Digital morphogenesis

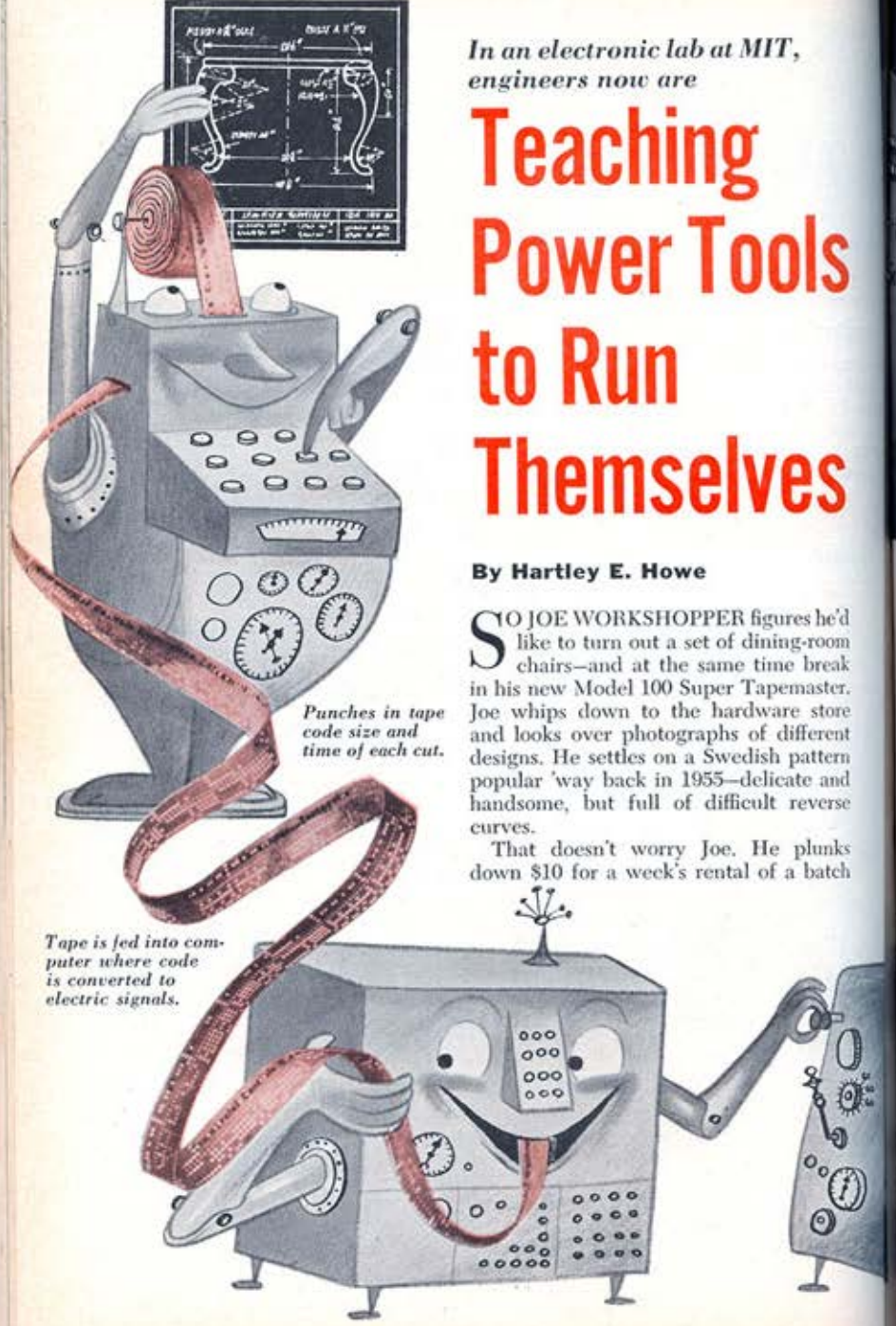
digital fabrication
data meaning
computational design

Arch. Amleto Picerno Ceraso

In an electronic lab at MIT, engineers now are

Teaching Power Tools to Run Themselves

By Hartley E. Howe



SO JOE WORKSHOPPER figures he'd like to turn out a set of dining-room chairs—and at the same time break in his new Model 100 Super Tapemaster. Joe whips down to the hardware store and looks over photographs of different designs. He settles on a Swedish pattern popular 'way back in 1955—delicate and handsome, but full of difficult reverse curves.

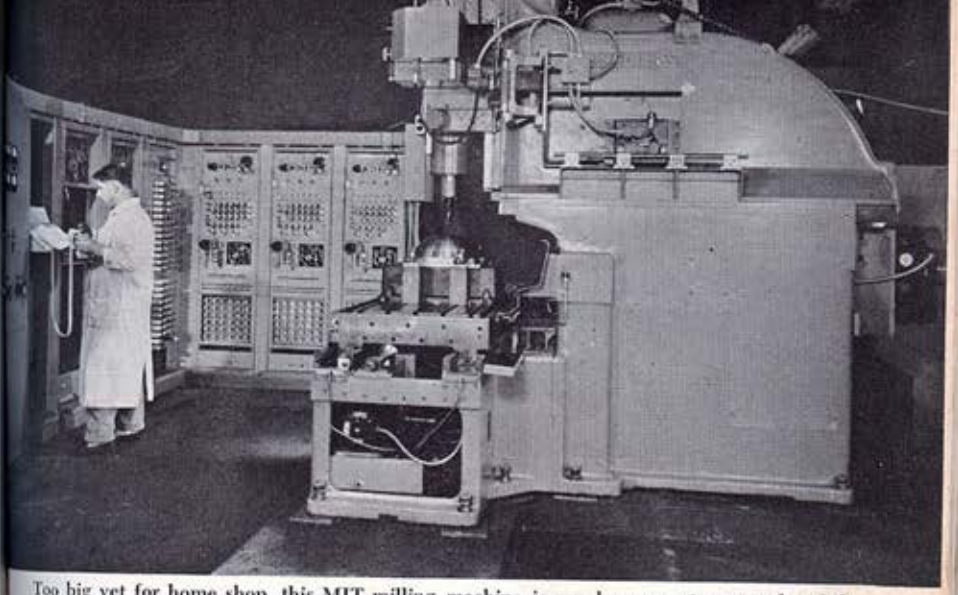
That doesn't worry Joe. He plunks down $10 for a week's rental of a batch of tapes—one each for legs, arms, back and seat.

That night, he clamps a nice piece of birch into his Tapemaster, slips the tape into the control box, flips the switch, and sits back with his pipe and the new issue of *Outdoor Life*.

Forty minutes later, the rumble of the Tapemaster stops and Joe takes a look. One leg is finished. So he clamps on another piece of birch . . .

Sure it's a dream—in 1955. But the engineering basis for Joe's Tapemaster exists right now. Sitting up in the Servomechanisms Laboratory of the Massachusetts Institute of Technology in Cambridge, Mass., is a milling machine that will turn out any metal part at the command of a little roll of tape. Originally a standard, vertical 28″ Cincinnati Hydro-Tel, it now has hitched to it $50,000 worth of electronics.

To conceive, design and build the MIT machine took some quarter-million

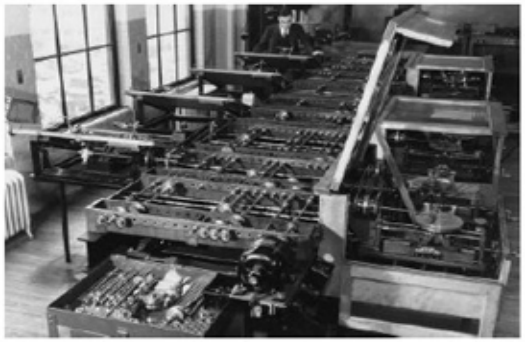


Too big yet for home shop, this MIT milling machine is run by computer-control at left.

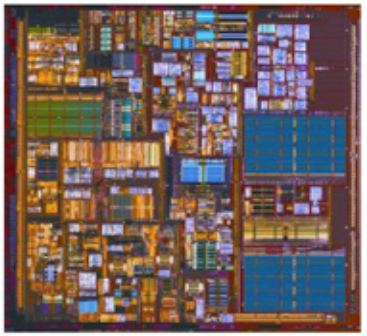
Signals control three-dimensional movement of cutter head, time each cut.

Digital Revolutions

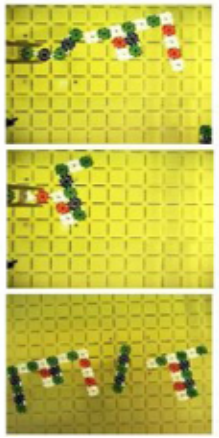
analog → digital communication
~1945



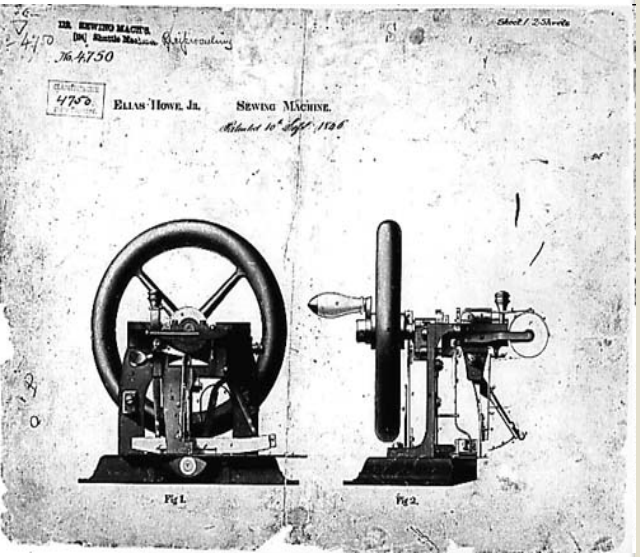
analog → digital computation
~1955



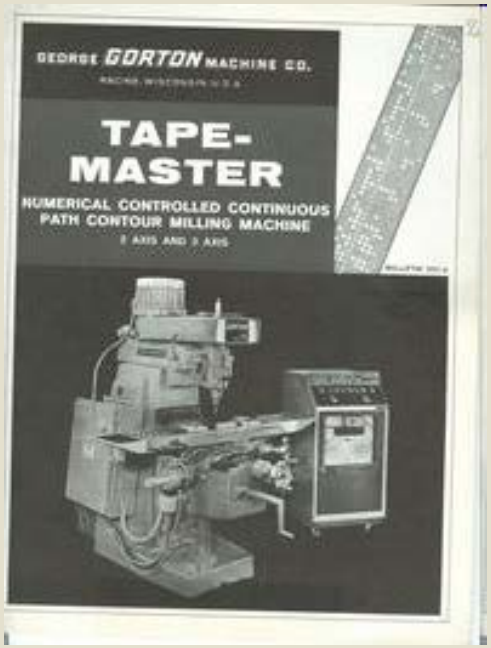
analog → digital fabrication
~2005



Always Manually Controlled machines



1940 Numerical Controlled machines



~1960 Computer Numerical Controlled machines

Additive

Rapid prototyping

*STA _ stereolithography,

*3Dprinting,

*Fused deposition modeling,...

Subtractive

2D

*Laser cut,

*Wire cut,

*Waterjet cut,

*Plasma cut,...

3D

*Cnc Milling

*Cnc Turning

*Cnc Chiseling

Deforming

*Cnc Forging

*Cnc Bending,

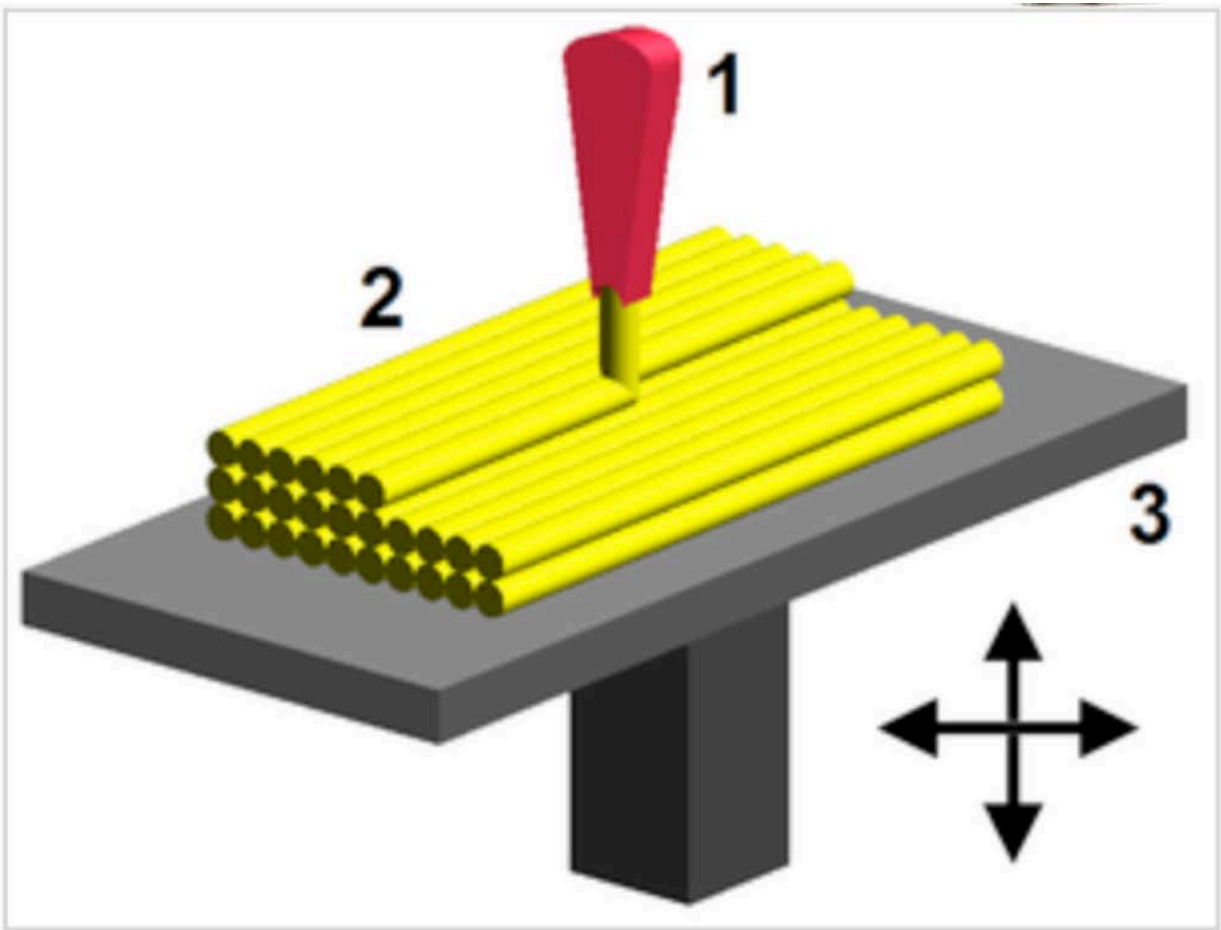
*Theormoforming Press ,...

Hybrid

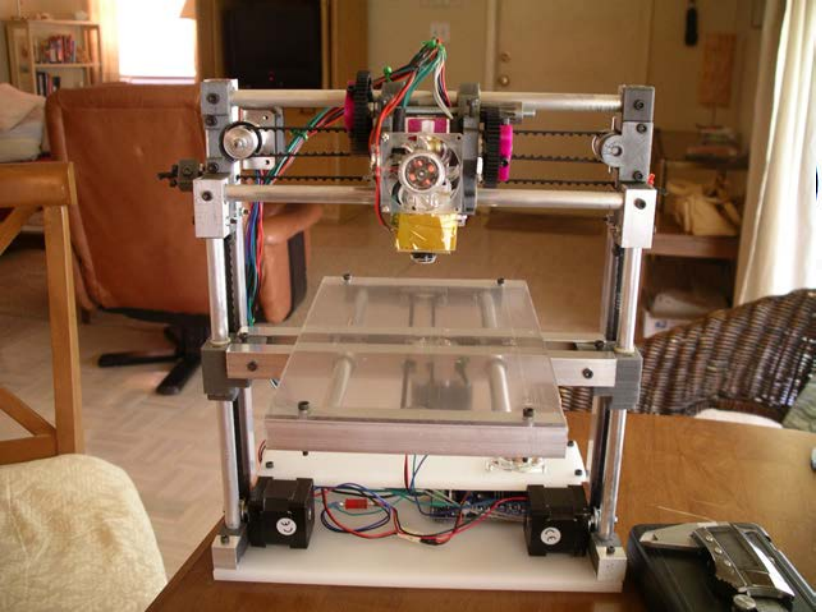
*Cnc Lasercut/ cnc folding

*Robotic Brick deposition

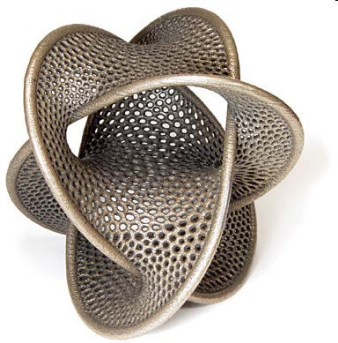
*Cnc Wire cutting/ cnc Coloring



Fused deposition modeling: 1 - nozzle ejecting molten plastic, 2 - deposited material (modeled part), 3 - controlled movable table




