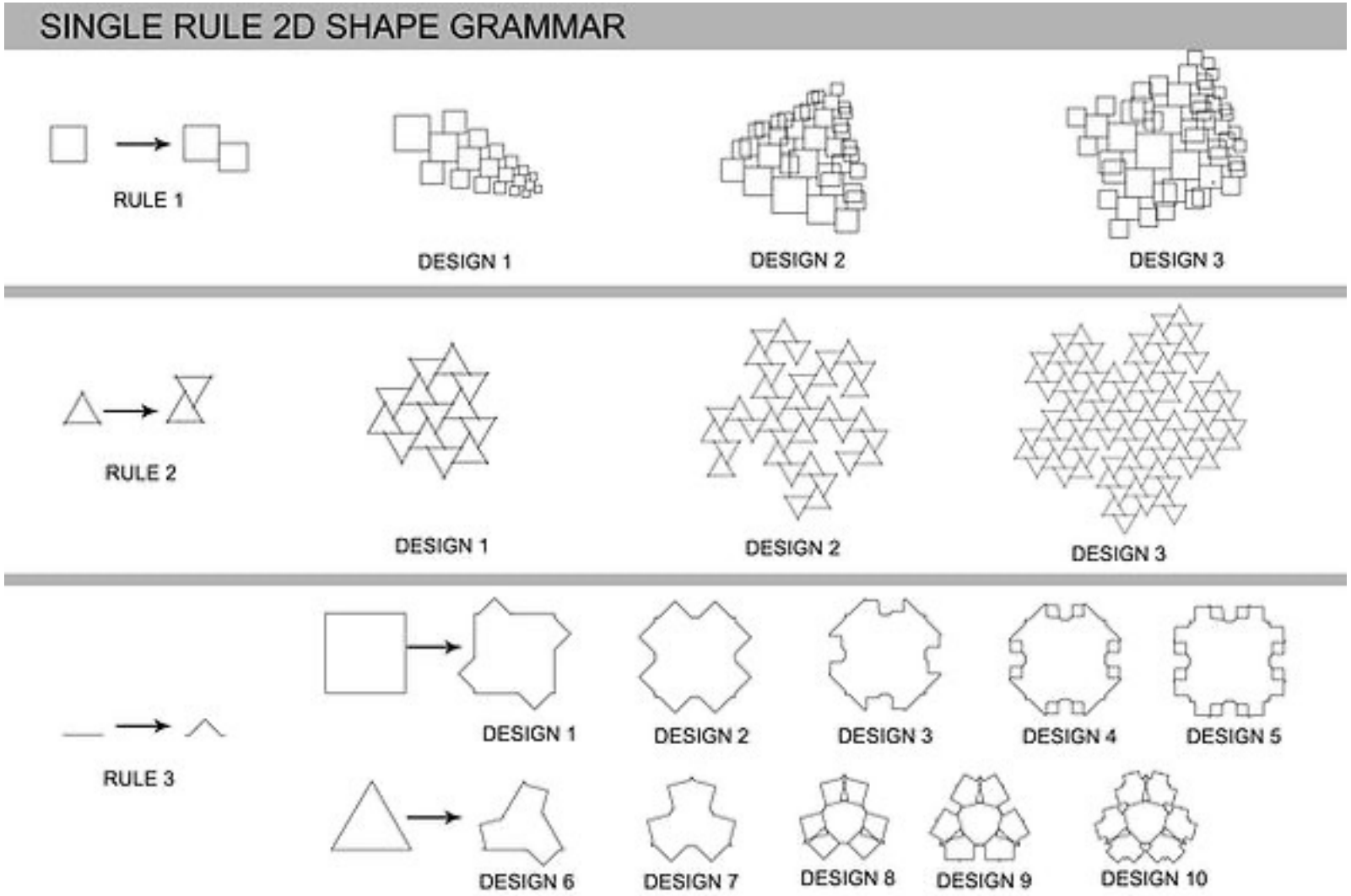
Recursive Logic



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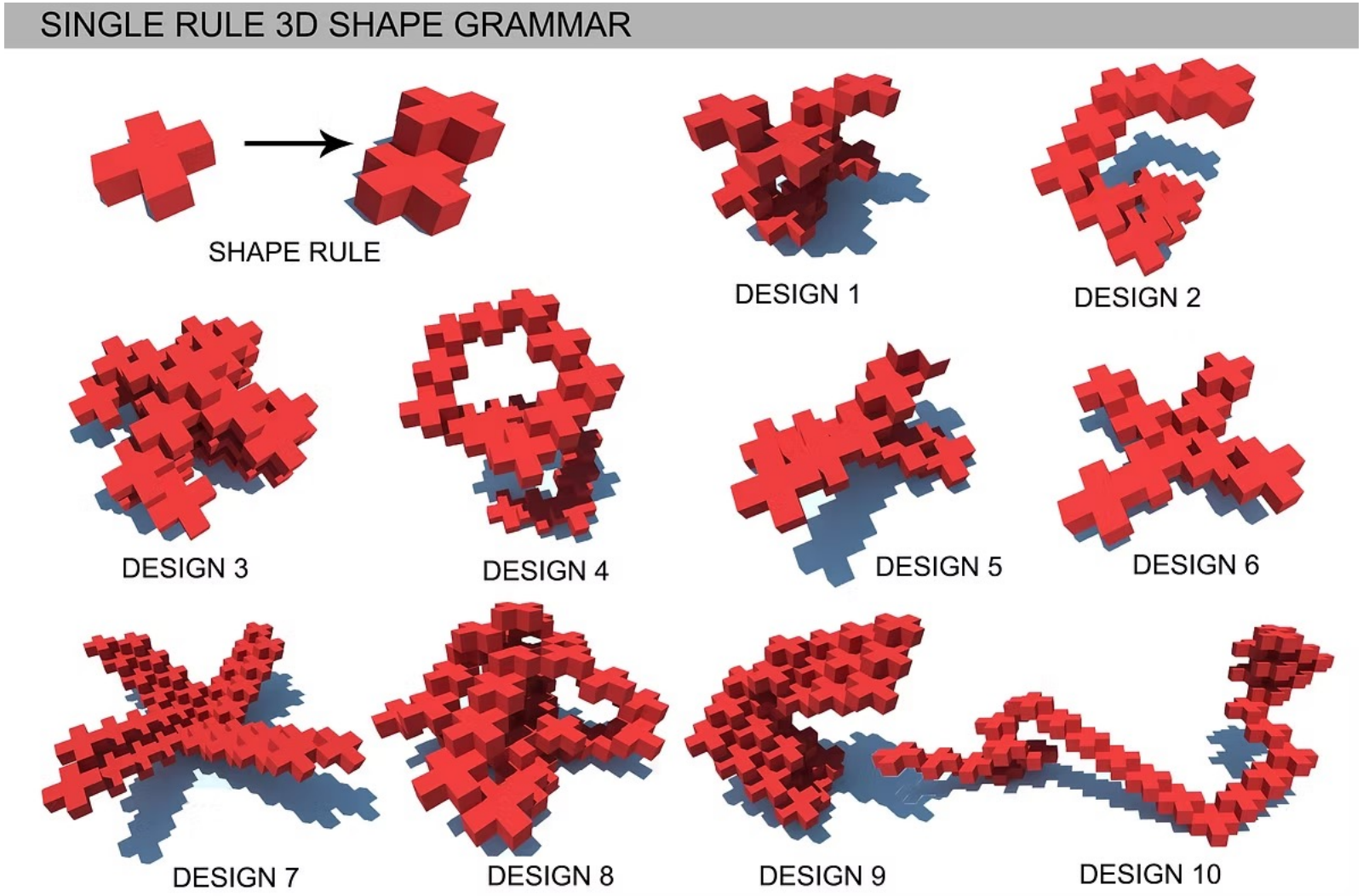
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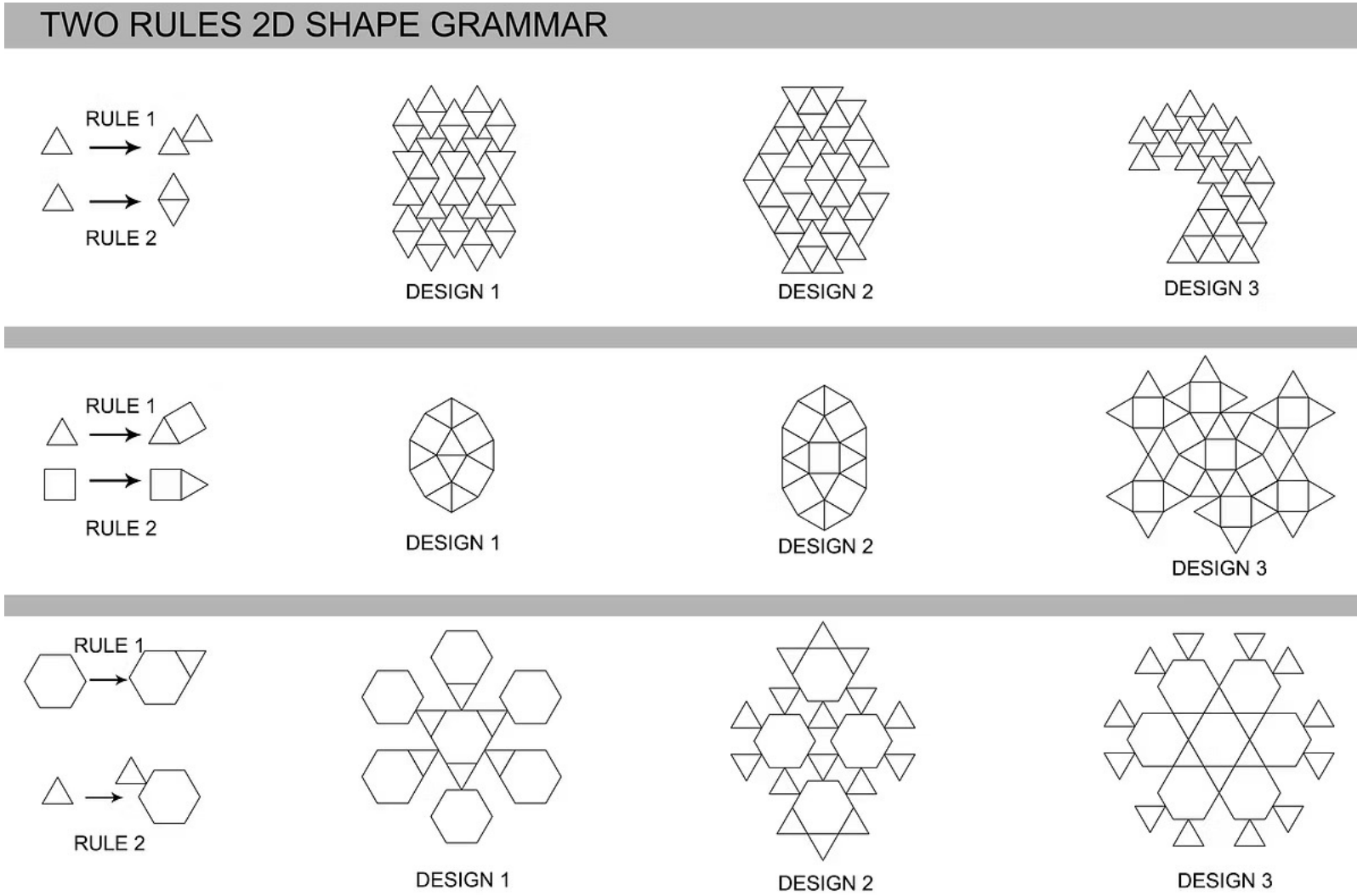
Recursive Logic



Shape Grammar

George Stiny & James Gips,1971

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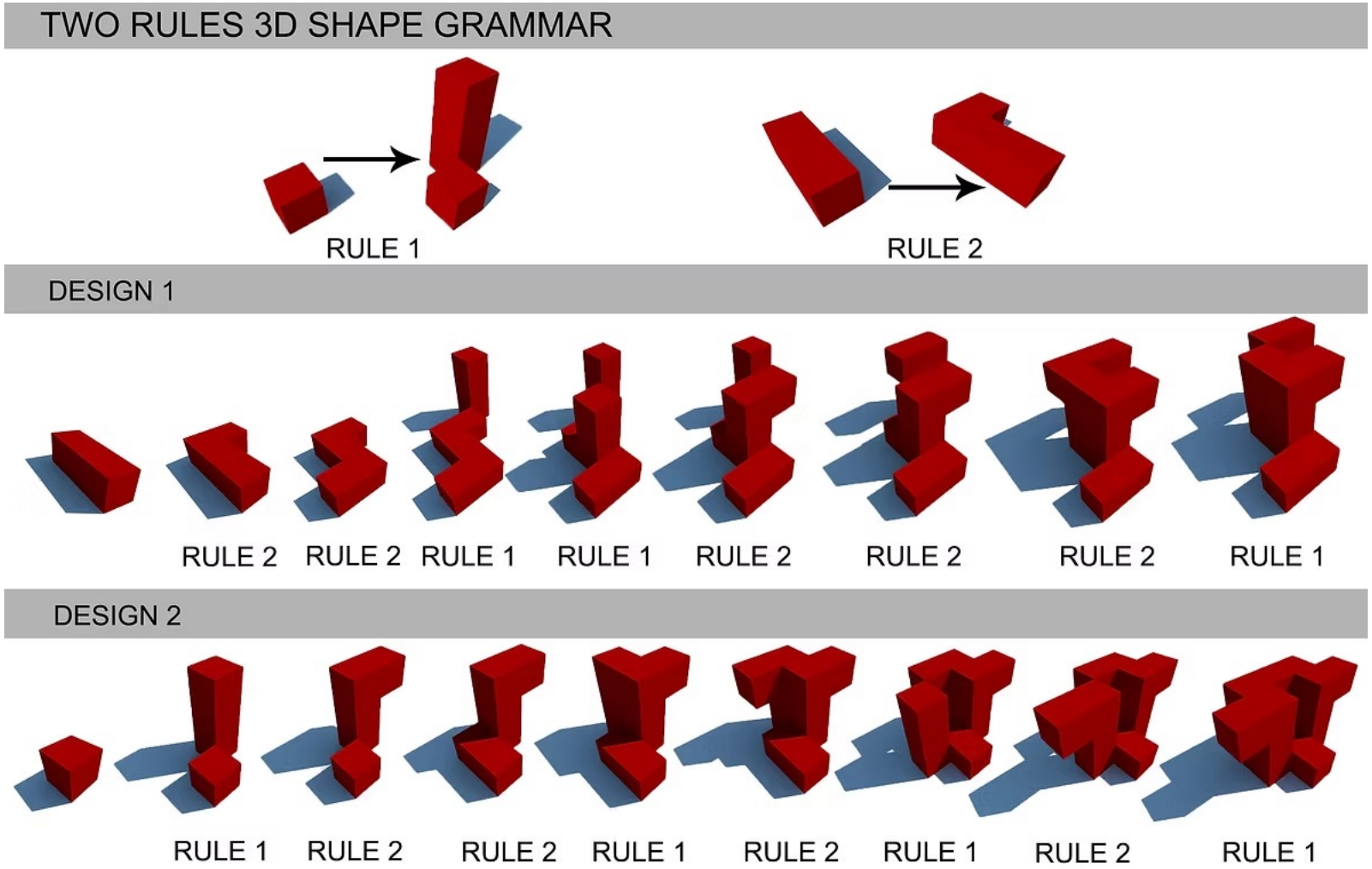


