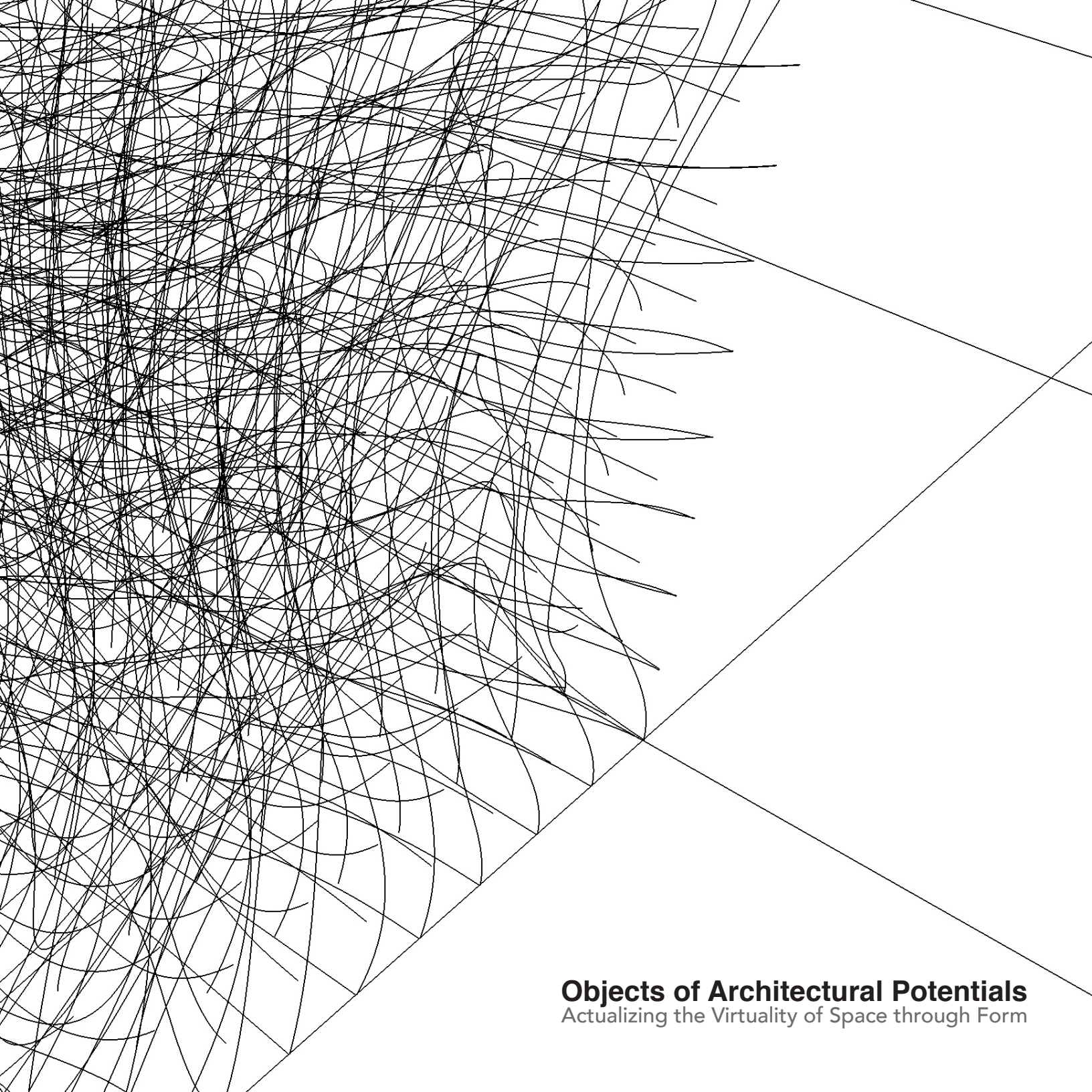