OBJET1000



Additive processes : 3D Printing

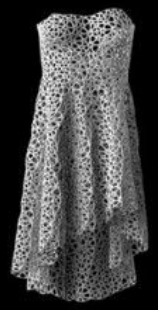
Additive processes : 3D Printing

3D SCAN

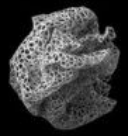
DRESS
SHAPE

TESSELLATED

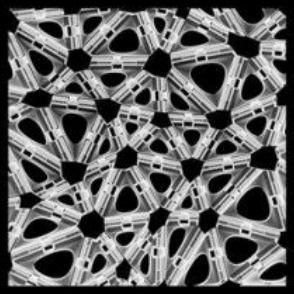
KINEMATICS
STRUCTURE



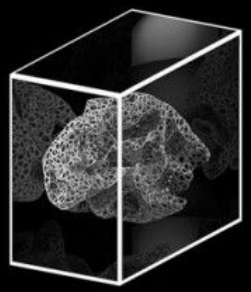
DRAPED



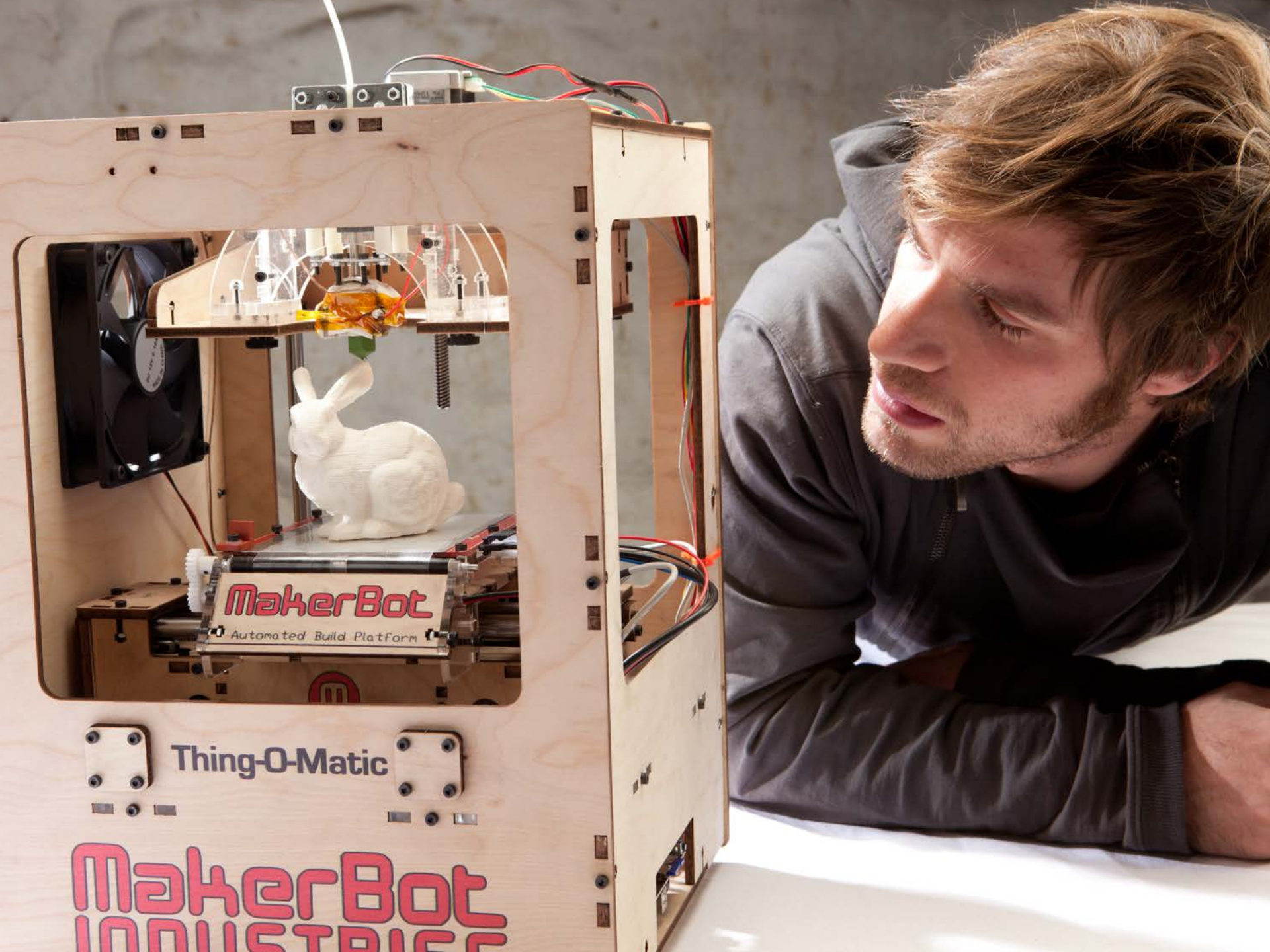
COMPRESSED

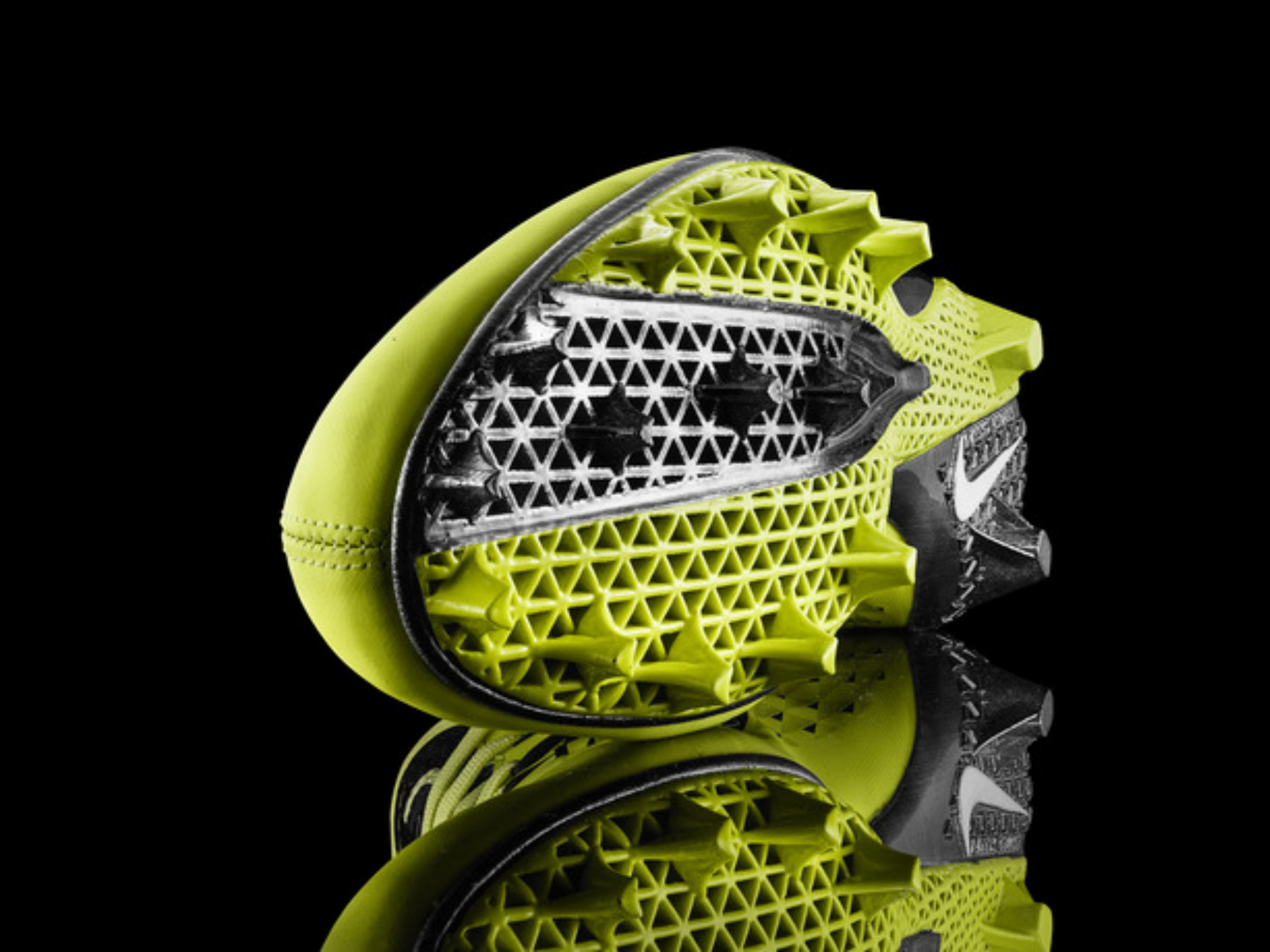


CLOSE-UP
OF STRUCTURE



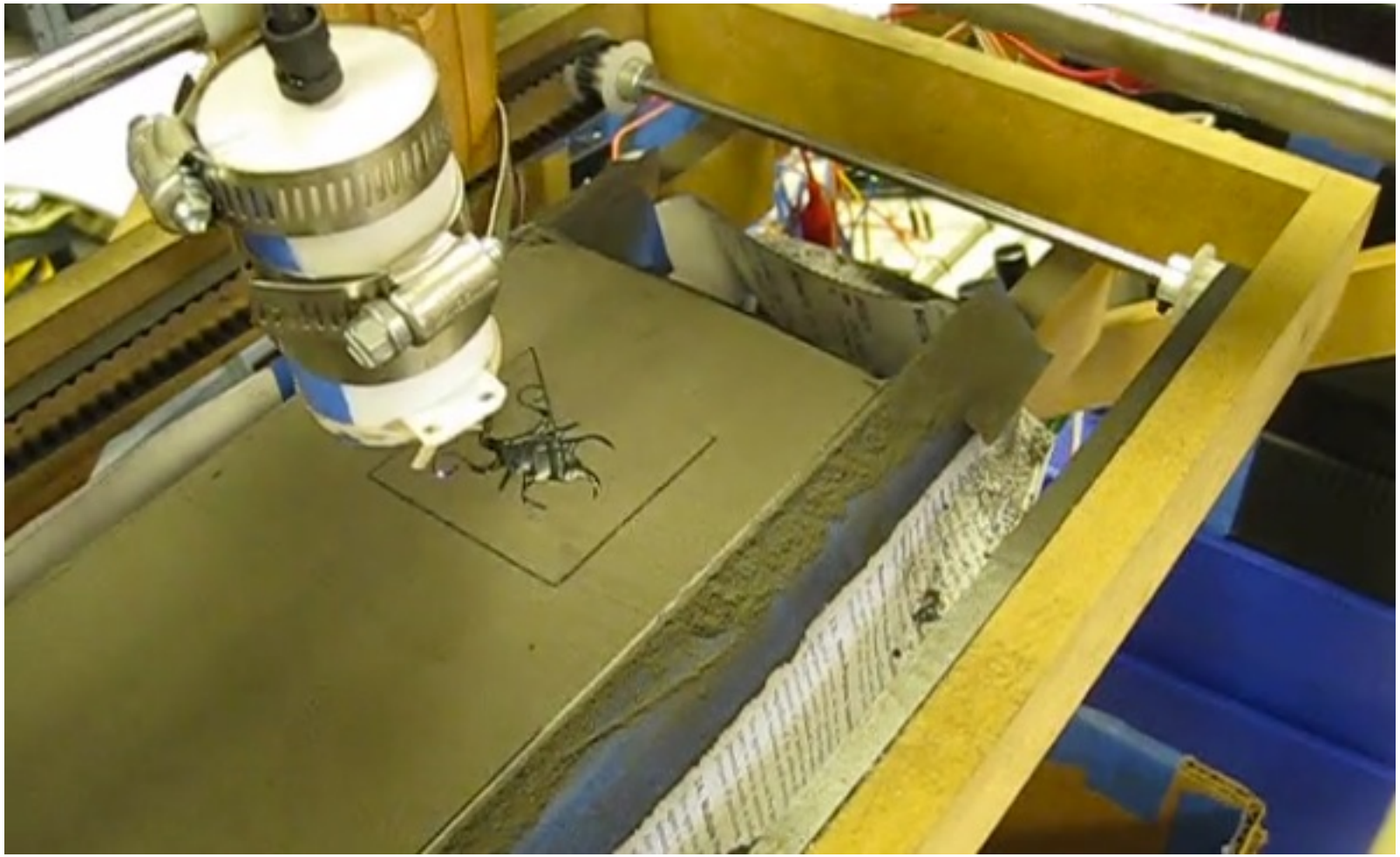
3D PRINTER
BUILD VOLUME

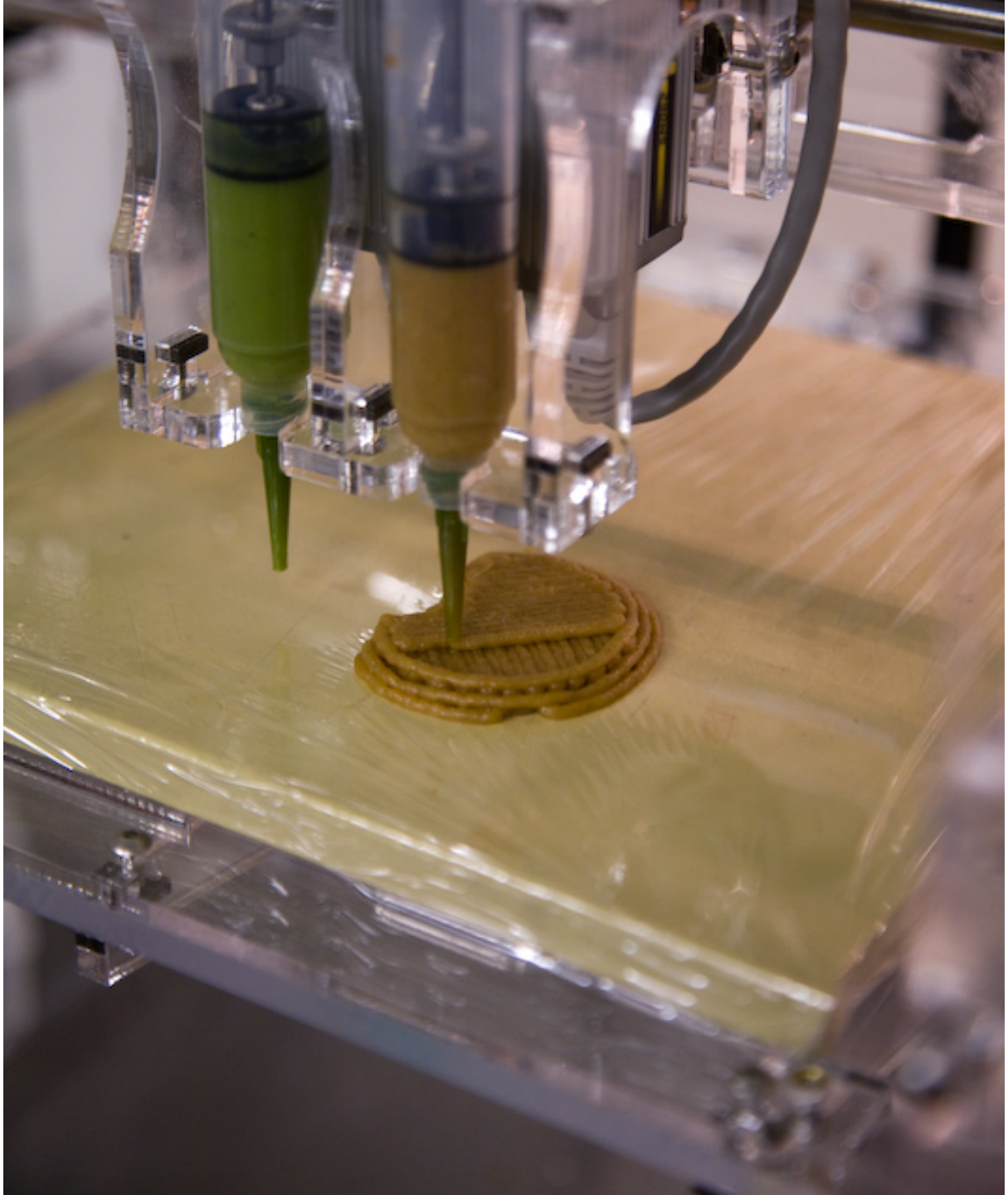

MakerBot
Automated Build Platform
Thing-O-Matic
MakerBot





Iris van Herpen and
Jolan van der Wiel



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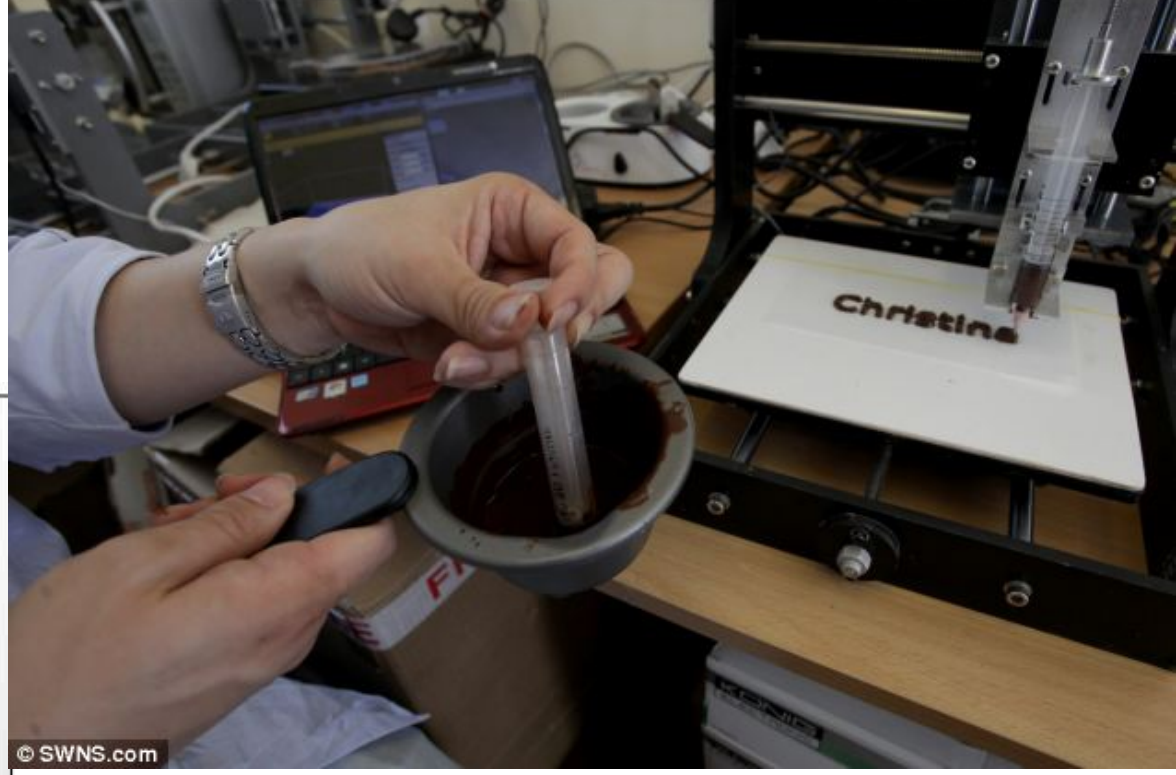
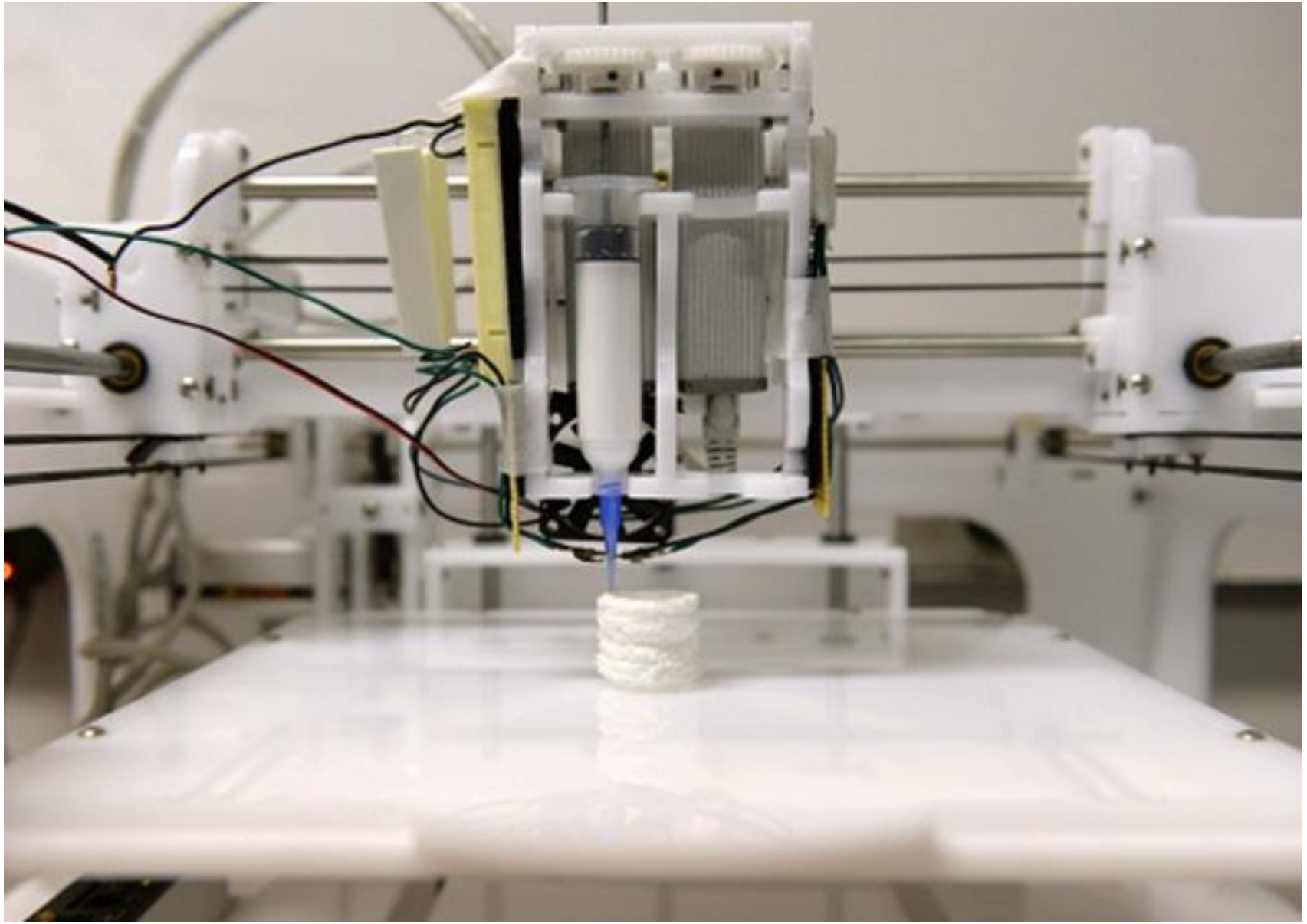

Christine
© SWNS.com


Emma

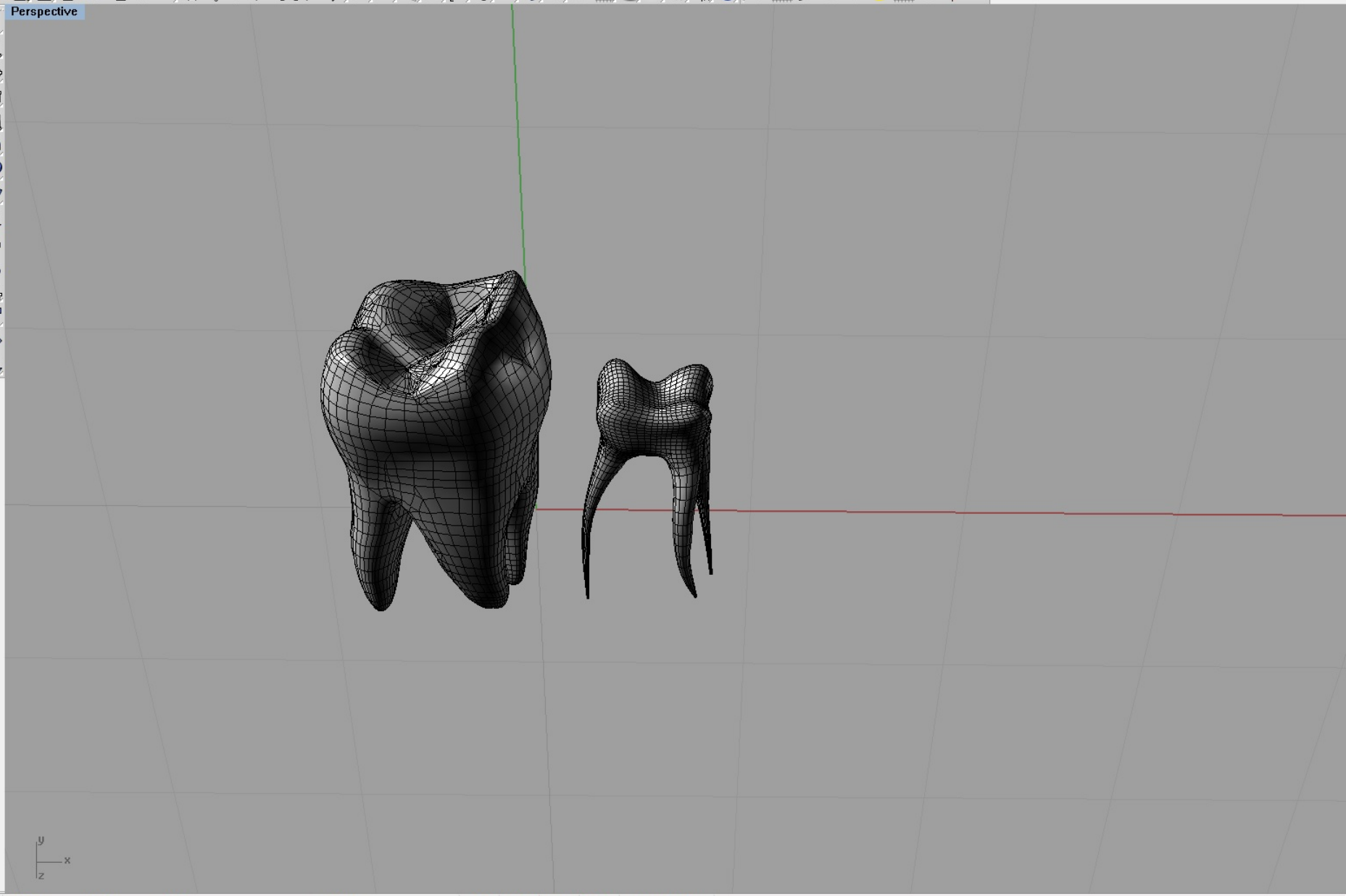


Untitled - Rhinoceros (Educational Lab License) - [Perspective]

File Edit View Curve Surface Solid Mesh Dimension Transform Tools Analyze Render Orca3D Flamingo Help

Click and drag to pan (Down Left Right Up In Out):

Command:

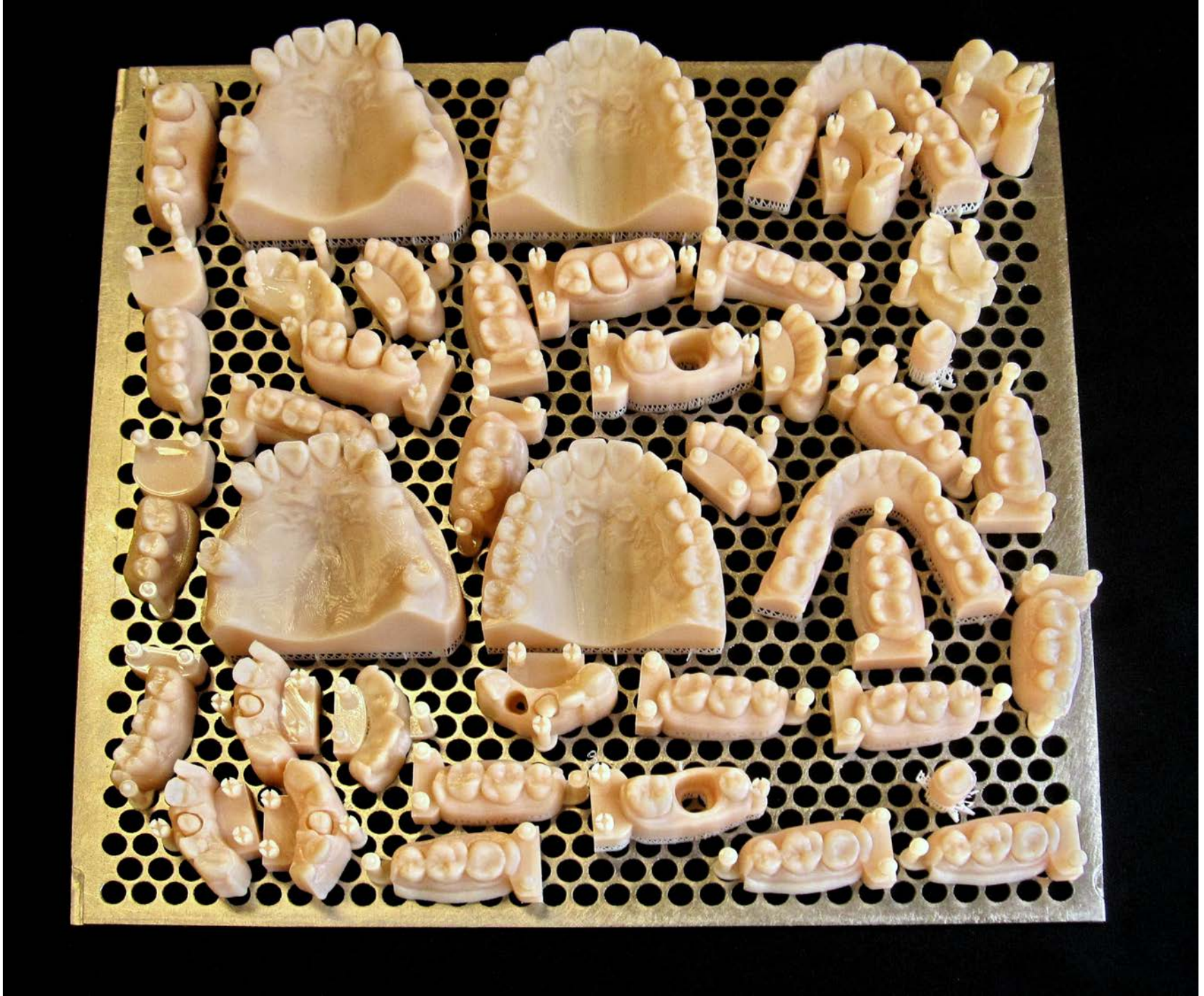


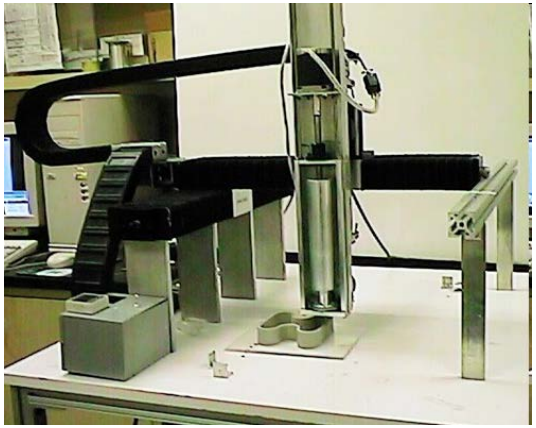
CPlane x -0.294 y 0.302 z 0.000 Default Snap Ortho Planar Osnap Record History

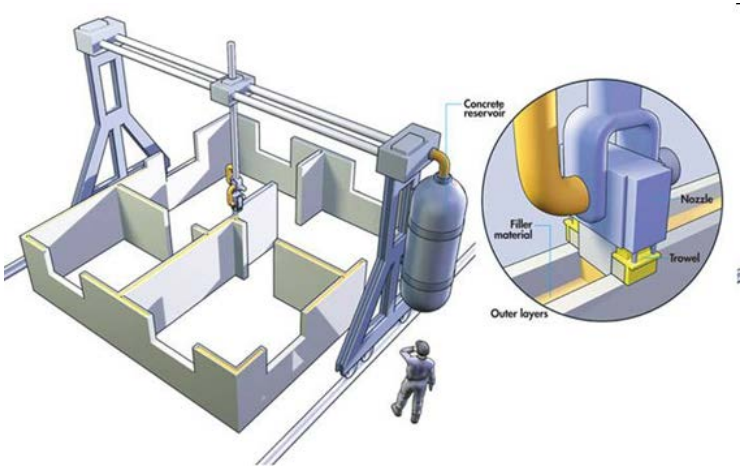
4:54 PM
5/13/2013

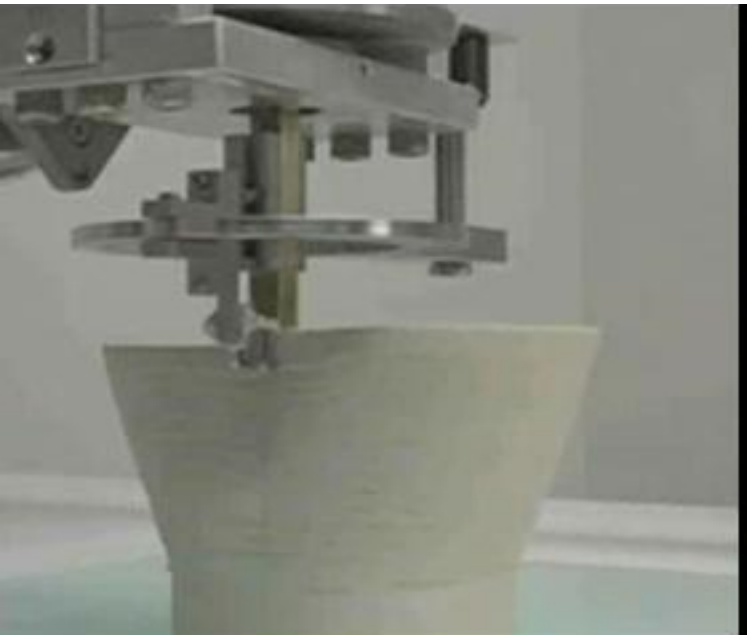

sirona
CEREC MC XL


CEREC 3

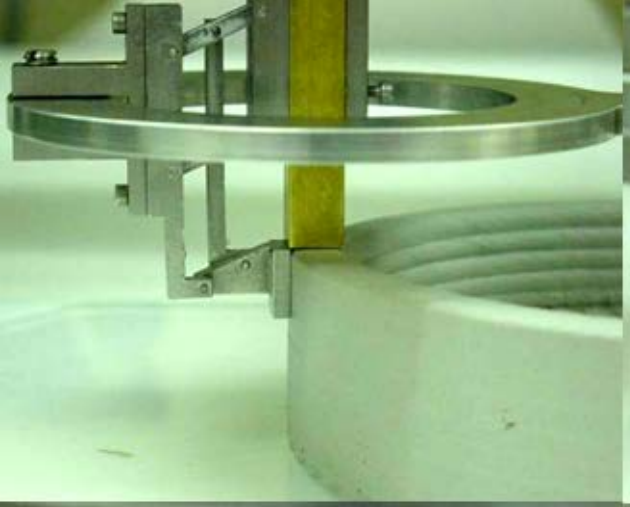
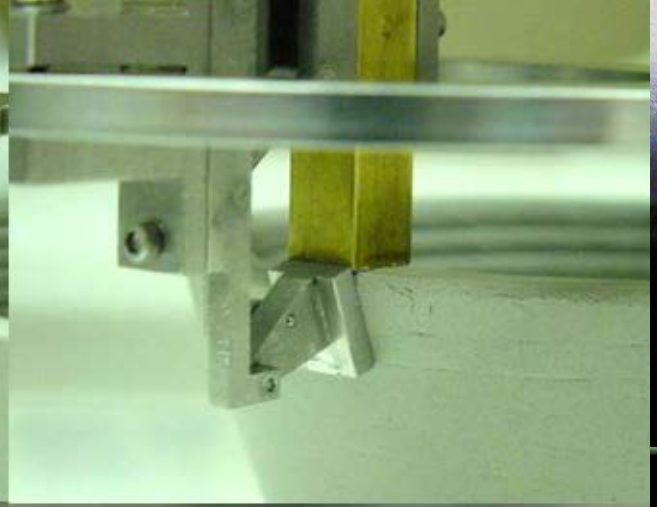
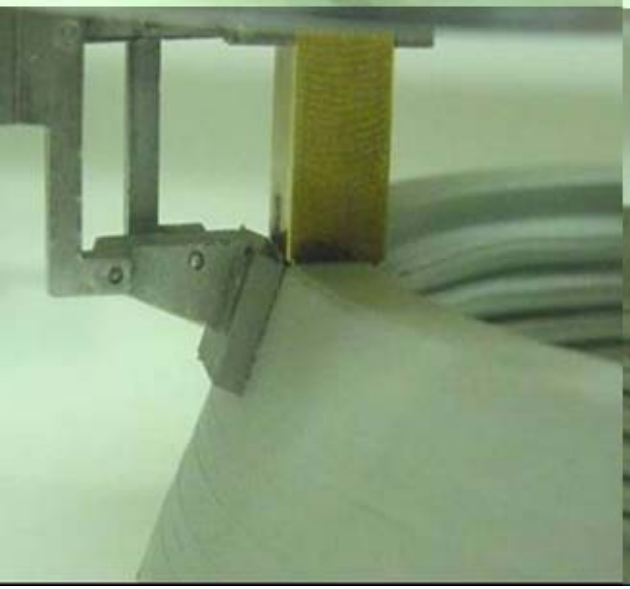


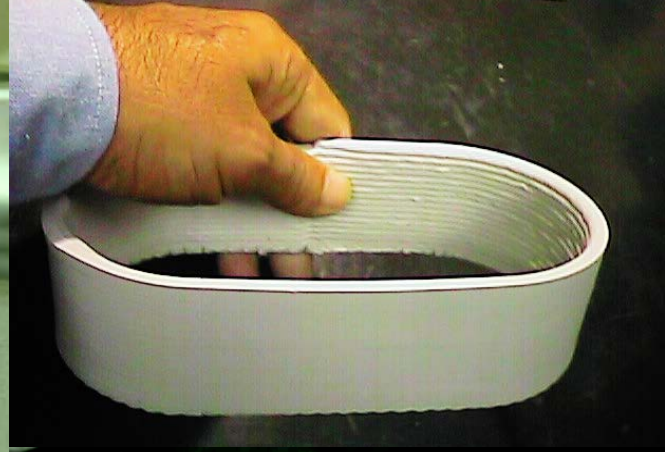






Contour Crafting_ Behrokh Khoshnevis

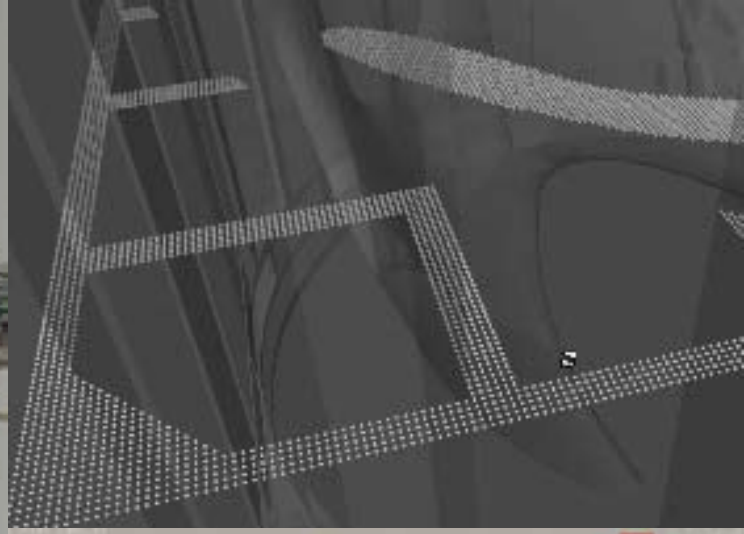


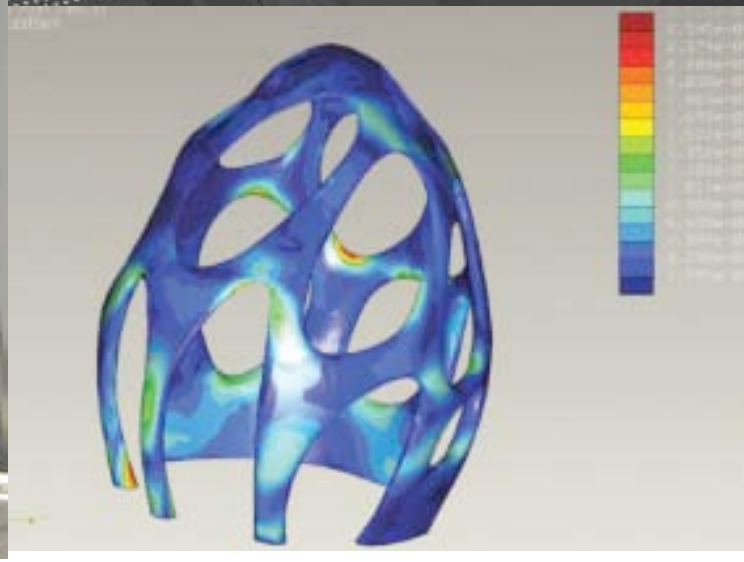
Presentation Contour Crafting_ Construction_Application.ppt