Shape Grammar

George Stiny & James Gips,1971

Recursive Logic

xx



Shape Grammar

George Stiny & James Gips,1971

Theoretical Foundations

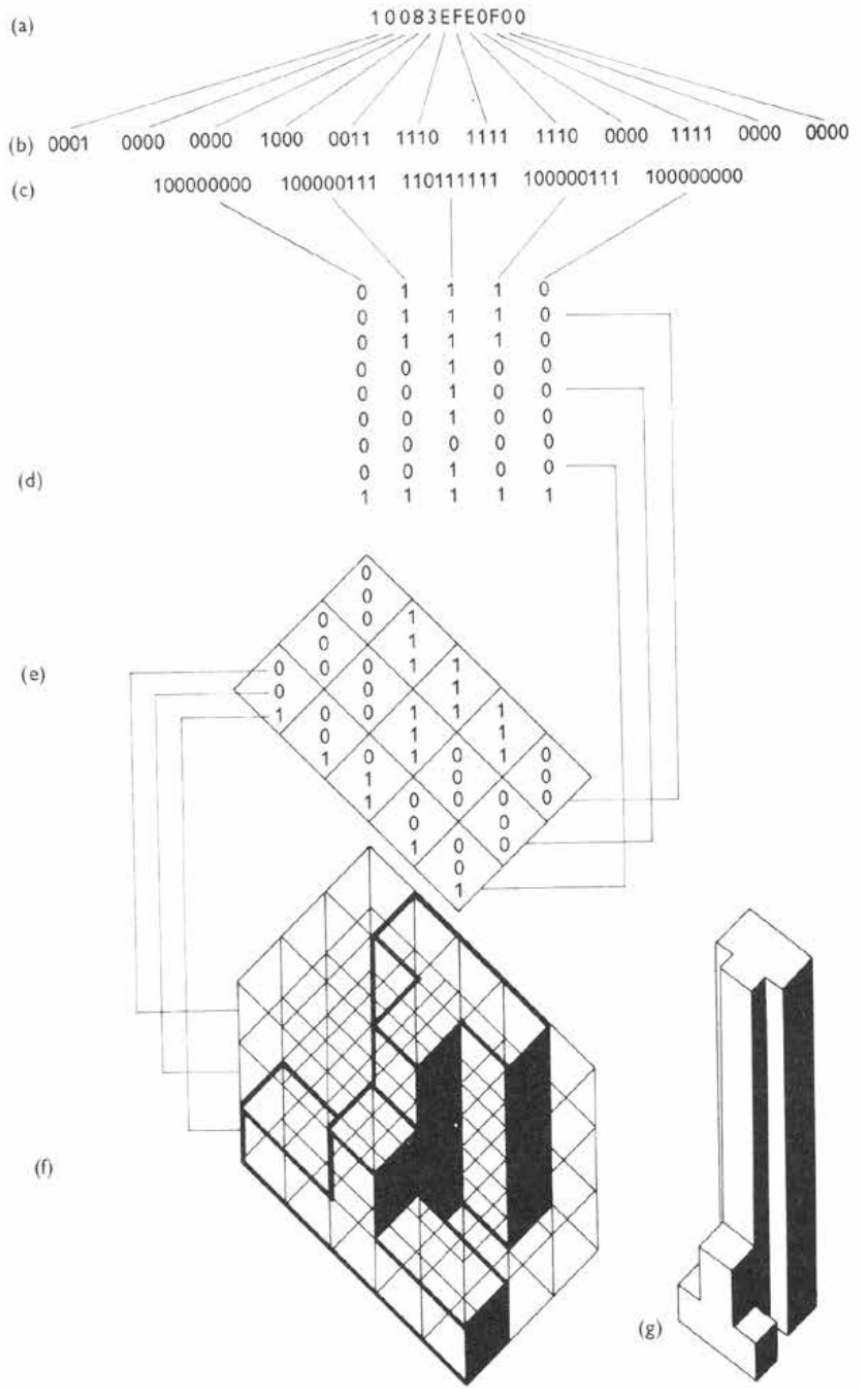
Boolean Logic

xx

10083EFE0F00

The Architecture of Form

Lionel March,1976

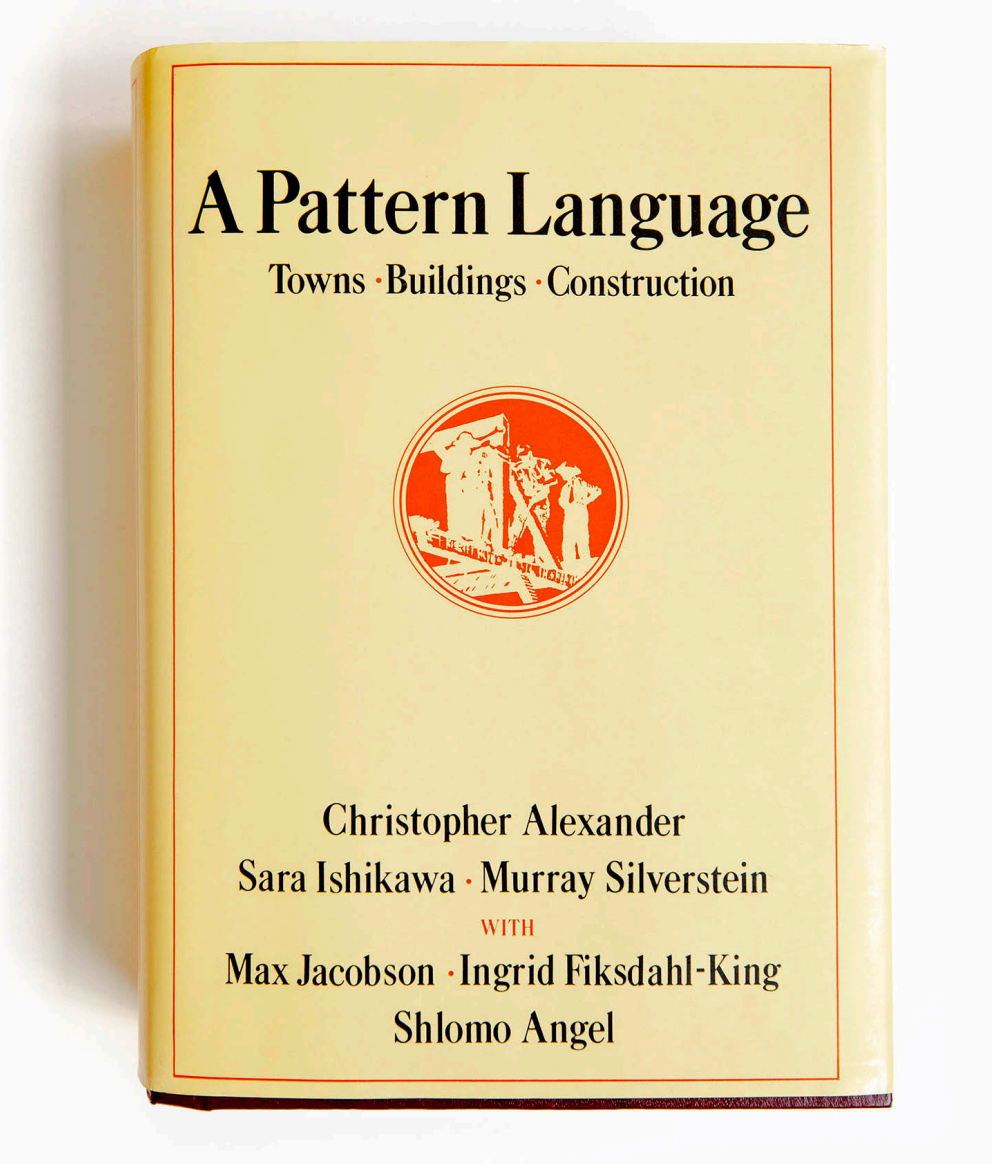


Relational Logic

xx

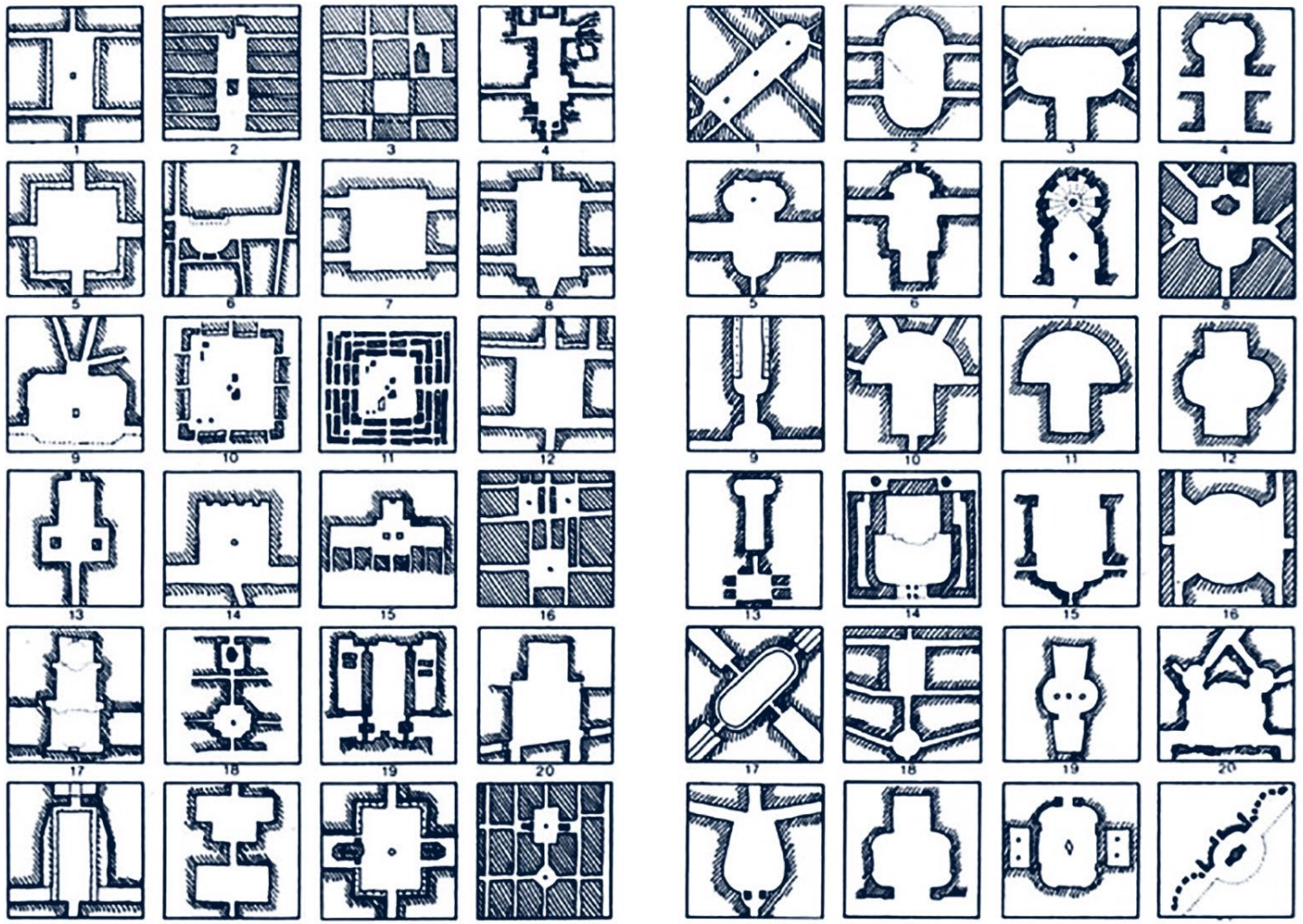
A Pattern Language

Christopher Alexander, 1977



Relational Logic

xx



A Pattern Language

Christopher Alexander, 1977

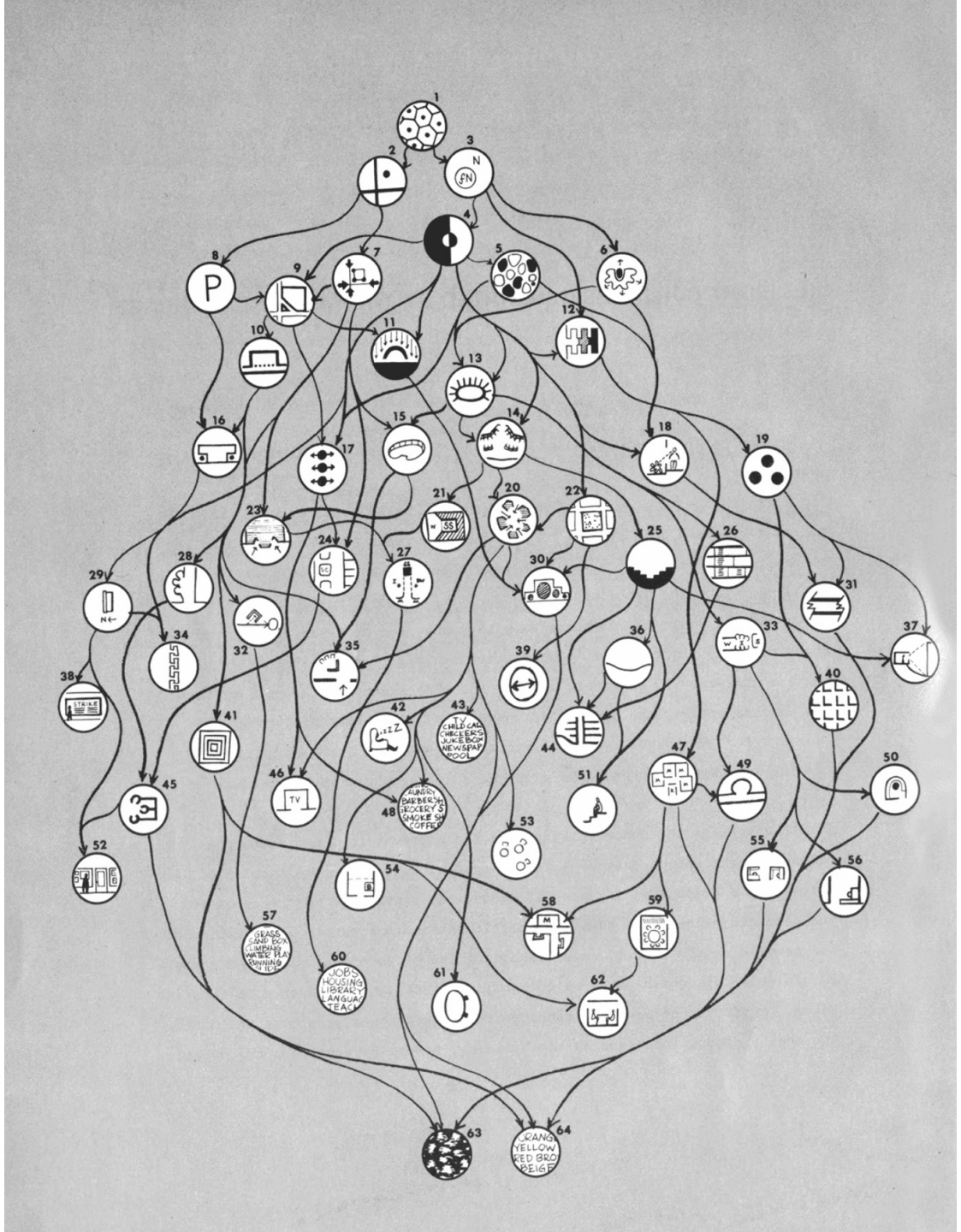
Theoretical Foundations

Relational Logic

xx

A Pattern Language

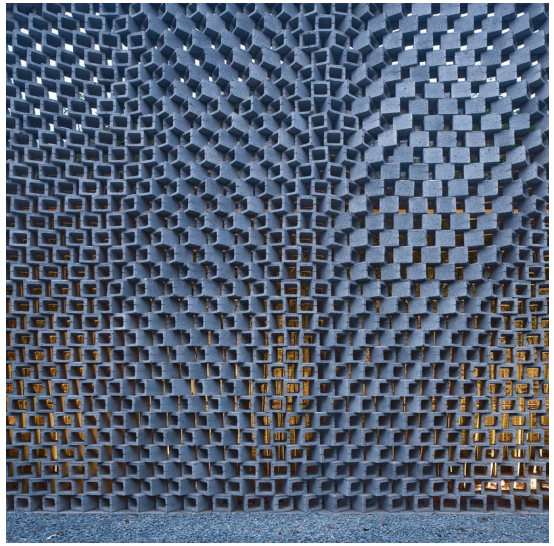
Christopher Alexander, 1977



And many more…

Contemporary Implementations

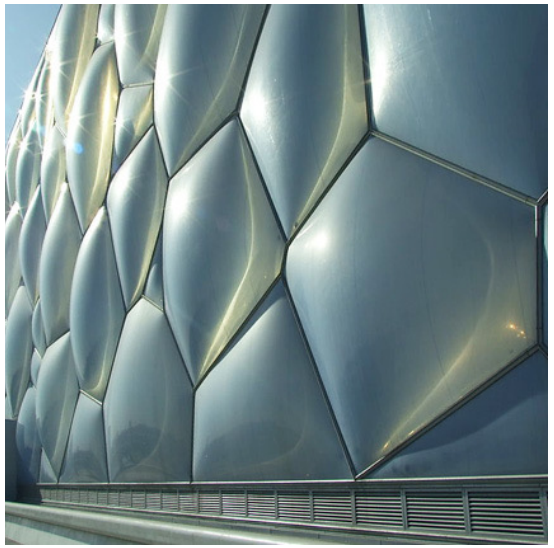
Aggregation
Tiling
Modular Systems



Sectioning
Stacking
Contouring

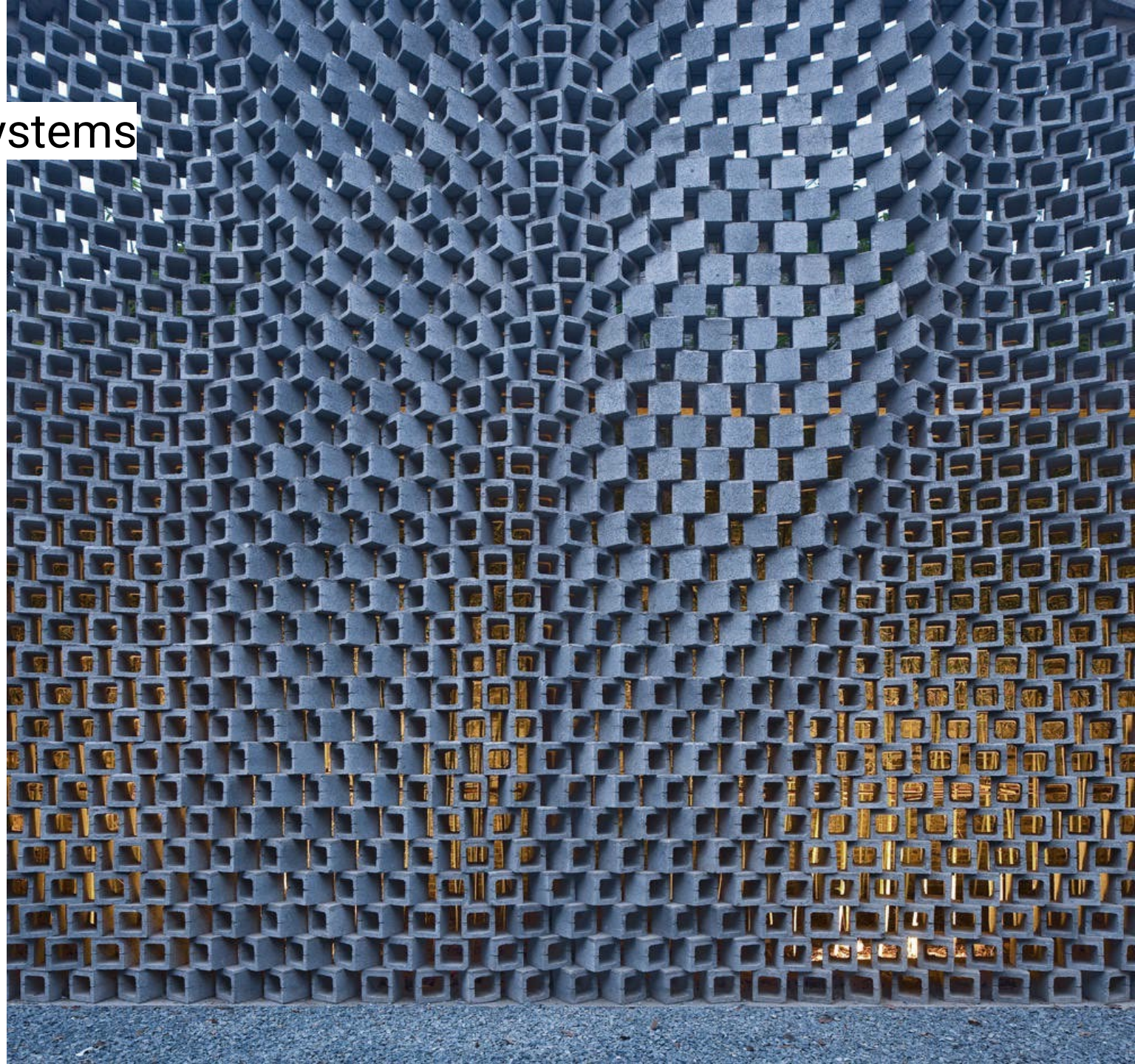


Paneling
Subdivision
Cellular Logic



Contemporary Implementations

Aggregation, Tiling & Modular Systems

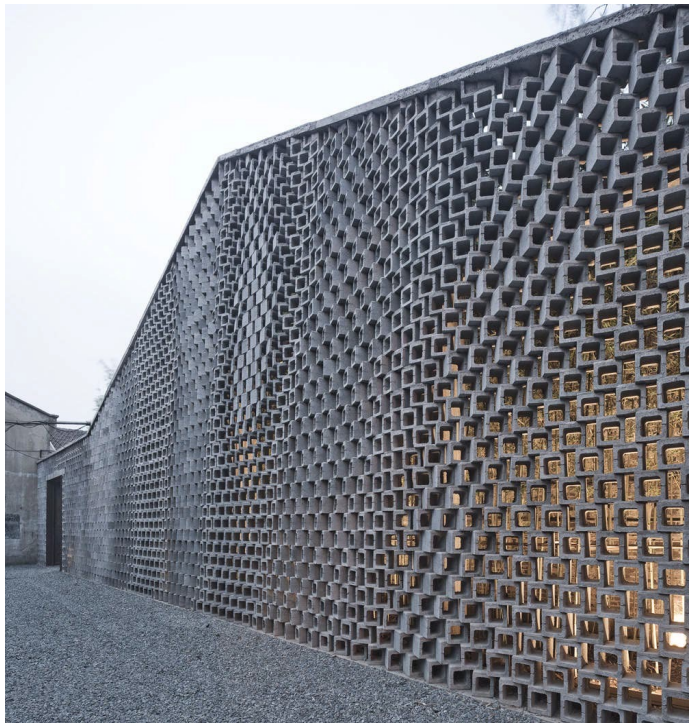


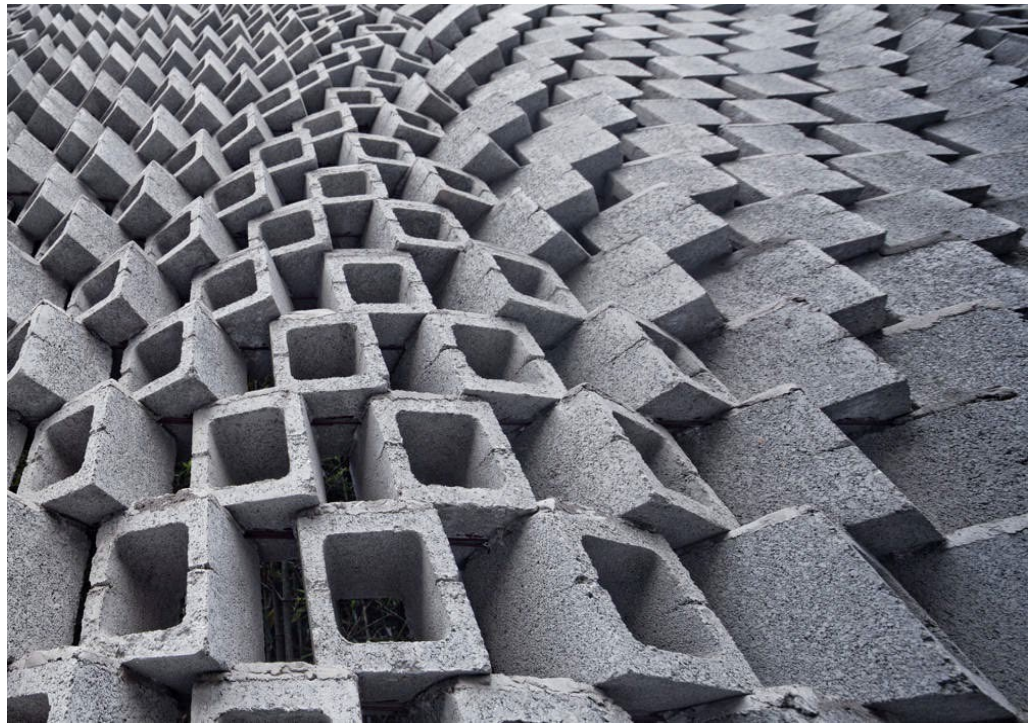
Silk Wall

Archi-Union, 2010