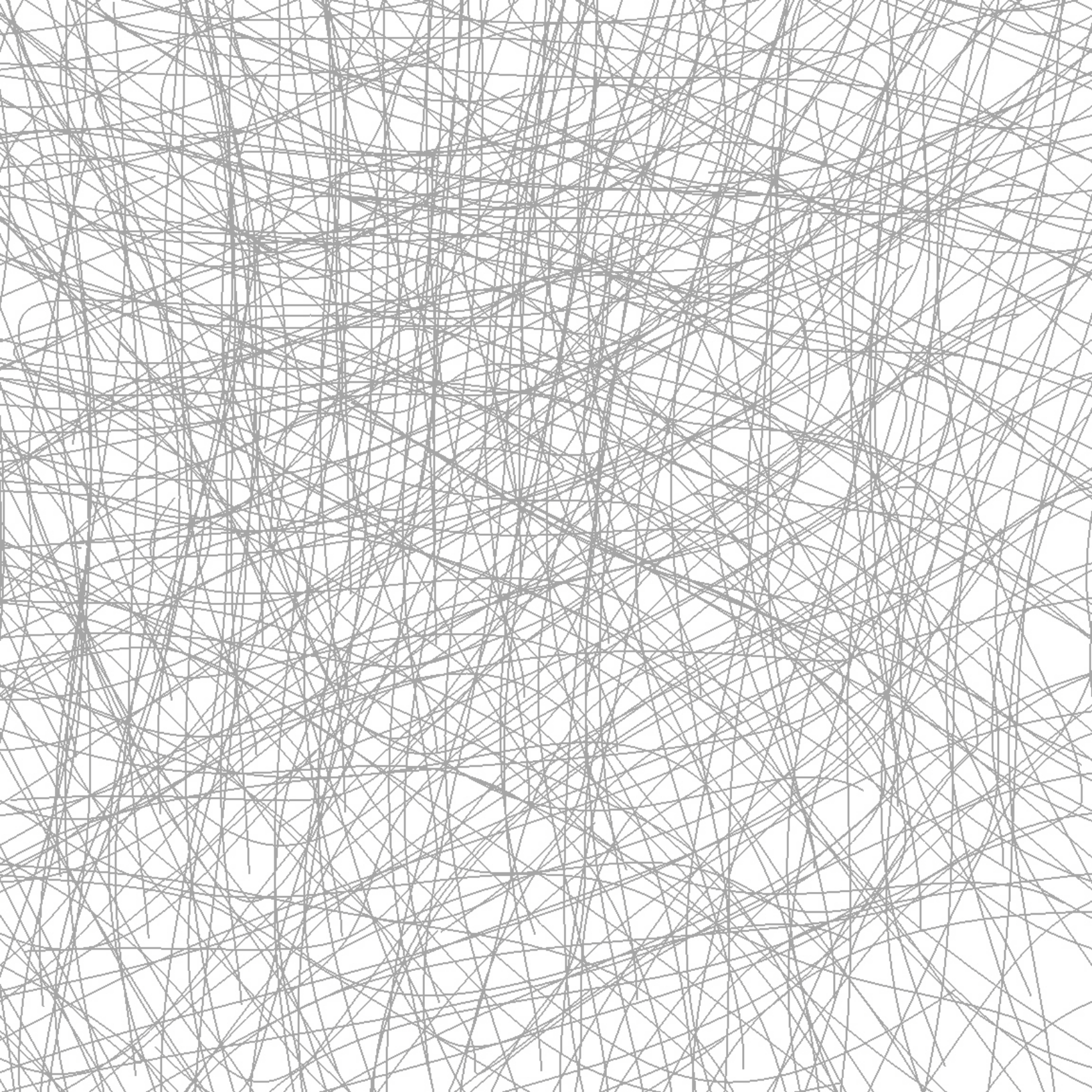