Video cchouse_large.wmv

Co rafting_ Behrokh Khoshnevis

D-Shape_Monolite Uk Ltd_ Enrico Dini





D-Shape_Monolite Uk Ltd_ Enrico Dini

D-Shape_Monolite Uk Ltd_ Enrico Dini

Overall plant dimensions: 7.5 x 7.5 m

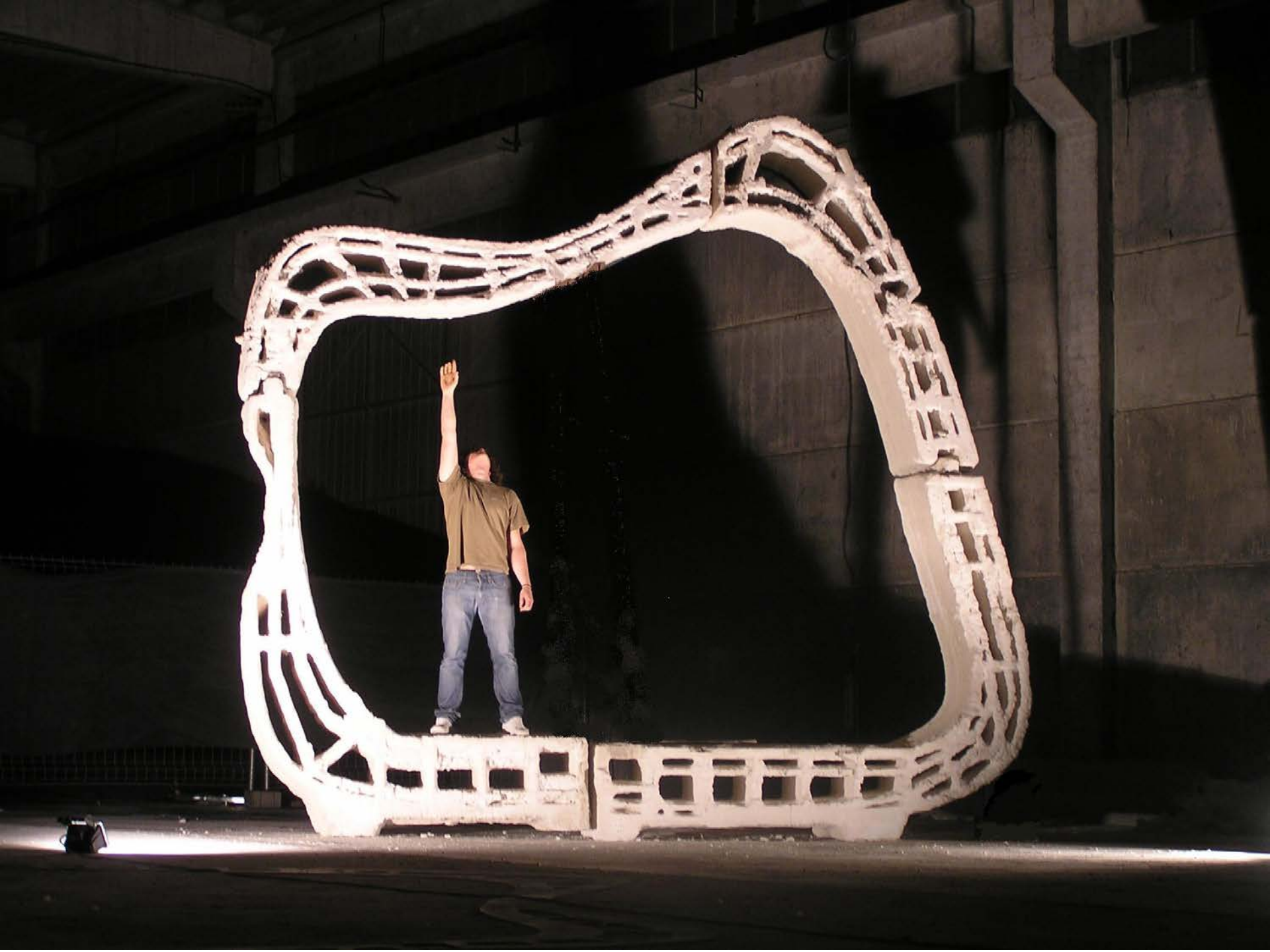
Height: 3-6-9-12-18 metres

Maximum areas of printing (including the shell) : 6 x 6 m

Number of nozzles: 300 at 20 mm interaxis

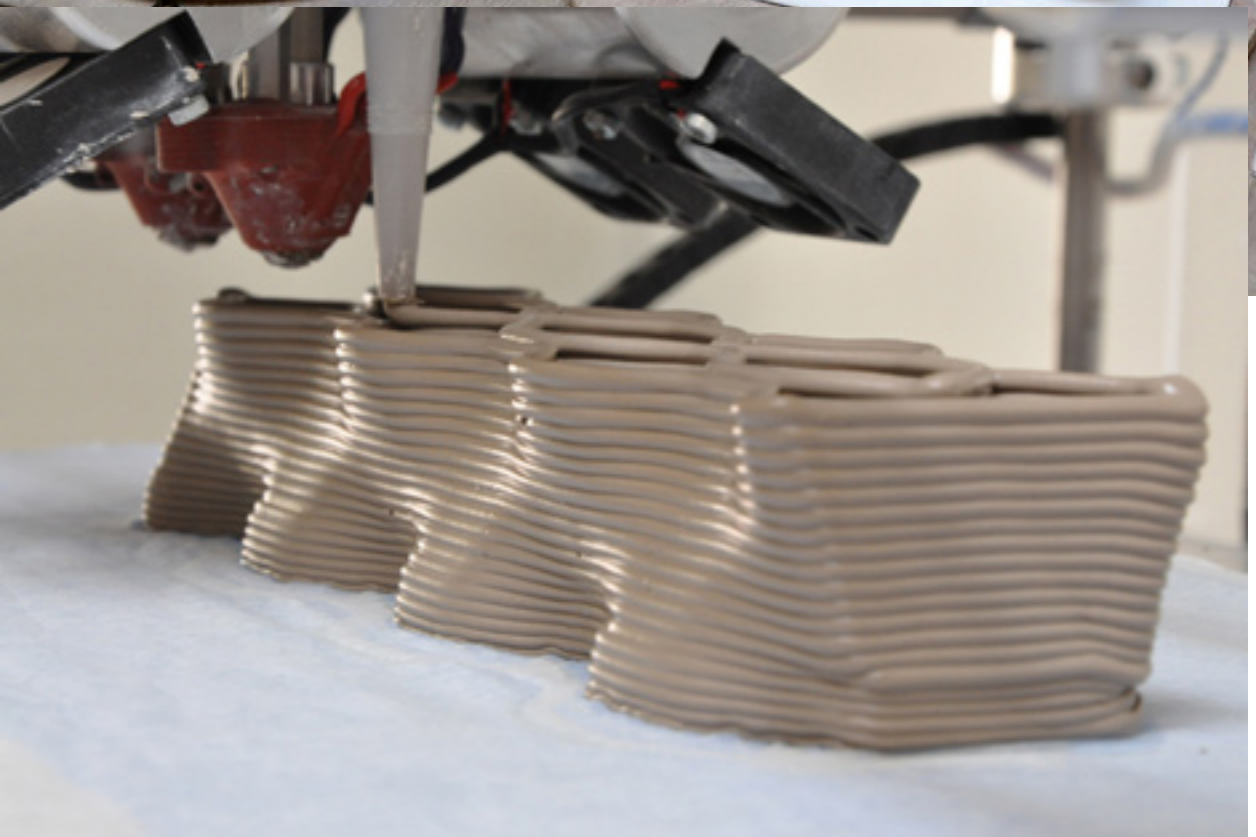
Nozzle intervention time: 10-15 msec

Command and Control: by PC-PLC Siemens operating via Profibus communication protocol

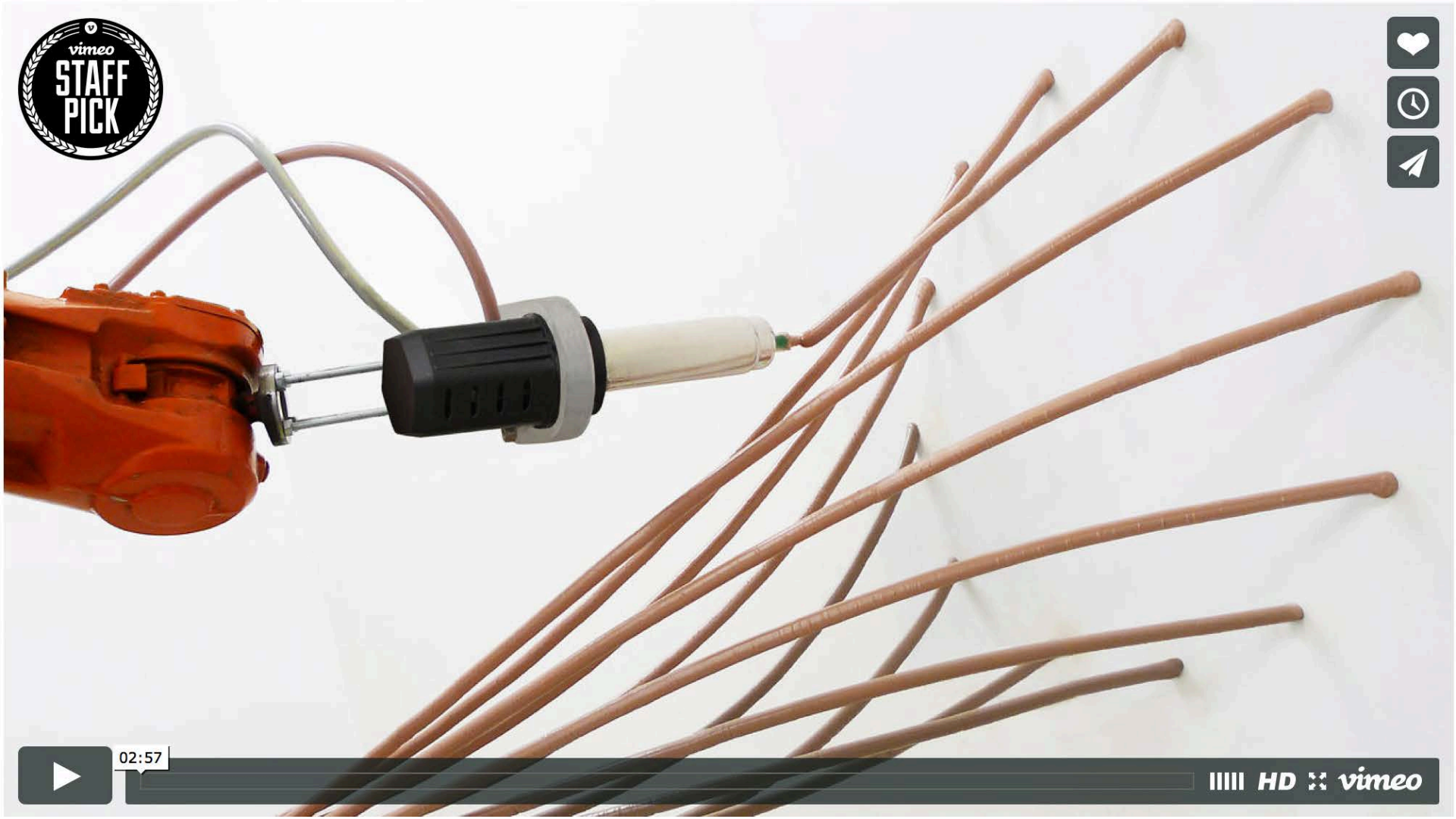



STONE SPRAY ROBOT


DLW
DESIGN
LAB
WORKSHOP

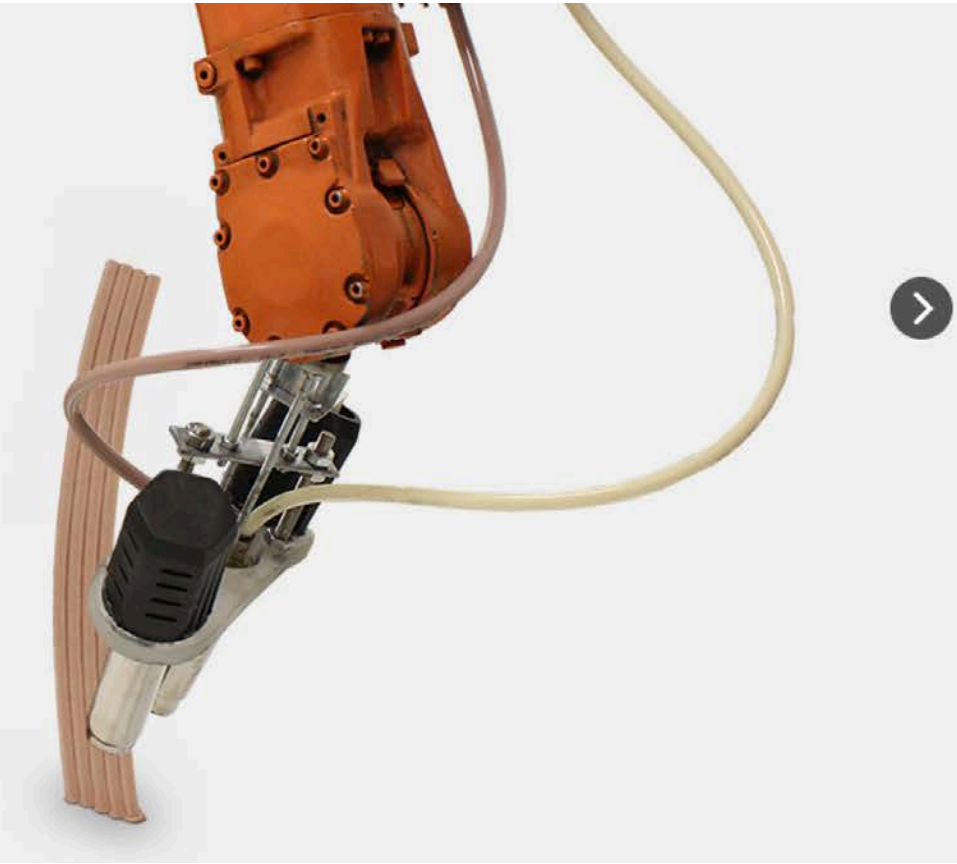


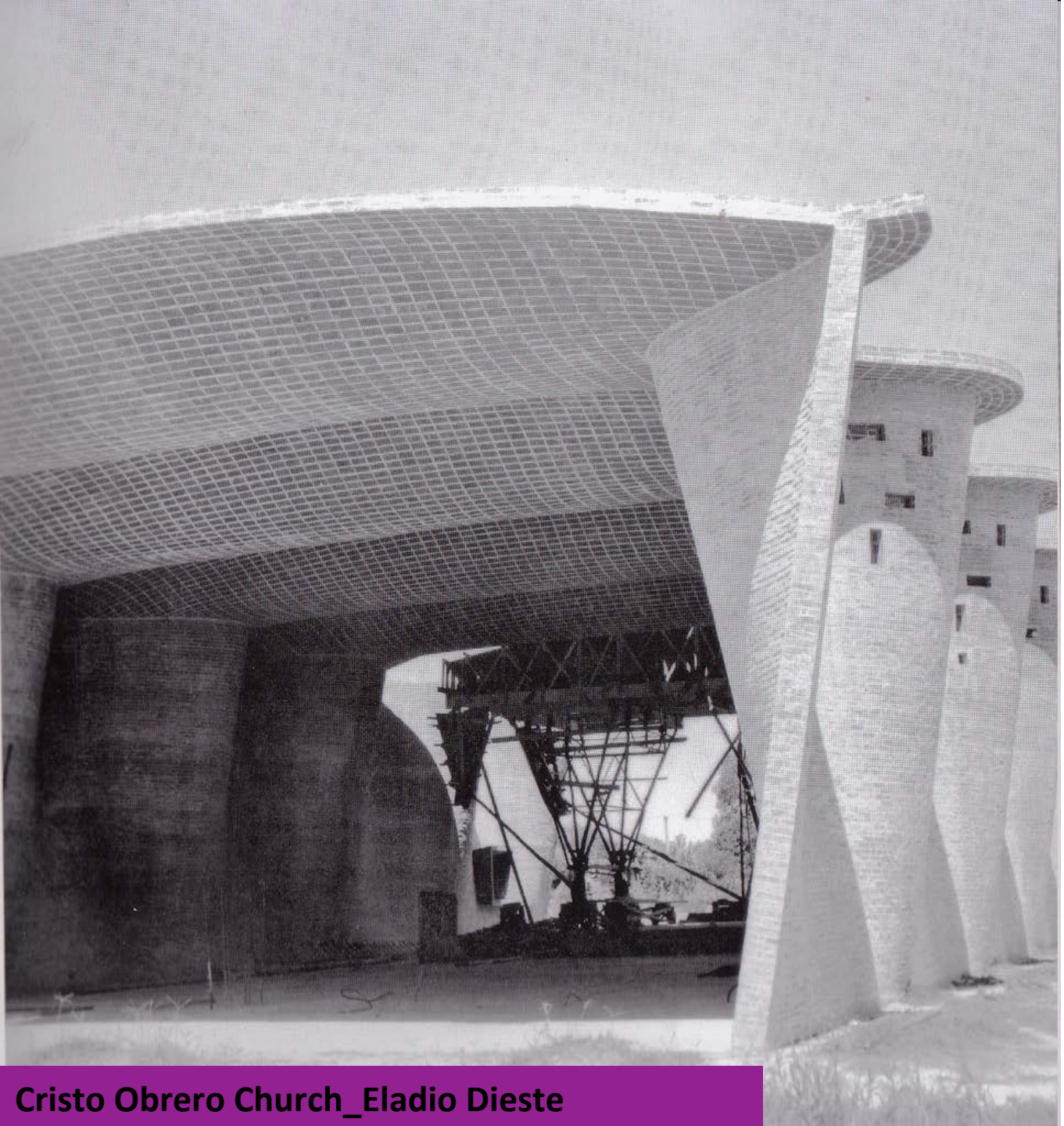
https://vimeo.com/16708764


vimeo
STAFF
PICK
02:57
HD
vimeo

3D CURVES INSTEAD OF 2D LAYERS

Surfaces and objects can be formed by combined 3D curves instead of successive 2D layers allowing more control over the fabrication process.



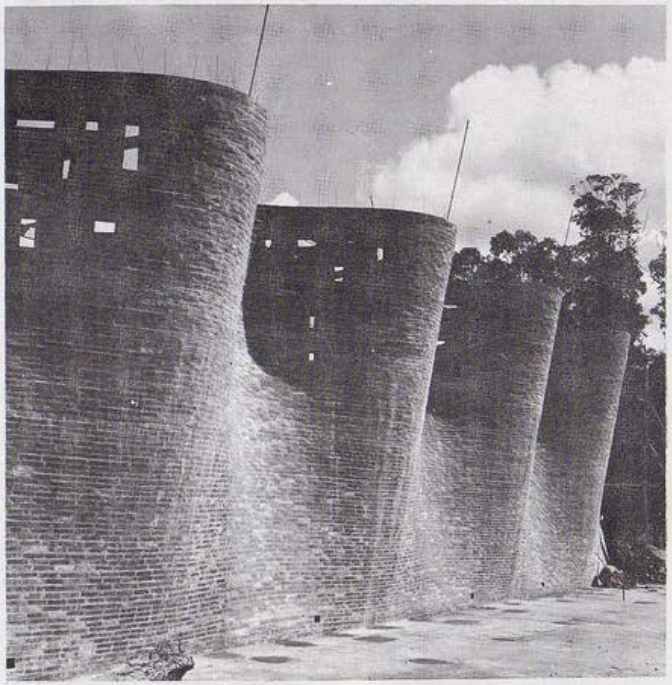


Cristo Obrero Church_Eladio Dieste

Cristo Obrero Church_Eladio Dieste

FIG. 8 Obreros trabajando en la construcción de la iglesia.

FIG. 13 Las paredes de la iglesia en el momento de su construcción.

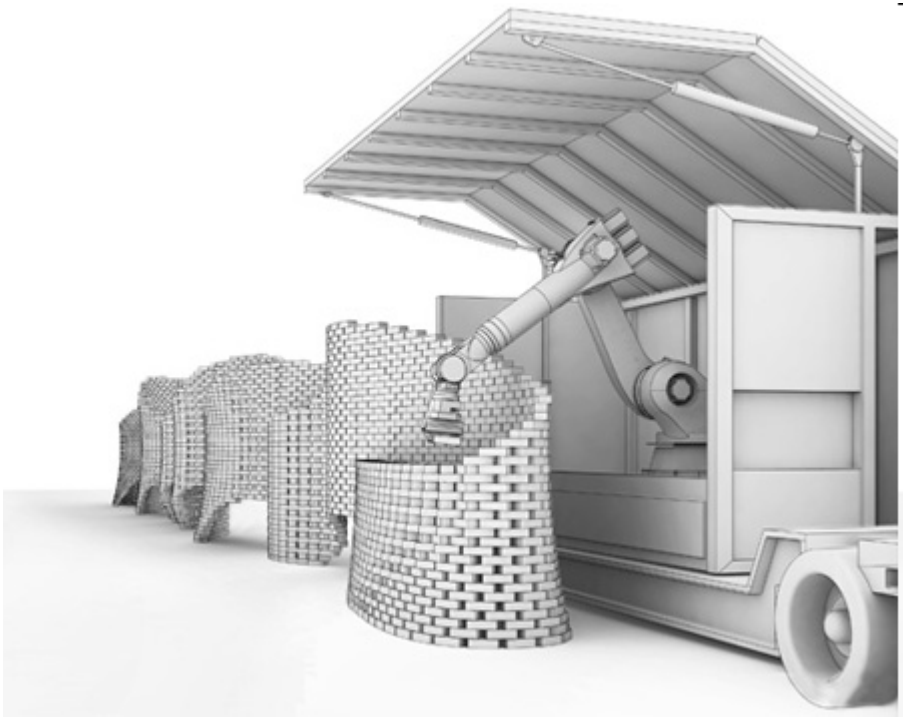


Cristo Obrero Church_Eladio Dieste

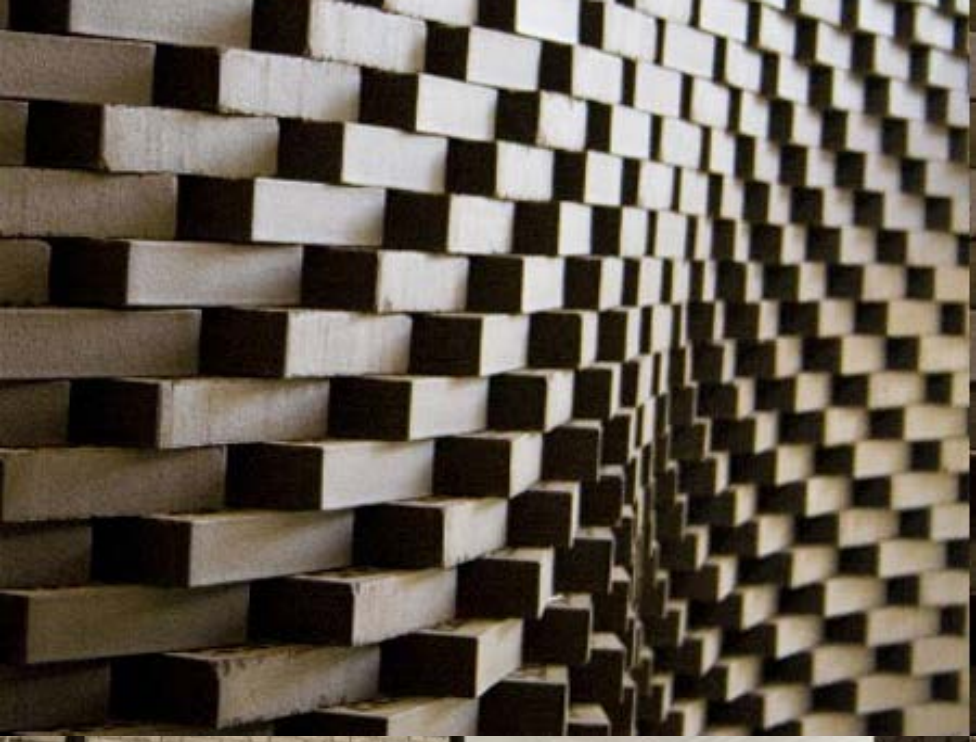
Love the Robots

Pike Loop_Gramazio/Kohler

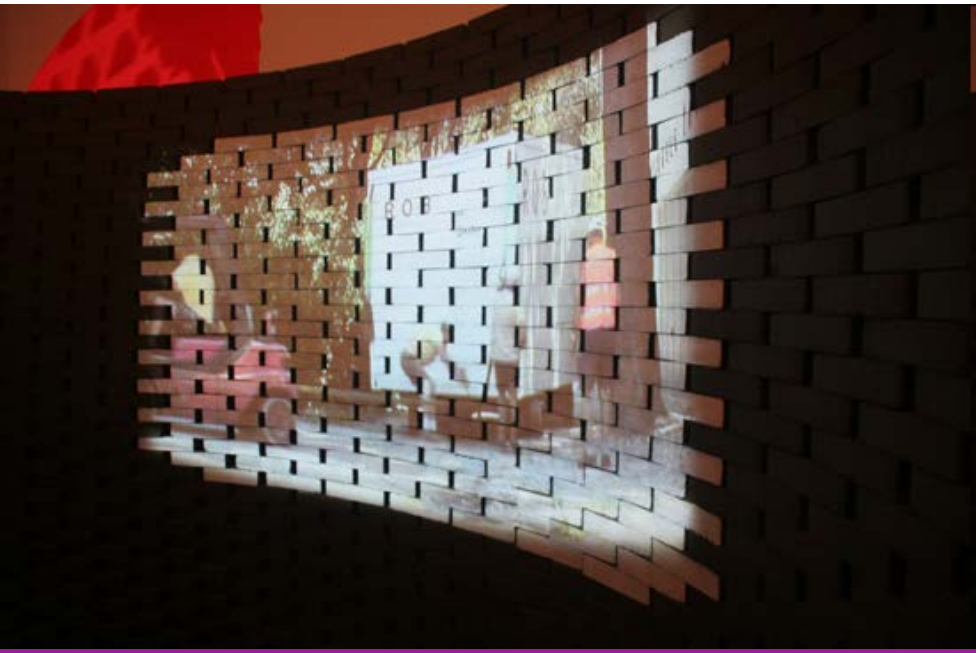
video



Pike Loop_Gramazio/Kohler

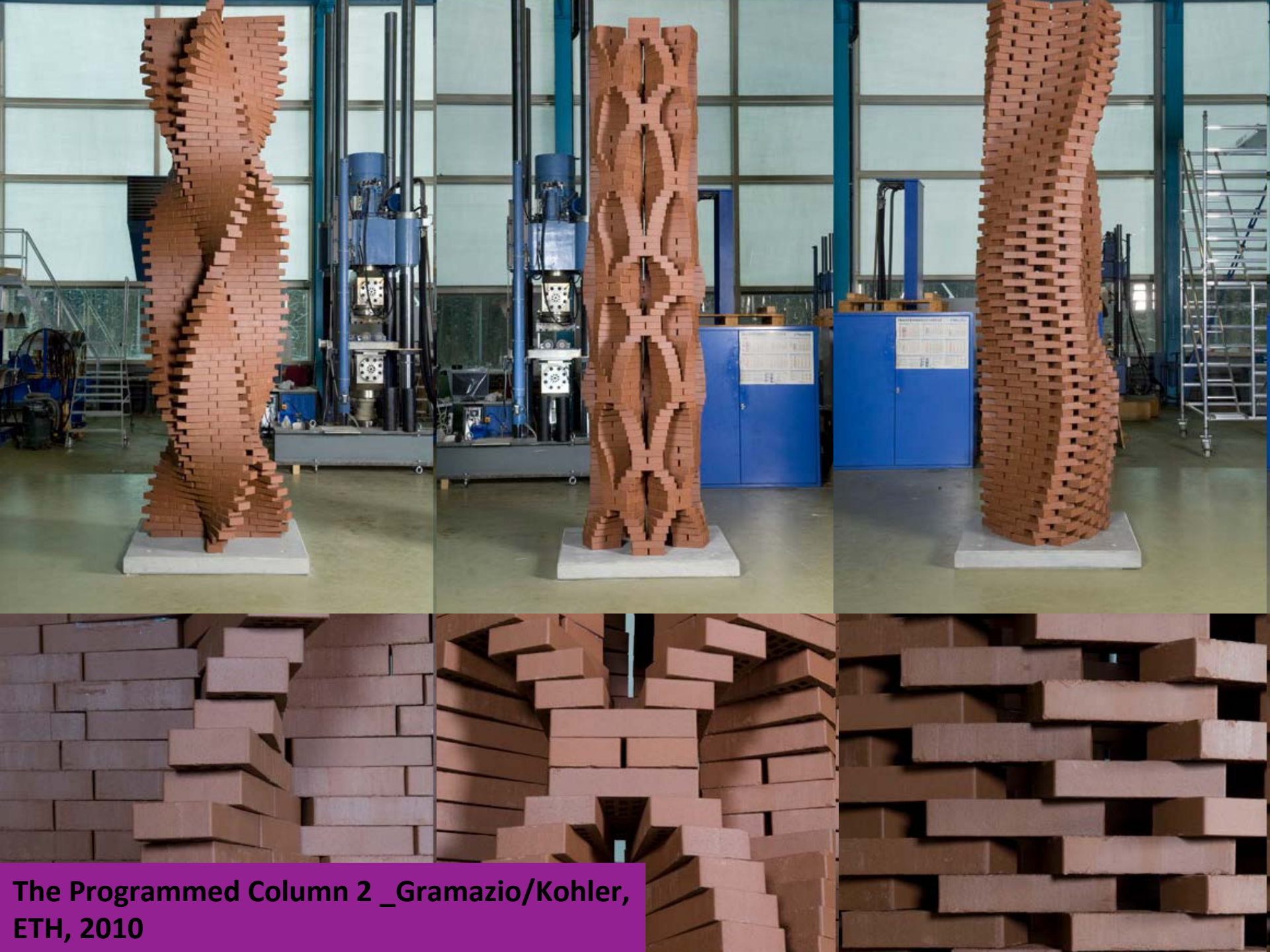


Structural Oscillations,2008 Venice biennial.
_Gramazio/Kohler

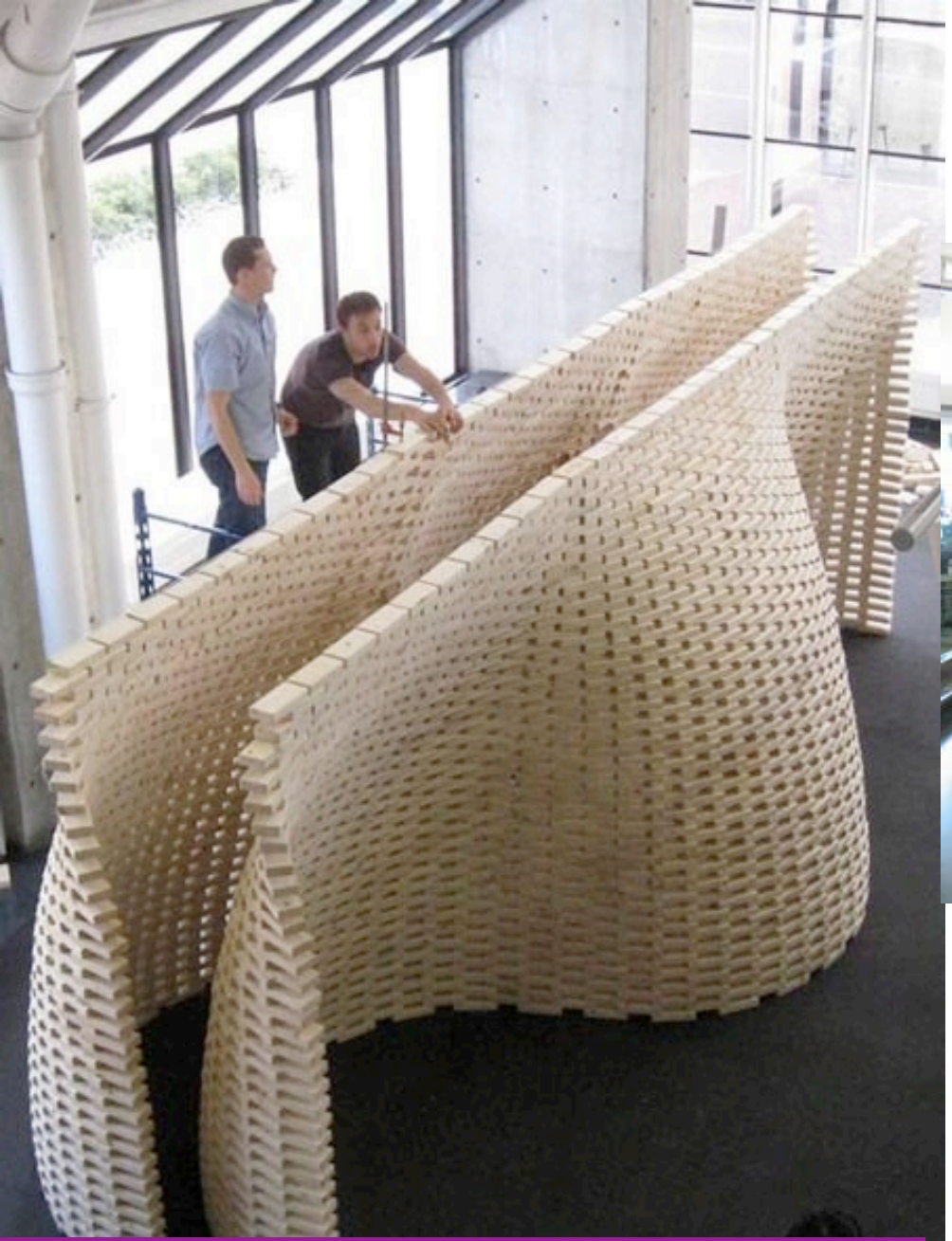


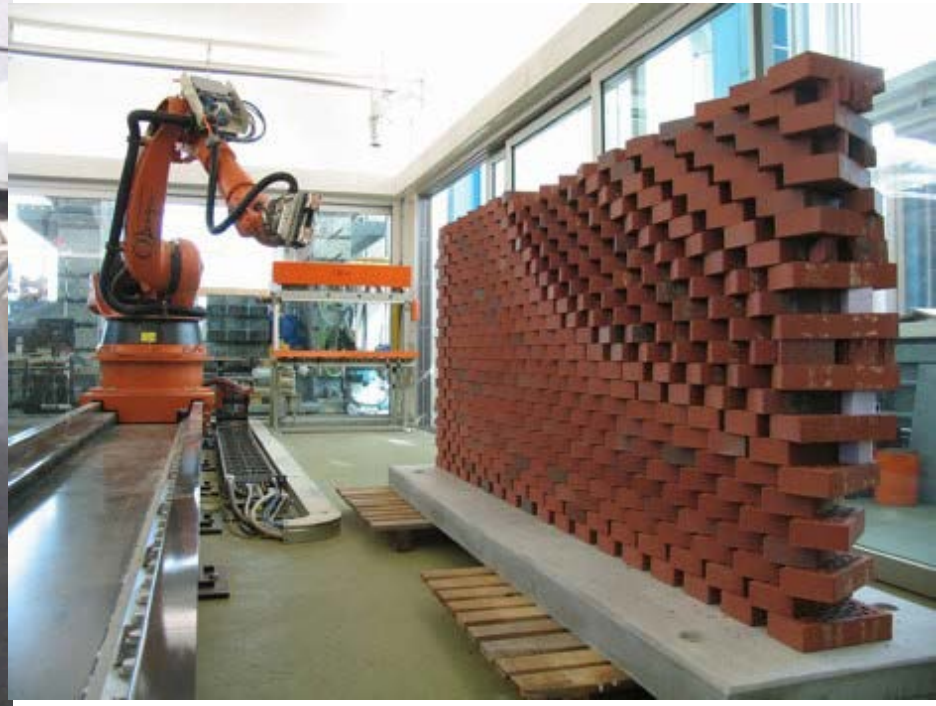
Structural Oscillations,2008 Venice biennial.
_Gramazio/Kohler