Contemporary Implementations

Aggregation, Tiling & Modular Systems





Silk Wall

Archi-Union, 2010

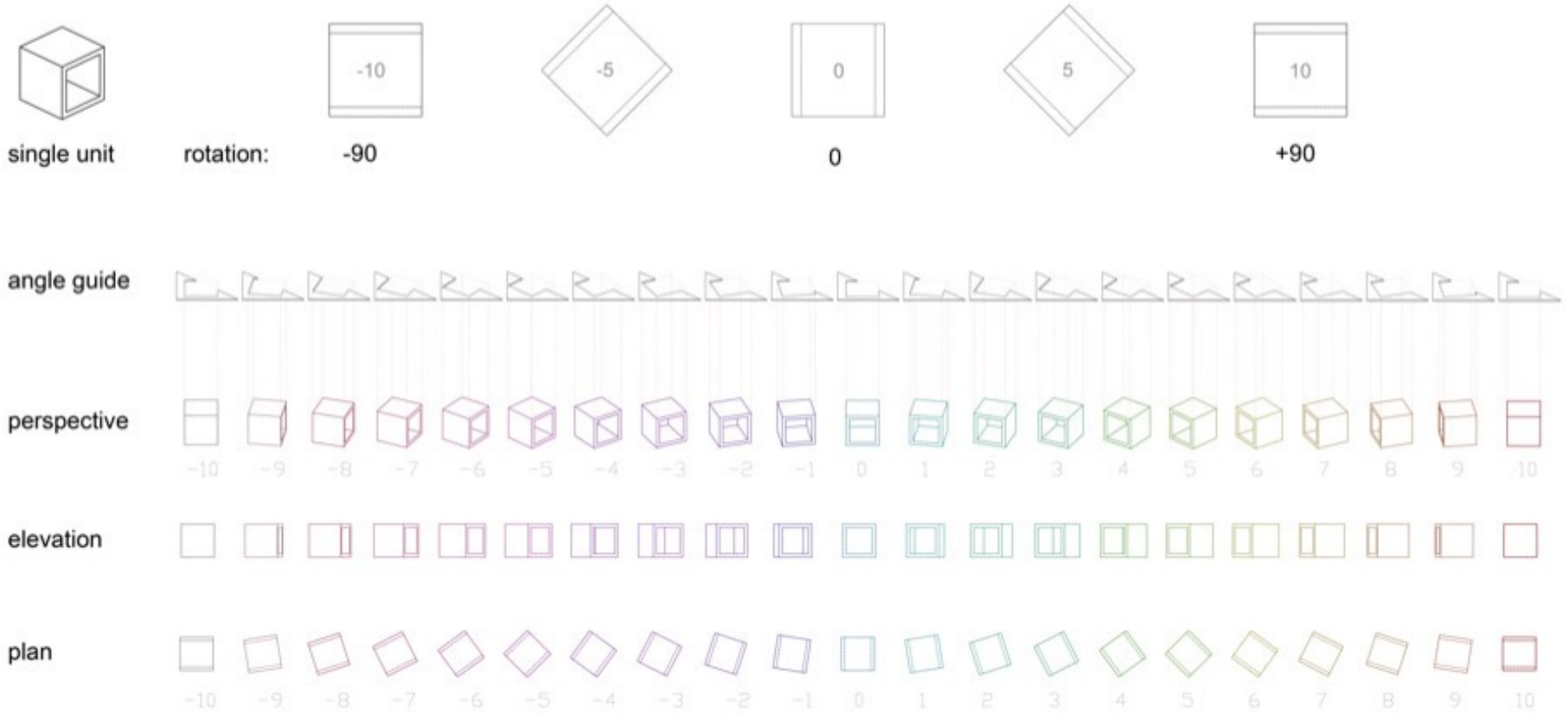
Aggregation, Tiling & Modular Systems



Silk Wall

Archi-Union, 2010

Aggregation, Tiling & Modular Systems



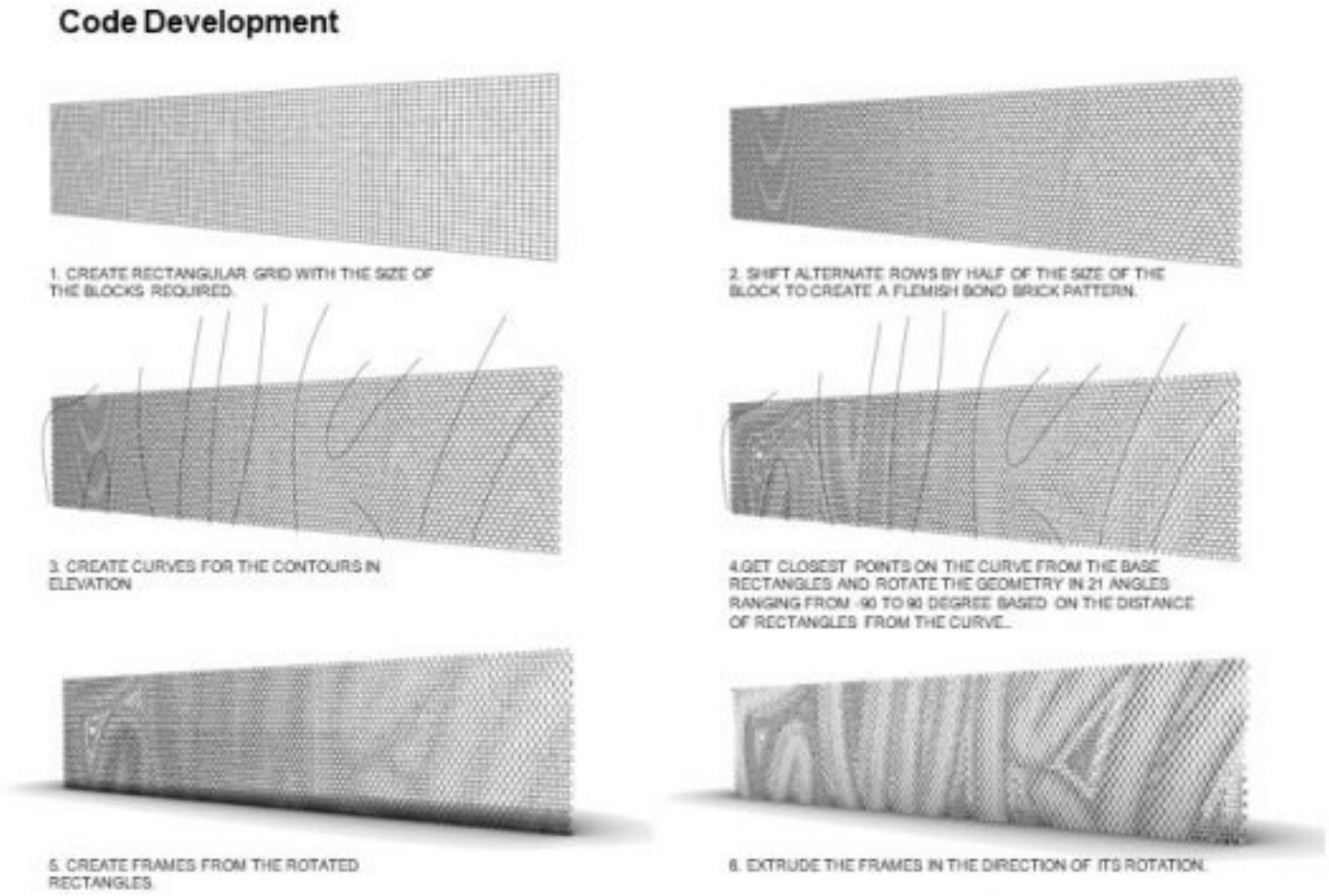
Silk Wall

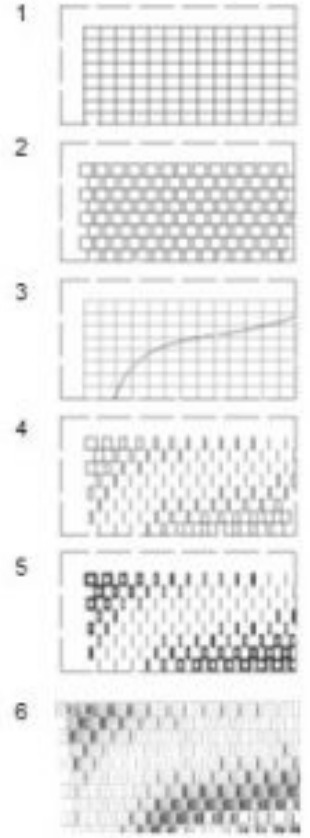
Archi-Union, 2010

Aggregation, Tiling & Modular Systems

Silk Wall

Archi-Union, 2010



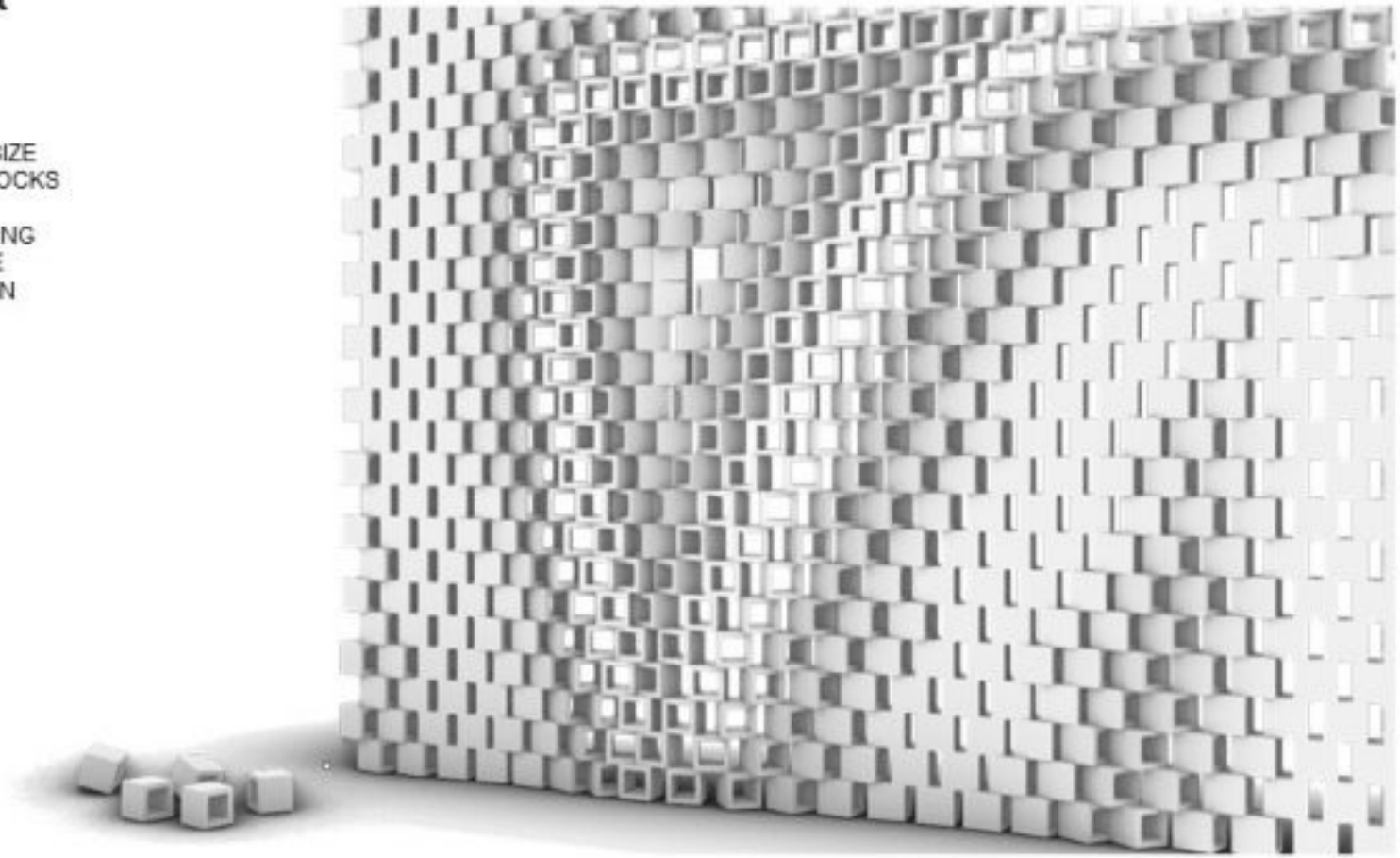


Aggregation, Tiling & Modular Systems

Facade main element

WALL PARAMETERS-

1. CONCRETE AIR BLOCK SIZE
2. DISTANCE BETWEEN BLOCKS
3. FRAME THICKNESS
4. 21 FIXED ANGLES RANGING FROM -90 TO 90 DEGREE
5. CONTOURS IN ELEVATION



Silk Wall

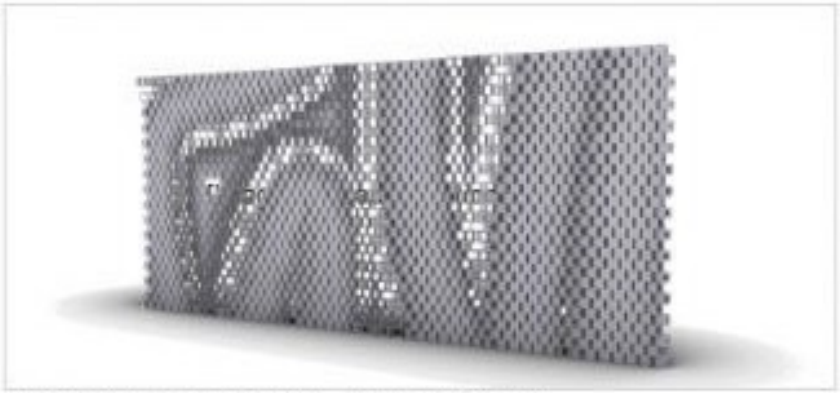
Archi-Union, 2010

Aggregation, Tiling & Modular Systems

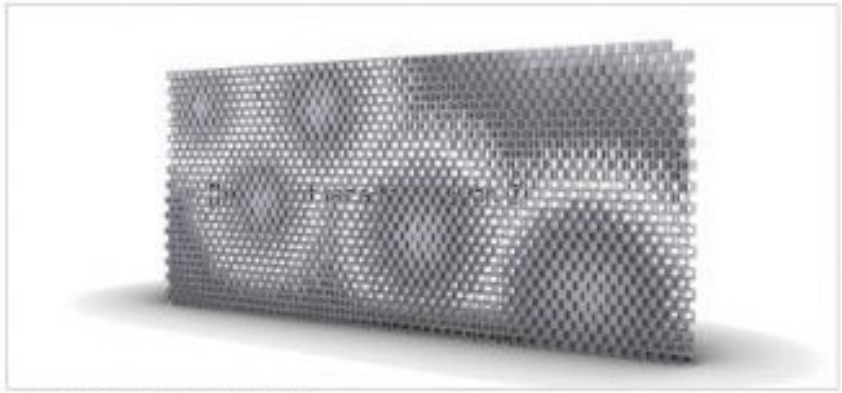
Silk Wall

Archi-Union, 2010

Facade iterations



[VARIATION IN THE OPENINGS- FRAME THICKNESS]



[USED ATTRACTOR POINTS]



[SINE CURVE GRAPH MAP]



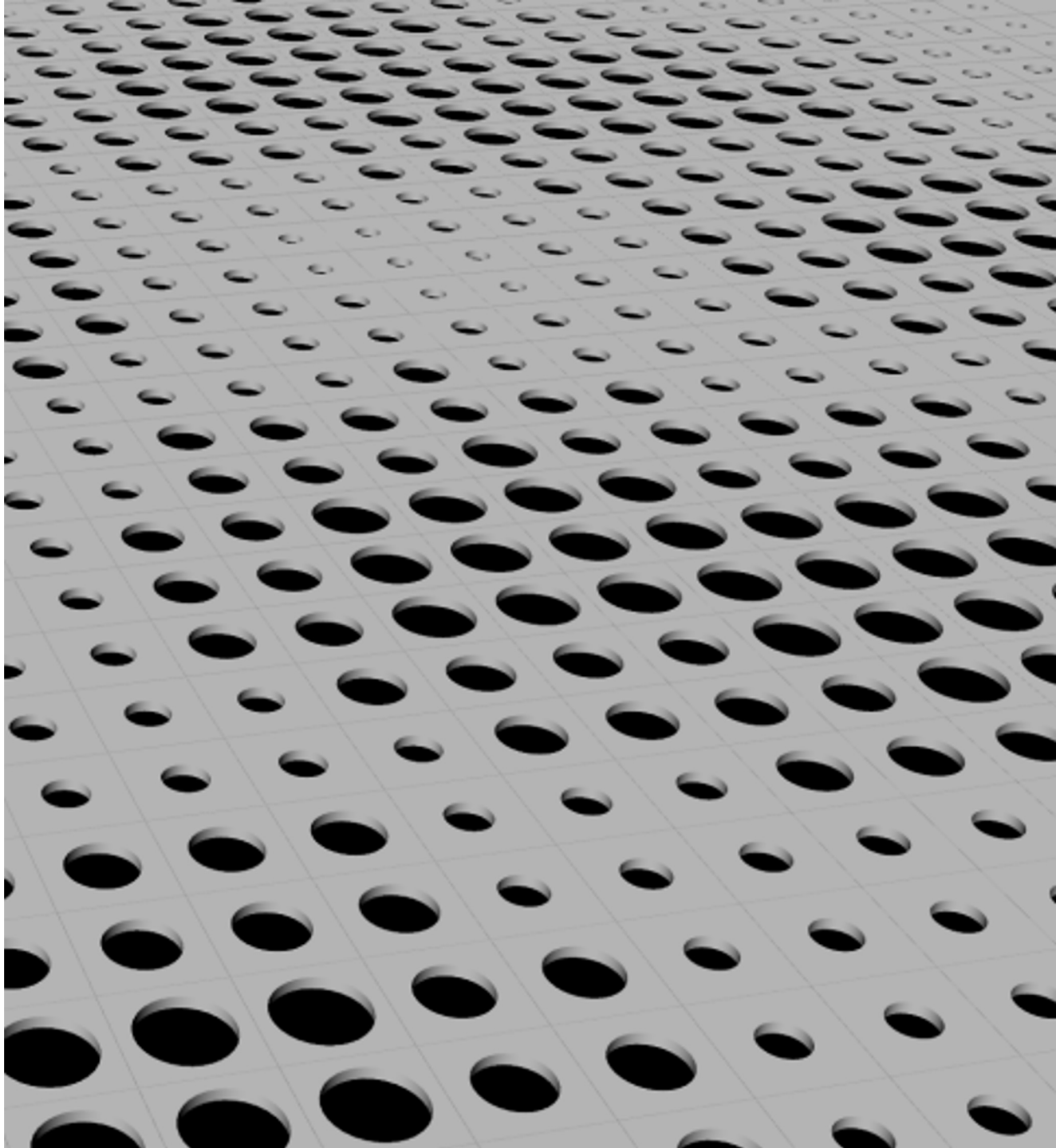
[BLOCK SIZE,GRAPH MAPPER AND ROTATION ANGLES CHANGED]