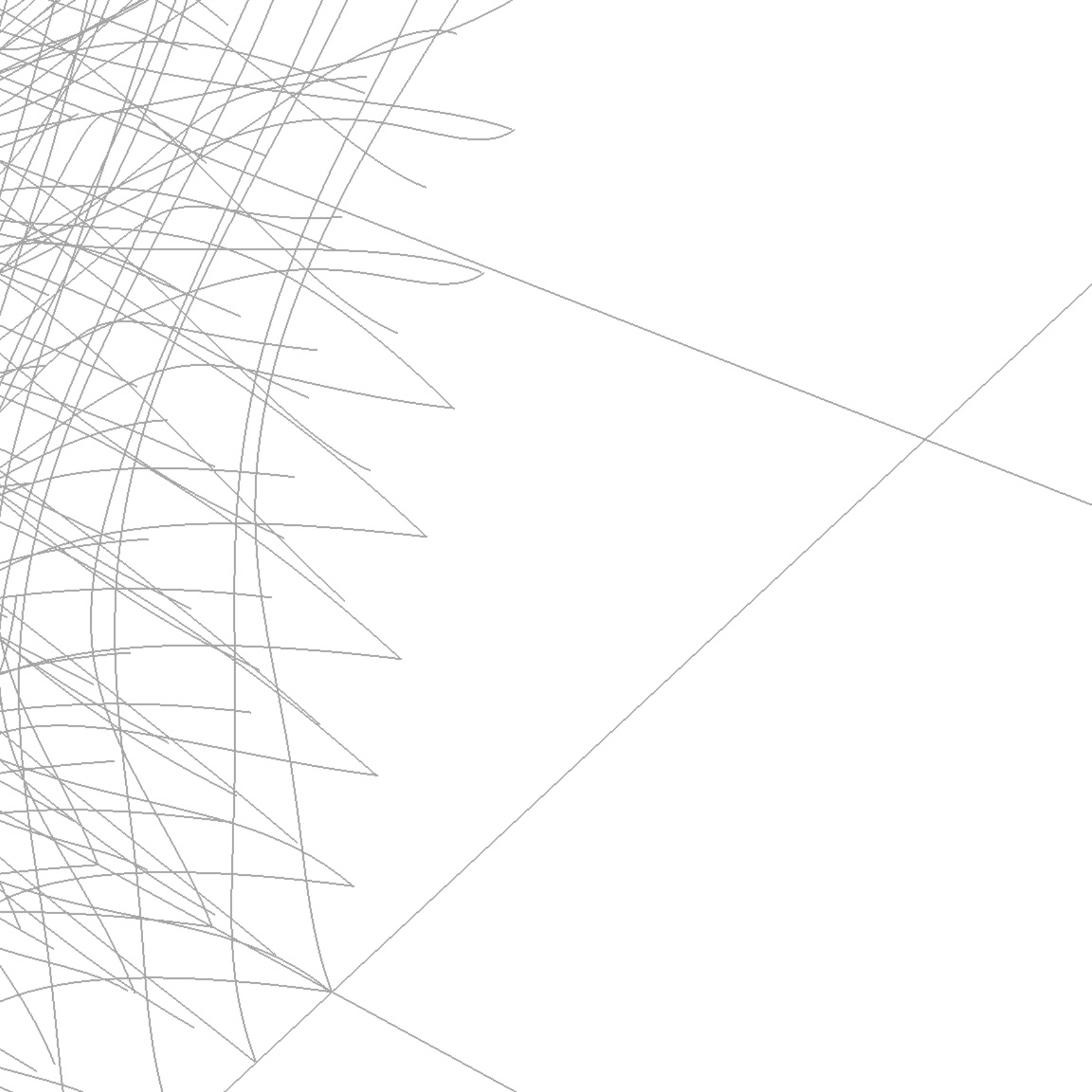