The Programmed Column 2 _Gramazio/Kohler, ETH, 2010

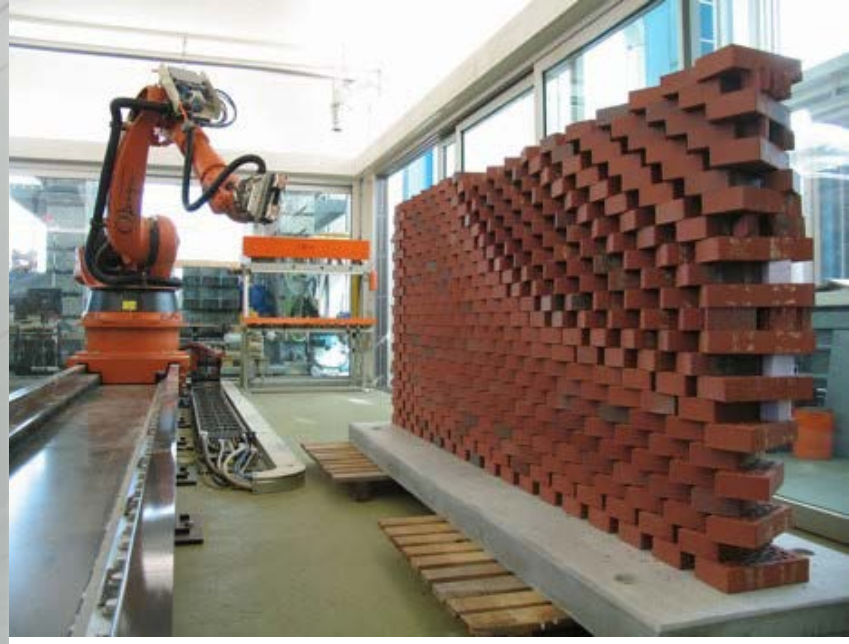


The Programmed Column 2 _Gramazio/Kohler, ETH, 2010



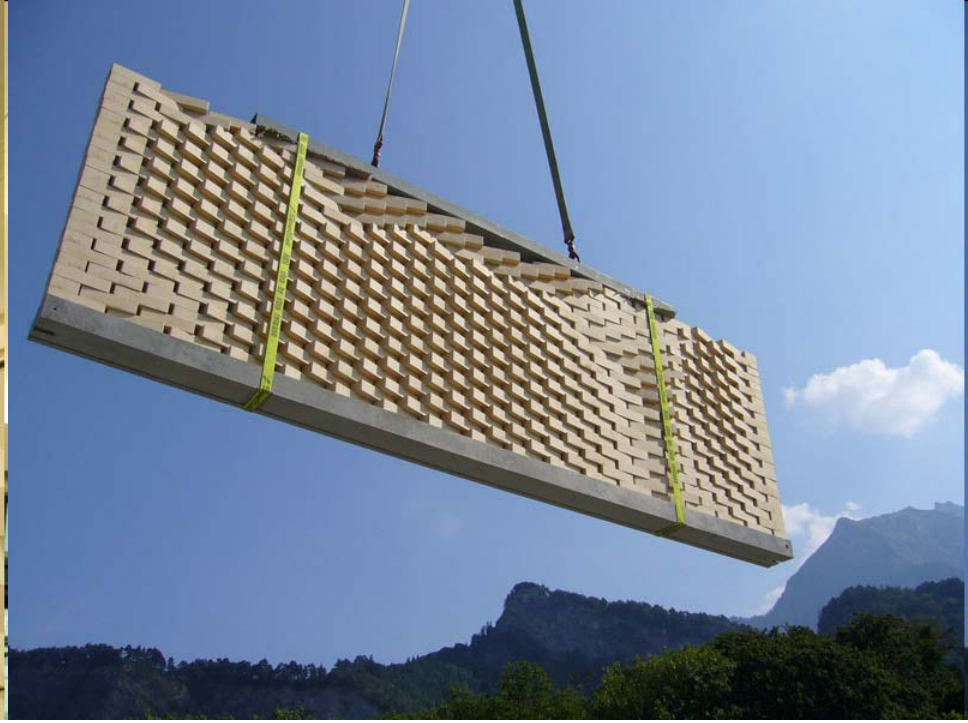


Structural Oscillations,2008 Venice biennial.
_Gramazio/Kohler

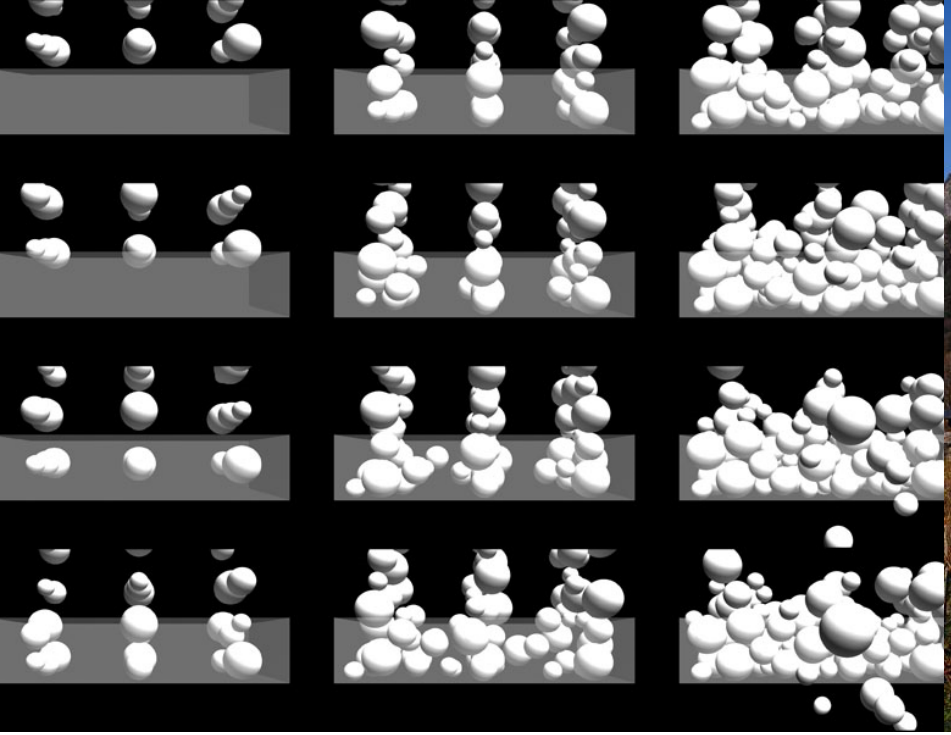


Structural Oscillations,2008 Venice biennial.
_Gramazio/Kohler

Non-Standardised Brick Façade -Gantenbein Vineyard Facade, Fläsch (Switzerland)
_Gramazio/Kohler



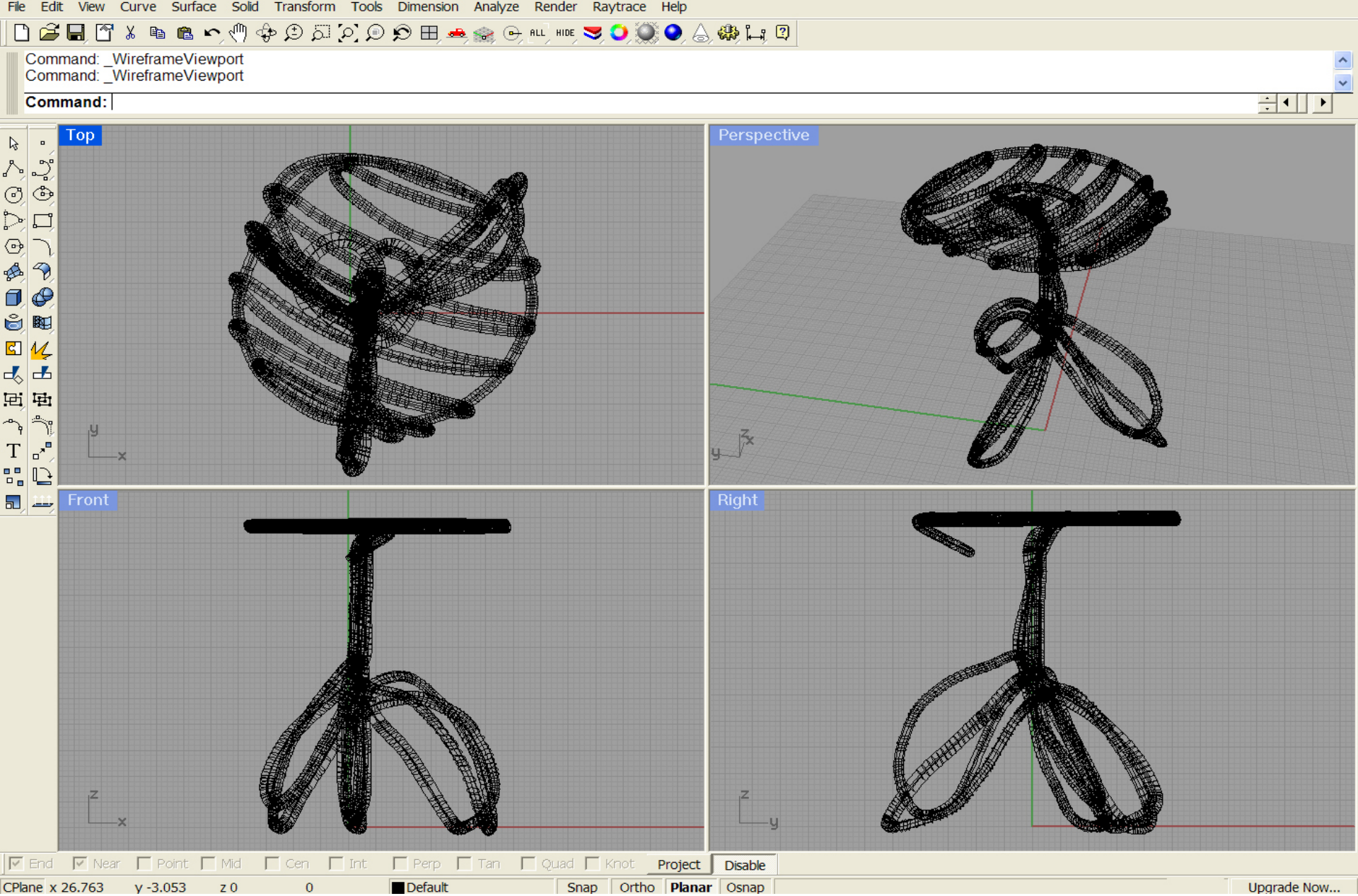
Non-Standardised Brick Façade -Gantenbein Vineyard Facade, Fläsch (Switzerland)
_Gramazio/Kohler



Non-Standardised Brick Façade -Gantenbein Vineyard Facade, Fläsch (Switzerland)
_Gramazio/Kohler

Sketch Furniture_FRONT

video

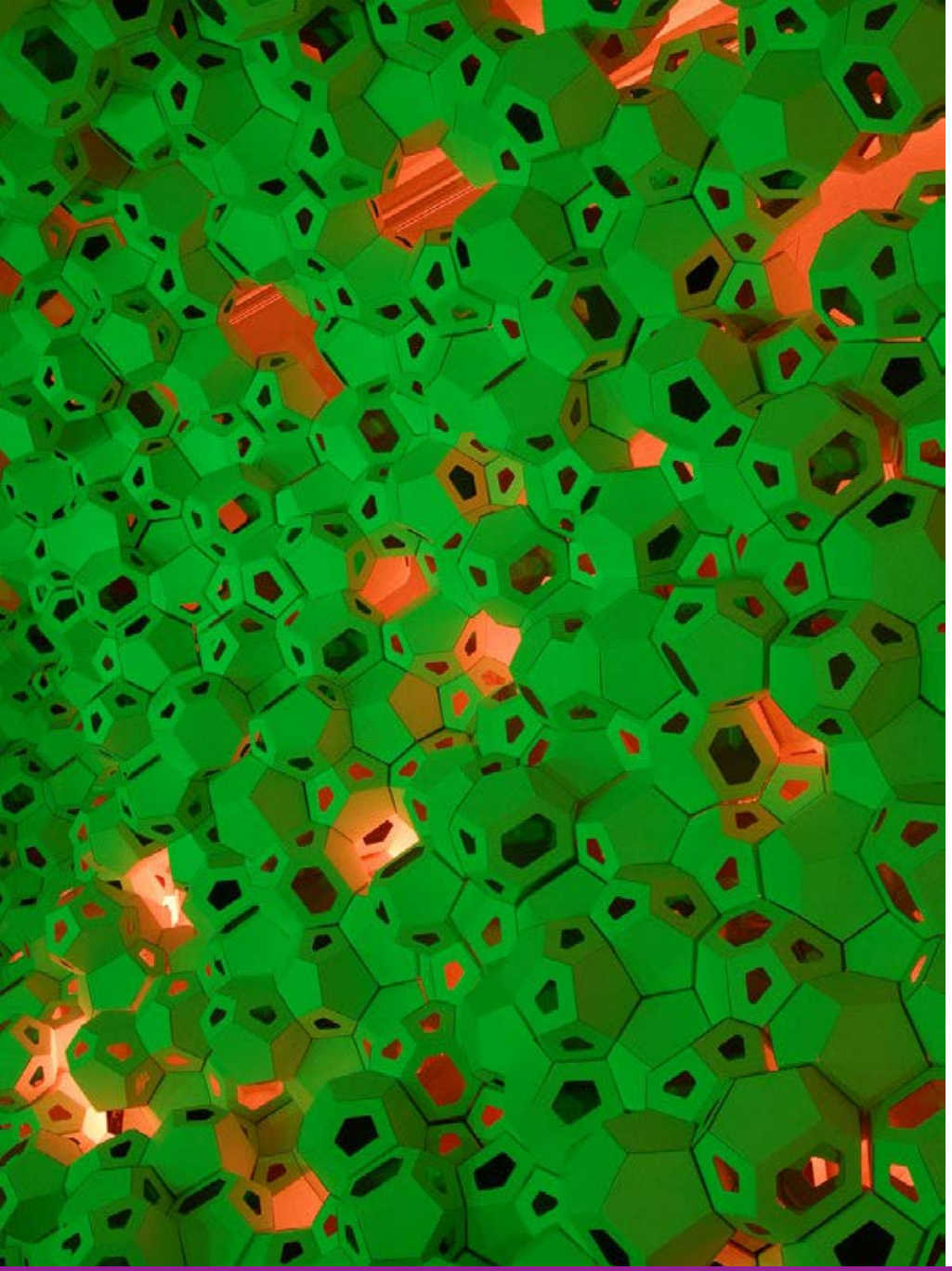


Sketch Furniture_FRONT

http://www.youtube.com/watch?v=8zP1em1dg5k

Sketch Furniture_FRONT

Digital Origami – Chris Bosse [UTS mastercalss students]



Digital Origami – Chris Bosse [UTS mastercalss students]

Digital Origami – Chris Bosse [UTS mastercalss students]

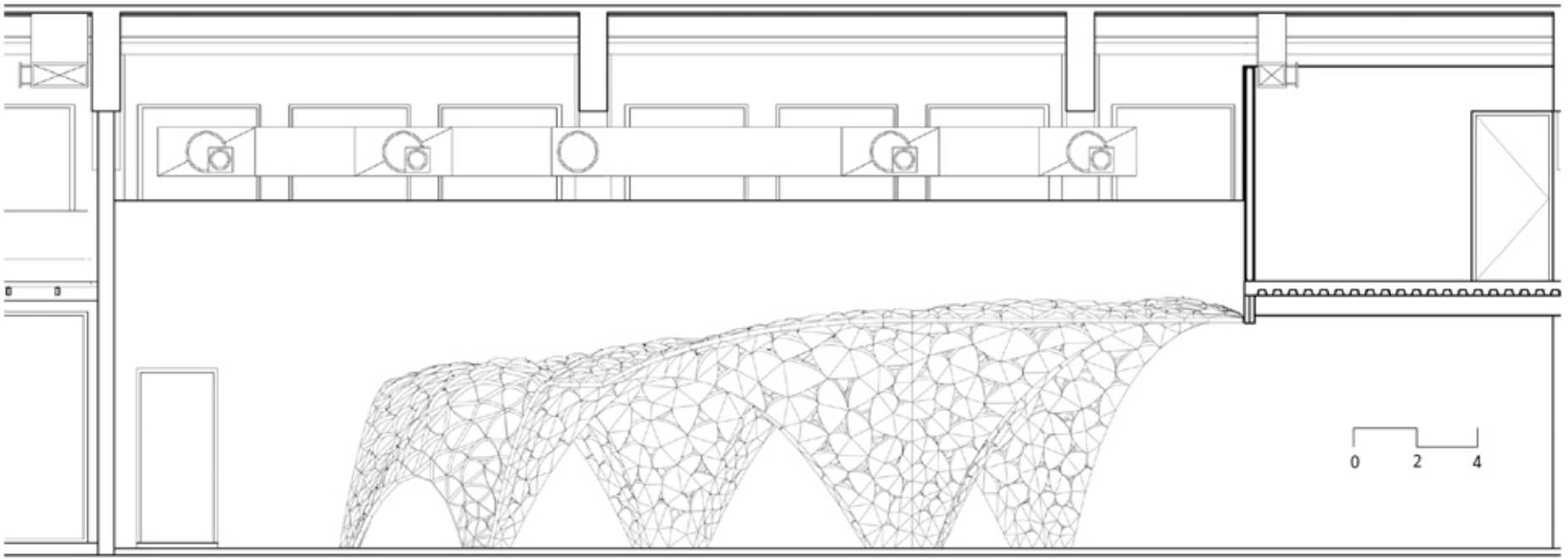
Digital Origami – Chris Bosse [UTS mastercalss students]

Voussoir Cloud – IwamotoScott, Buro Hapold [L.A.]

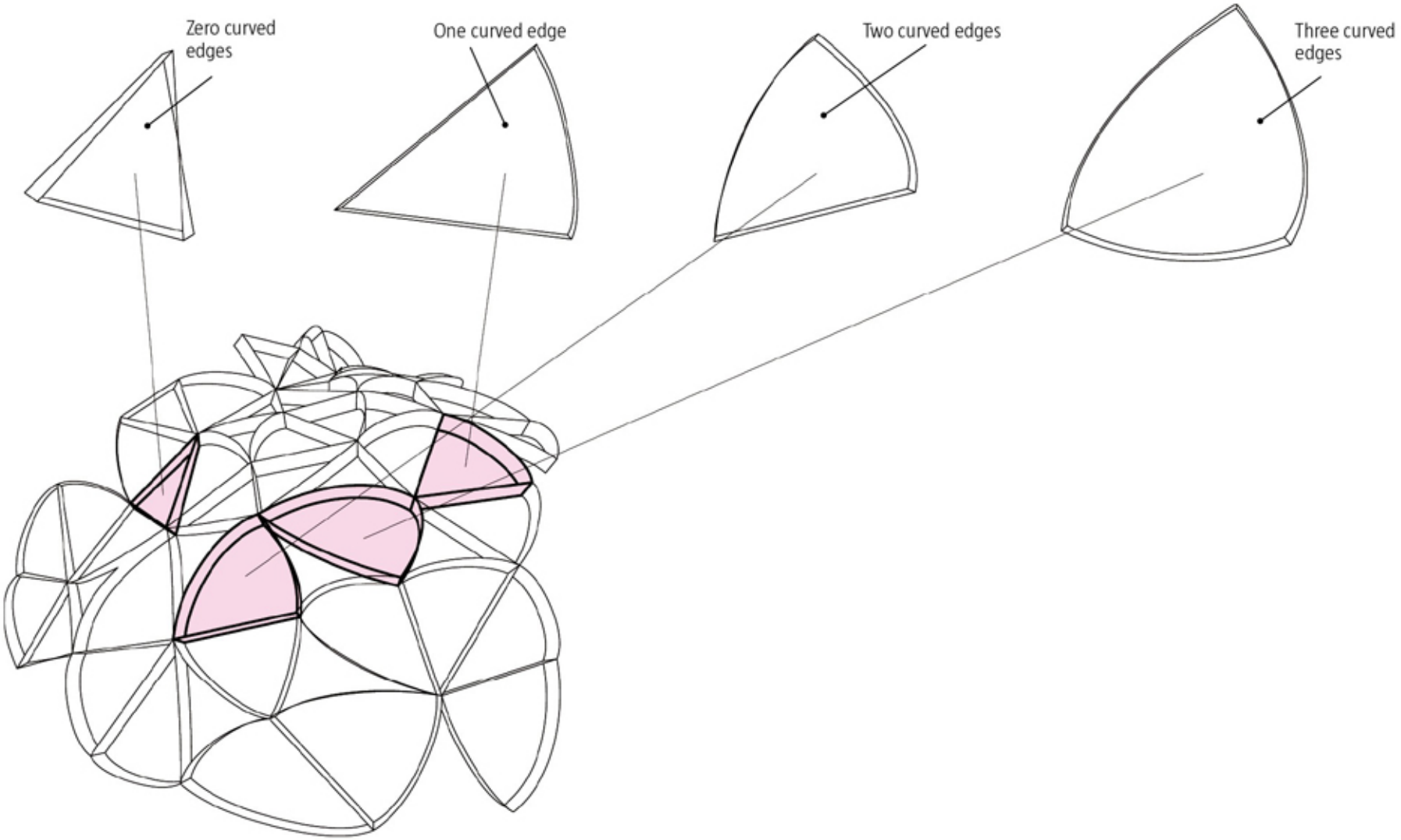
Voussoir Cloud – IwamotoScott, Buro Hapold [L.A.]

Voussoir Cloud – IwamotoScott, Buro Hapold [L.A.]

Section

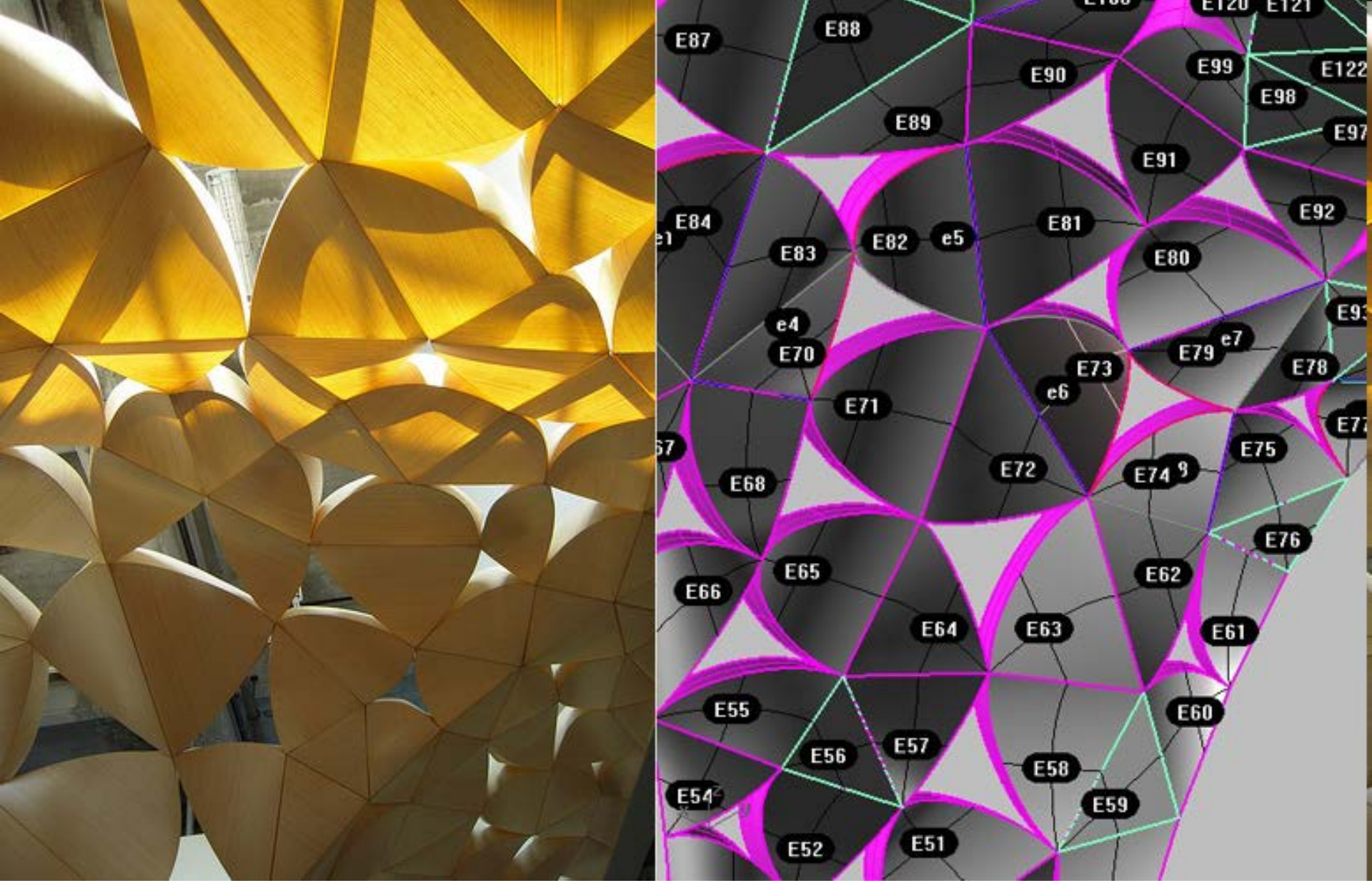


Voussoir Cloud – IwamotoScott, Buro Hapold [L.A.]

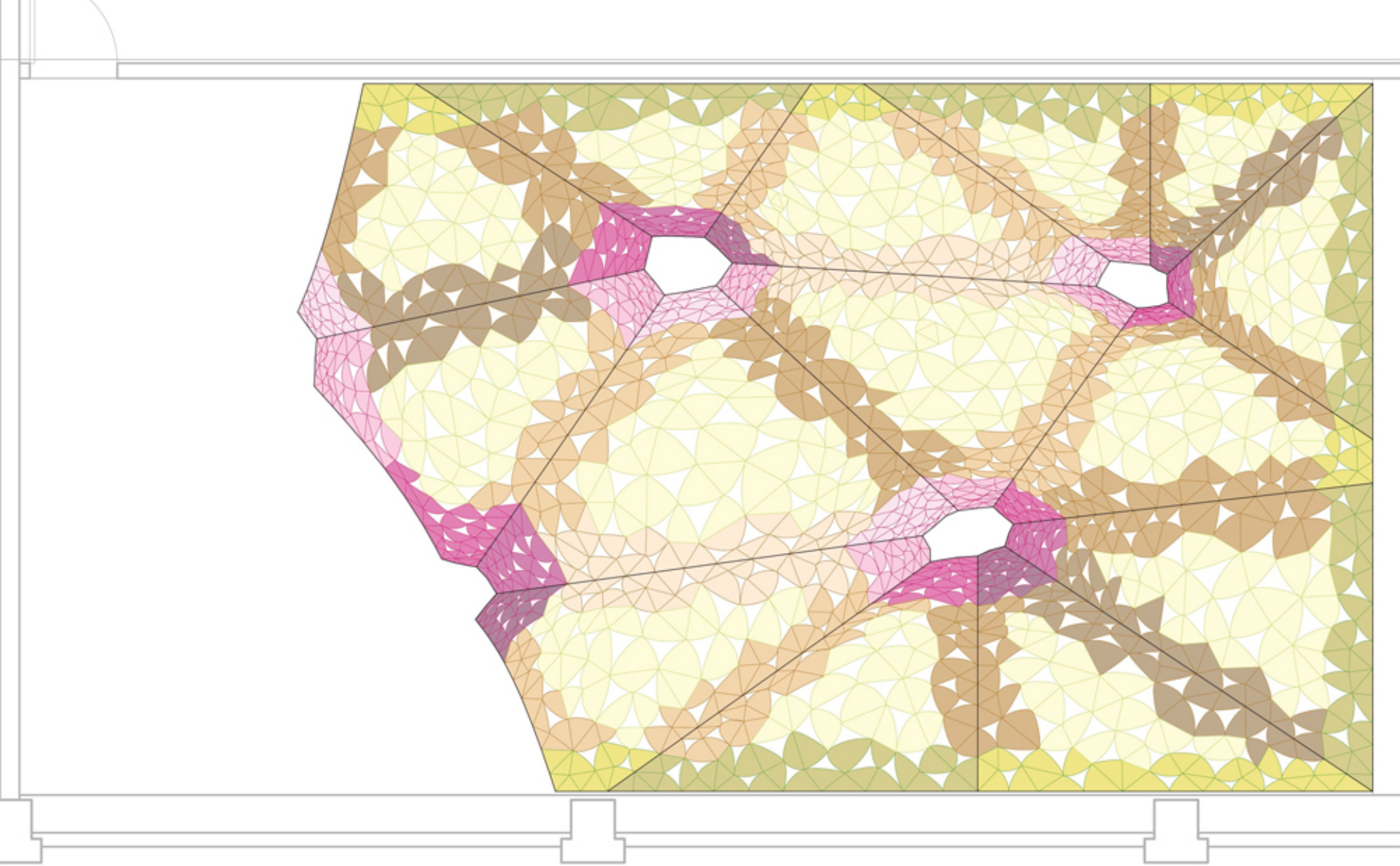


Voussoir Cloud – IwamotoScott, Buro Hapold [L.A.]