Contemporary Implementations

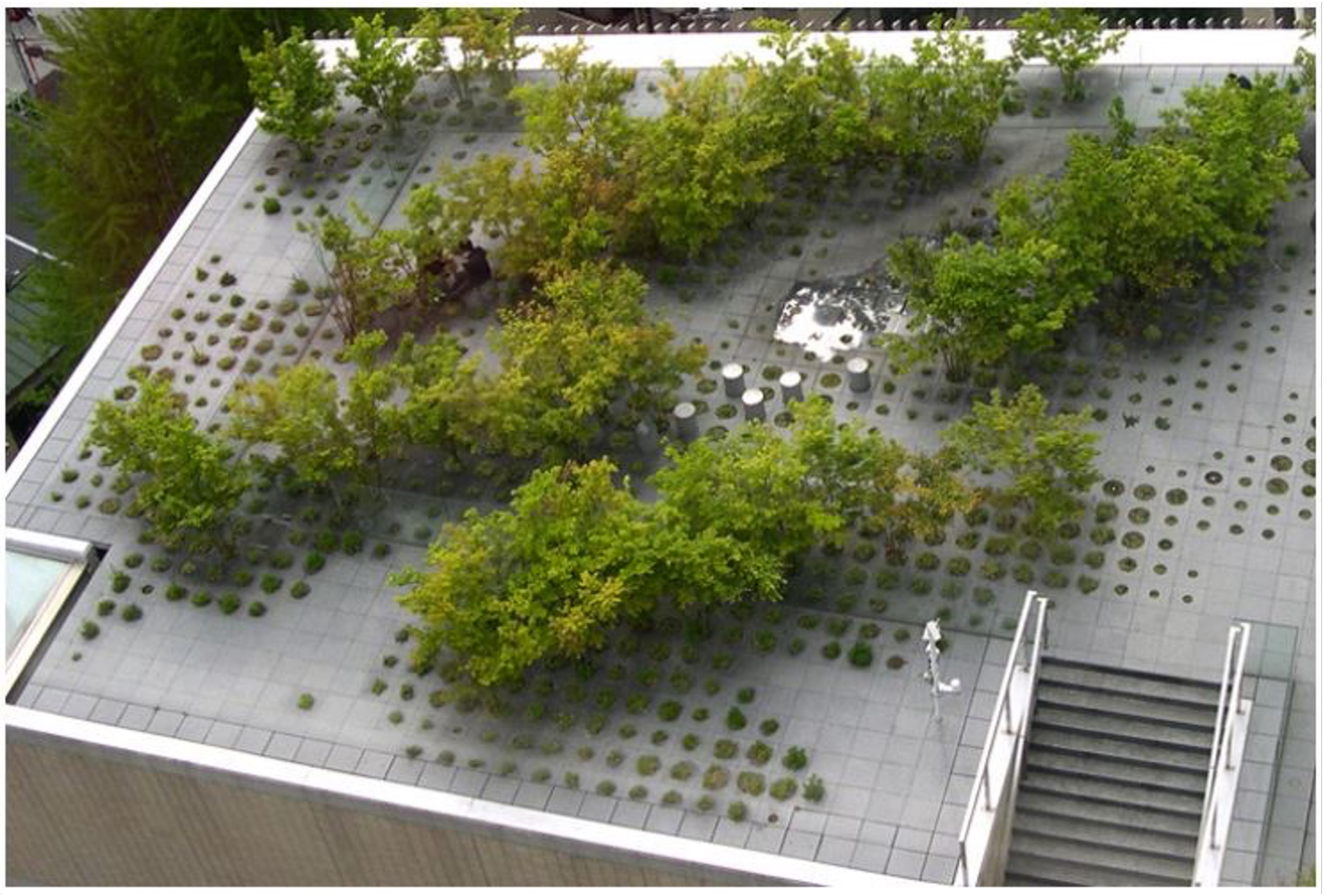
Aggregation, Tiling & Modular Systems

Keio University Roof Garden

Michel Desvigne



Aggregation, Tiling & Modular Systems



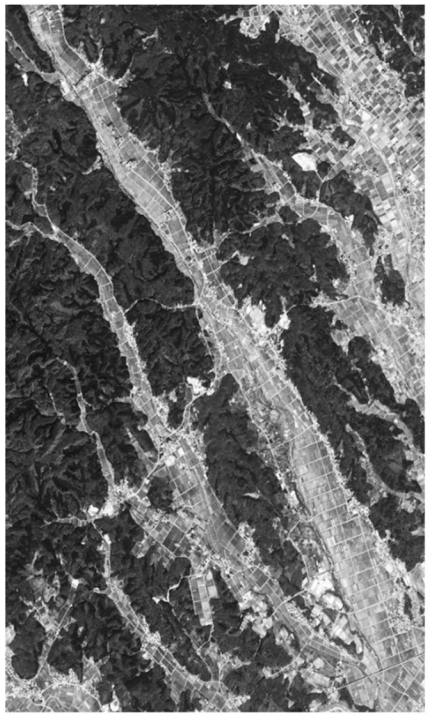
Keio University Roof Garden

Michel Desvigne

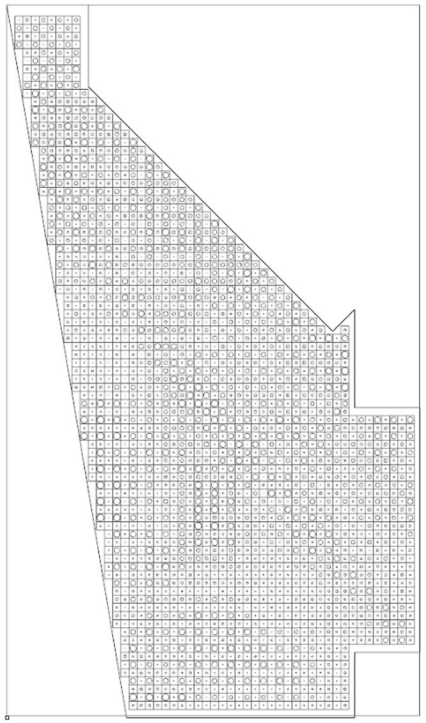
Aggregation, Tiling & Modular Systems

Keio University Roof Garden

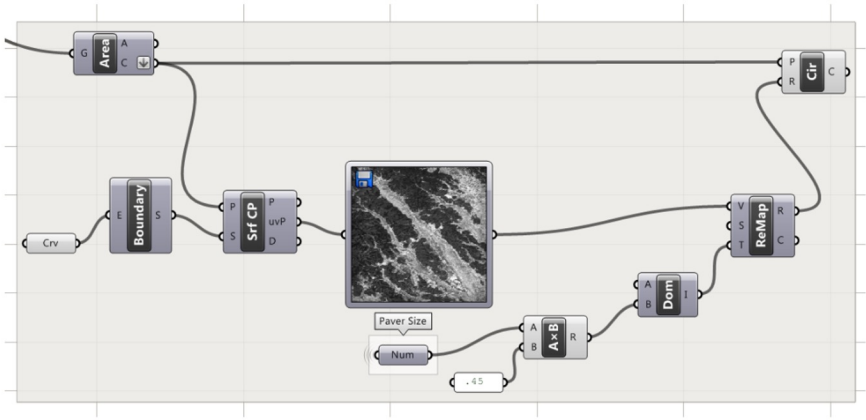
Michel Desvigne



1 - Aerial (Source: Google Earth)

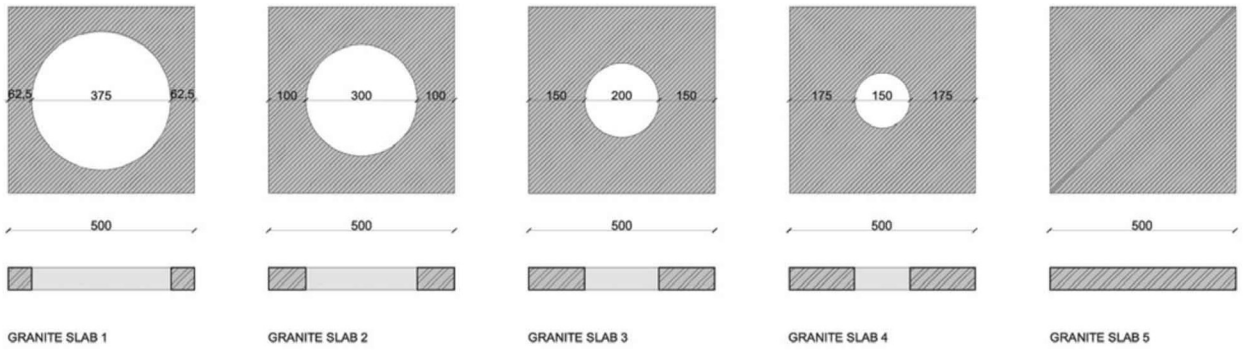


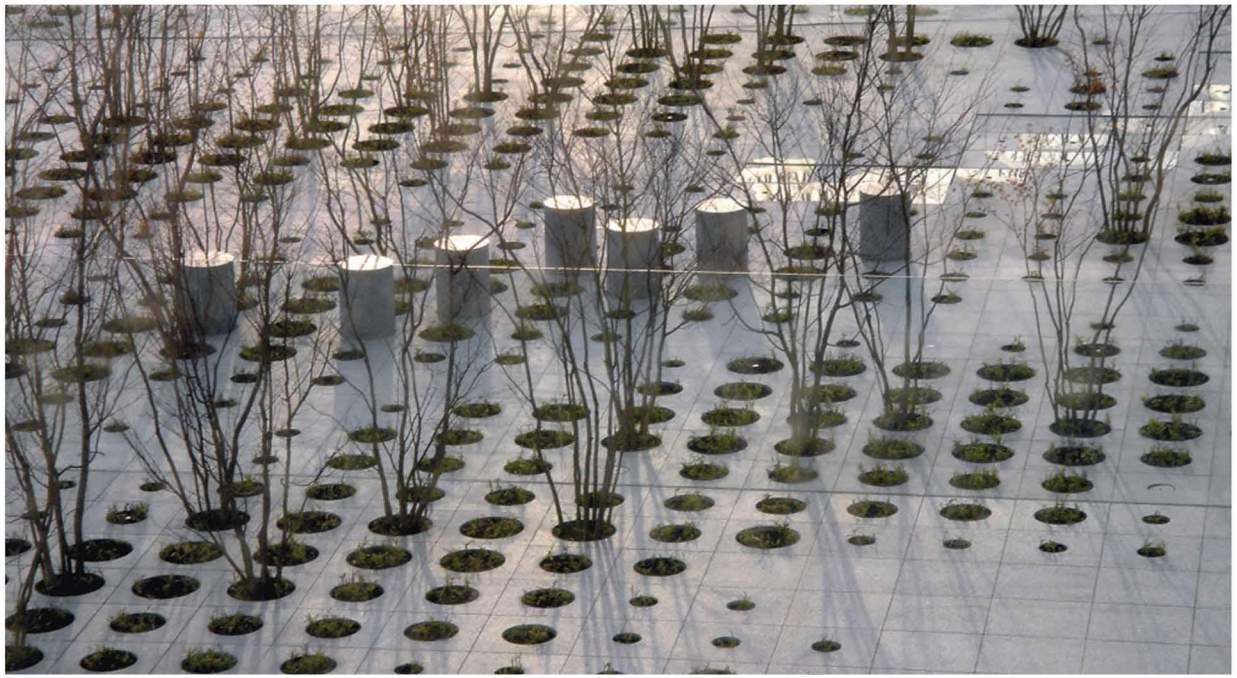
2 - Resulting Circles Based on Image Sampler of Aerial