Objects of Architectural Potentials

Actualizing the Virtuality of Space through Form





Objects of Architectural Potentials

Actualizing the Virtuality of Space through Form

Stephen Reilly Mounteer
Masters of Architecture
Advisor: Noah Resnick
2015-2016
The University of Detroit Mercy School of Architecture

Table of Contents

Abstract 09
Thesis Paper 10-23
The Process 24-25
Singularity 26-29
Intensity 30-33
Continuity 34-37
Connectivity 38-39
Intersectionality 40-45
Interiorirty 46-49
Peelability 50-53
Cellularity 54-67
Endnotes 69
Bibliography 71

Abstract

Objects of Architectural Potentials is less interested in the production of dynamic, fluid, complex shapes or forms, than it is in discovering dynamic, fluid, complex architectural, design processes. By reframing our traditional understanding of space, as one of static or order, to one of movement or action, a new architecture can emerge. An architecture of becoming, that is perhaps only achievable through the in-between, fold, or inflection as the opening up to the infinite potentials of the virtual. It is through the actualization of the virtual that this thesis dwells, arriving at a sequence of solutions to an ongoing problem in architecture with hopes of presenting new possibilities of seeing and thinking within this new, virtual space.

Objects of Architectural Potentials

Actualizing the Virtuality of Space through Form

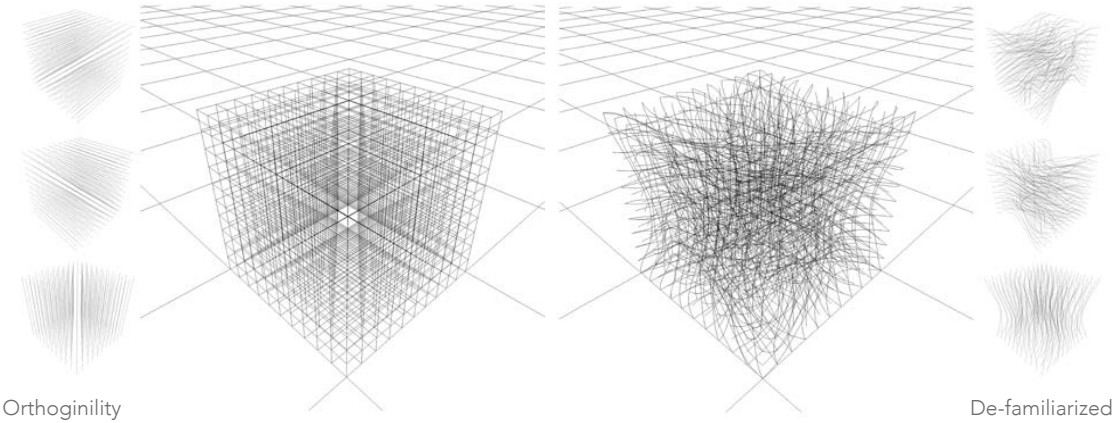
Introduction

This thesis is less interested in the production of dynamic, fluid, complex shapes or forms, than it is in discovering dynamic, fluid, complex architectural, design processes. By reframing our traditional understanding of space, as one of static or order, to one of movement or action, a new architecture can emerge. An architecture of becoming, that is perhaps only achievable through the in-between, fold, or inflection as the opening up to the infinite potentials of the virtual. It is through the actualization of the virtual that this thesis dwells, arriving at a sequence of solutions to an ongoing problem in architecture with hopes of presenting new possibilities of seeing and thinking within this new, virtual space.

The Theory

Orthoginality, composed of parallel and perpendicular points, lines, and planes is a dominating presence in our built environment. The reliance upon orthogonal methods for framing space seems to reflect our conventional understanding of space. "Architectural form is conventionally conceived in a dimensional space of idealized stasis, defined by Cartesian fixed-point coordinates."[01] While stasis is linked with architecture through: permanence, usefulness, typology, procession and verticality, it "does not hold an essential grip on architectural thinking as much as it is a lazy habit or default that

architects either choose to reinforce or contradict for lack of a better model."[02] The concept of de-familiarization introduced a break from the constraints of Cartesian space in search of a more dynamic understanding of space as reacting to forces. By twisting, bending, and stretching the organizational components of the cube, to the point where they no longer resembled their original state, a method of de-familiarization is achieved. While each distorted form still identifies with their original fixed Cartesian state, they begin to express a new dynamic, fluid state which appears to be under continuous deformation and reformation. This new dynamic and animate state, composed of a series of splines is characteristic of topology.