Voussoir Cloud – IwamotoScott, Buro Hapold [L.A.]

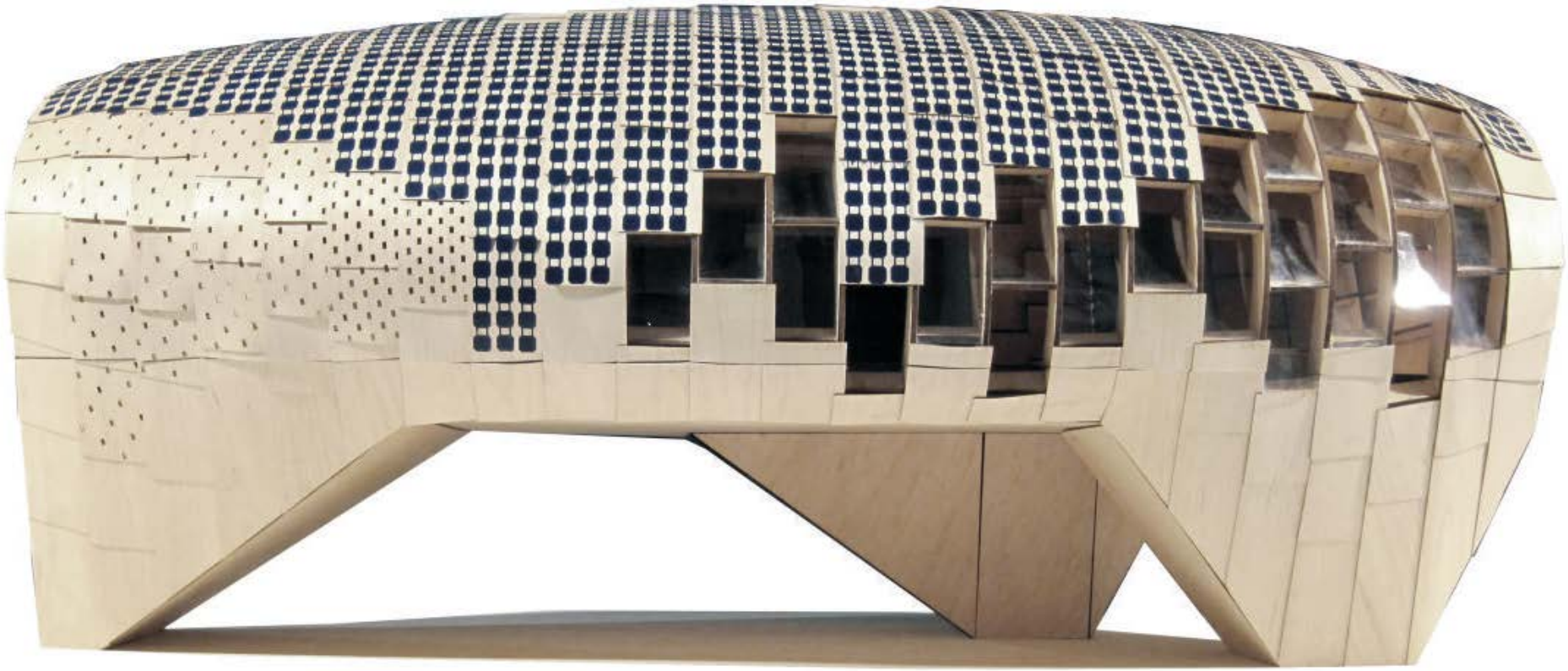


Voussoir Cloud – IwamotoScott, Buro Hapold [L.A.]



Voussoir Cloud – IwamotoScott, Buro Hapold [L.A.]

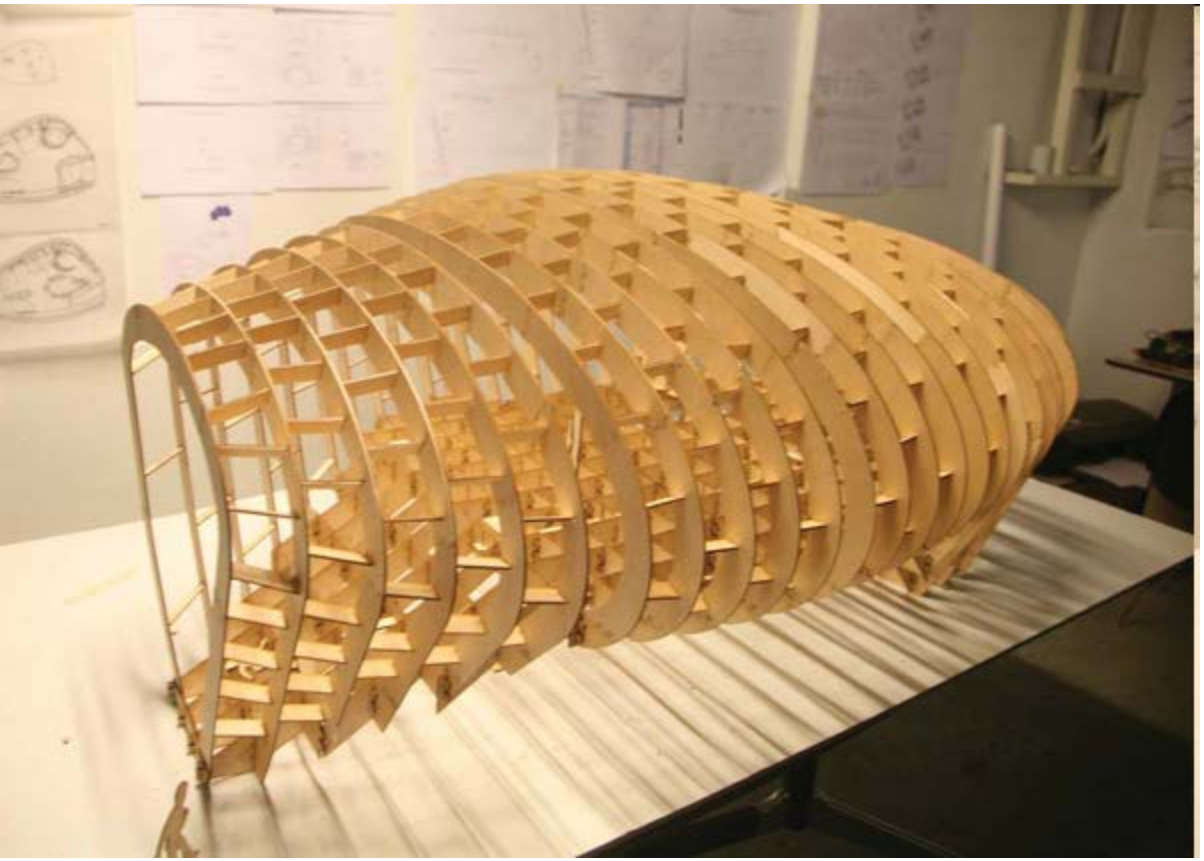
Interior view



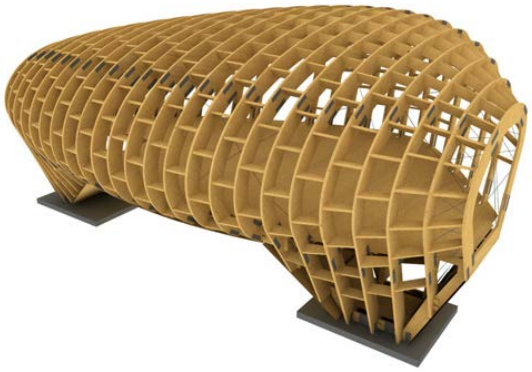
Solar House _ Iaac, 2010

Night view

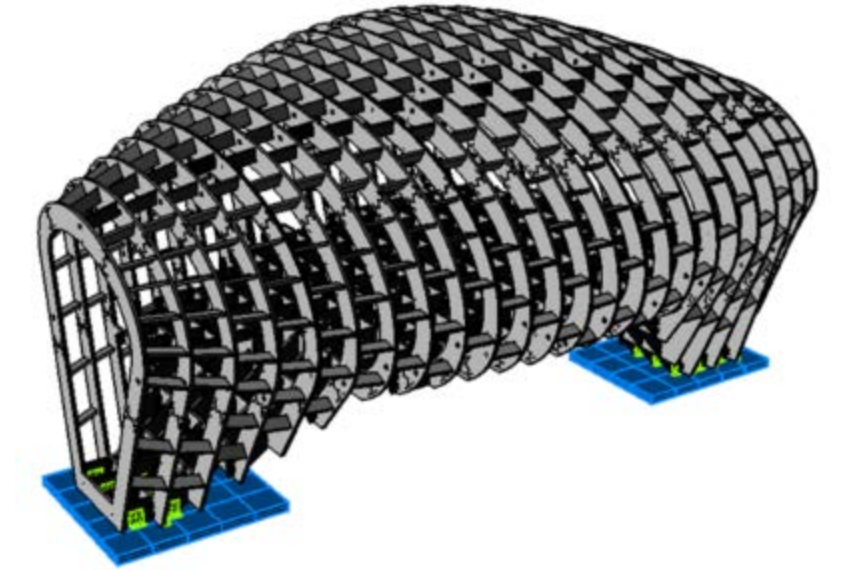
Solar House _ Iaac, 2010



Structural model



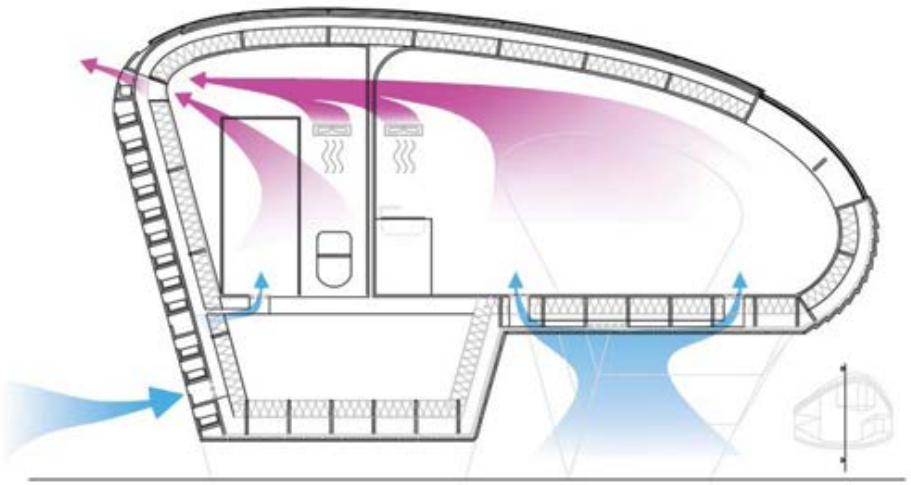
Solar House _ Iaac, 2010

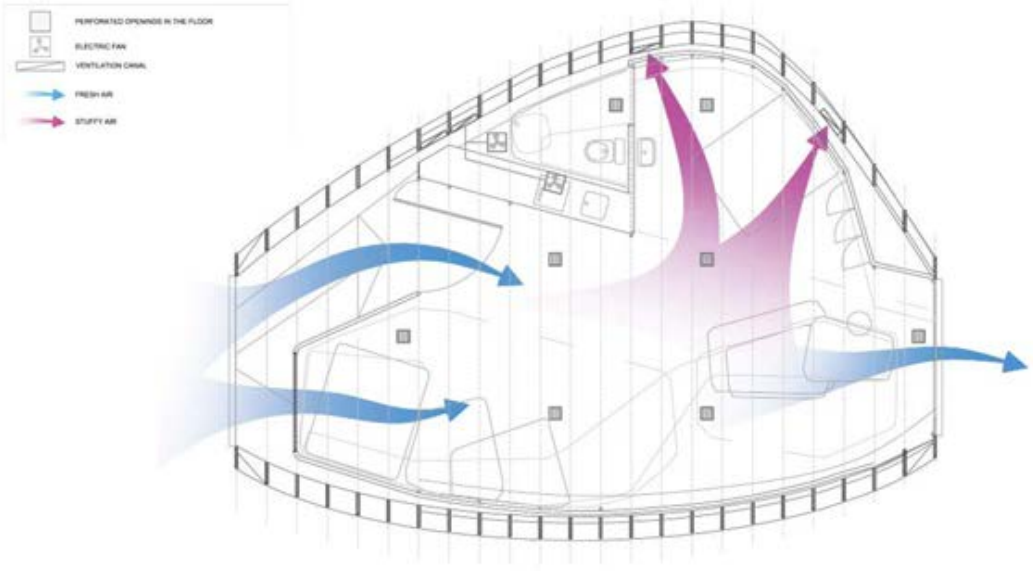


Solar House _ Iaac, 2010

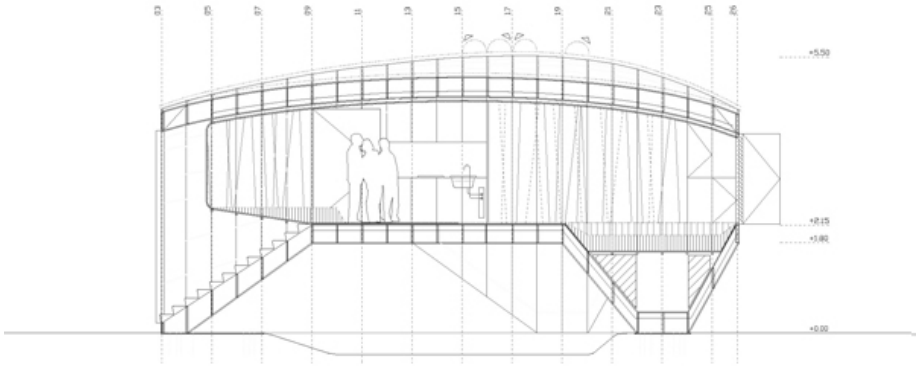
Planting diagram

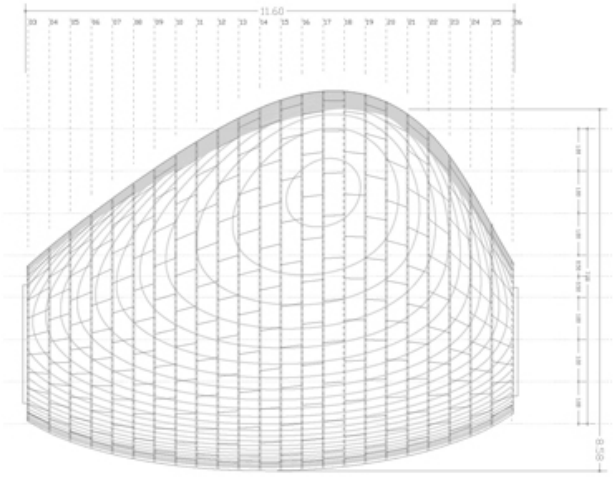
Solar House _ Iaac, 2010

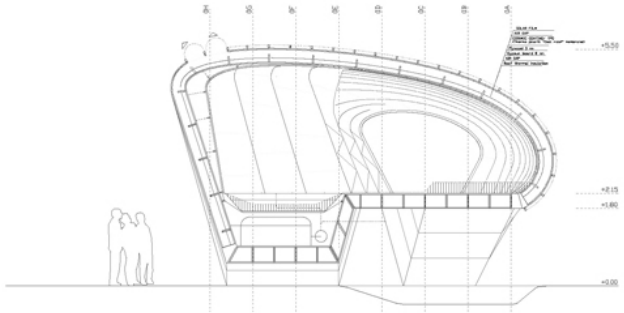


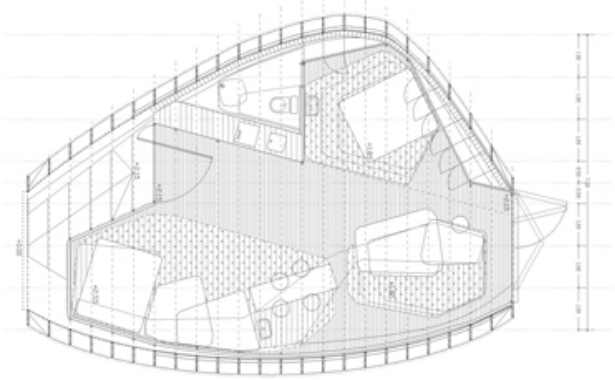


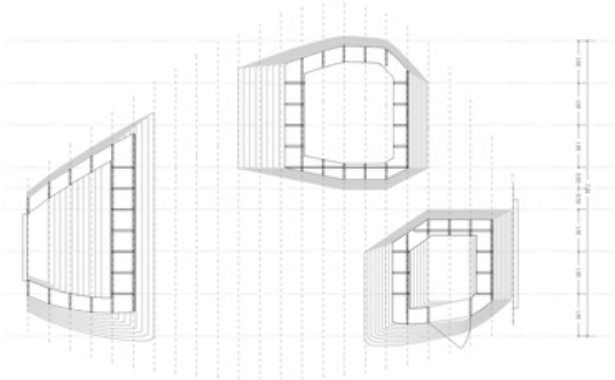
Ventilation Diagram











Solar House _ Iaac, 2010

Video
http://www.youtube.com/watch?v=G4DXC-U2ymU

Video
http://www.youtube.com/watch?v=1UPieAx_SdU

Mock up with curvable plywood

Solar House _ Iaac, 2010

Solar House _ Iaac, 2010

Solar House _ Iaac, 2010

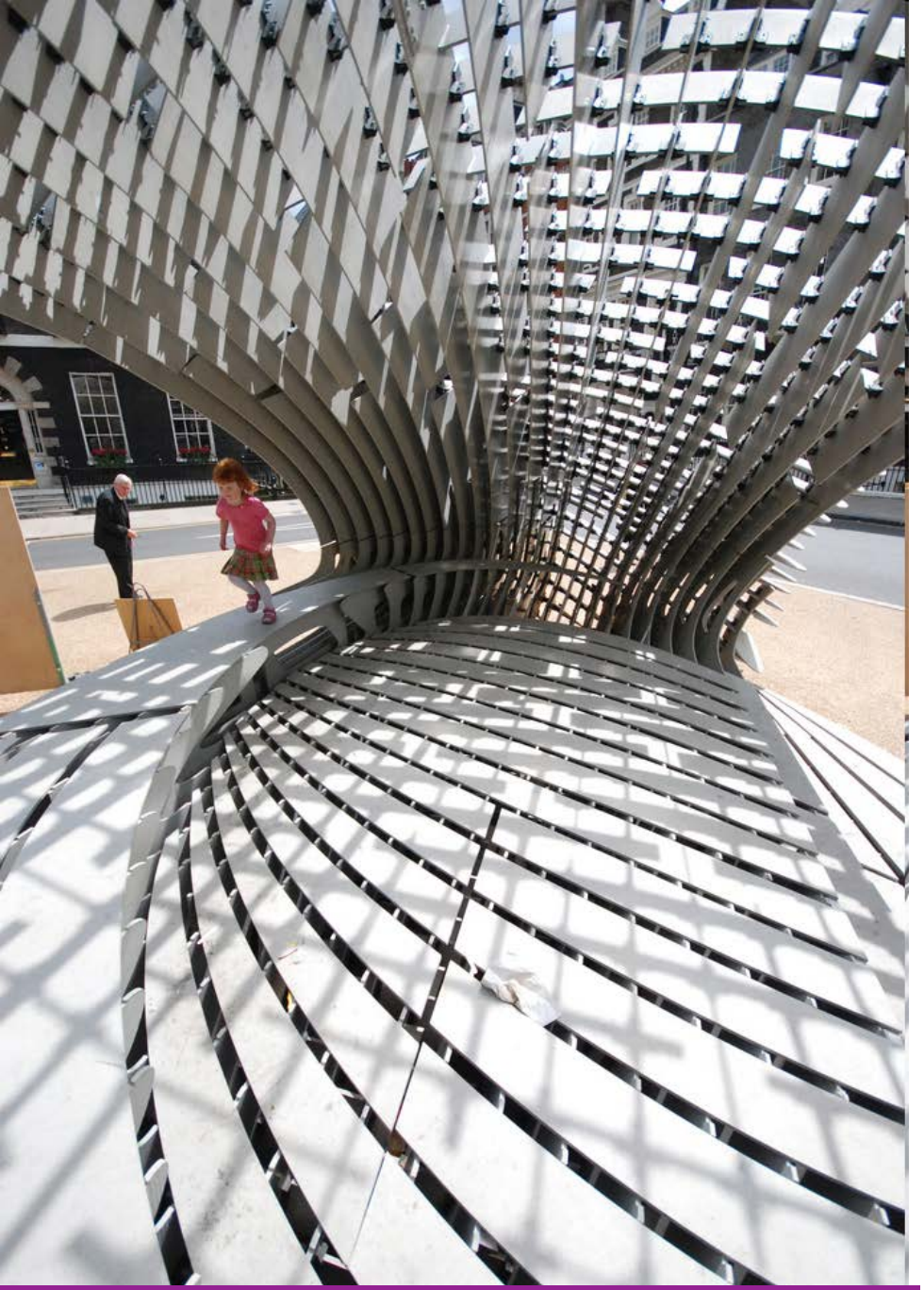
Solar House _ Iaac, 2010

Solar House _ Iaac, 2010

Solar House _ Iaac, 2010

[C]space_ AADRL pavillion

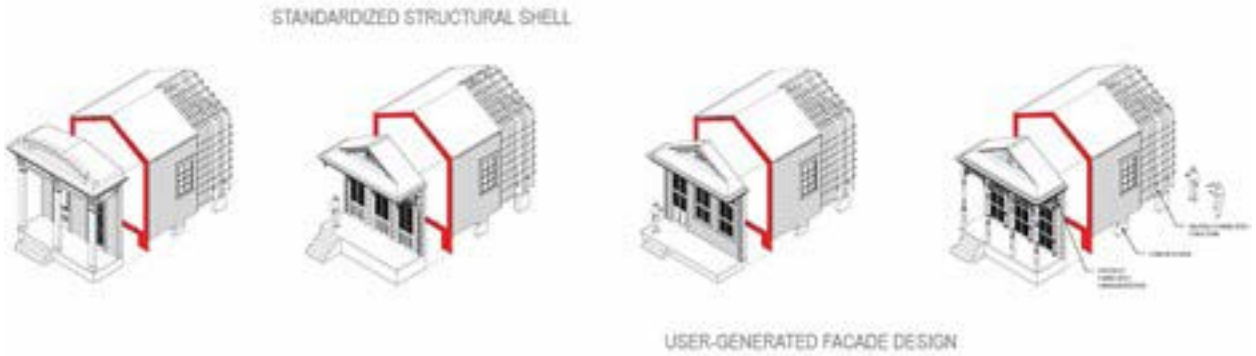
[C]space_ AADRL pavillion

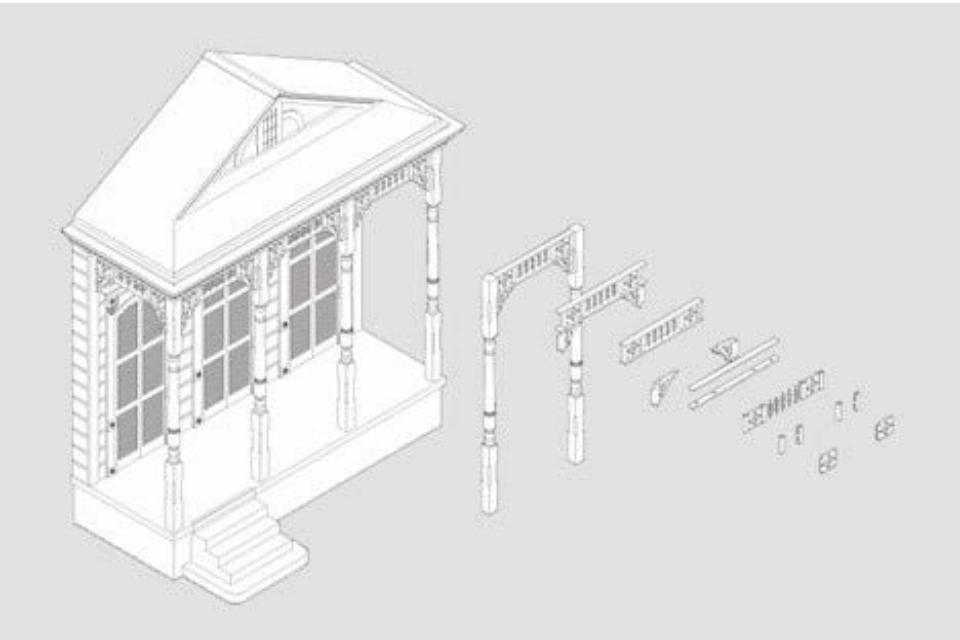


[C]space_ AADRL pavillion

Digitally Fabricated Housing for New Orleans

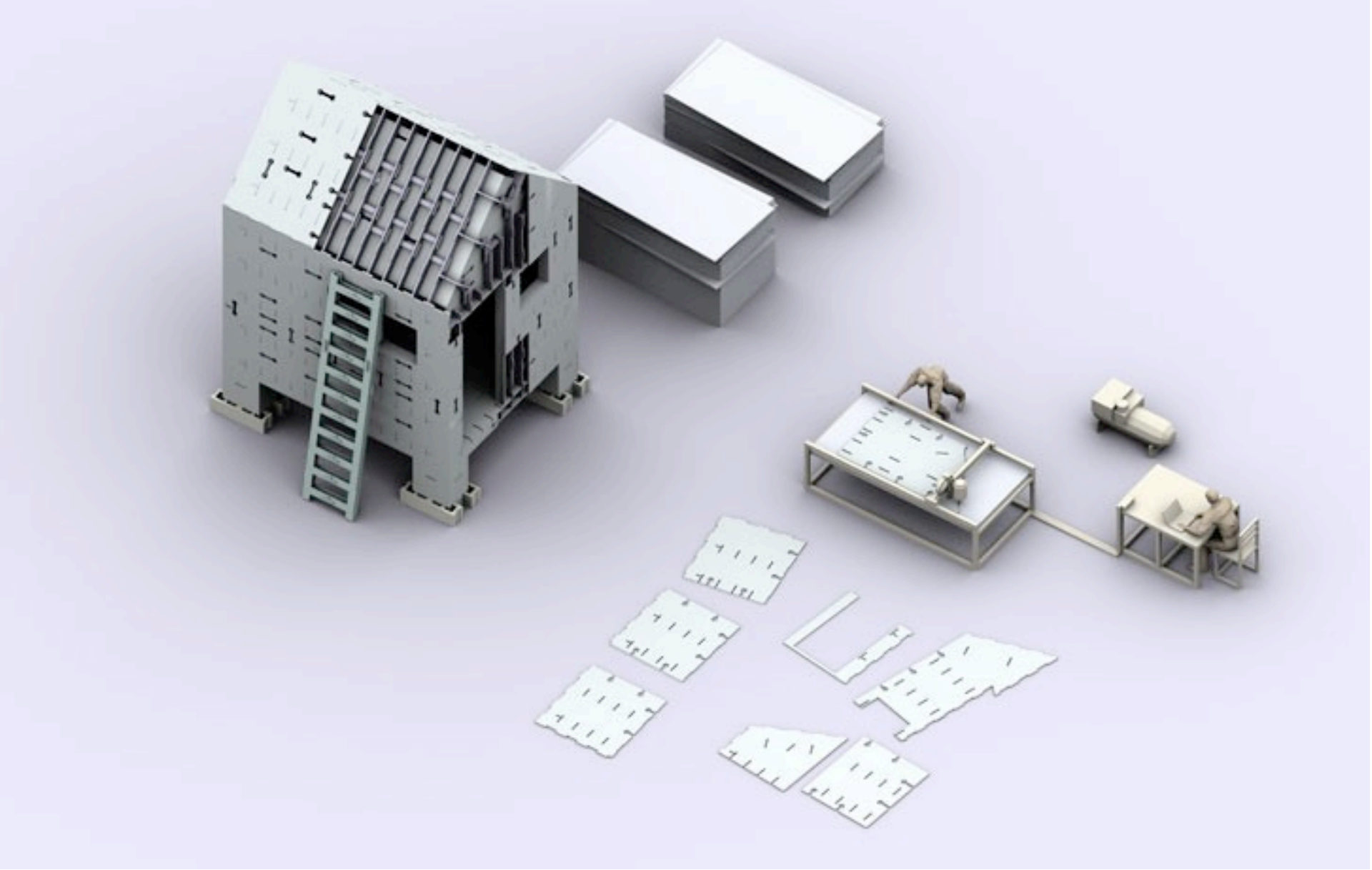
Lawrence Sass MIT [http://web.mit.edu/yourhouse/]





Digitally Fabricated Housing for New Orleans

Lawrence Sass MIT [http://web.mit.edu/yourhouse/]