3 - Grasshopper Script

Aggregation, Tiling & Modular Systems





Keio University Roof Garden

Michel Desvigne

Aggregation, Tiling & Modular Systems

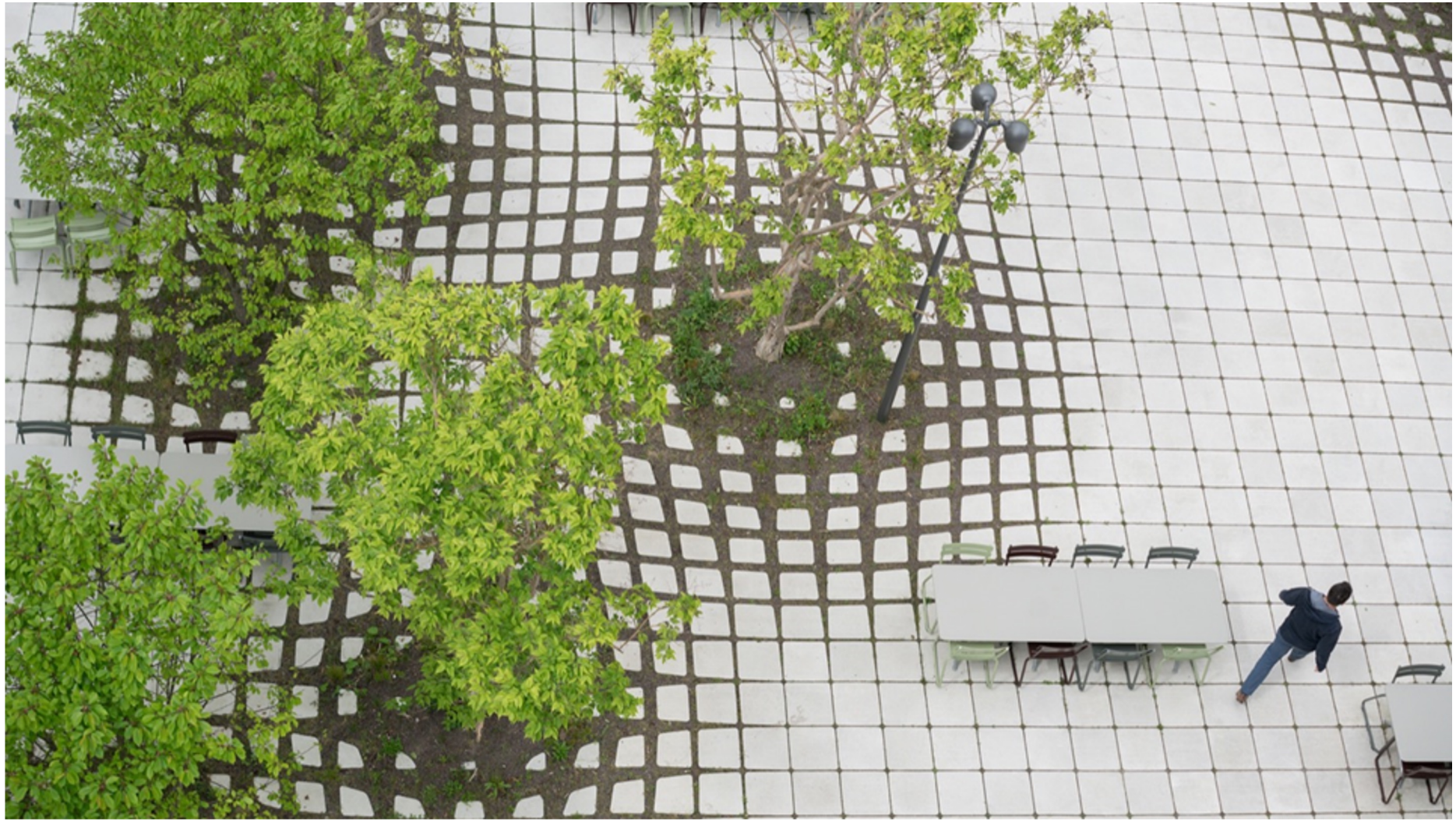


Keio University Roof Garden

Michel Desvigne

Contemporary Implementations

Aggregation, Tiling & Modular Systems

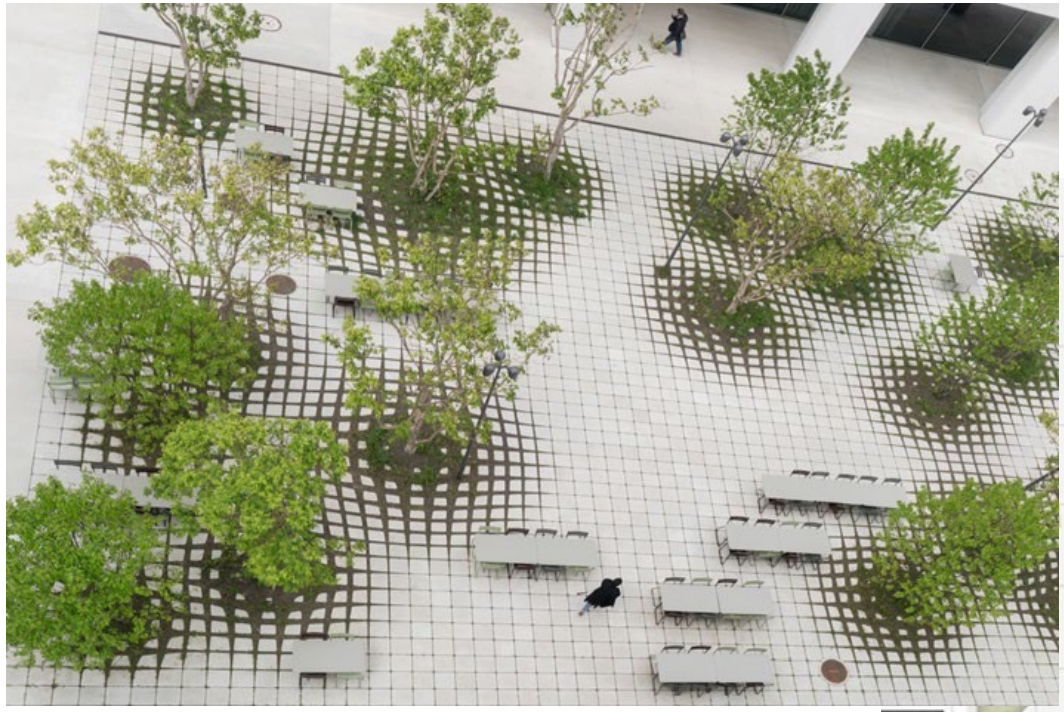


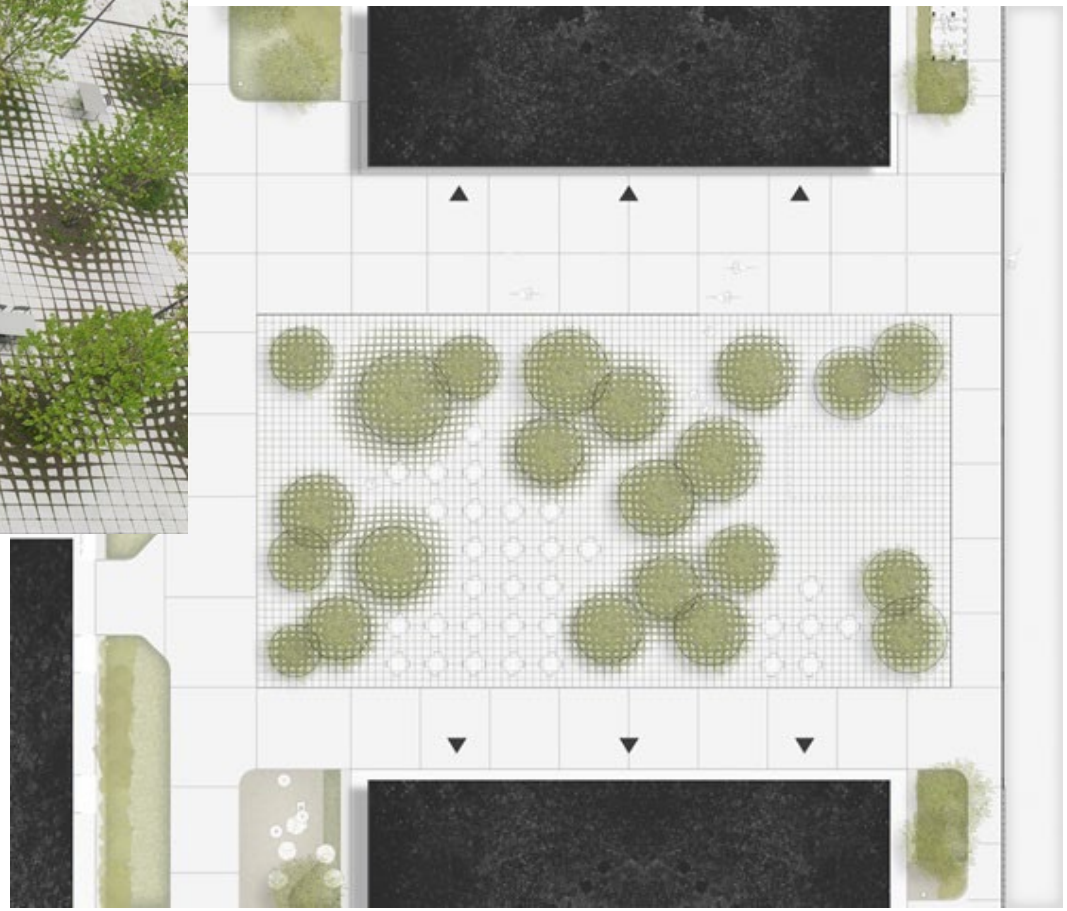
Roche Pocket Park

Bryum

Contemporary Implementations

Aggregation, Tiling & Modular Systems

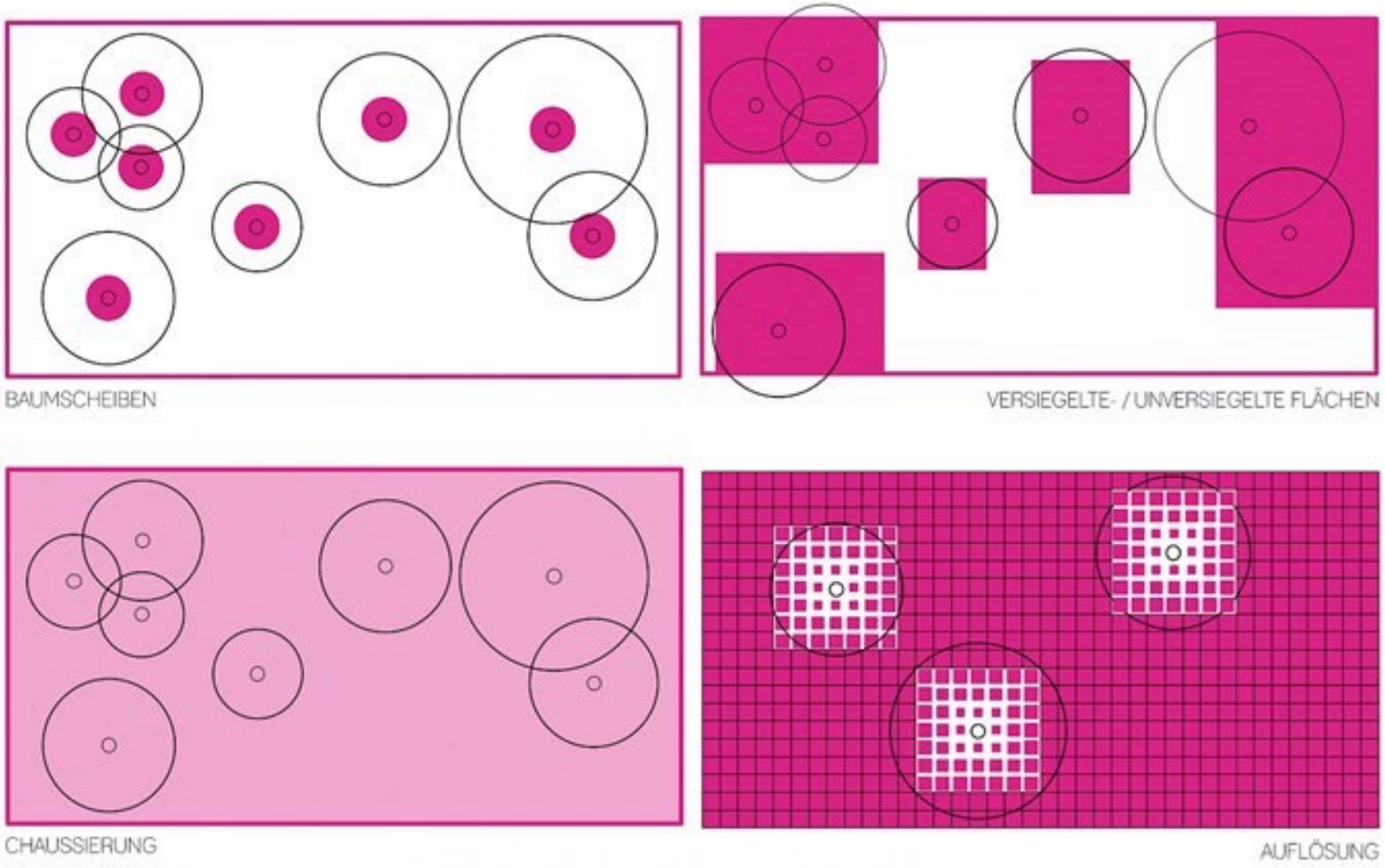




Roche Pocket Park

Bryum

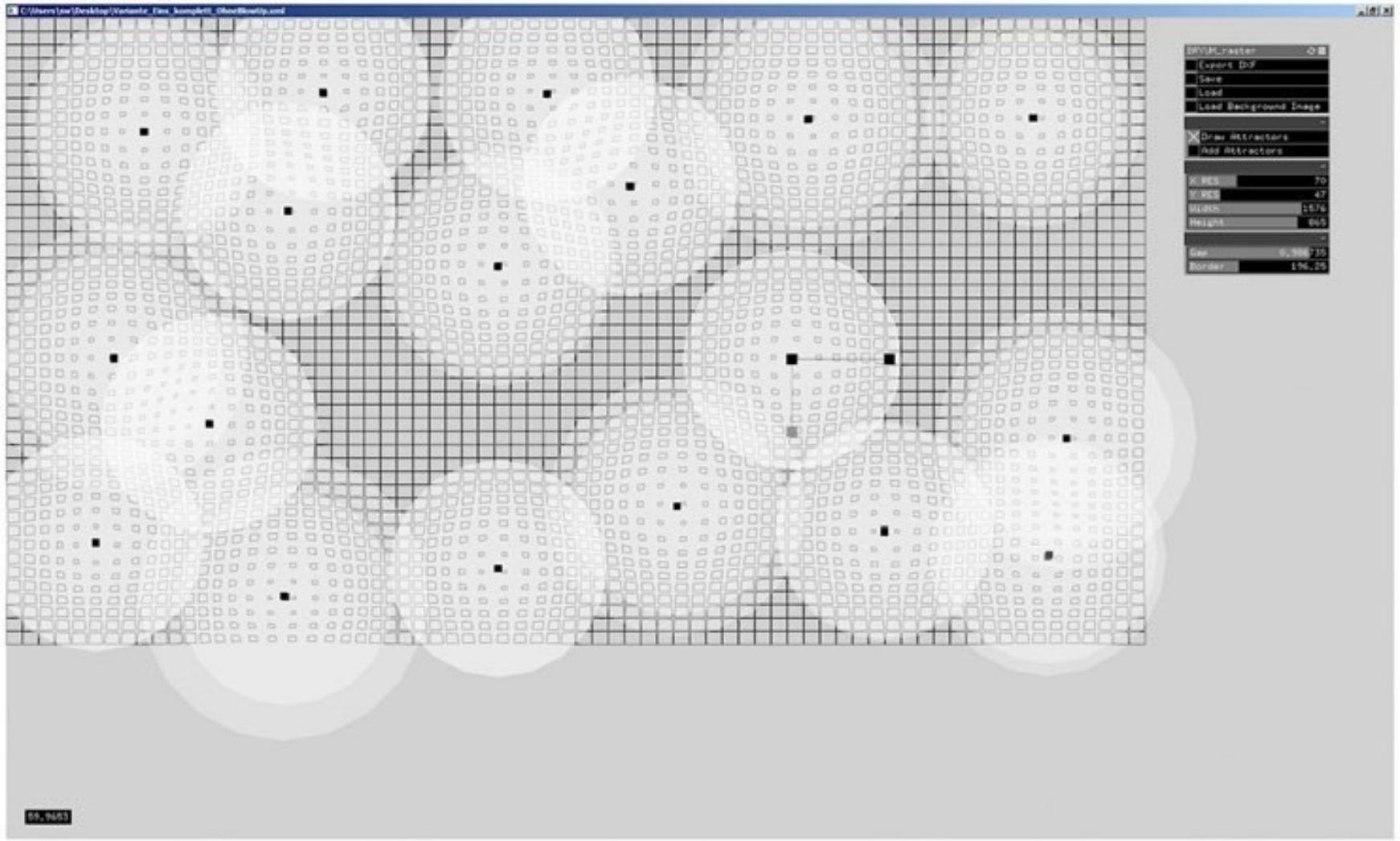
Aggregation, Tiling & Modular Systems



Roche Pocket Park

Bryum

Aggregation, Tiling & Modular Systems

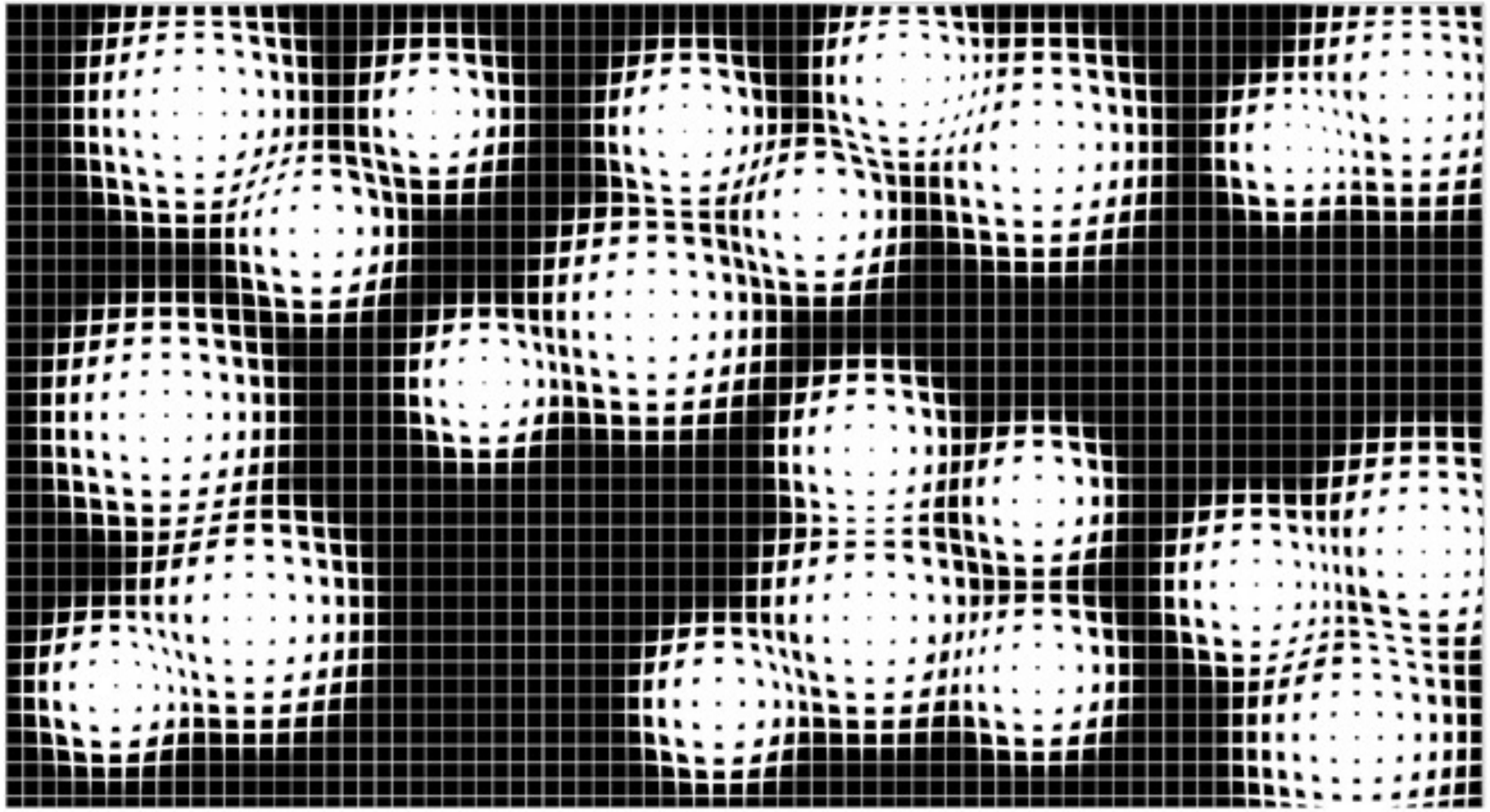


Roche Pocket Park

Bryum

Contemporary Implementations

Aggregation, Tiling & Modular Systems



Roche Pocket Park

Bryum

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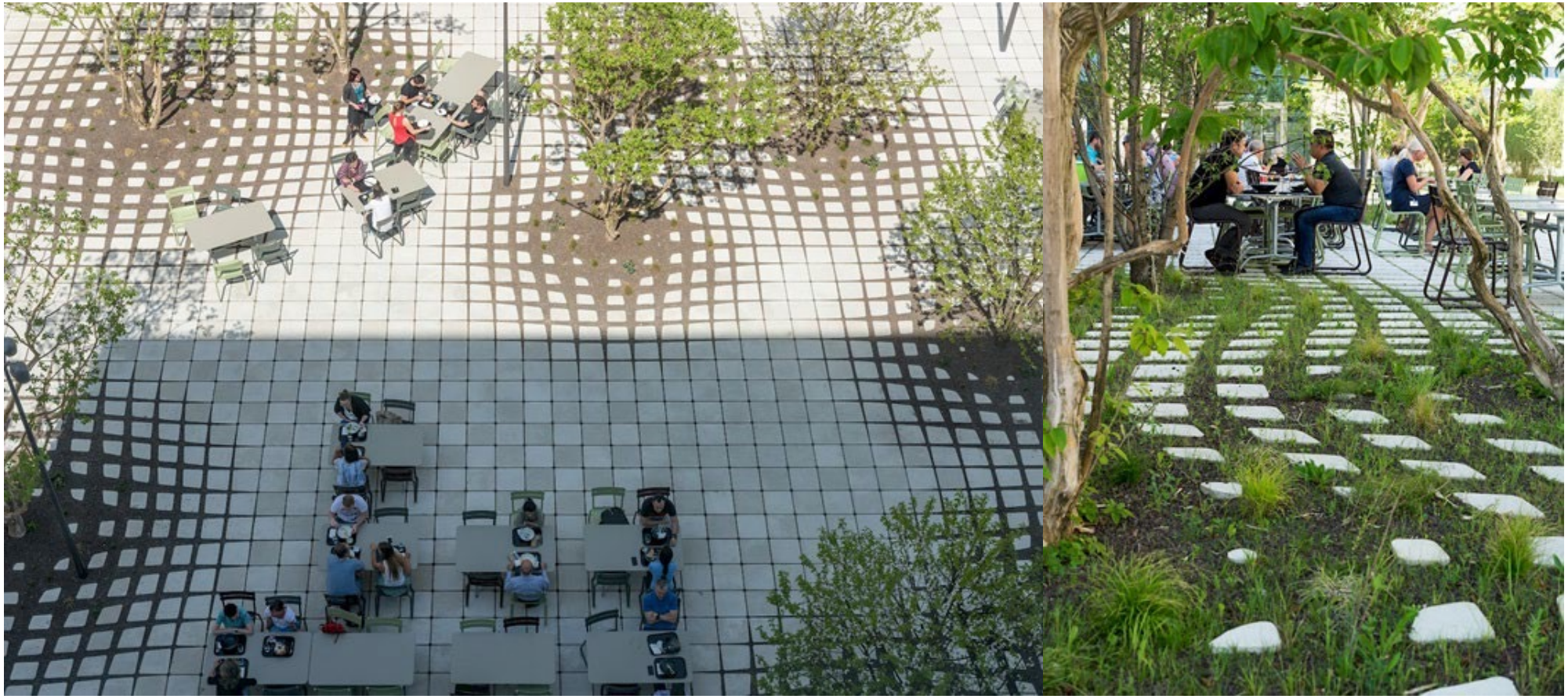