Orthoginility

De-familiarized

Topology is based on Leibniz's invention of integral calculus which retained "the creative structural role of time and force",[03] in determining a position in space. Where Cartesian entities are composed of fixed discrete points, topological entities are "composed of a continuous stream of relative

values."[04] This new "concept of gravity as integral and continuous with masses in space"[05] requires a redefinition of space all together. Where space was previously understood as neutral and timeless, Leibniz established it as being temporally dynamic. Space now, like time, is oriented to movement or action.[06] This new space "is not an existing, God-given space, the Cartesian space of numerical division, but an unfolding space, defined, as time is, by the arc of movement and thus a space open to becoming".[07] An unfolding space is understood as the in-between, or inflection which "represents a totality of possibilities, as well as an openness, a receptiveness, or an anticipation".[08] It could be said that the inflection "is the locus of futurity, movement, speed; it is thoroughly spatial and temporal, the very essence of space and time and their intrication."[09] While the inflection "is first primary, it is also virtual, ungraspable, and fleeting."[10] Now, both space and time "can be conceived as the field for the play of virtualities."[11]

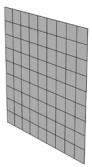
The term Virtual here refers to "an abstract scheme that has the possibility of becoming actualized, often in a variety of possible configurations",[12] not to be confused with the digital space of computers. Deleuze distinguishes between the realization of the possible and the actualization of the virtual "in order to differentiate between two kinds of multiplicity: one that is redundant and one that is creative."[13] "The possible is a performed real: the real is simply the coming into material form of this nonmaterial possible."[14] In other words "there is no difference between the possible and its realization, without difference,

the new cannot take form",[15] thus resulting in a redundant act. "The actual in no way resembles the virtual nor does it limit or select from the virtual."[16] "In order to be actualized, the virtual must create its own lines of actualization, operating by differentiation, and divergence",[17] resulting in creation. "Thus the virtual requires the actual to diverge, to differentiate itself, to proceed by way of division and disruption, forging modes of actualization that will transform this virtual into others unforeseen by or uncontained within it."[18] In this sense, the virtual has "the capacity for generating innovation through an unpredicted leap, the capacity of the actual to be more than itself, to become other than the way it has always functioned."[19]

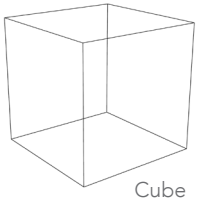
The Process

In the exploration of this new understanding of space, as being temporally dynamic, there is a need for new digital tools in both the design and production of these new potentials. Just as "in every province of industry, new problems have arisen and have been met by the creation of a body of tools capable of dealing with them."[20] Rhinoceros, a computer-aided design software, which utilizes the NURBS mathematical model to represent curves and free form surfaces serves as the tool for this problem. While this software was used initially as the digital space of design, it also seamlessly integrated with laser cutting as a means of producing these new forms.

Based on an understanding of the possibilities and potentials within this temporally dynamic space, a sequence of virtualities were defined including; singularity, intensity, continuity, connectivity, intersectionality, interiority, and peelability. The plane, being a conventional architectural framing device as wall, ceiling, and floor was chosen as the starting point of actualization to illustrate new topological devices for framing space. The final actualized form of each virtuality is confined within the Cube as it represents the transition from traditional architectural space of Cartesian coordinates to one of topological surfaces and flowing forces. Where each surface of variable curvature frames space in new ways, their exterior boundary holds traces of their traditional static frame as a nod to the past from the future.