Digitally Fabricated Housing for New Orleans

Lawrence Sass MIT [http://web.mit.edu/yourhouse/]

yourHOUSE™

The Octagon

picernoceraso*lab*

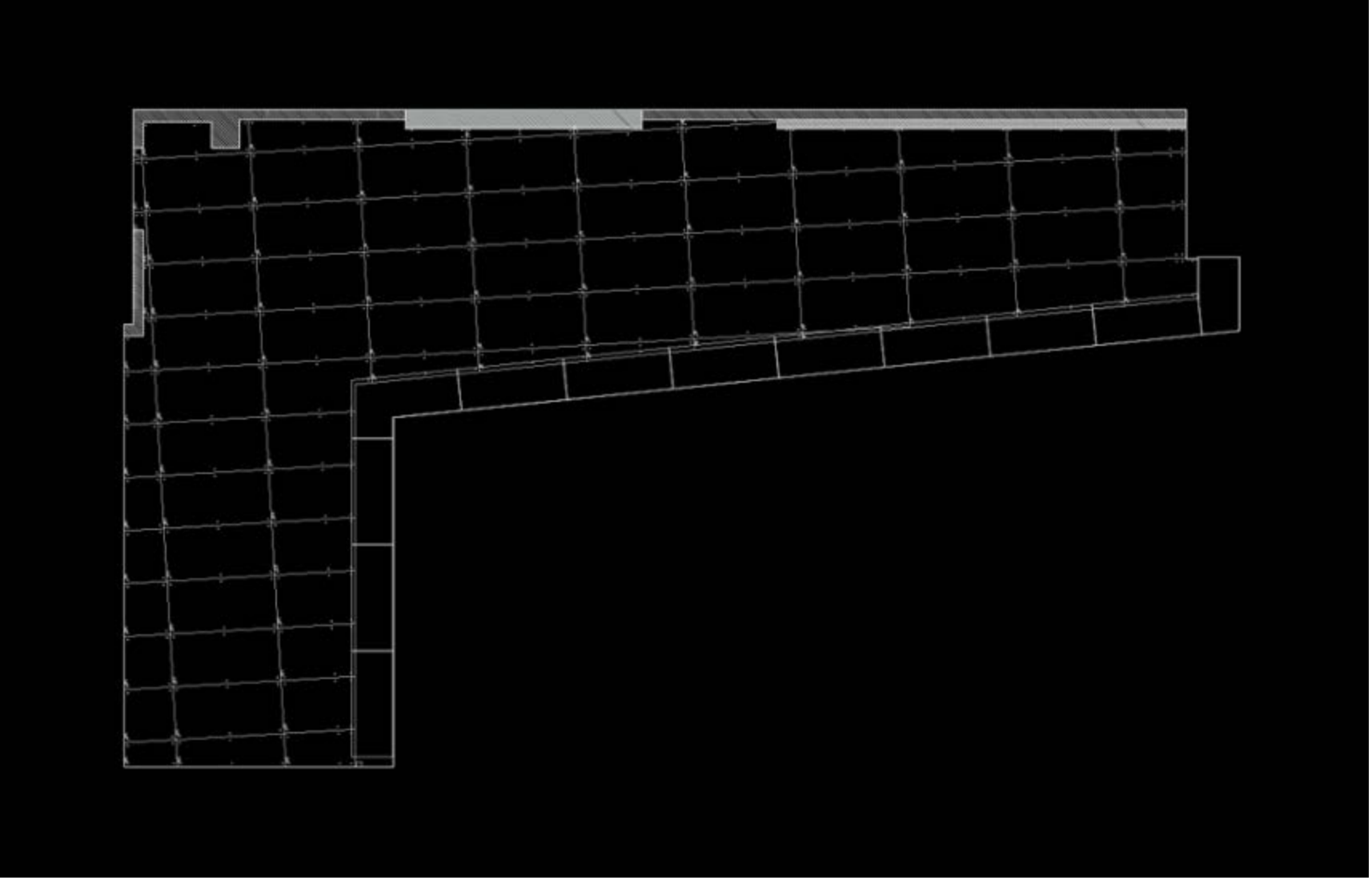
The Lake Cabinet - Min|Day Architects

Concrete Things - Komplot

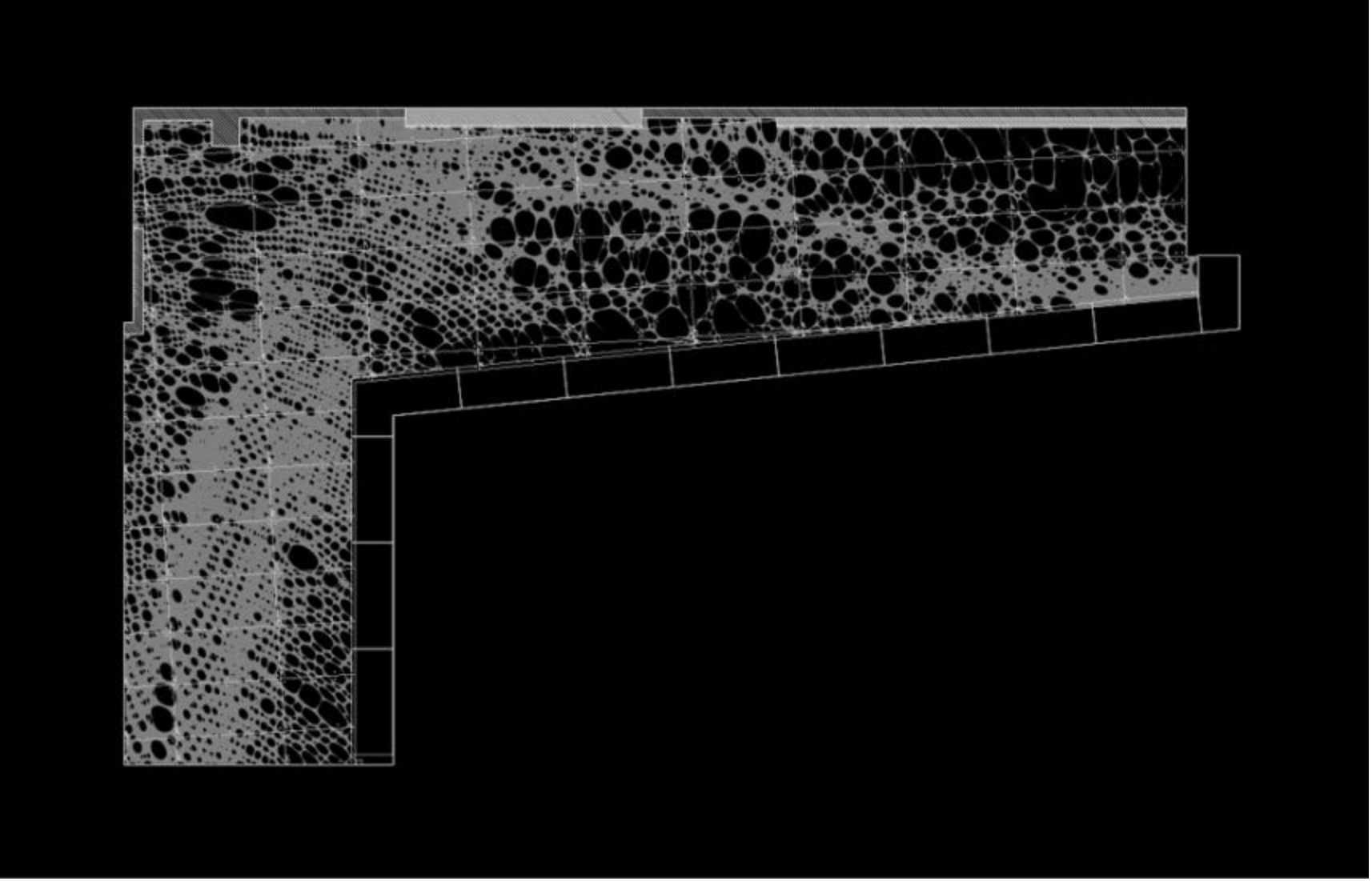
Fleshless_ Commonwealth

Fleshless_ Commonwealth

Fleshless_ Commonwealth

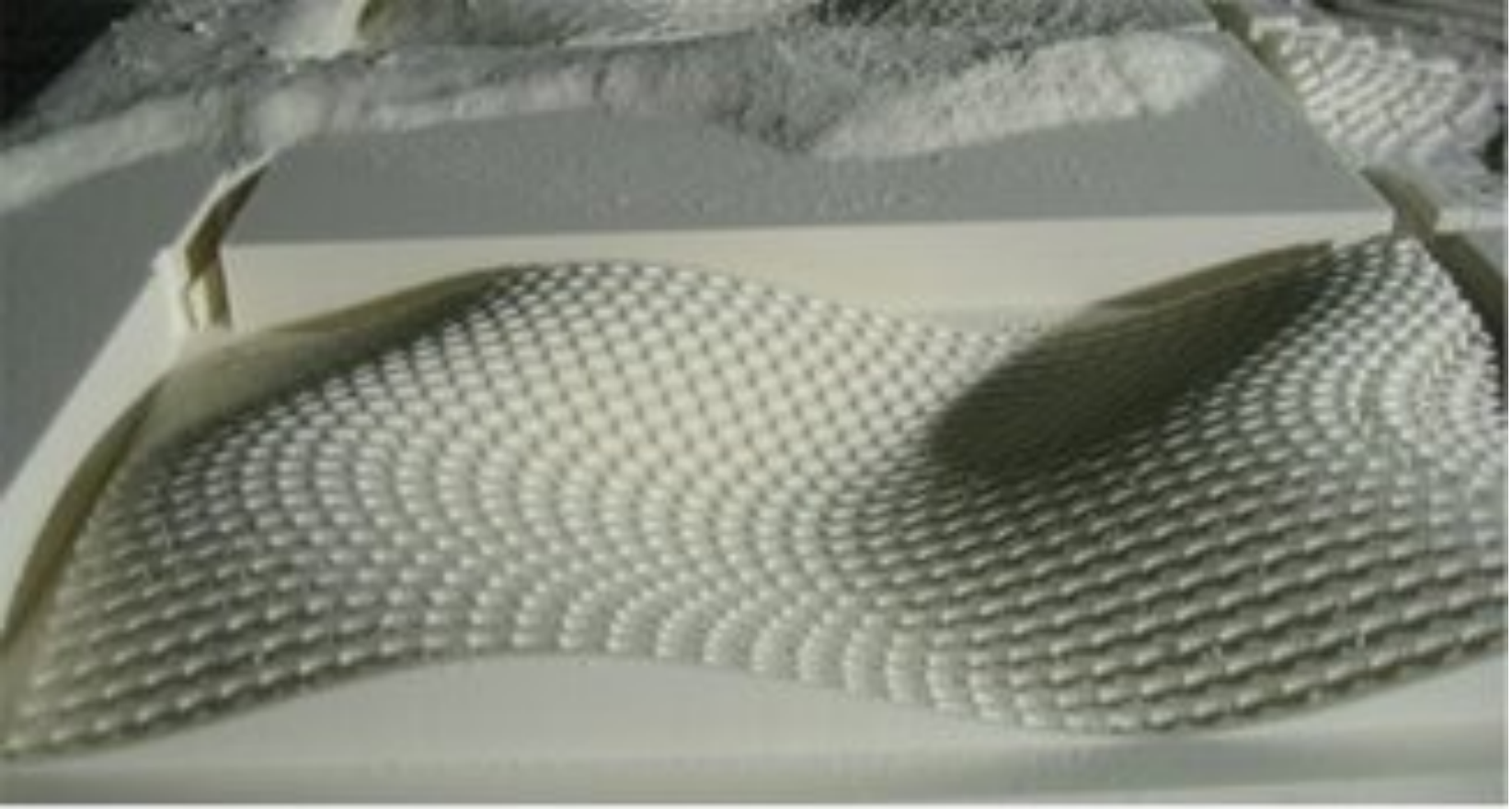


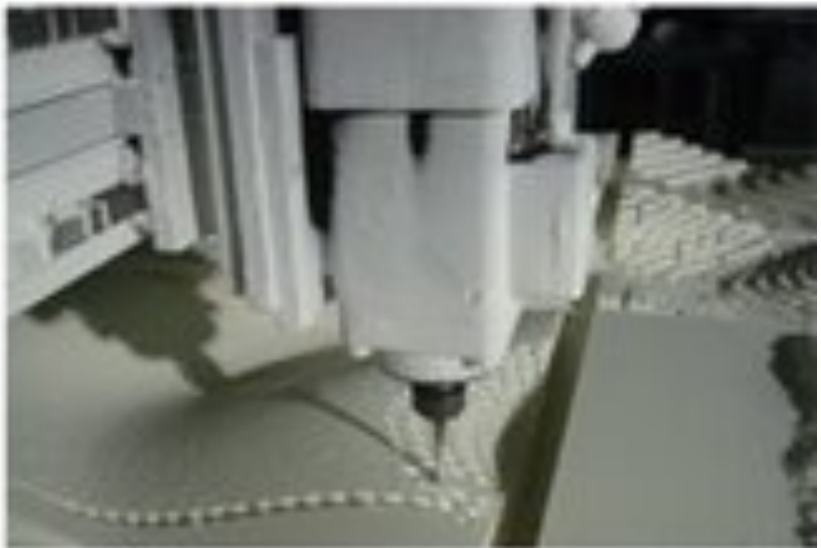
Fleshless_ Commonwealth



Fleshless_ Commonwealth

Fleshless_ Commonwealth





DIGITAL FABRICATION

ASSIGNEMENT 3_THE CASE

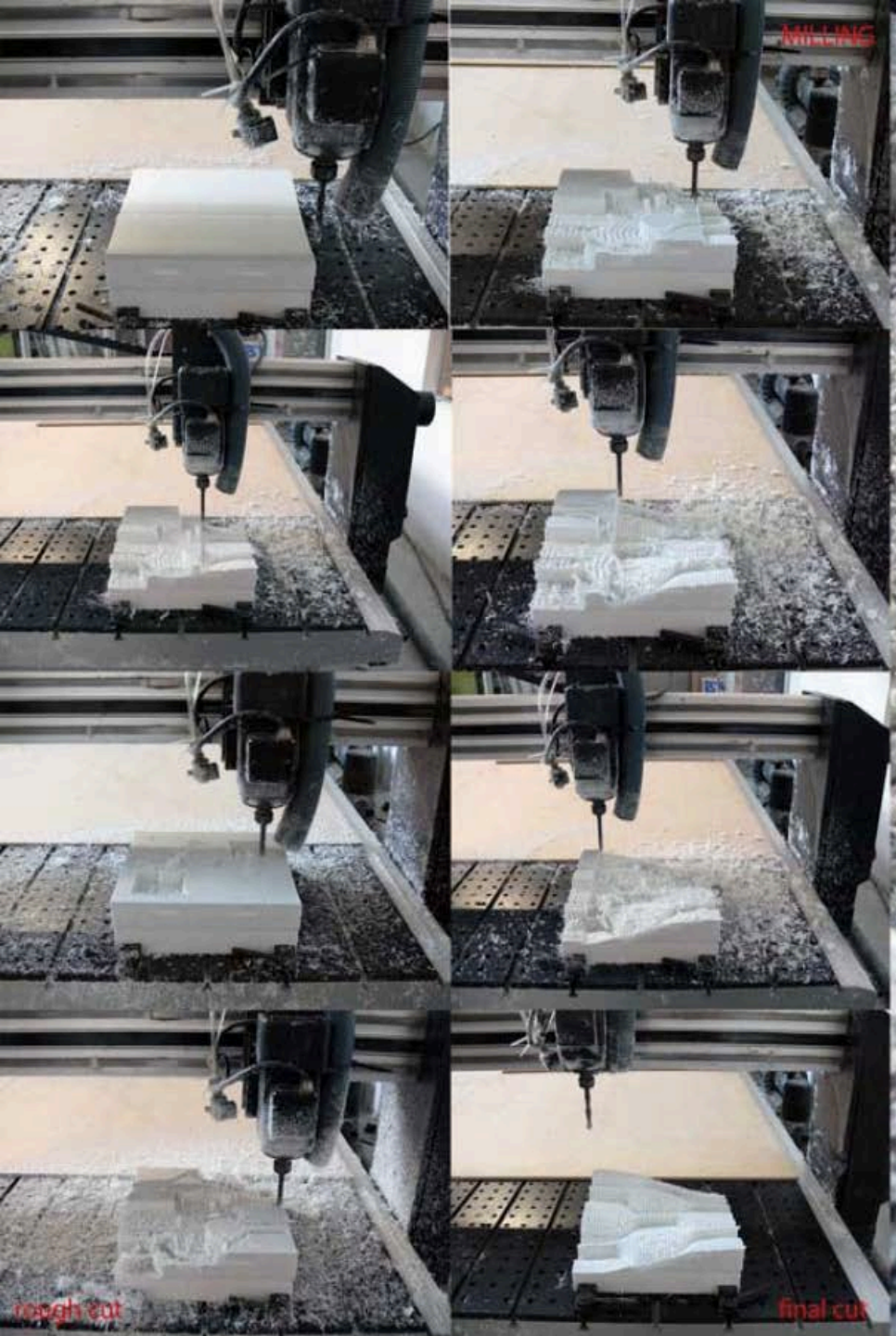
areti nikolopoulou
gaweł tyrała
konstanty stajniak

3D MODEL

Molding / Cheescake

Areti Nikolopoulou, Gawel Tyrala, Konstanty Stajniak

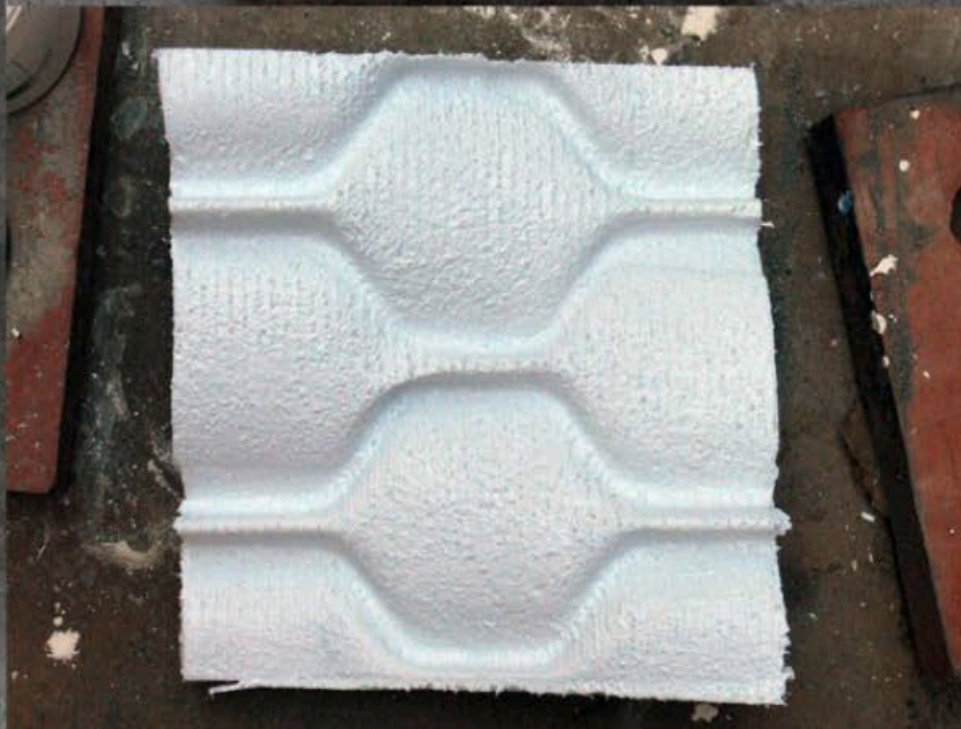
2009, proyecto en Iaac


MILLING
rough cut
final cut


THE MODEL


THE MATRIX

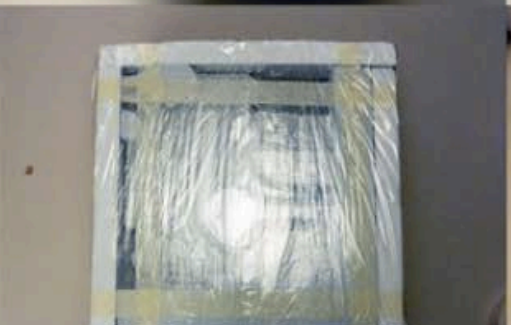

FILLING OUT




Royal
Pastel de Queso


COOKING


Mantequilla
Mantequilla





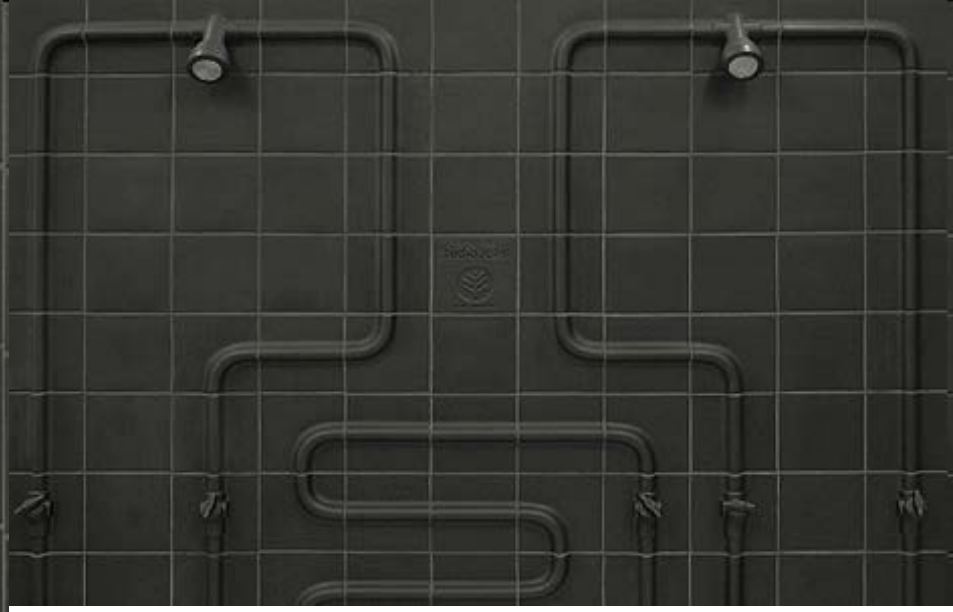
CHEESECAKE

THE PARTY



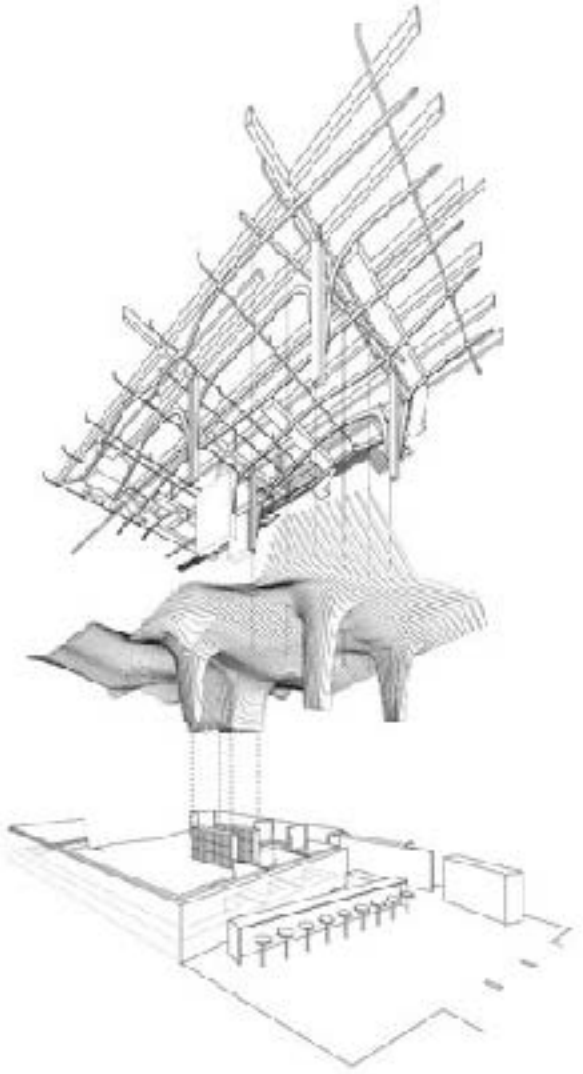




MOCO design_2006

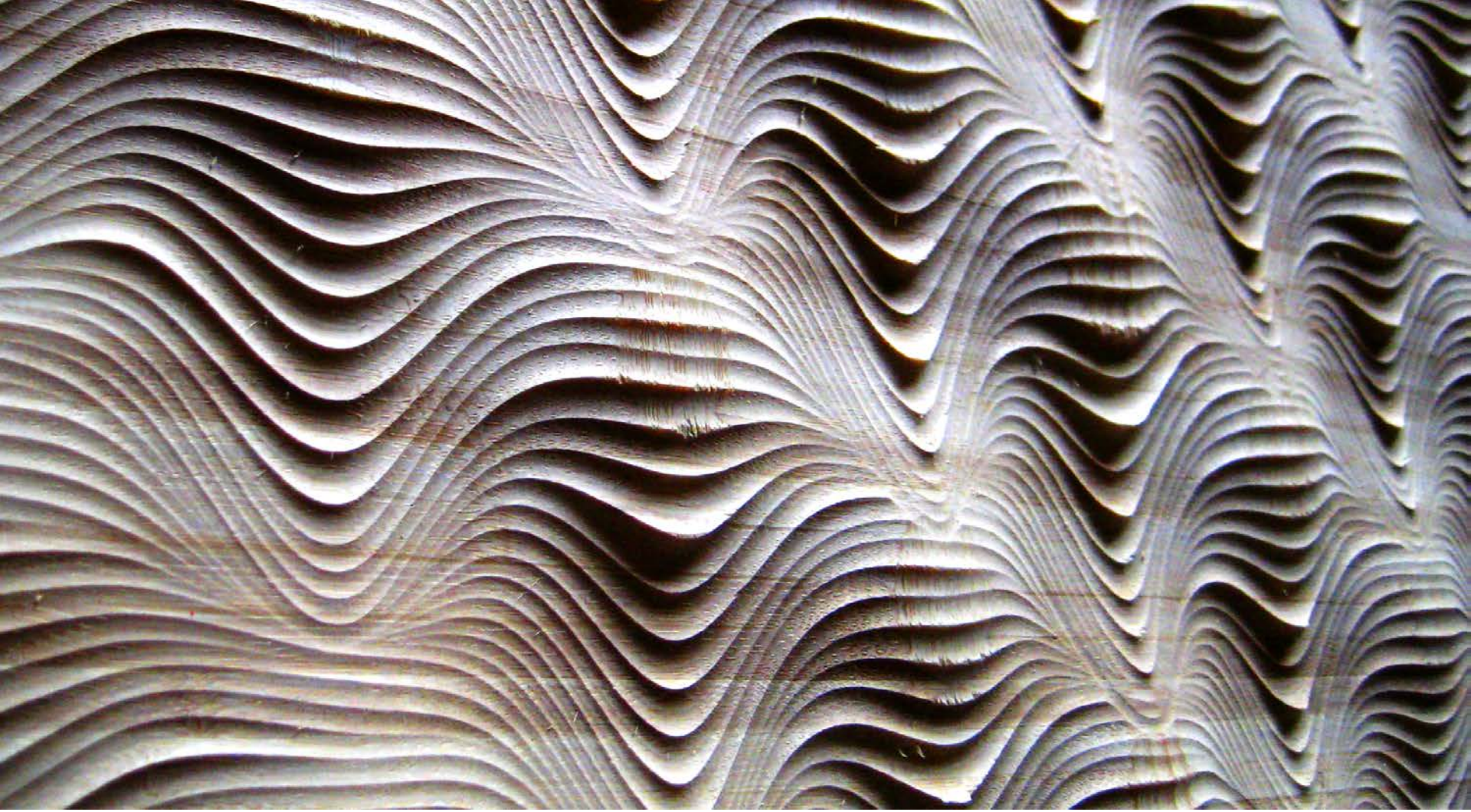
CNC Milled table_Daniel Dendra



Restaurant in Boston_Office dA

Restaurant in Boston_Office dA

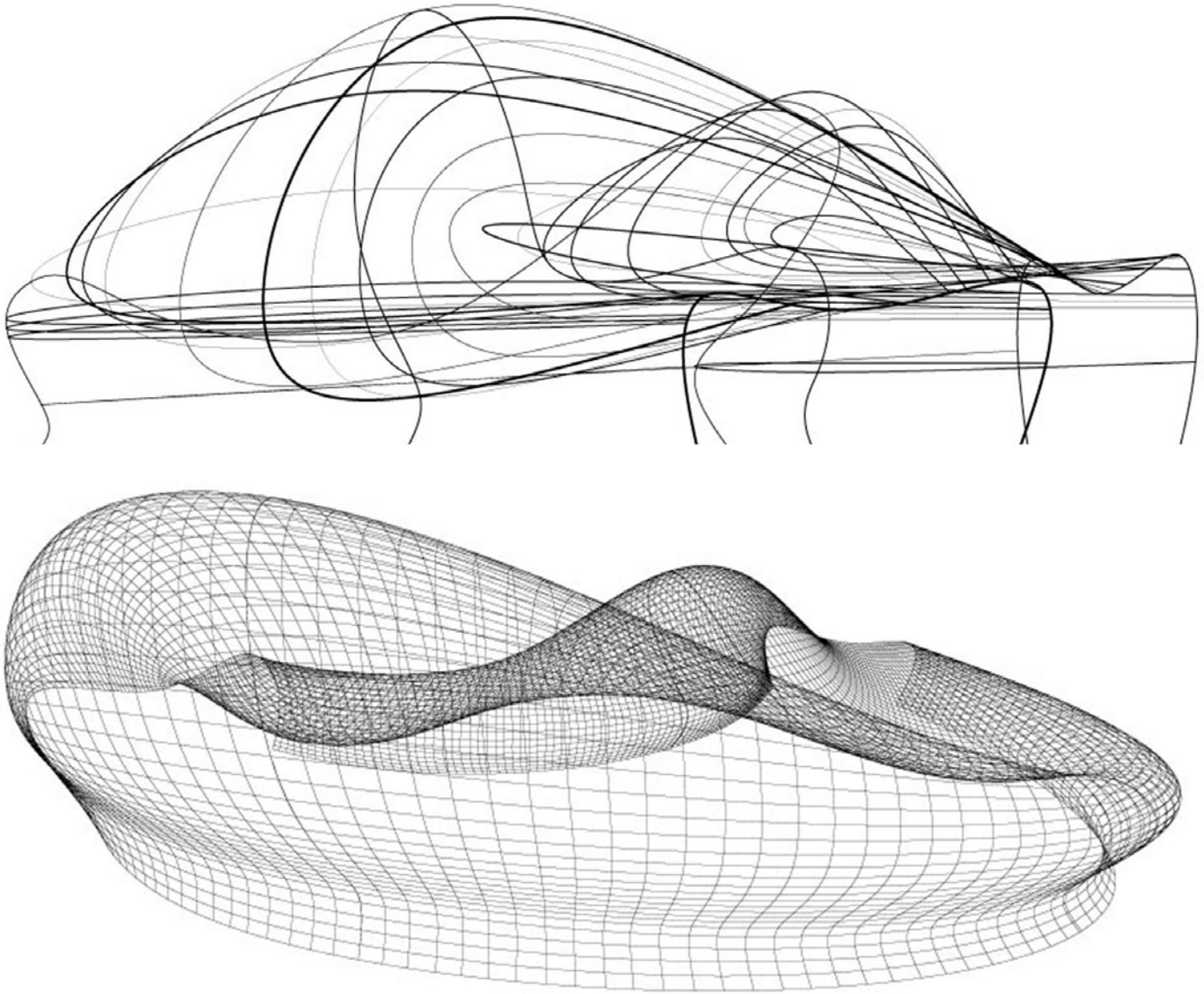
Field Files/ Slip Desk_Shane Williamson/Office dA