Roche Pocket Park

Bryum

Contemporary Implementations

Aggregation, Tiling & Modular Systems



Roche Pocket Park

Bryum

Contemporary Implementations

Sectioning, Stacking & Contouring



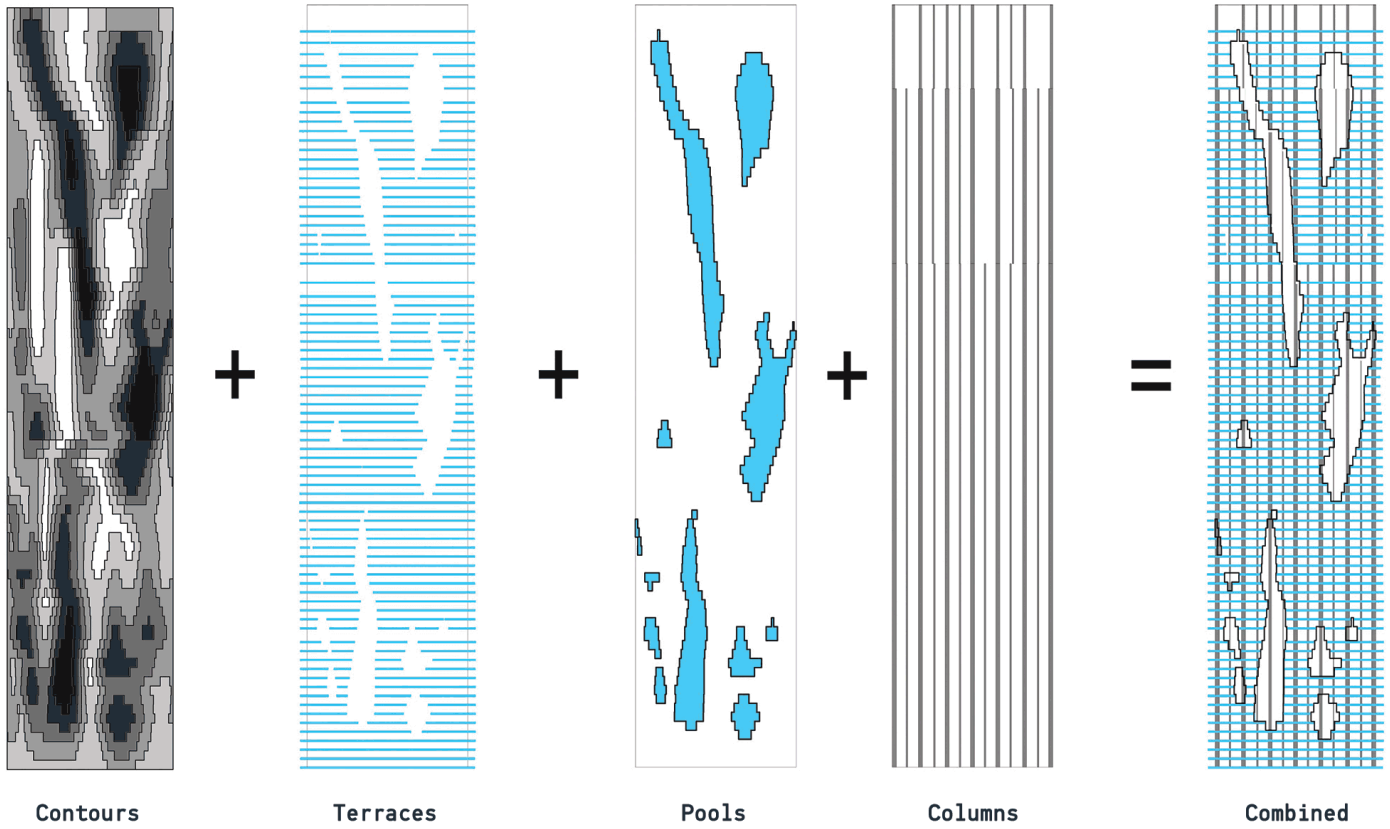
Aqua Tower

Studio Gang

Sectioning, Stacking & Contouring

Aqua Tower

Studio Gang



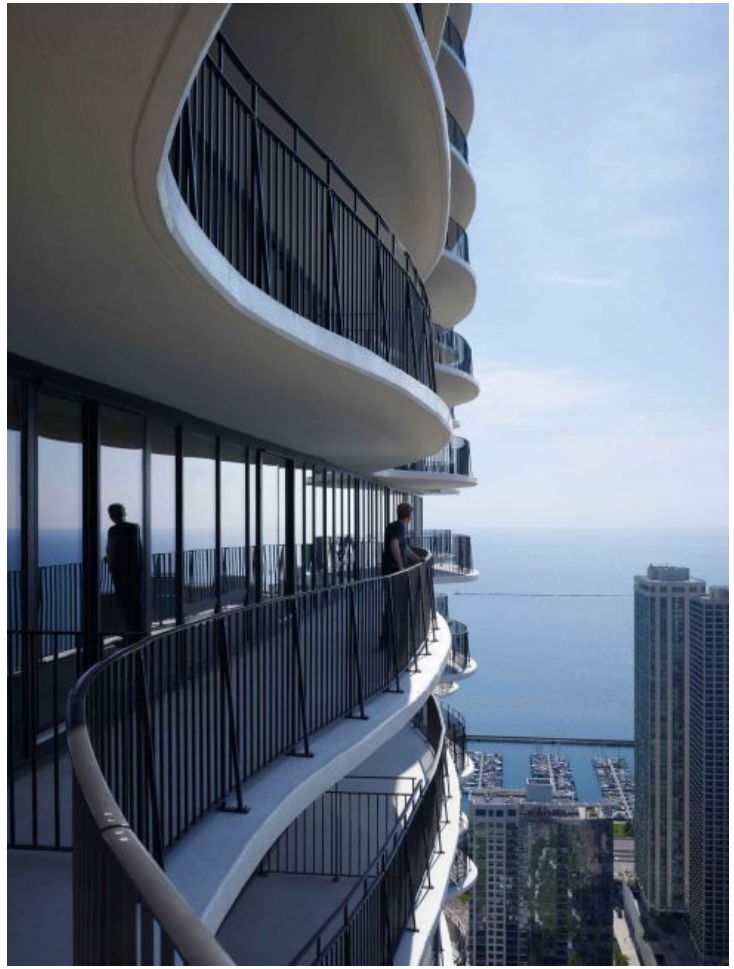
Contemporary Implementations

Sectioning, Stacking & Contouring

Aqua Tower

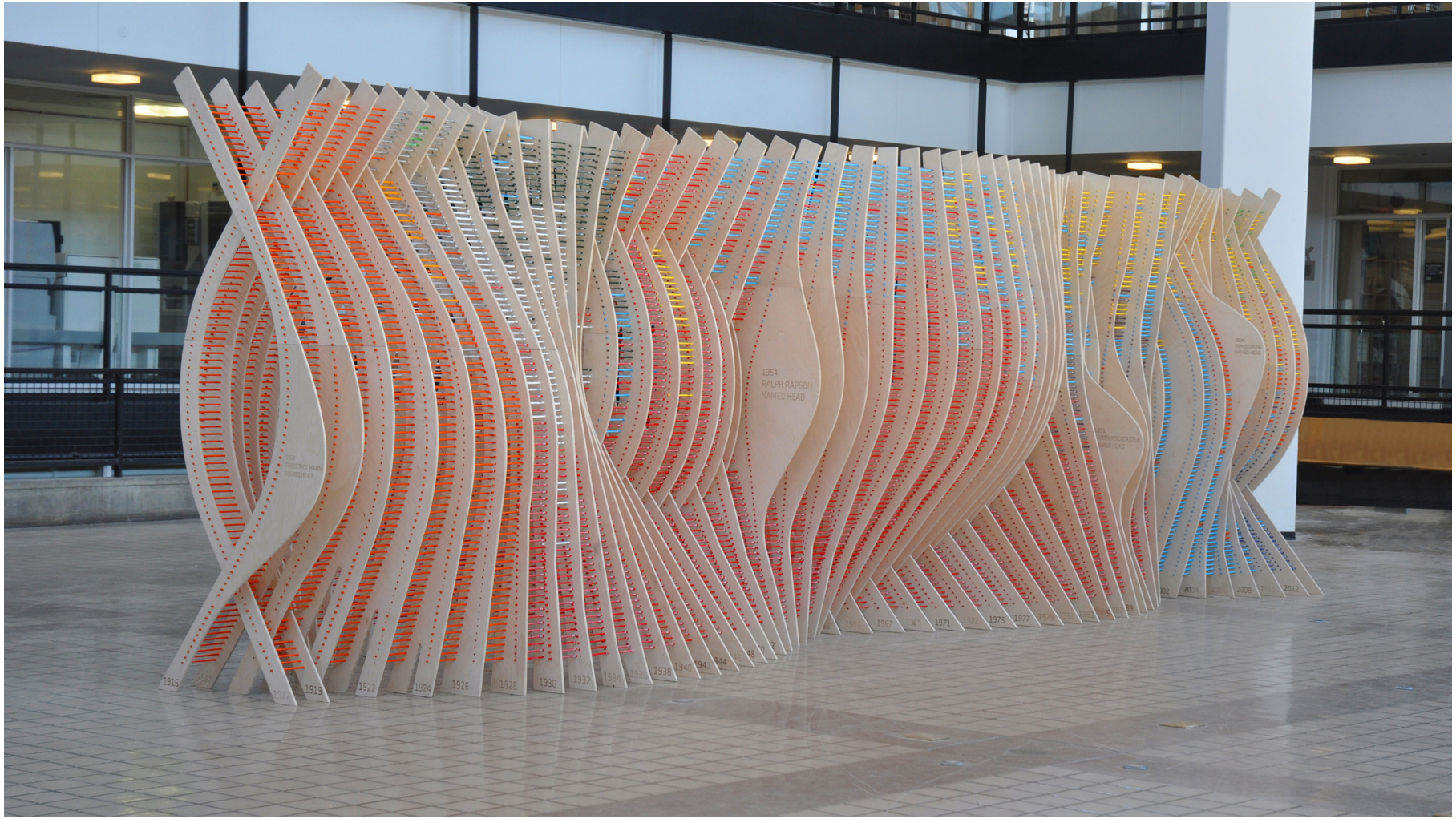
Studio Gang





Contemporary Implementations

Sectioning, Stacking & Contouring

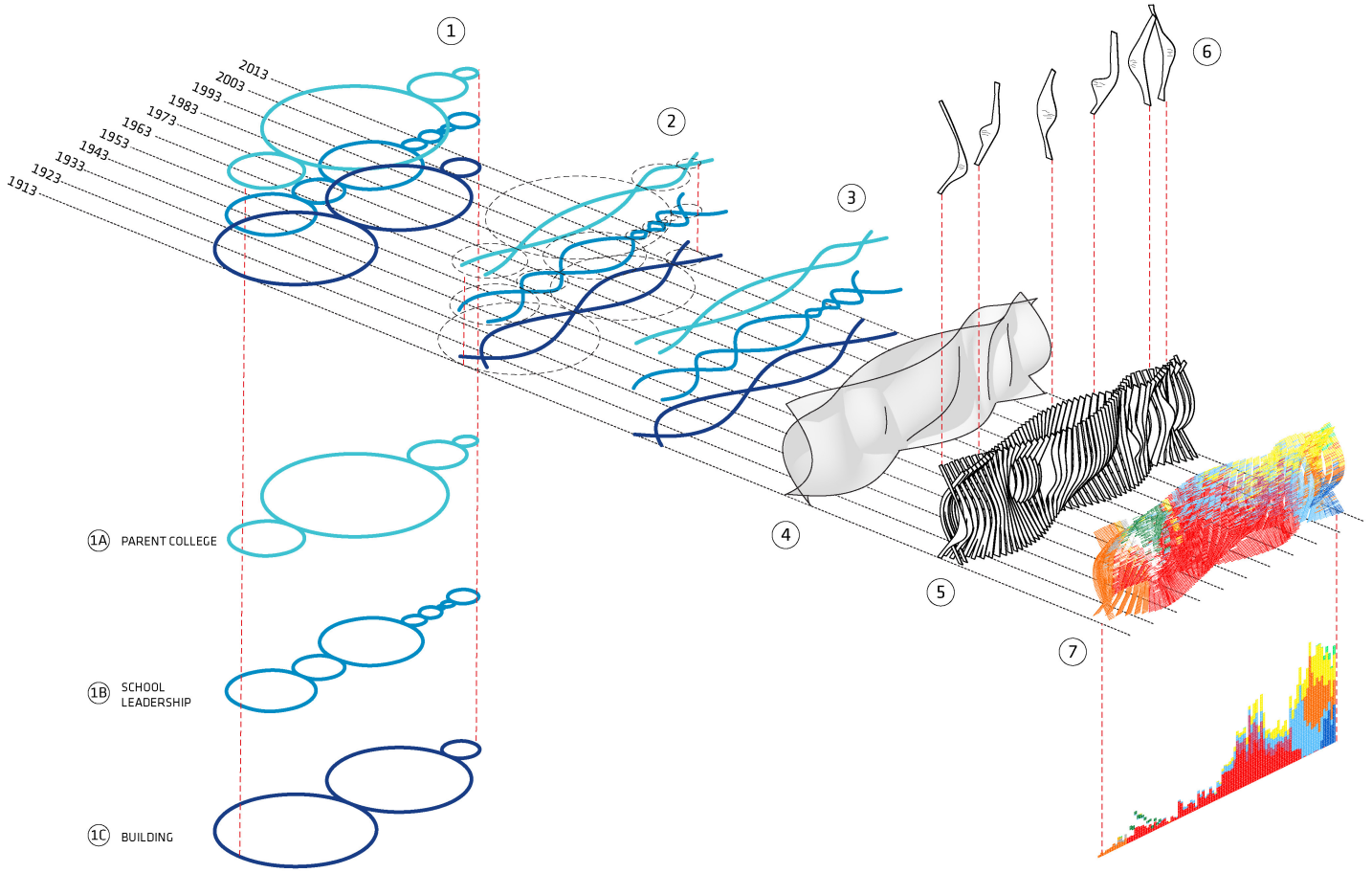


Centennial Chromagraph

Variable Projects+

Daniel Raznick

Sectioning, Stacking & Contouring



1. HISTORICAL RANGES
2. TRANSFORMATION TO SPLINES
3. CONSTRUCTION CURVES
4. SURFACE GENERATION
5. SECTIONAL RIBS
6. ENGRAVINGS: HEADS OF SCHOOL
7. PENCILS COLORED BY DEGREE TYPE, PROPORTIONAL BY YEAR

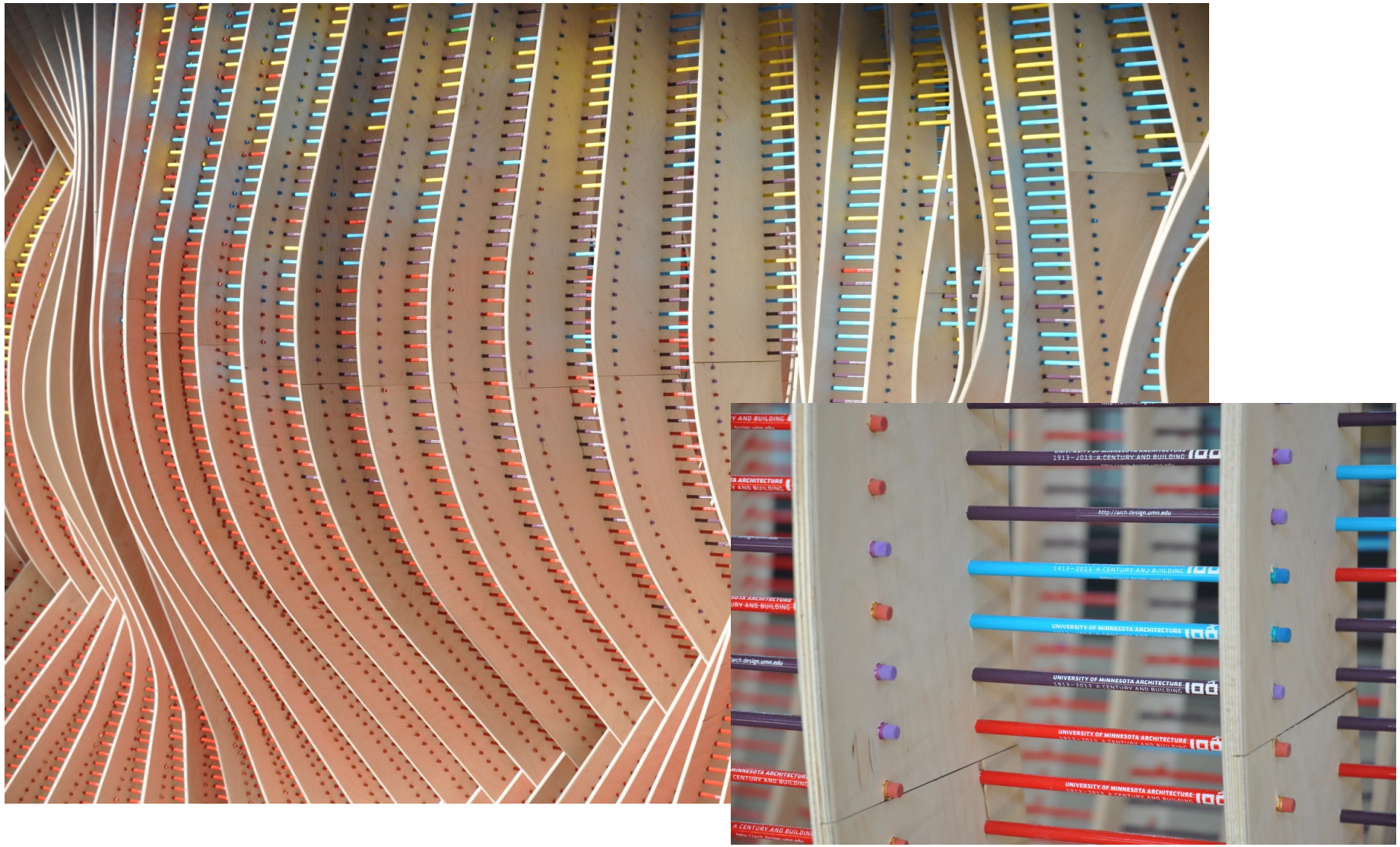
Centennial Chromagraph

Variable Projects+

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Contemporary Implementations

Sectioning, Stacking & Contouring



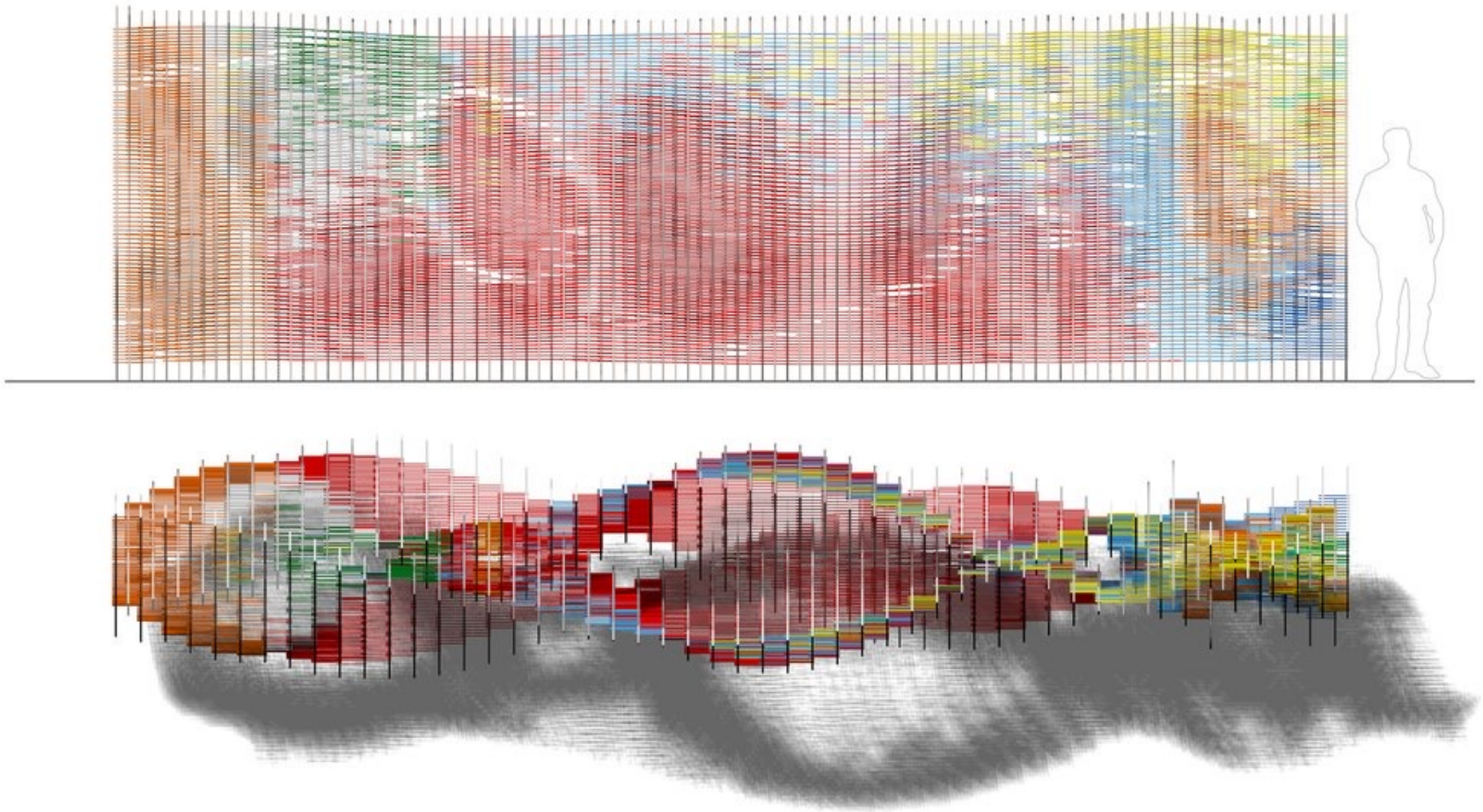
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Sectioning, Stacking & Contouring



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Contemporary Implementations