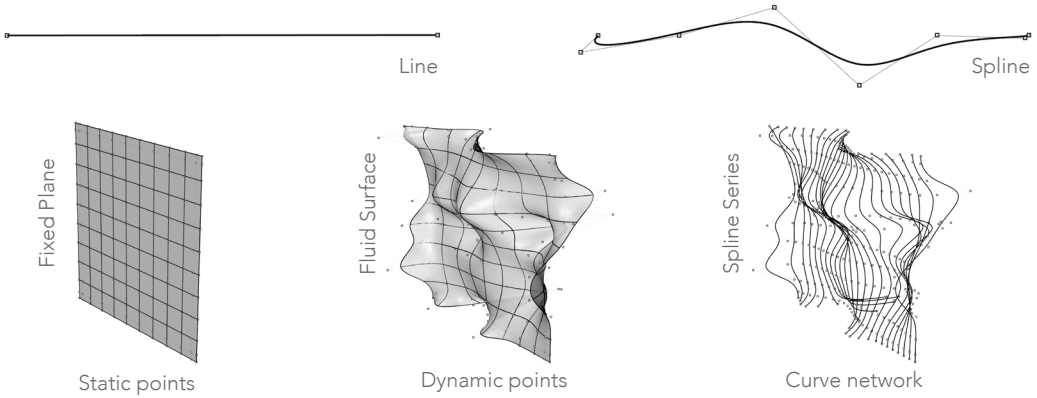
Plane



Cube

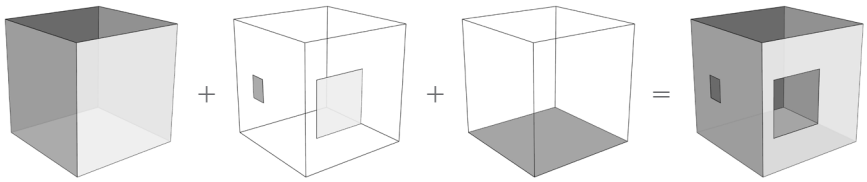
Two distinct but similar methods of actualization were executed for each virtuality. The first being a digital representation utilizing Rhinoceros. A series of splines "oriented in an opposing U and V orientation to construct surfaces composed of curve networks."[21] The second being a three dimensional material presence in the form of laser cut models, as a continuation of the first. The significant difference between the two methods of actualization is

that "the computer creates a distance between the maker and the object, whereas drawing by hand as well as working with models put the designer in a haptic contact with the object, or space. In our imagination, the object is simultaneously held in the hand and inside the head, and the imagined and projected physical image is modelled by our embodied imagination. We are inside and outside of the conceived object at the same time."[22] While each actualized form embodies one, or many virtualities, the form itself is only one potential among a multiplicity of potentials. In light of an evolutionary process, each actual only remains relevant in relation to the whole, as a singular point along the continuum of a curve.



Function, in the traditional architectural sense, plays no significant role in the actualization of these forms, as it is believed that "the significance of architecture is found in the distance between it and function."[23] That in fact, form does not follow function because "over their long lives buildings

can successfully accommodate a variety of uses."[24] Instead, "form frames function"[25] allowing for a multiplicity of potentials to take place within the "architectural frame." Where conventional architectural function is negated in this process, an abstract architectural function of the frame is explored. Bernard Cache claims that "the architectural frame fulfills at least three functions, what ever the concrete purpose of the building might be."[26] The first function being separation with walls, the second being selection through windows, and the third is the arrangement of the ground plane. All three of these abstract functions of the architecture frame allows for what Cache refers to as "autonomous form." Essentially, stating that the architectural frame can take a multiplicity of forms so long as it addresses each abstract function with the desired specificity allowing for "the frame of probability to produce its effects."[27]



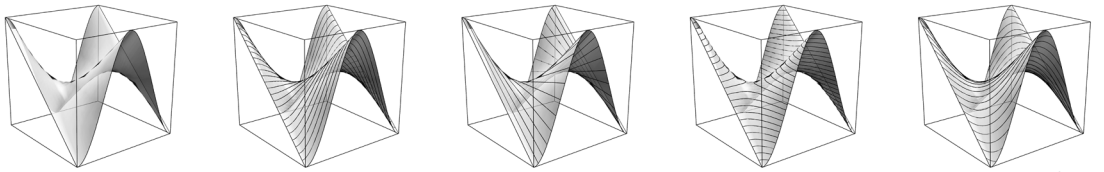
We ultimately arrive at a sequence of forms or frames, proposing solutions to the problem posed by a temporally dynamic space, better yet to the problem of framing within this new space. This formal sequence is an "open-ended, expanding class"[28] who's possibilities cannot be exceeded by any individual, but rather continue to be expanded upon through time. Without

scale or function one is left to their imagination as to what it is, but more importantly what it could become. "We make objects in order to live in the world. Or, in another, Nietzschean sense, we must live in the world artistically, not as homo sapiens but as homo faber."[29] This artistic living, or "creativity, consists in nothing else than the continuous experimentation with the world of things to produce new things from the fluidity or flux that eludes everyday need, or use value."[30]