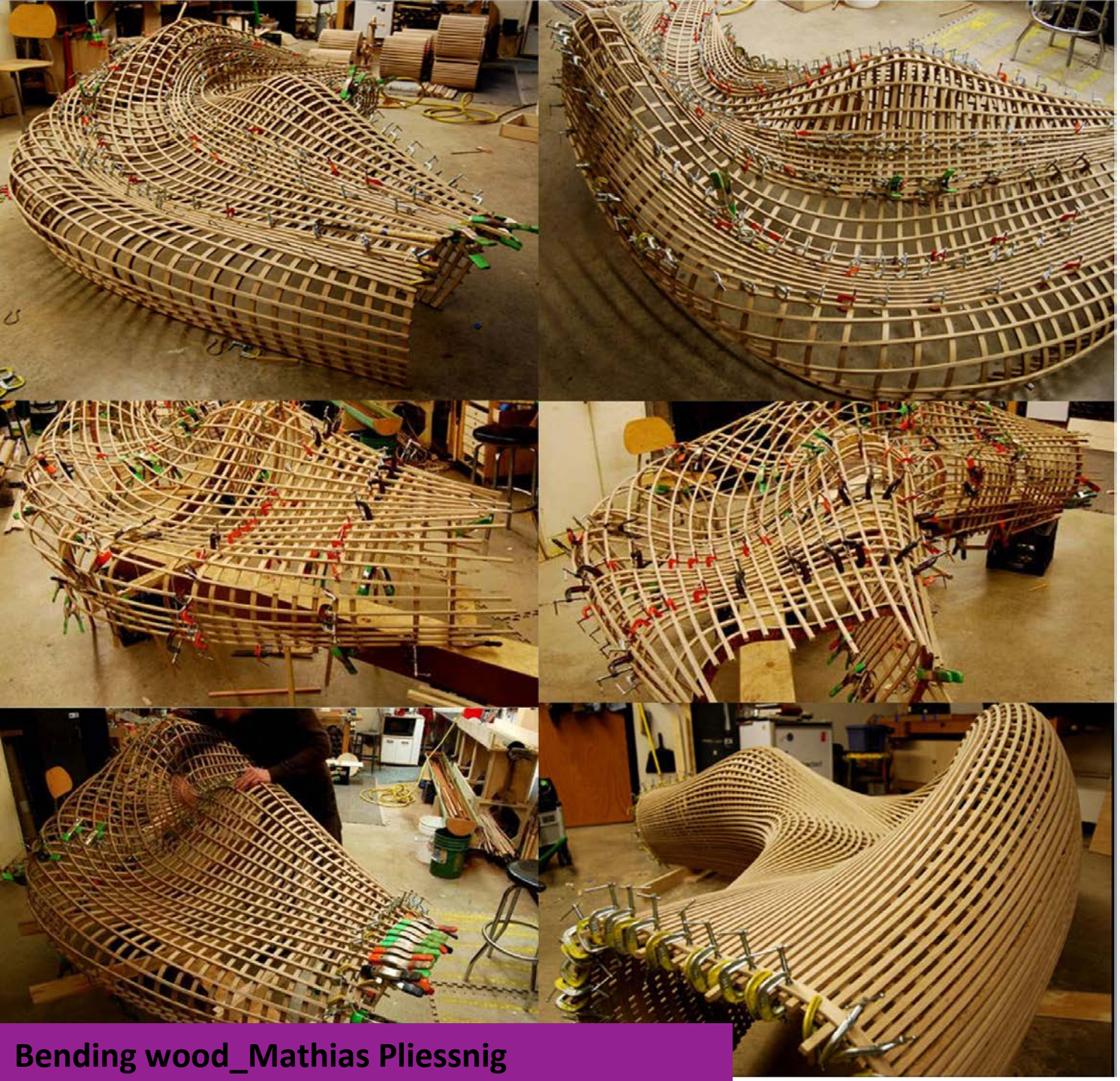
Path Responsive Surface Milling 02_ The very Many

Path Responsive Surface Milling 02_ The very Many

Bending wood_Mathias Pliessnig



Bending wood_Mathias Pliessnig



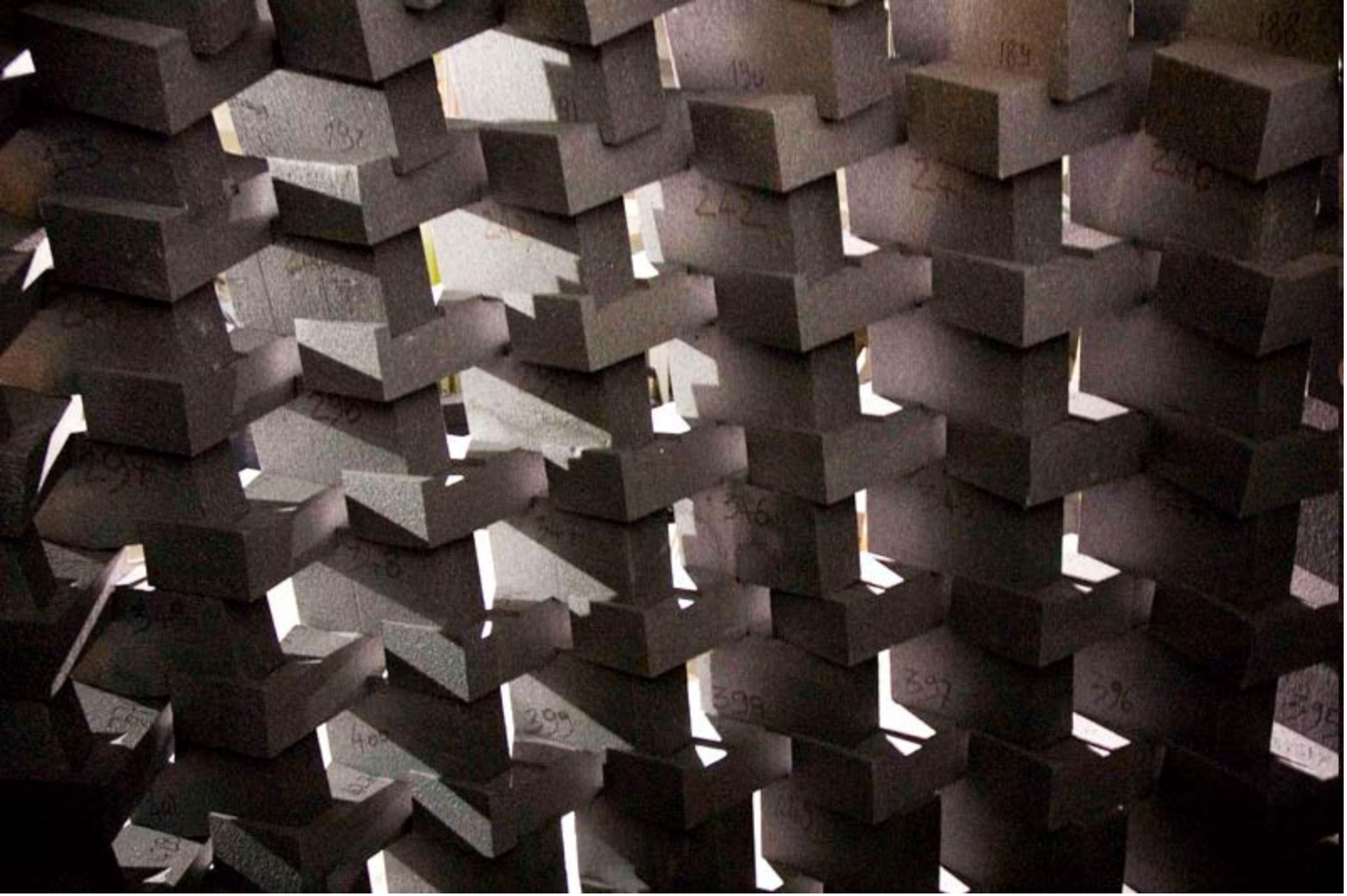
Bending wood_Mathias Pliessnig

Playground fence_Tejo Remy

Explicit Bricks, Barcelona, 2010 [Smart Geometry Workshop]

Gramazio and Kohler

Collaborators: Tobias Bonwetsch (project leader), Ralph Bärtschi, Andrea Kondziela



Explicit Bricks, Barcelona, 2010 [Smart Geometry Workshop]

Gramazio and Kohler

Collaborators: Tobias Bonwetsch (project leader), Ralph Bärtschi, Andrea Kondziela

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Explicit Bricks, Barcelona, 2010 [Smart Geometry Workshop]

Gramazio and Kohler

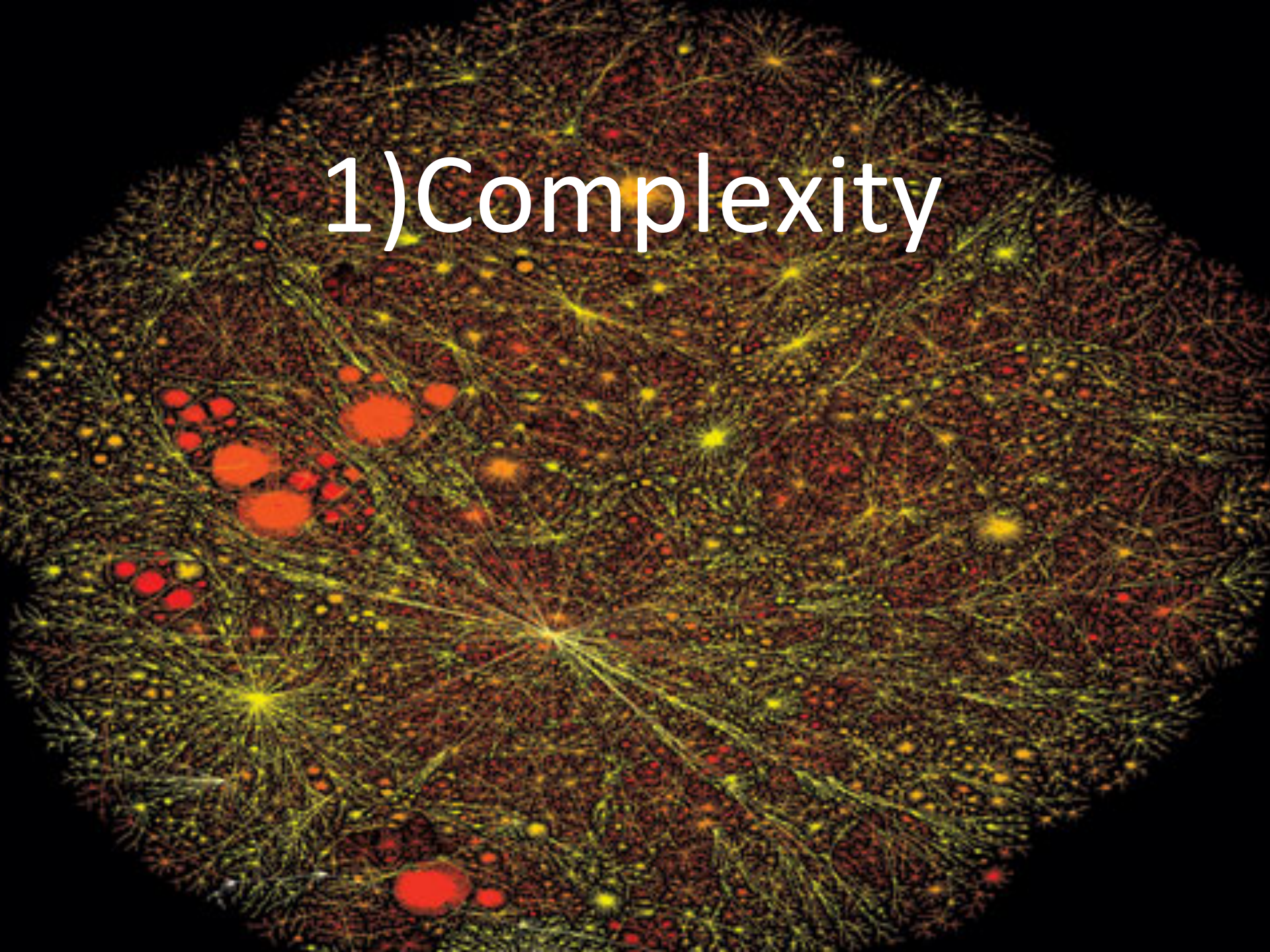
Collaborators: Tobias Bonwetsch (project leader), Ralph Bärtschi, Andrea Kondziela


THEVERYMANY


THEVERYMANY


THEVERYMANY


THEVERYMANY

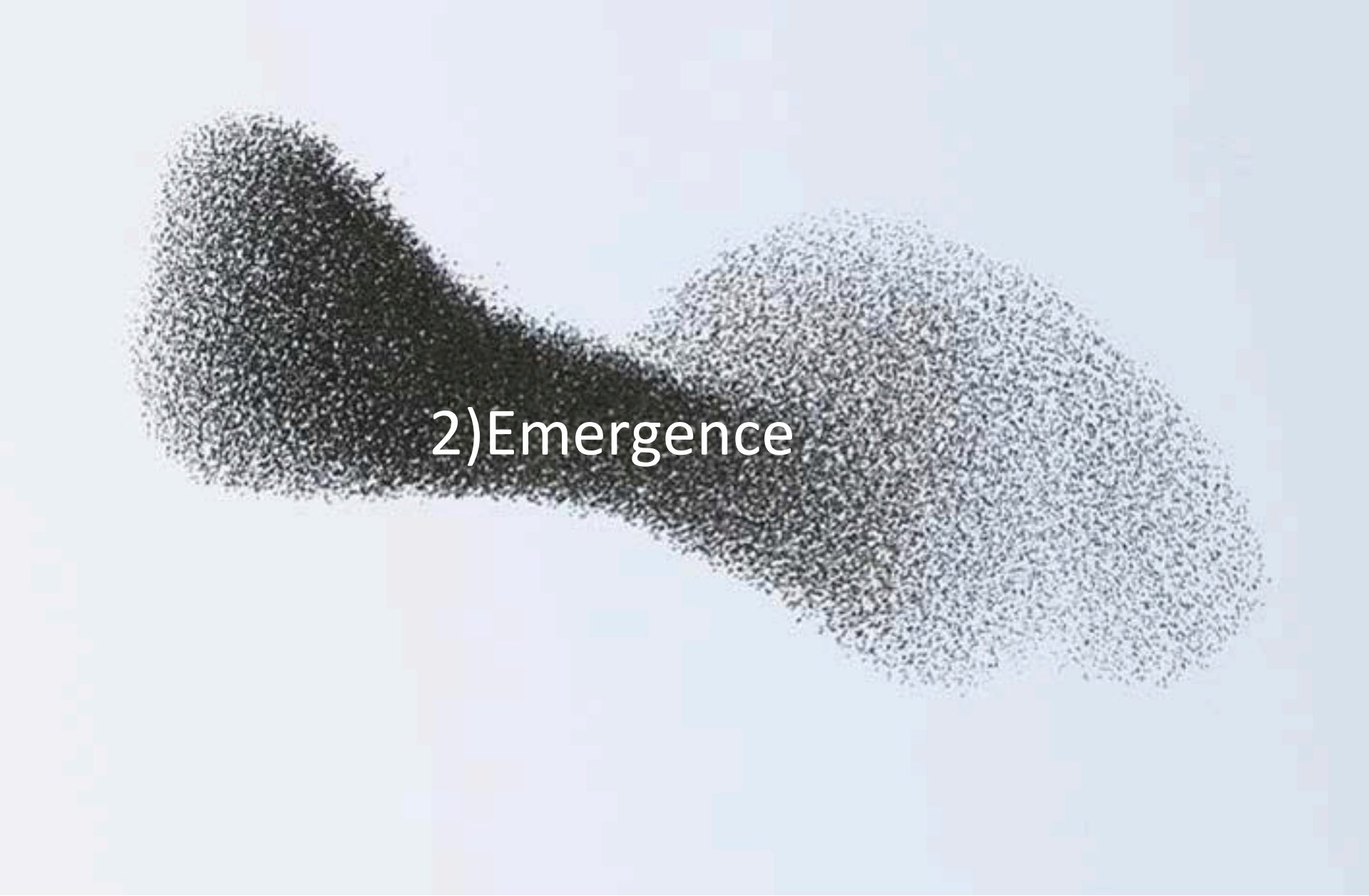

1)Complexity


NASDAQ
KB Home
-2.2%
50.96
-1.16
Microsoft
+1.5%
30.89
+0.44
+2.0%
17.84
+0.35
BUY ORDERS
19.12
+1.10
19.09
+6.1%
+1.0%
17.15
+0.17
+1.2%
23.46
+0.27
NDTV PROFIT
BusinessWeek
NASDAQ
NASDAQ
NASDAQ
NASDAQ

La realtà come sistema complesso

Maggiore è la quantità e la varietà delle relazioni fra gli elementi di un sistema, maggiore è la sua complessità; a condizione che le relazioni fra gli elementi siano di tipo **non-lineare.**
Un sistema **non-lineare è tanto più complesso** quanto maggiori parametri sono necessari per la sua descrizione.
Dunque la complessità di un sistema non è una sua proprietà intrinseca, ma si riferisce sempre ad una sua descrizione

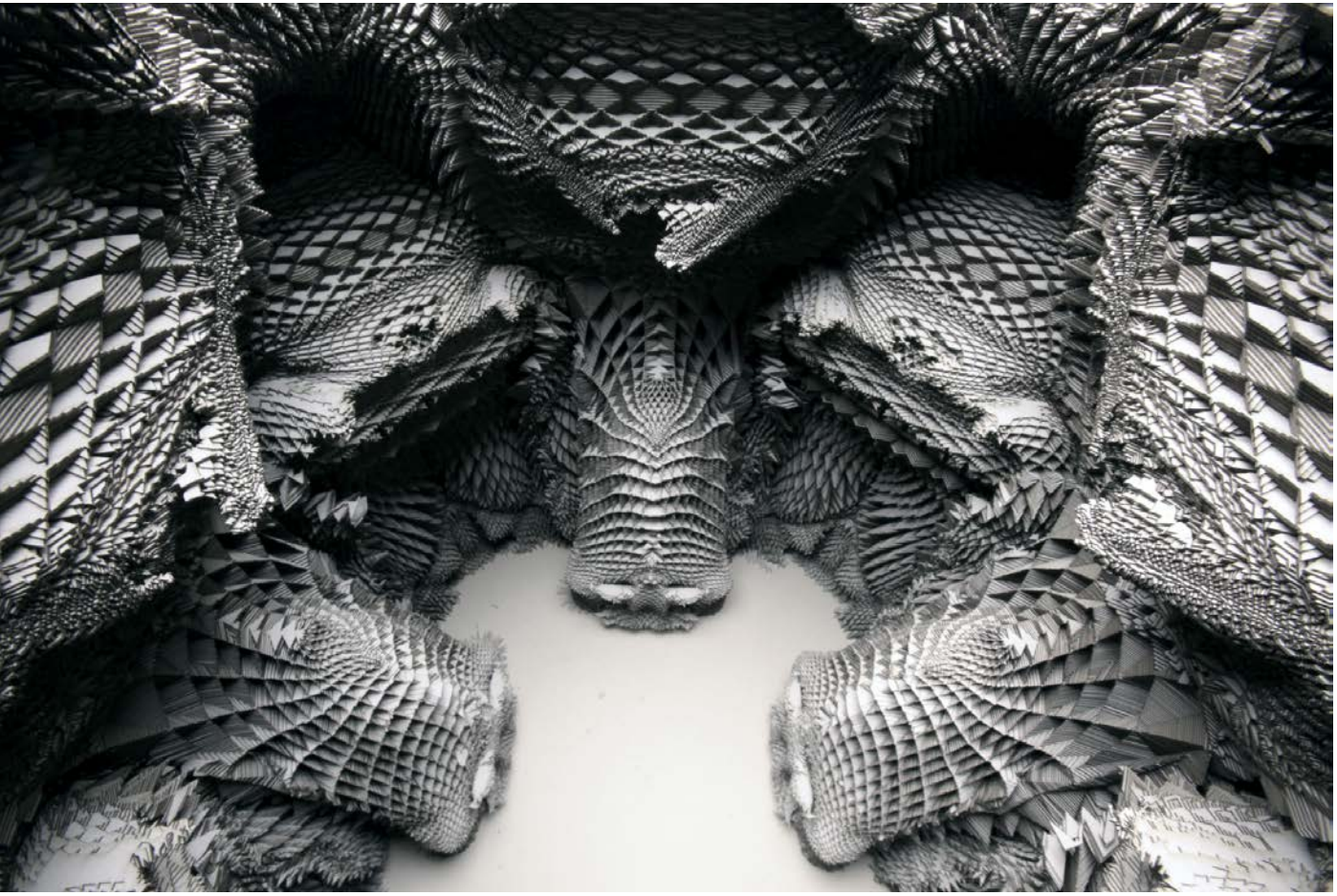
simplicity is a convenient way to look at complexity!



Ie Interazioni non lineari sono alla base di alcuni comportamenti del SIstema Complesso detti **Comportamenti Emergenti**, o Emergenze

I sistemi complessi sono sistemi il cui comportamento non può essere compreso a partire dal comportamento dei singoli elementi che li compongono in quanto interagenti tra loro:
l'interazione tra i singoli elementi determina il comportamento globale dei sistemi e fornisce loro delle proprietà che possono essere completamente estranee agli elementi singoli.

Comportamenti emergenti



Questa proprietà è chiamata comportamento emergente, nel senso che a partire dalle interazioni tra i singoli componenti del sistema emerge un "comportamento globale" non previsto dallo studio delle singole parti.

un C.A S è un sistema che emerge nel tempo in forma coerente, e si adatta ed organizza senza una qualche entità singolare atta a gestirlo o controllarlo deliberatamente

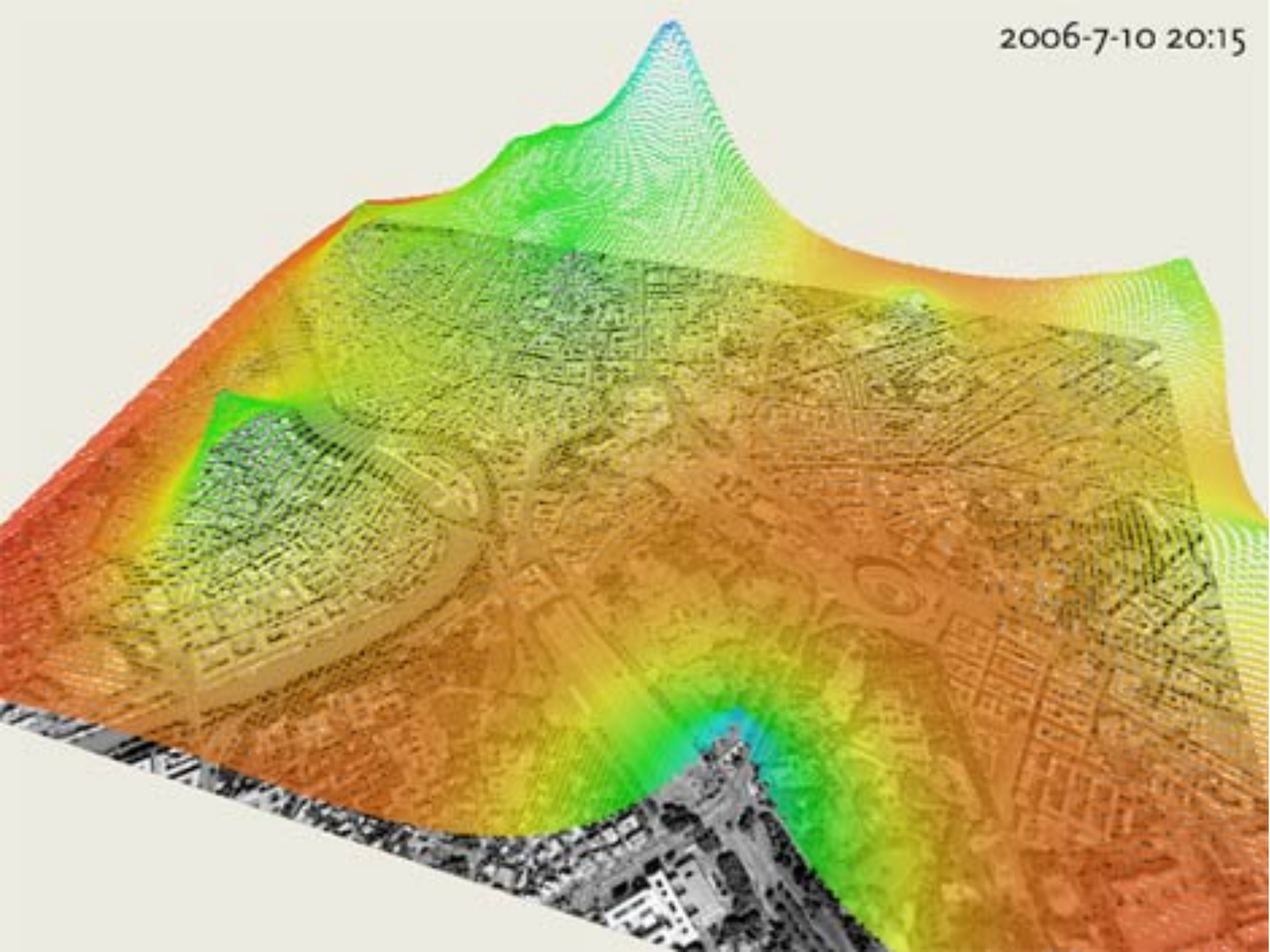

3)Pattern

Il Pattern è una sequenza, nel tempo e nello spazio, nella quale le informazioni sono registrate

4)Data driven Mapping

Il Mapping:
l'elaborazione, la manipolazione di dati e di informazioni,
e' il modo con cui noi **decifriamo Pattern,**
cioè informazioni derivanti da **comportamenti emergenti**

"Una macchina di trattativa che attiva i collegamenti fra realtà disconnesse"
Uriel Fouge