Sectioning, Stacking & Contouring

Metropol Parasol

Jürgen Mayer H



Sectioning, Stacking & Contouring



Metropol Parasol

Jürgen Mayer H

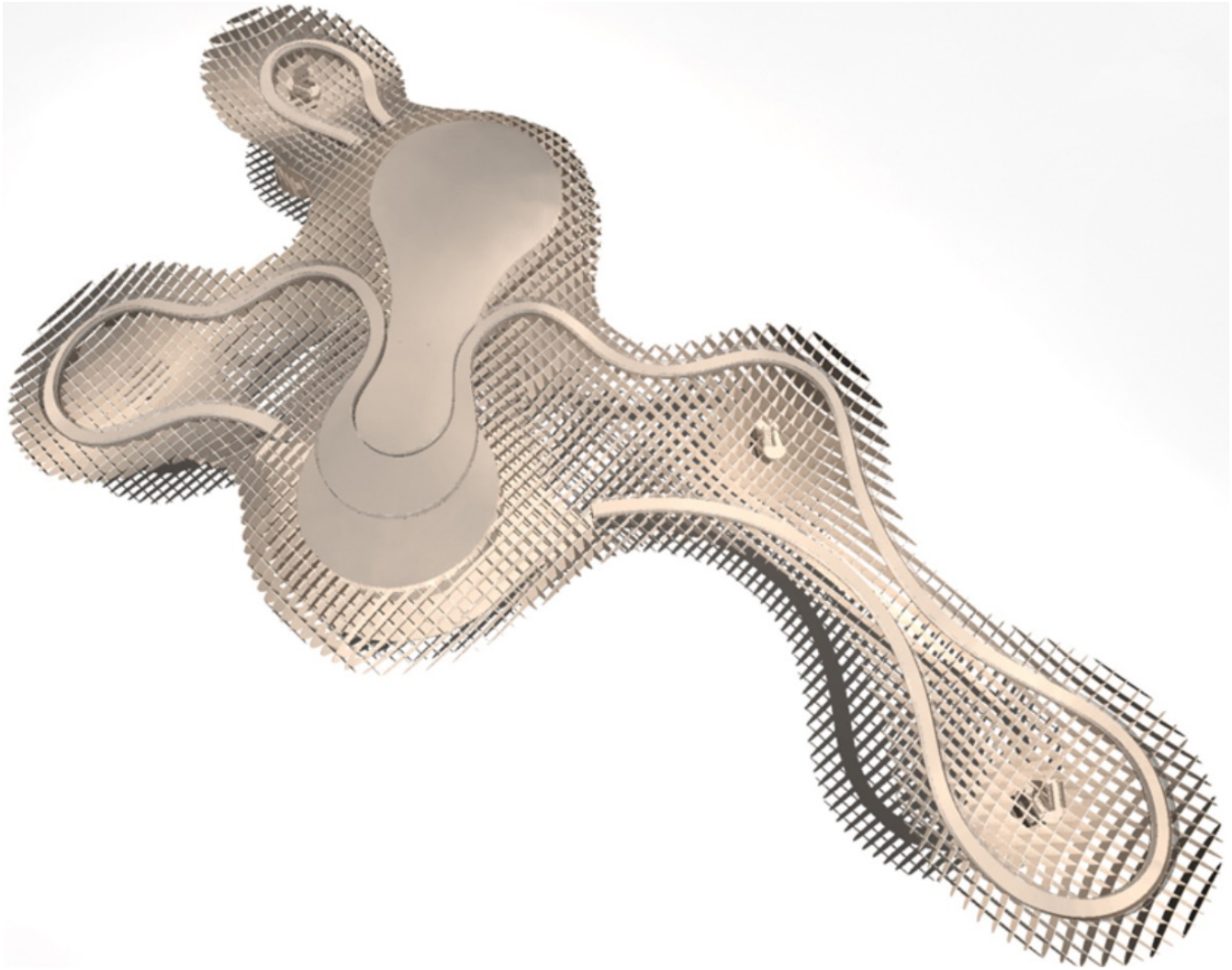
Sectioning, Stacking & Contouring



Metropol Parasol

Jürgen Mayer H

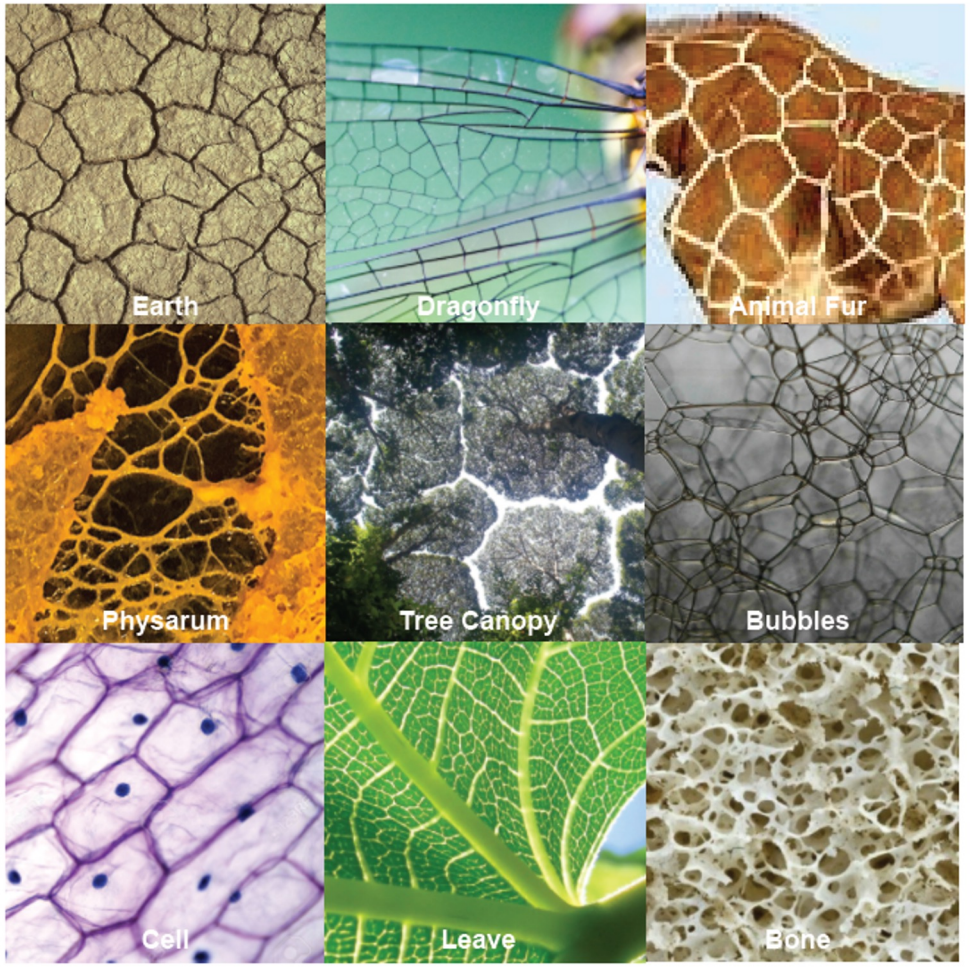
Sectioning, Stacking & Contouring



Metropol Parasol

Jürgen Mayer H

Paneling, Subdivision & Cellular Logic



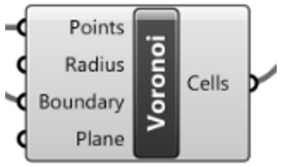

```
private void RunScript(List<Point3d> nodePts, object y, ref object polylines)
{

  //# Create a boundingbox and get its corners
  BoundingBox bb = new BoundingBox(nodePts);
  Vector3d d = bb.Diagonal;
  double dl = d.Length;
  double f = dl / 15;
  bb.Inflate(f, f, f);
  Point3d[] bbCorners = bb.GetCorners();

  //# Create a list of nodes
  Node2List nodes = new Node2List();
  foreach(Point3d p in nodePts)
  {
    Node2 n = new Node2(p.X, p.Y);
    nodes.Append(n);
  }

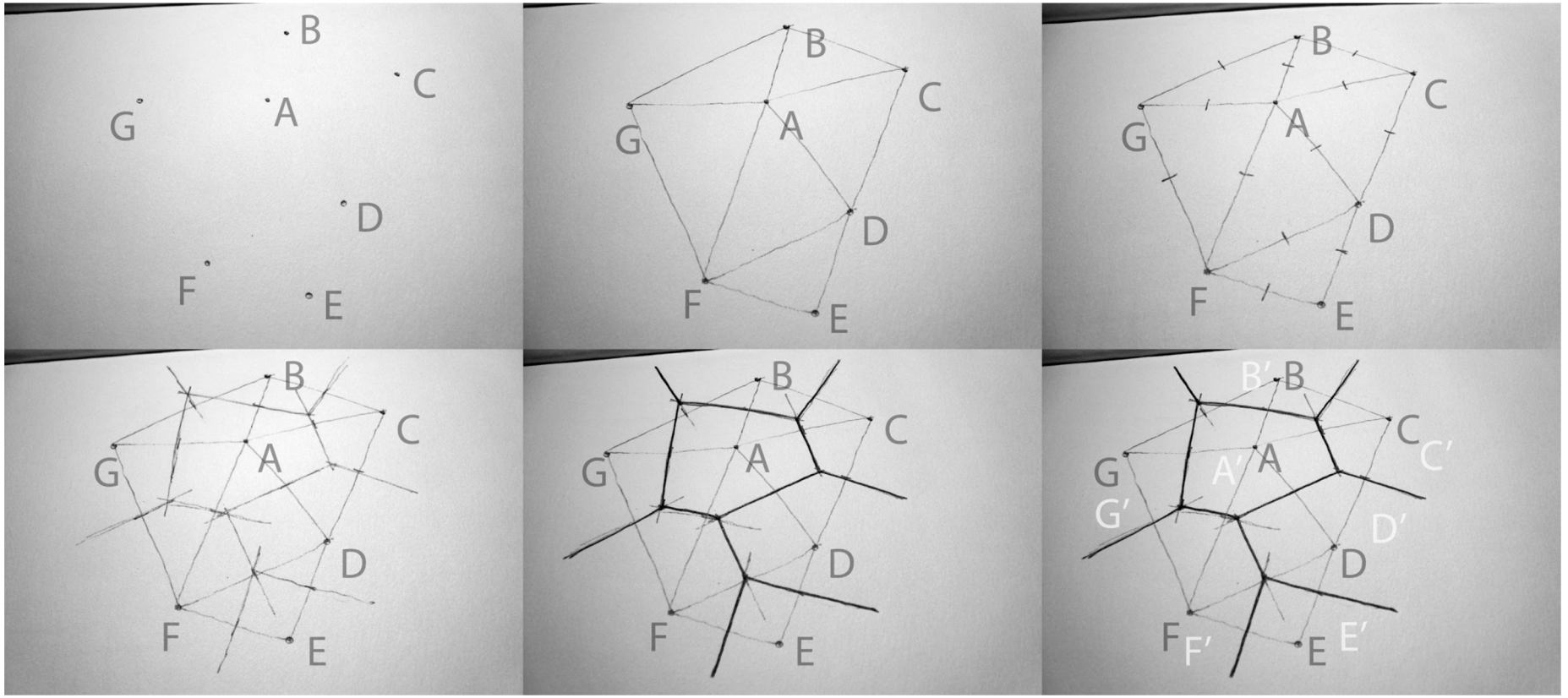
  //Create a list of outline nodes using the BB
  Node2List outline = new Node2List();
  foreach (Point3d p in bbCorners)
  {
```