The Virtualities

Elizabeth Grosz introduces us to what she calls a "logic of invention" when articulating a notion of virtuality linked to futurity, to becoming and to differentiation.[31] Such a logic is expansive, ramifying and expedient. It is interested in producing techniques, solutions, and effects rather than premises, conclusions and arguments.[32] In that sense, its key ingredients include ingenuity, experimentation, novelty, specification and particularity.[33] It does not concern itself with certainty but rather wishes to incite, to induce, and to proliferate.[34] A logic of invention is as open to failure as much as it is to innovation. In this frame of innovation, seven virtualities were arrived at: Singularity, Intensity, Continuity, Connectivity, Intersectionality, Interiority, Peelability. While there is a lineage in the evolution of these seven, the development and actualization of each one individually influenced them all, spawning new unforeseen potentials further expanding the sequence.

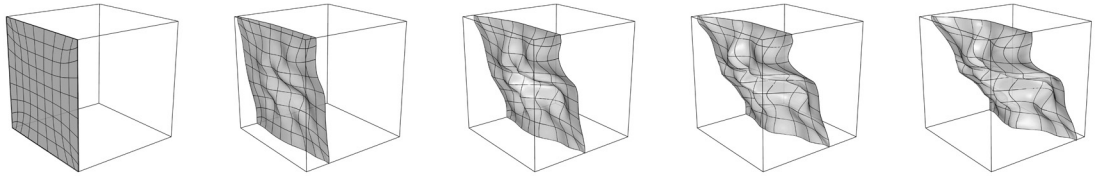
Singularity dealing specifically with intrinsic singularities was the first virtuality explored. Cache describes intrinsic singularities, or the in-between points of inflection as being defined only in relation to themselves. "The singular is not a given point, but a set of points on a given curve. A point is not singular in isolation, but becomes singularized on a continuum."[35] This exploration was directly related to the material process of actualization. The idea being a modular system where each individual piece is the same general form, yet slightly unique from its counterparts, playing with the idea of a singular point along a continuum. The actualization of this was achieved by slicing each piece in a different orientation with the laser cutter. Although the laser cutter played a significant role in execution of this study, it has little relevance in the overall integrity of the thesis as it is simply the only resource accessible for the material actualization. This initial exploration serves as an extrodinary diagram for the entirety of this process.



Singularity

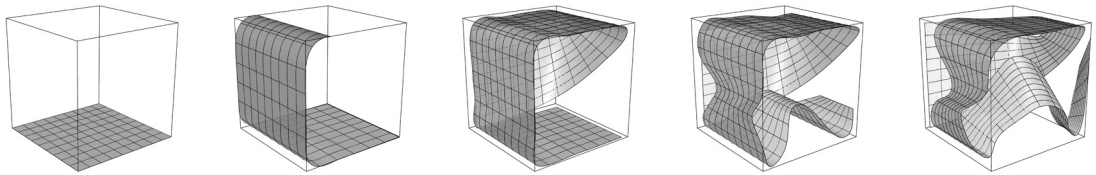
Intensity, deals specifically with Caches concept of the two types of singularities along a curve, the extrinsic and the intrinsic. The intrinsic being the inflection or the fold which is open to infinite potentials, and the extrinsic or extrema (maximum-minimum) locked in a fixed coordinate system. The main

idea being that as the surface of variable curvature moves along the curve, the intensity of its deflection grows as it reaches the point of the inflection, at its openness to becoming something other. As the surface moves away from the inflection, the intensity of the deflection softens until it reaches either extrema, returning to its original fixed position as a static plane.