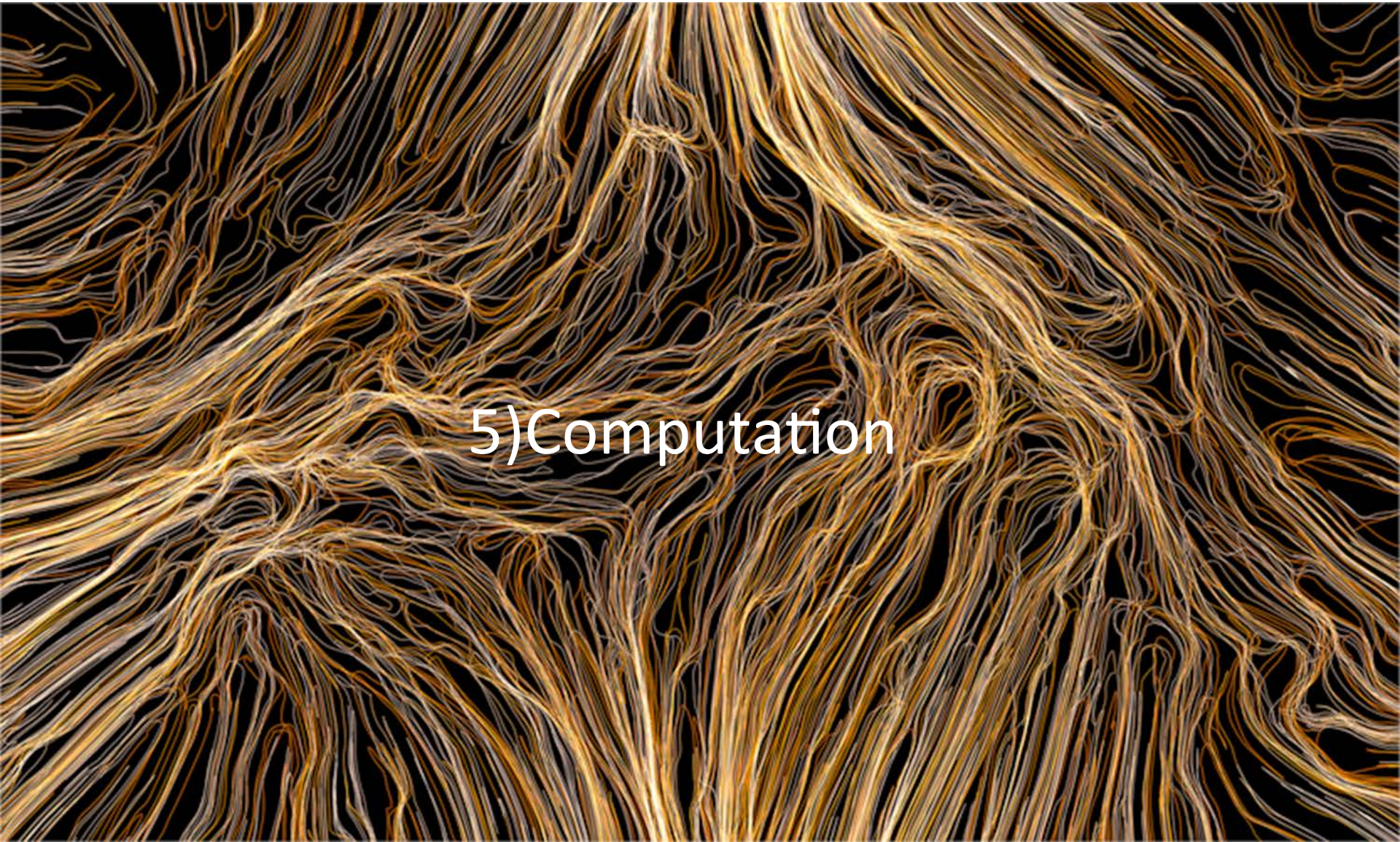

2006-7-10 20:15

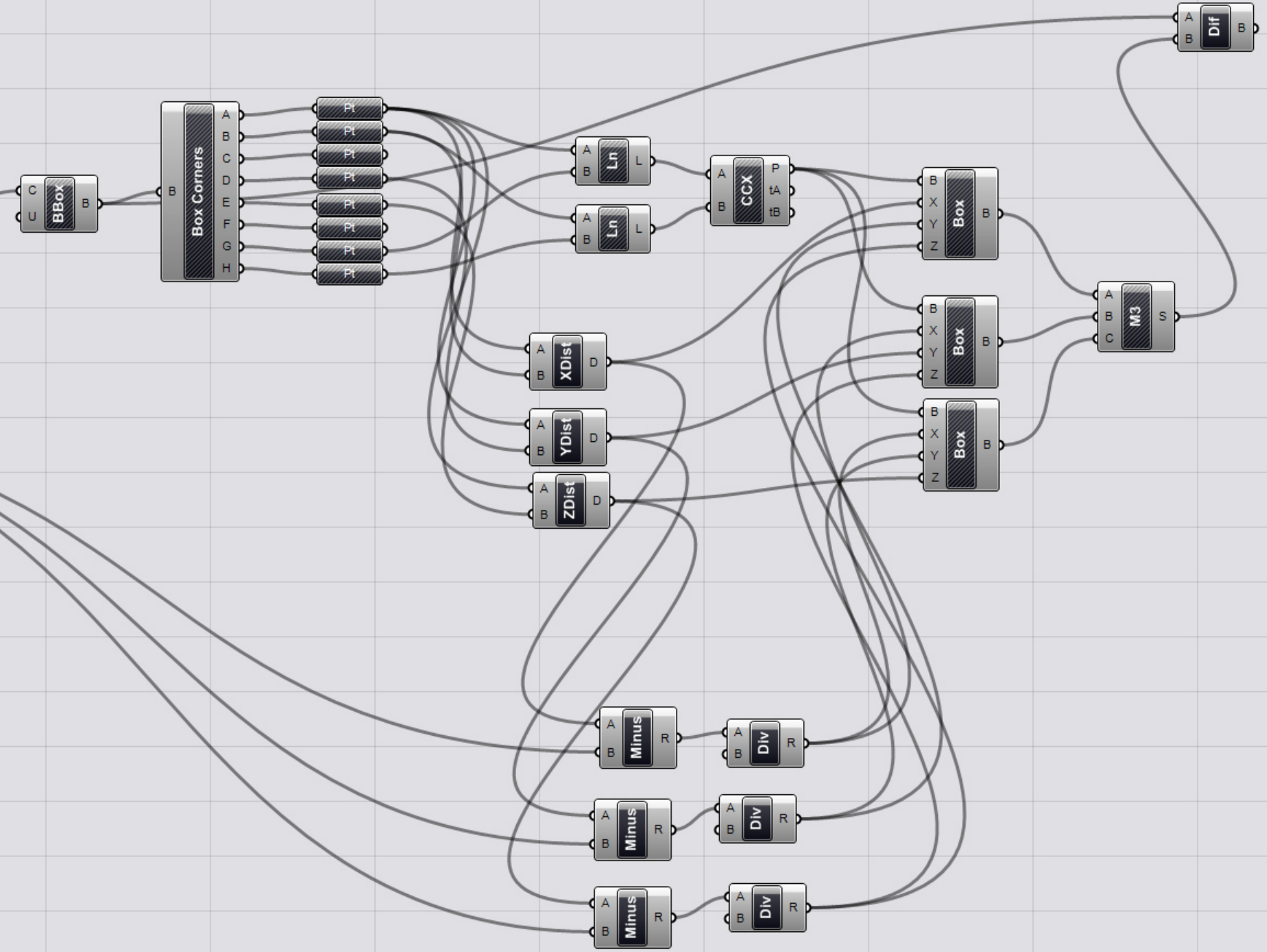
CAD

computazione= rappresentazione

C D

computazione= emulazione




BBox
C
U
B
Box Corners
A
B
C
D
E
F
G
H
Pt
Pt
Pt
Pt
Pt
Pt
Pt
Pt
Ln
Ln
CCX
P
tA
tB
XDist
YDist
ZDist
D
Box
X
Y
Z
M3
S
Dif
Minus
Minus
Minus
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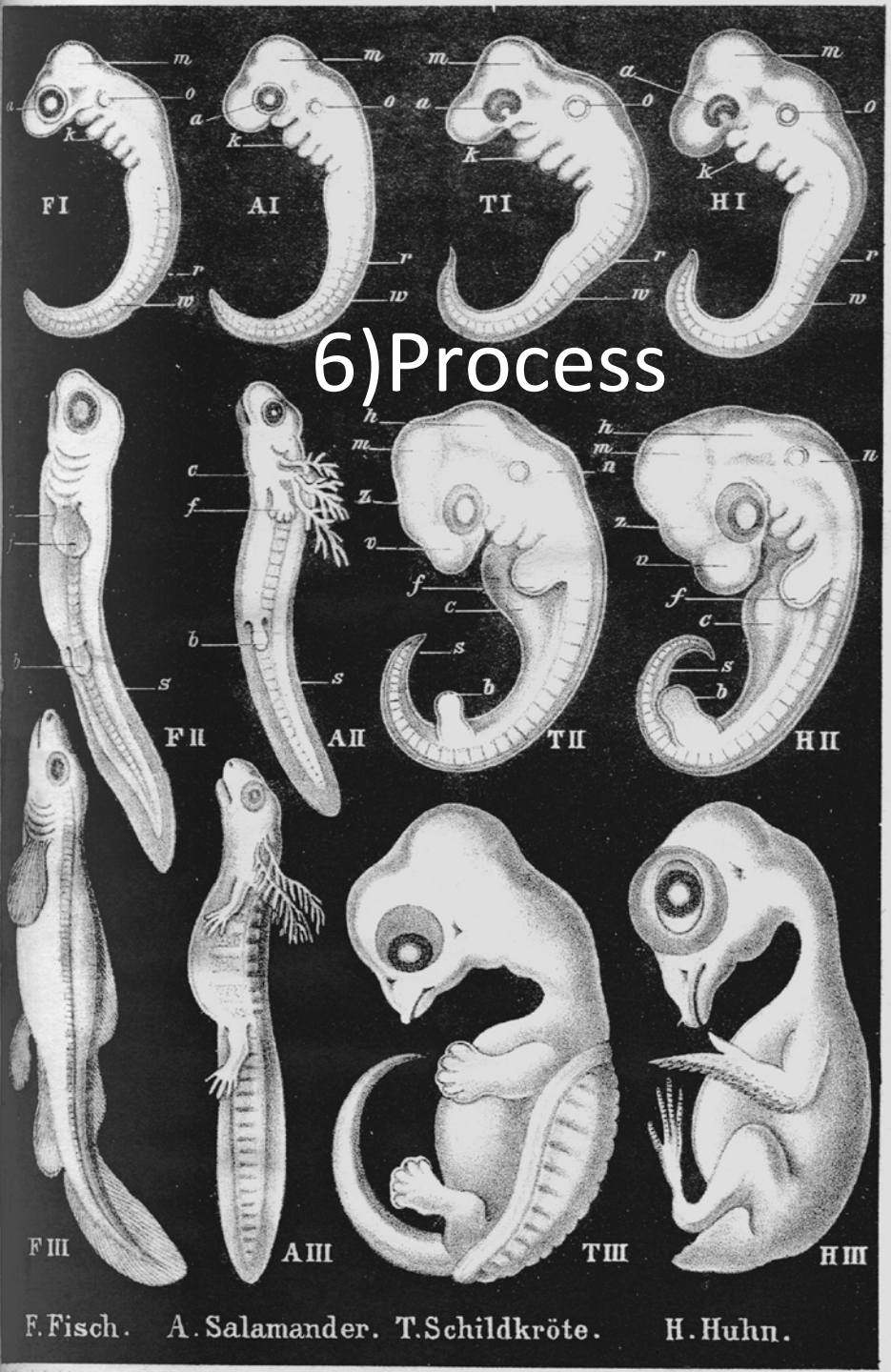
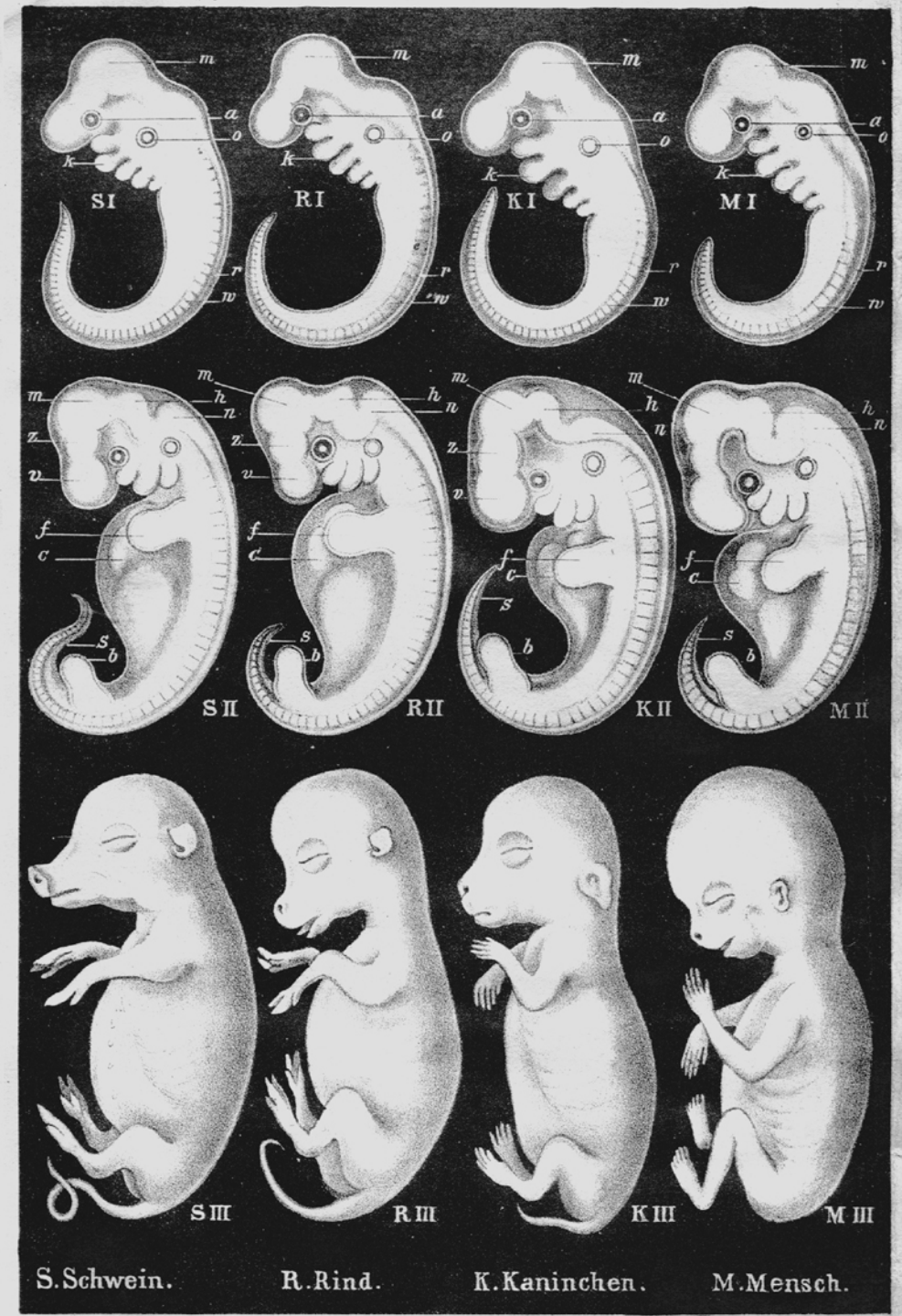
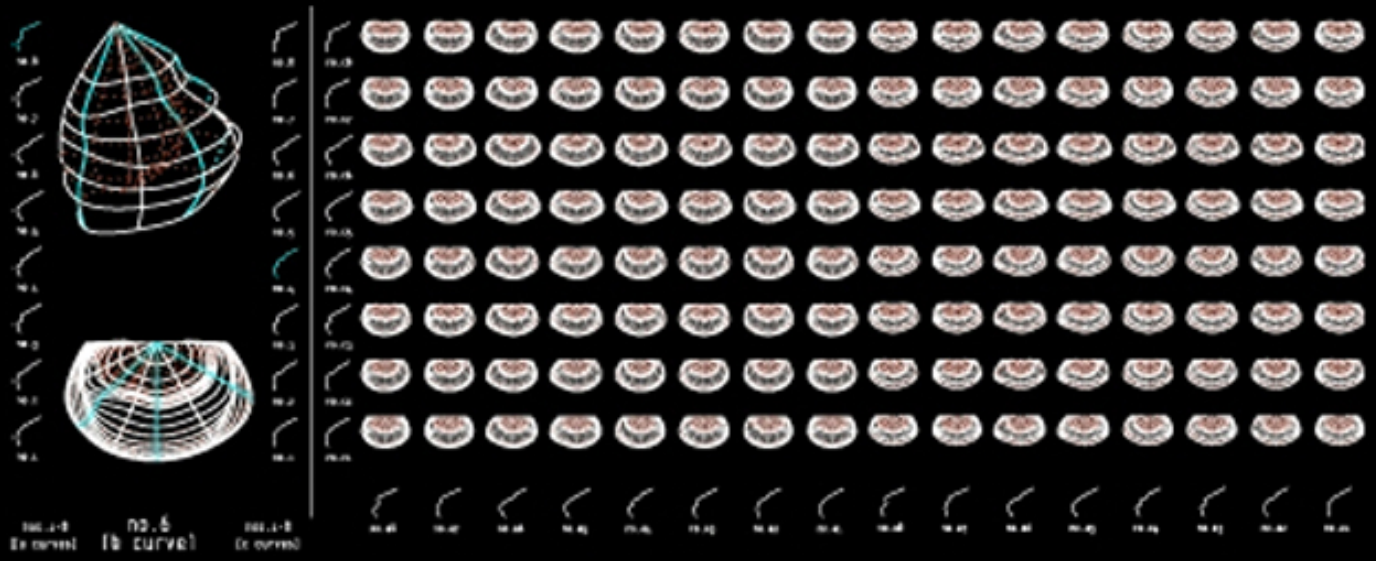
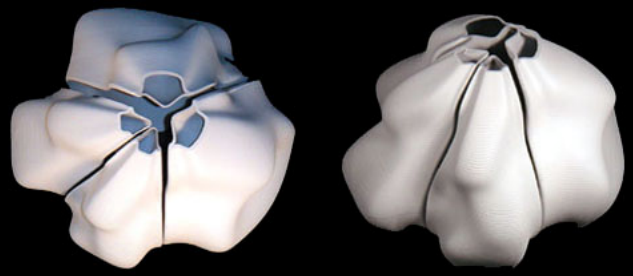
Div
Div
R


FI
AI
TI
HI
FII
AII
TII
HII
FIII
AIII
TIII
HIII
F. Fisch.
A. Salamander.
T. Schildkröte.
H. Huhn.

6)Process


SI
RI
KI
MI
SII
RII
KII
MII
SIII
RIII
KIII
MIII
S. Schwein.
R. Rind.
K. Kaninchen.
M. Mensch.

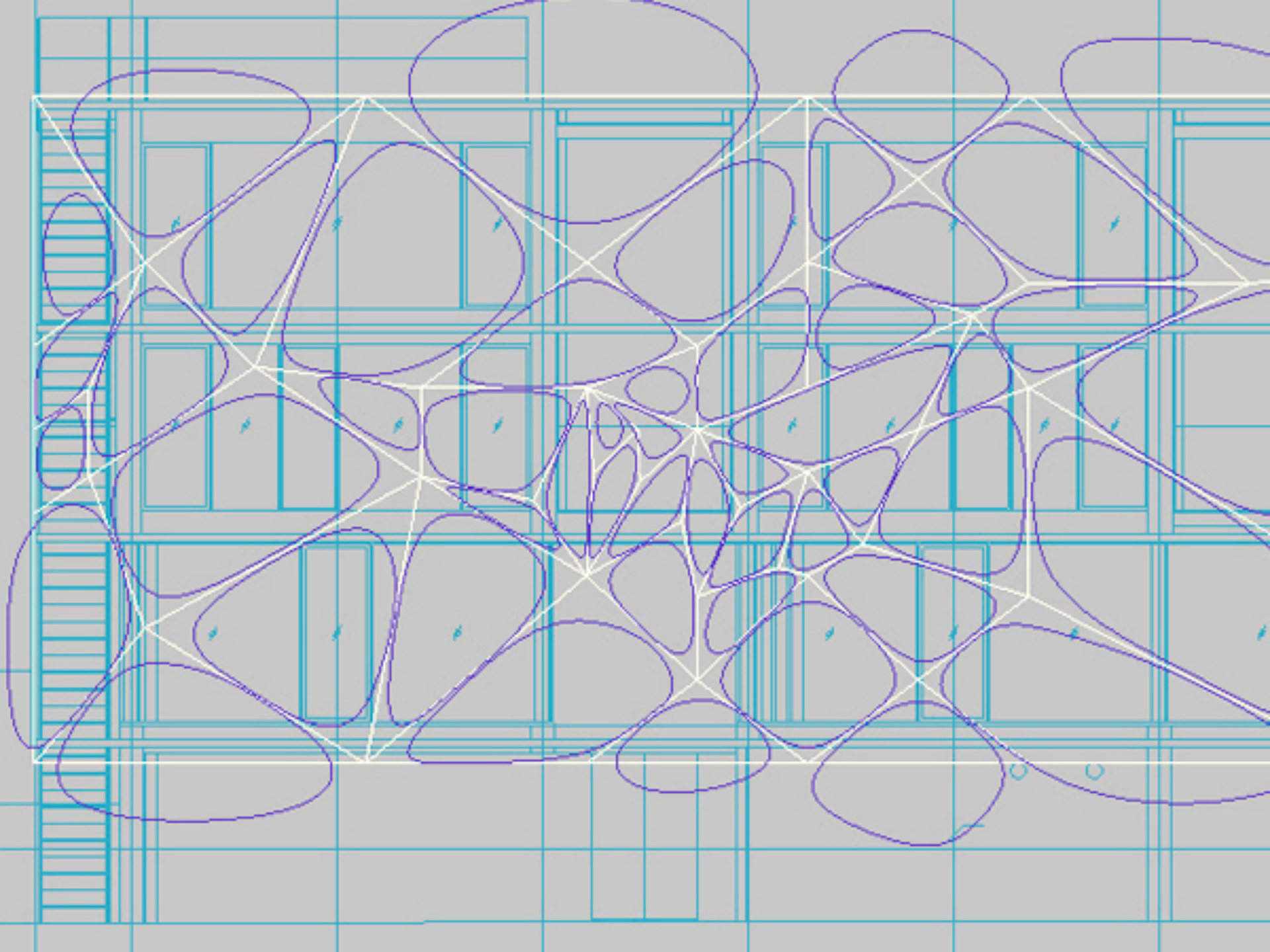


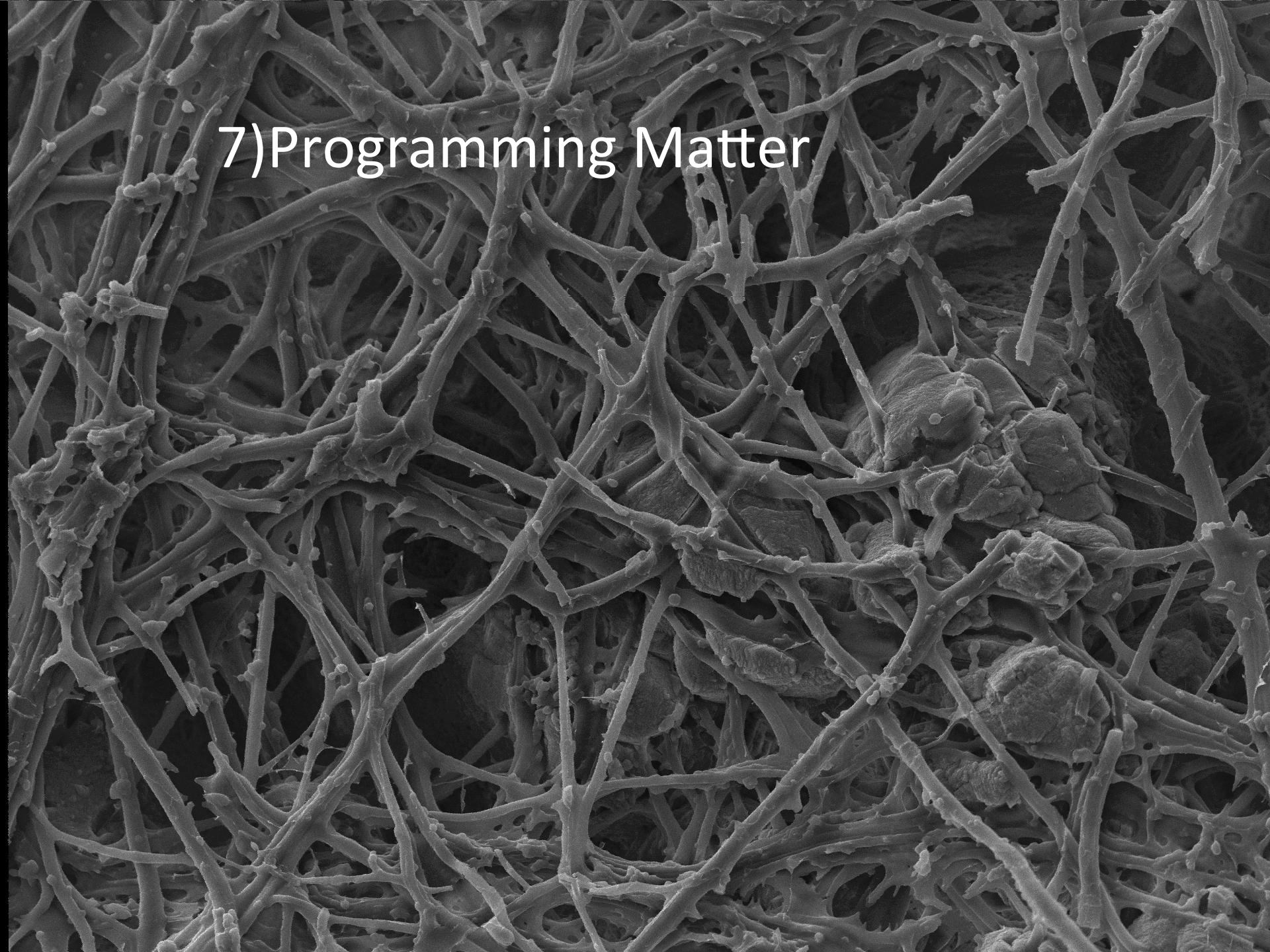


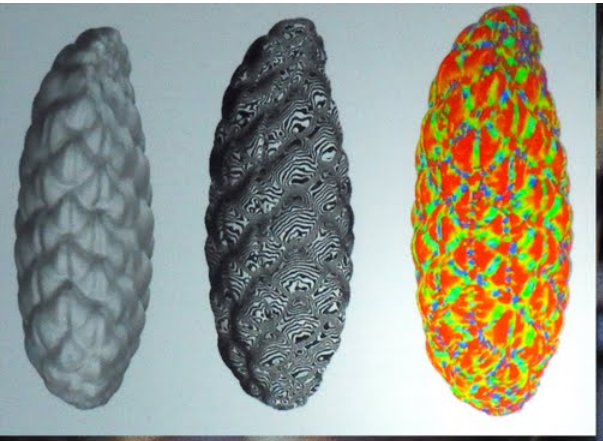
Greg Lynn - Alessi Coffee and Tea Towers.

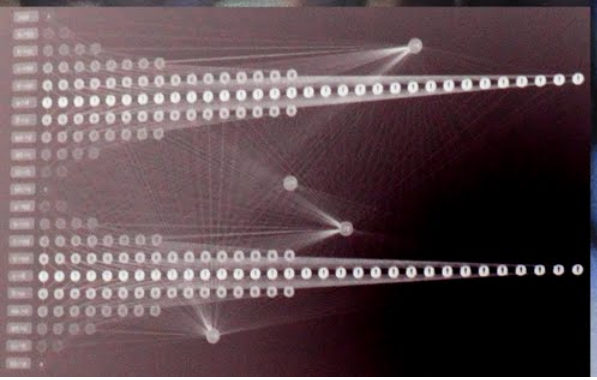
“Ornamento deriva dalla radice indoeuropea ar- che significa “mettere insieme”, radice comune ad armonia, armonizzare ed arrangiare (disporre). L’ornamento non viene quindi considerato come qualcosa di non necessario quanto la condizione che emerge nelle operazioni di articolazione e differenziazione di un sistema, espressione della sua stessa natura” A. Erioli

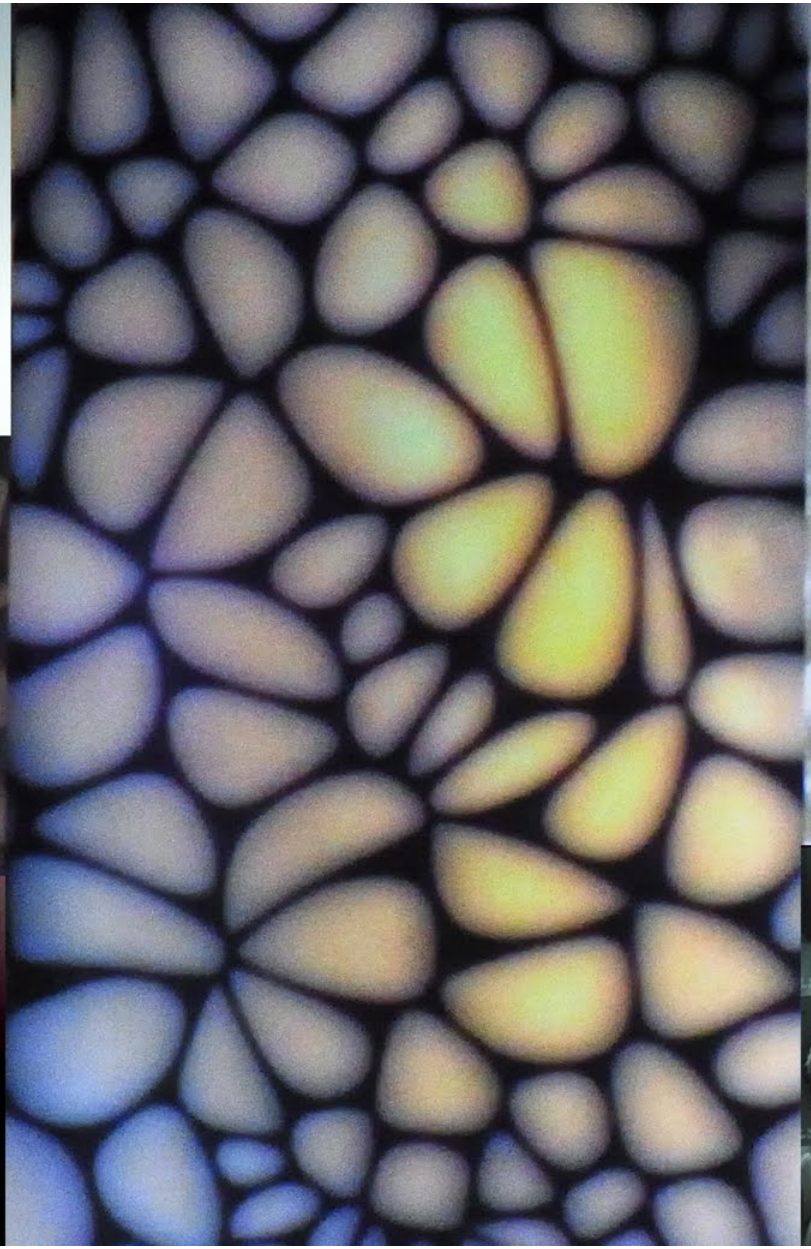
7)Ornament

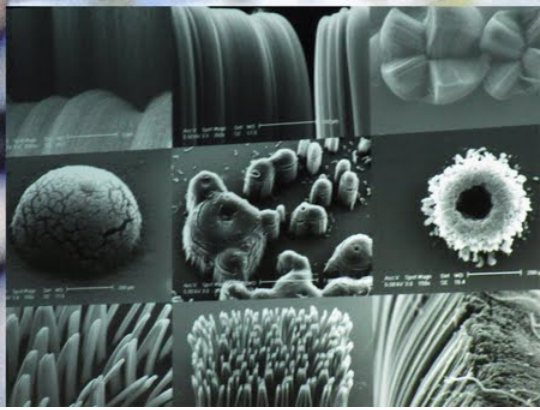



7)Programming Matter

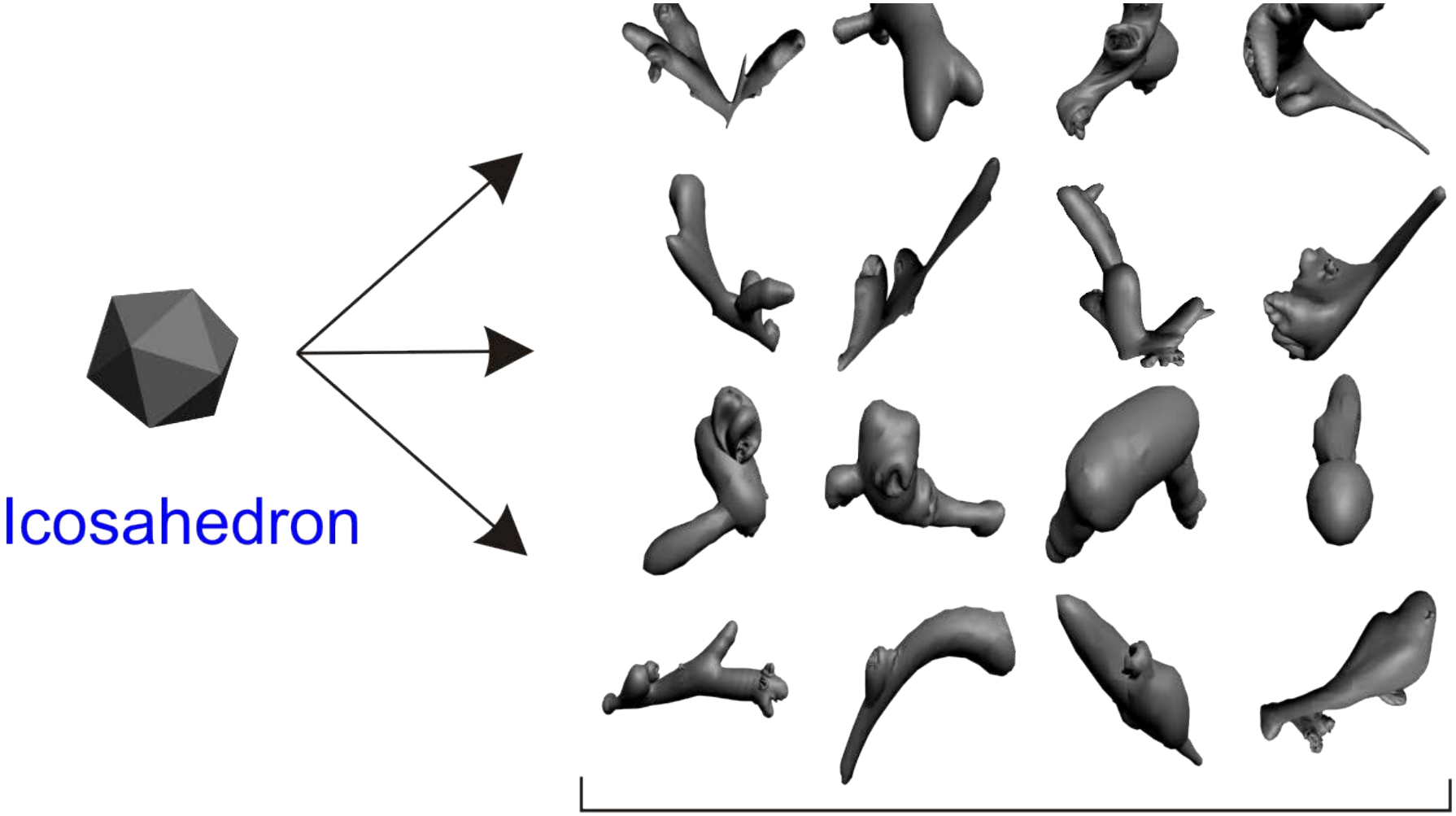








7) **Digital morphogenesis**

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Calendario Attività 2014

Medaarch

at mediterranean fablab

Interaction design
06,07,08 **giugno**

Blender
16,17,18 **maggio**

Fabricated fashion
22,23,24,25,26,27 **aprile**

Emotional design
23,24,25 **marzo**

Grasshopper advanced
18,19,20 **marzo**

Arduino for Interaction
15,16 **marzo**

4x4 Architecture

08/02 **Rhinoceros**
16/02 **Grasshopper**
09/03 **Stampa 3d**
08/03 **Rhino cam**

Grazie !!!

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