Voronoi Pattern



Paneling, Subdivision & Cellular Logic

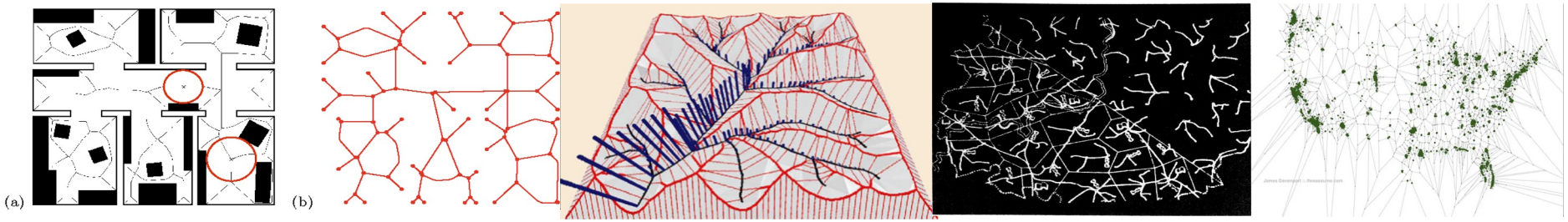
Voronoi Pattern



Contemporary Implementations

Paneling, Subdivision & Cellular Logic

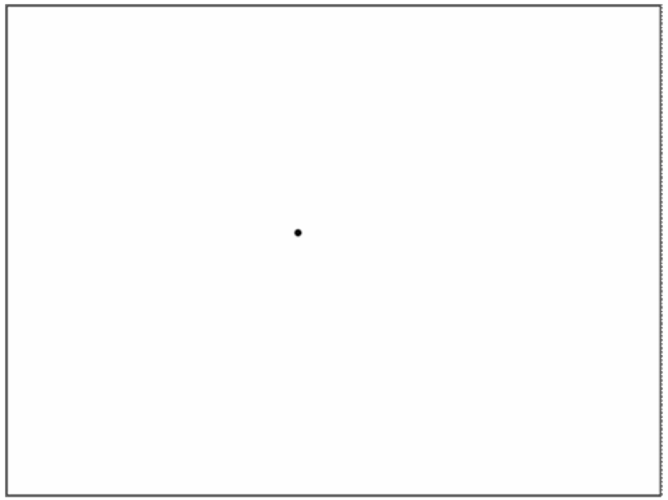


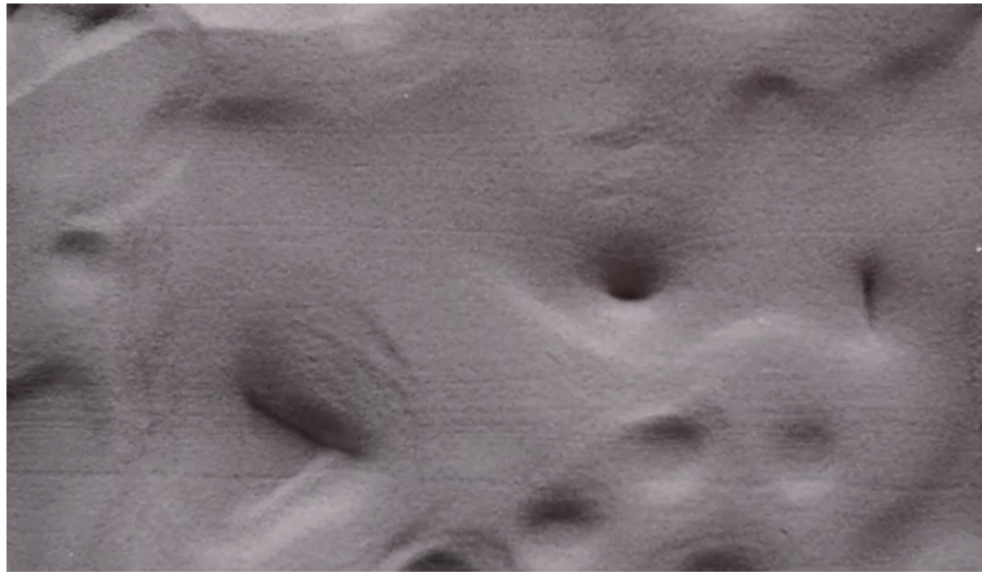


Voronoi Pattern



Paneling, Subdivision & Cellular Logic

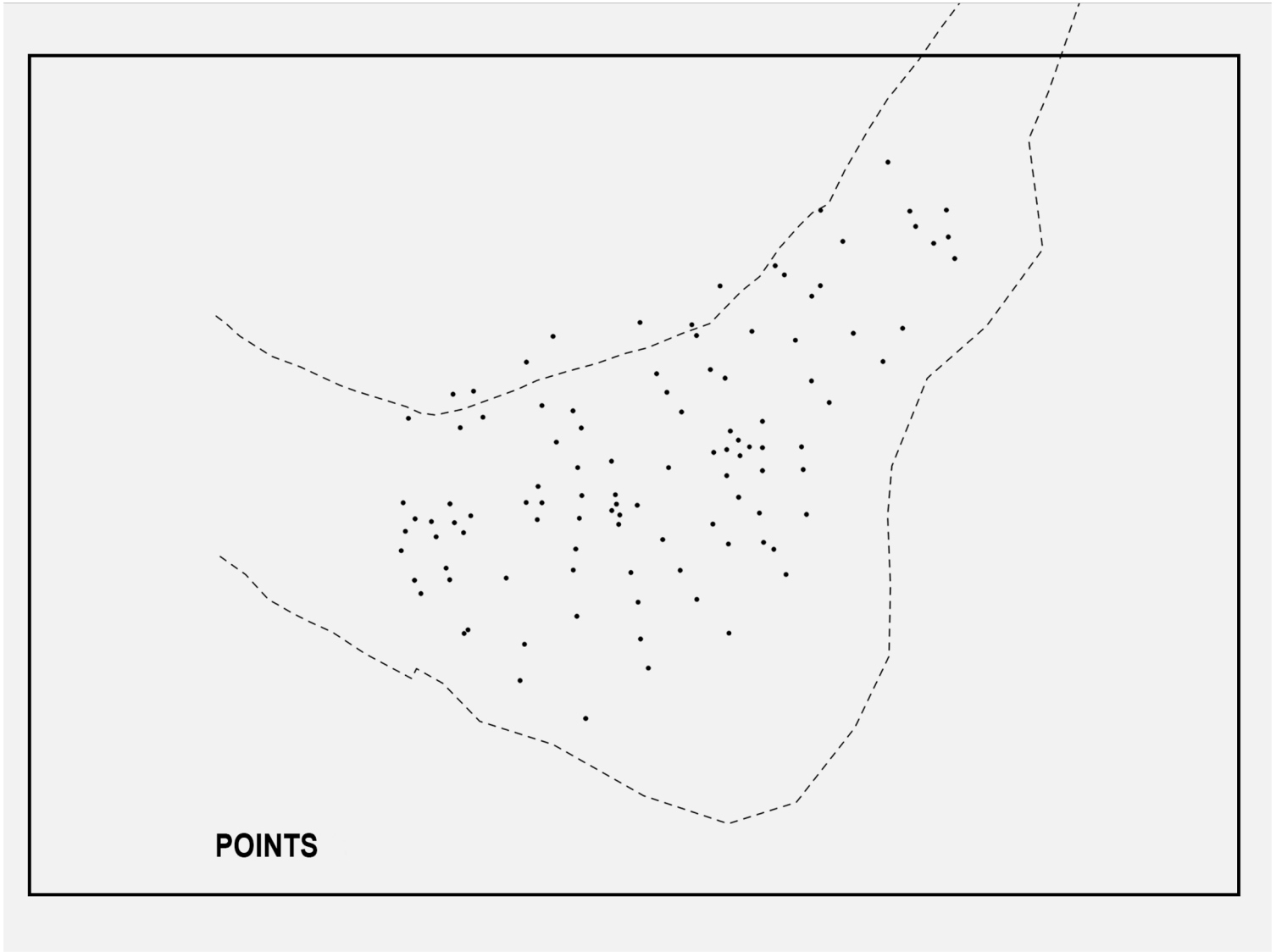




Voronoi’s Corral

DECA Architecture

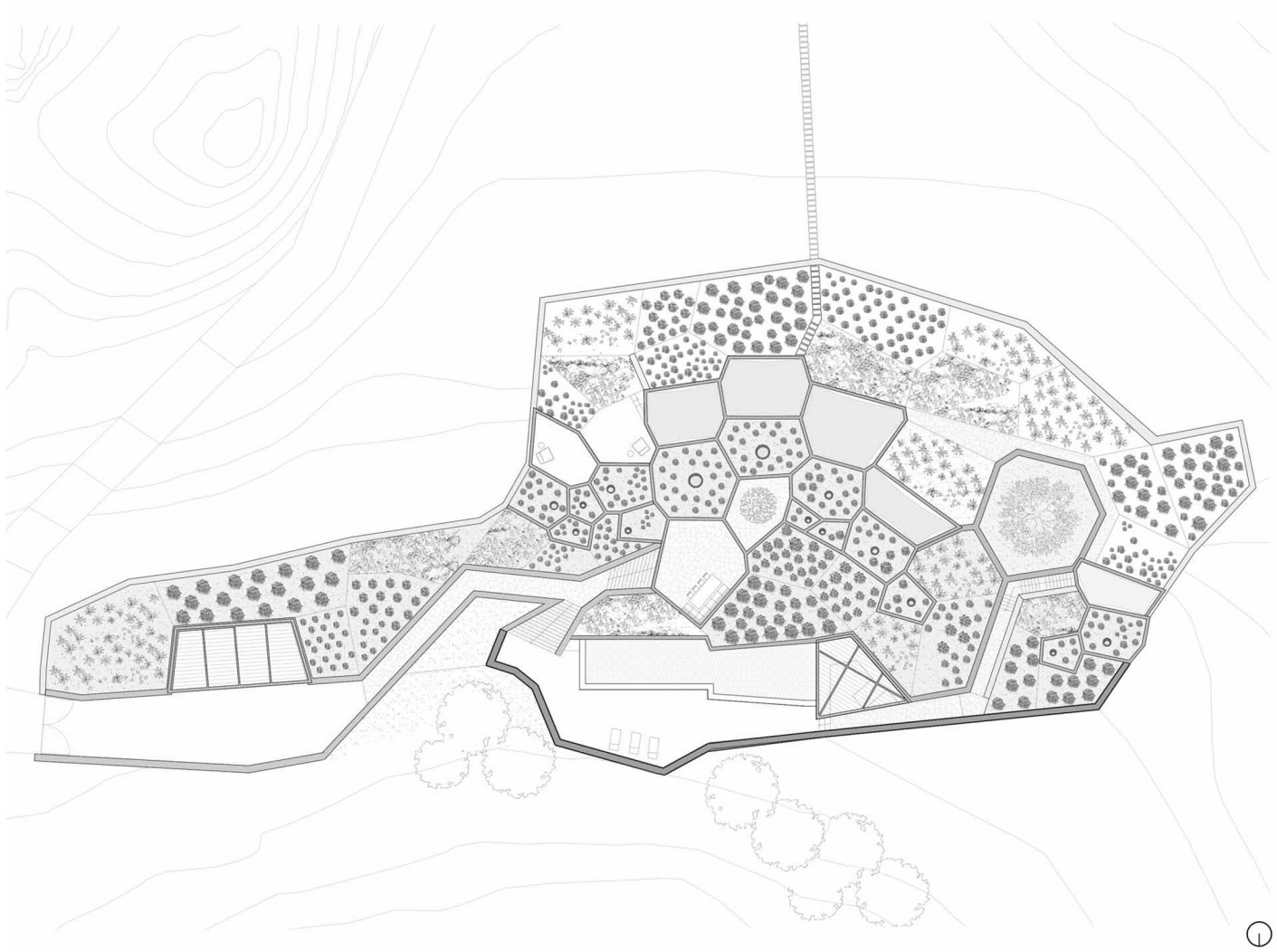
Paneling, Subdivision & Cellular Logic



Voronoi’s Corral

DECA Architecture

Paneling, Subdivision & Cellular Logic



Voronoi’s Corral

DECA Architecture

Paneling, Subdivision & Cellular Logic



Voronoi’s Corral

DECA Architecture

Paneling, Subdivision & Cellular Logic

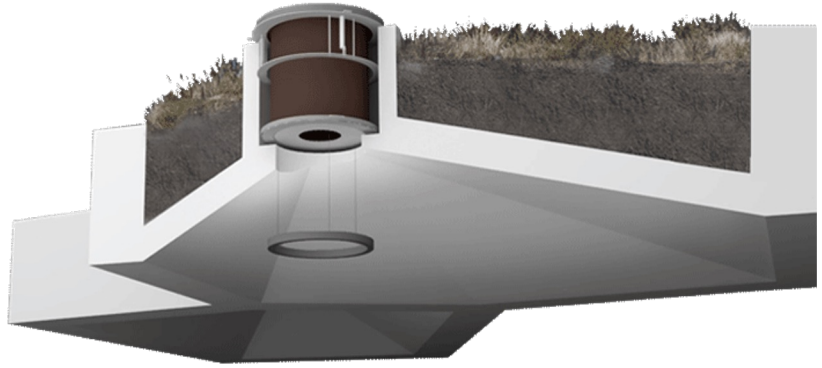


Voronoi’s Corral

DECA Architecture

Contemporary Implementations

Paneling, Subdivision & Cellular Logic







Voronoi’s Corral

DECA Architecture

Contemporary Implementations

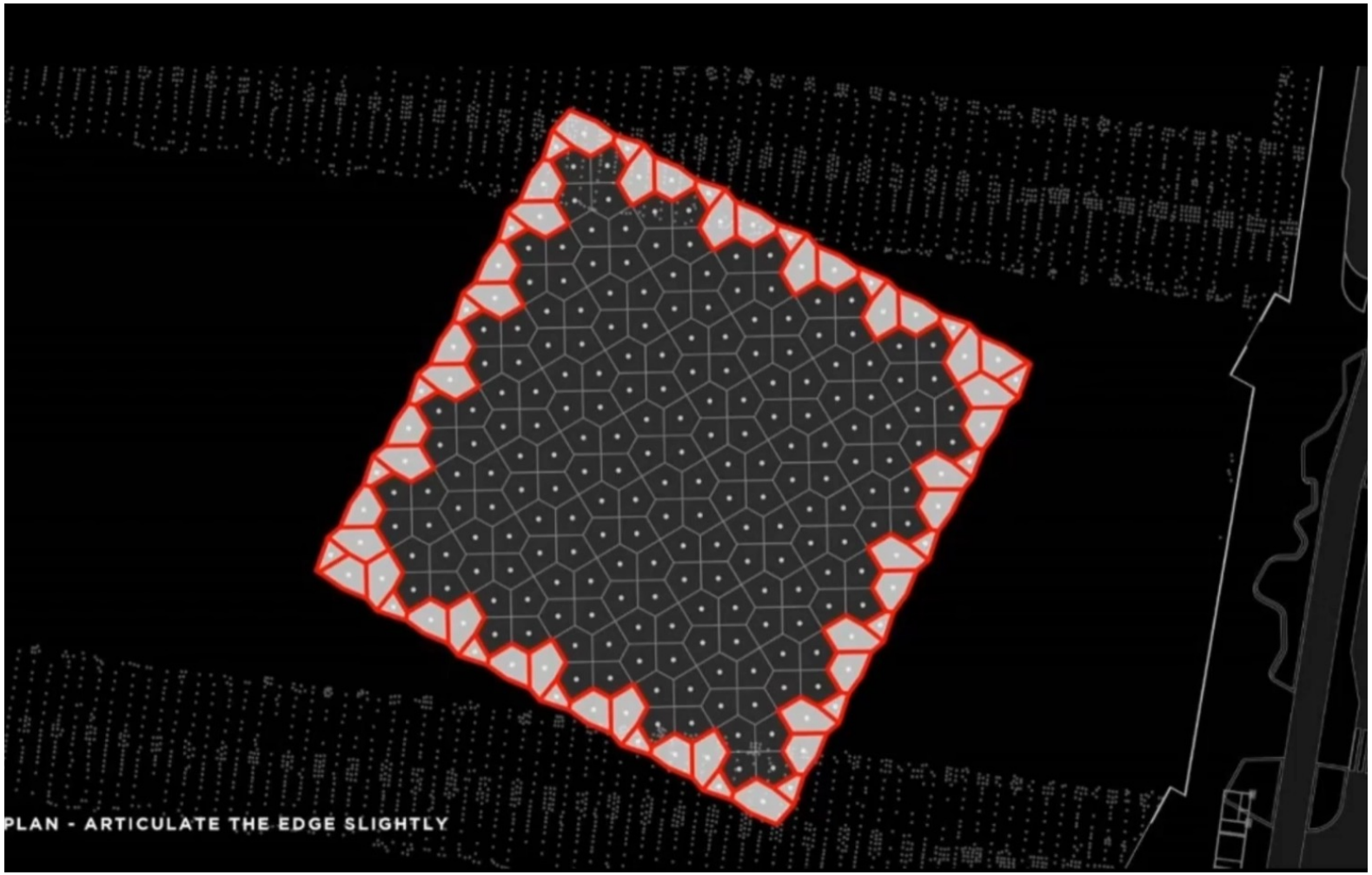
Paneling, Subdivision & Cellular Logic



Little Island

Heatherwick Studio+MNLA

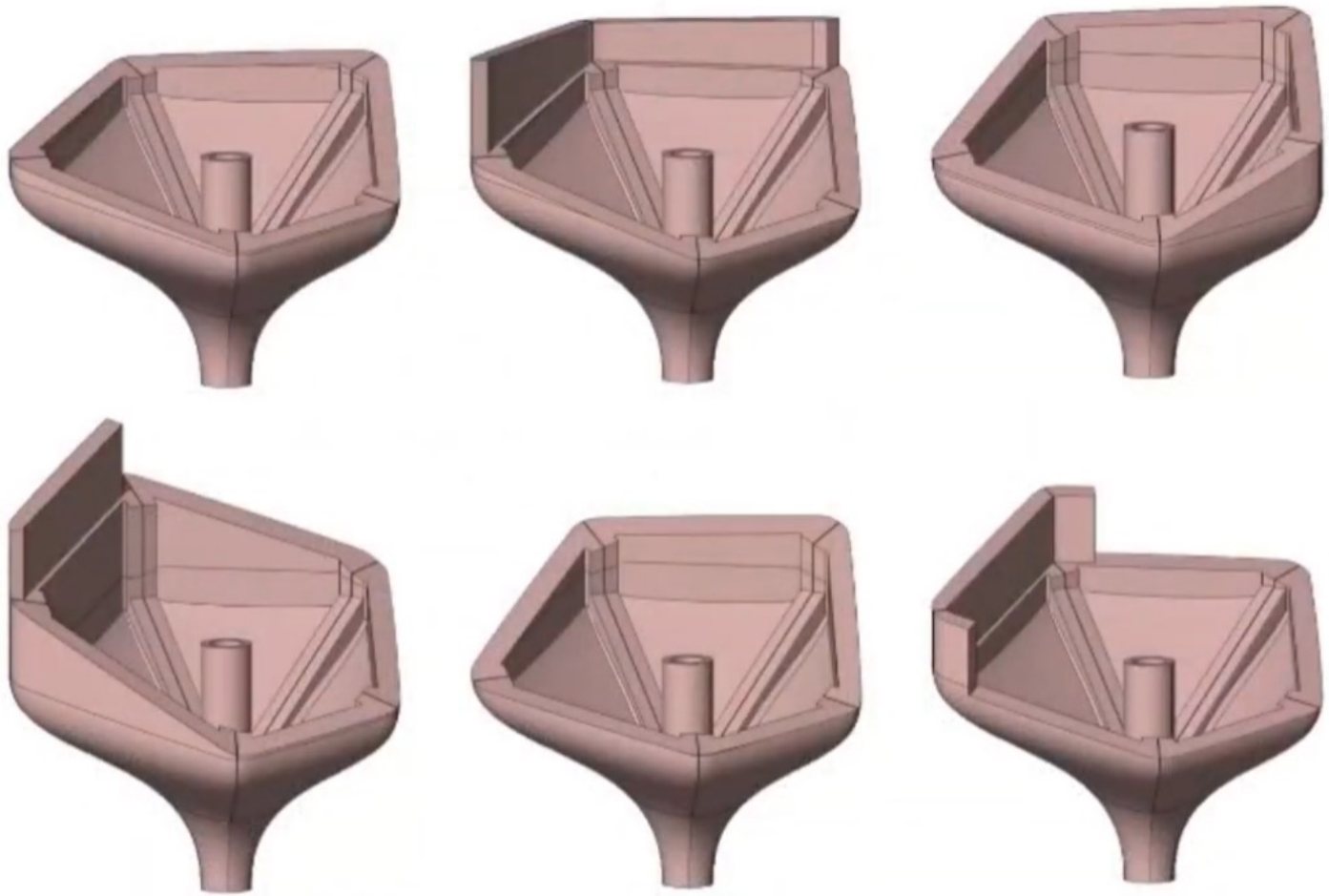
Paneling, Subdivision & Cellular Logic



Little Island

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Paneling, Subdivision & Cellular Logic

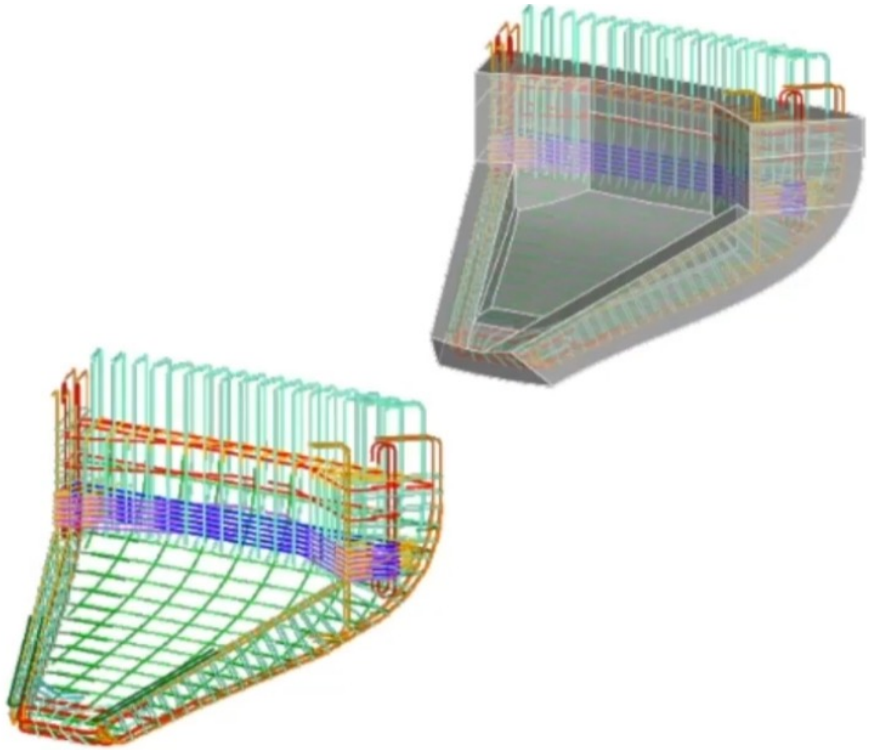


Little Island

Heatherwick Studio+MNLA

Paneling, Subdivision & Cellular Logic





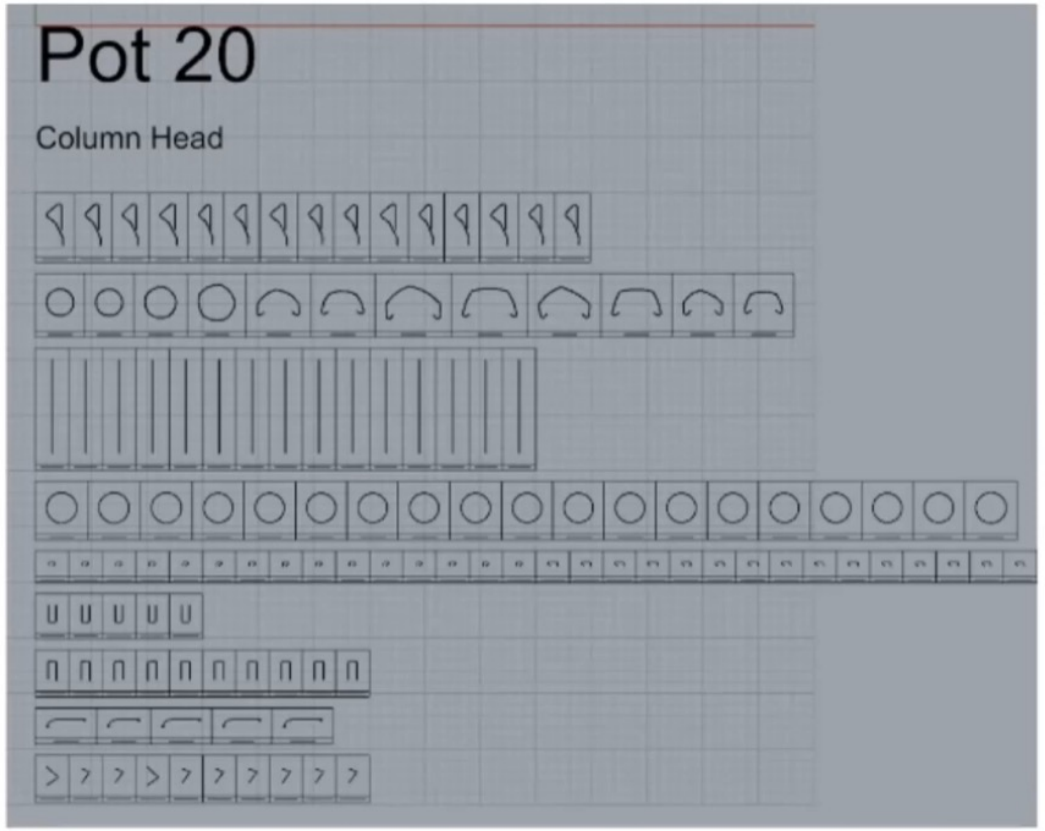
Little Island

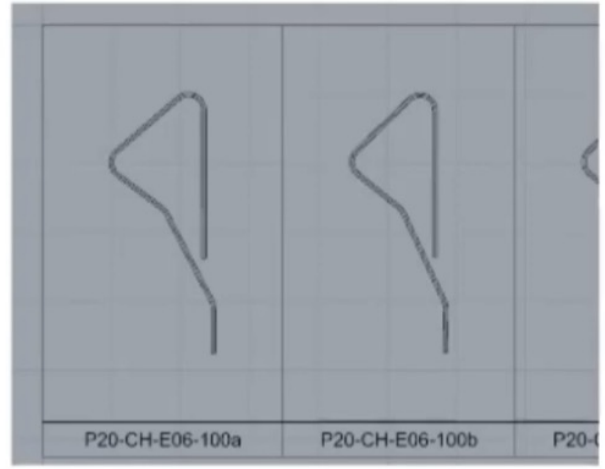
Heatherwick Studio+MNLA

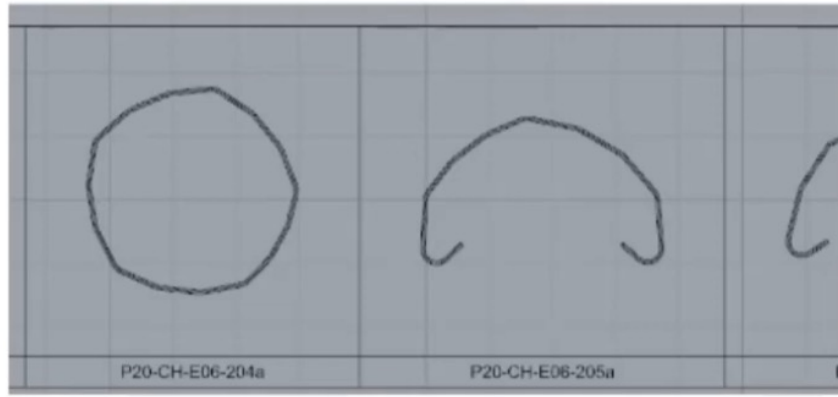
Paneling, Subdivision & Cellular Logic

Little Island

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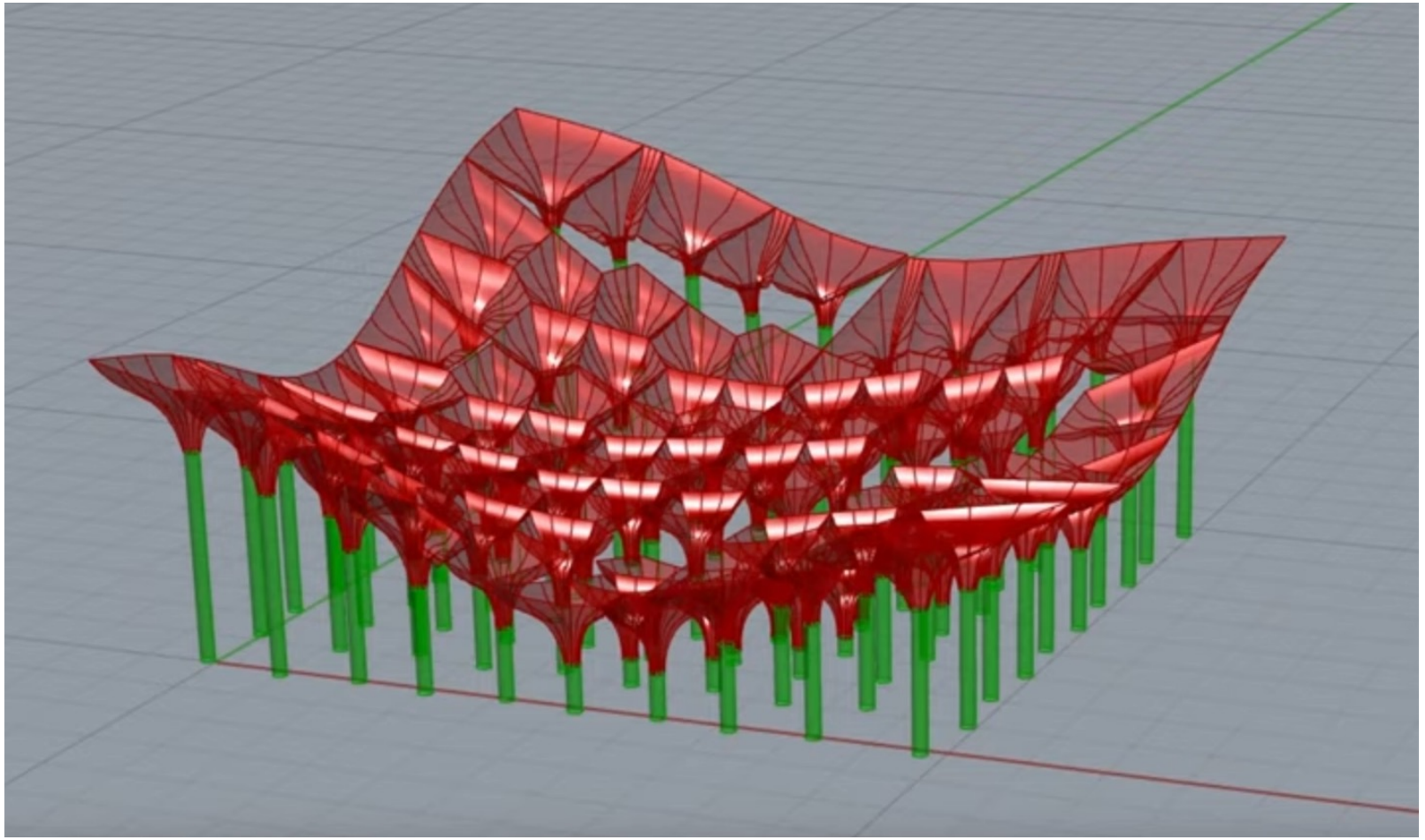






'Arrayed on 2D plane' Rebar model

Paneling, Subdivision & Cellular Logic



Little Island

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