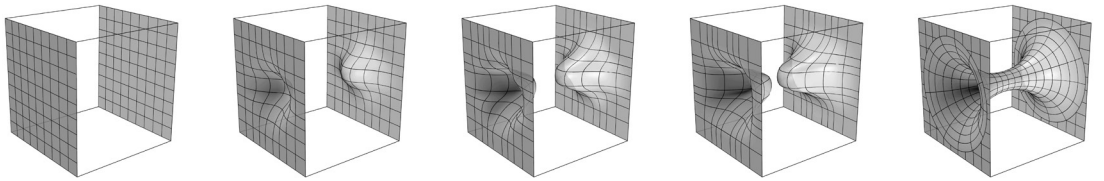
Intensity

Continuity explores Greg Lynn's comment on the Deleuzian concept of the fold, "If there is a single effect produced in architecture by folding, it will be the ability to integrate unrelated elements within a continuous mixture".[36] The main idea is exploring the potential of a single plane to stretch, bend and compress, around all the functional needs of a building. The plane becomes a surface of variable curvature within which the walls, floors, ceilings, windows, and even furniture reside. This method of framing space attempts to integrate all three of Caches abstract functions into one continuous flowing surface.



Continuity

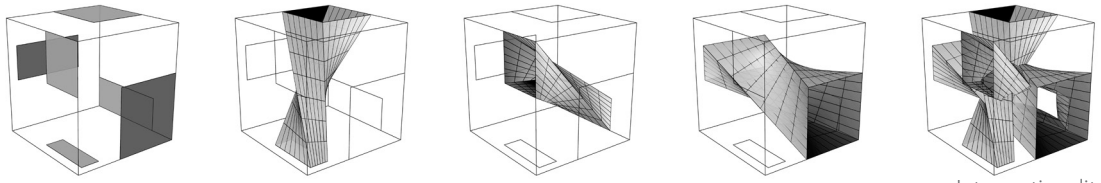
Connectivity is a reevaluation of continuity, reacting to Greg Lynn's comments on folding in architecture. "This new, folded design strategy offers a way to design heterogeneous yet coherent folded forms that do not represent but instead affiliate or link together differences between forms and their contexts."[37] The intention of this study is to explore the potential flow and force of cohesion between two distant, seemingly unrelated or opposed objects. In this case, the two parallel planes of a cube. By stretching and pulling on their control verticies as if they had a gravitational attraction between them, meeting at the middle and morphing into a smooth transition from one face to the other. This new frame creates one continuous surface revealing a new interior space. The new, unexpected interior space spawns an idea for a future virtuality.



Connectivity

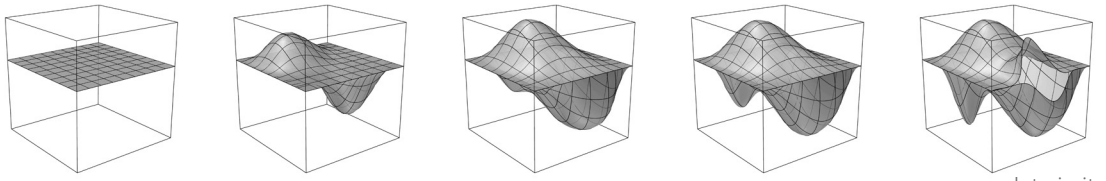
Intersectionality also explores an interior space, however this one is created through a collision rather than the morphing. It is an attempt at actualizing Cache's redefinition of architecture as the art of the frame. Cache's redefined architectural practice of enframing, liberates architecture from its traditional role to become a practice of framing images in such a way that they

induce new forms of life, through isolation (with walls), selection (with windows), and rearranging (the ground plane). Deleuze's comments on the practice of enframing, "Interlocking these frames or joining up all these planes--wall section, window section, floor section, slope section--is composite system rich in points and counterpoints. The frames and their joints hold the compounds of sensations, hold up figures, and intermingle with their upholding, their own appearance."[38] Intersectionalty starts by selecting vectors on each of the cubes six faces. Isolation takes place through lofting the two opposed vectors on the cube. Each loft is then rearranged with a subtle rotation, resulting in the interlocking, collision of three forms. Where regardless of orientation all three abstract functions of the frame are present.



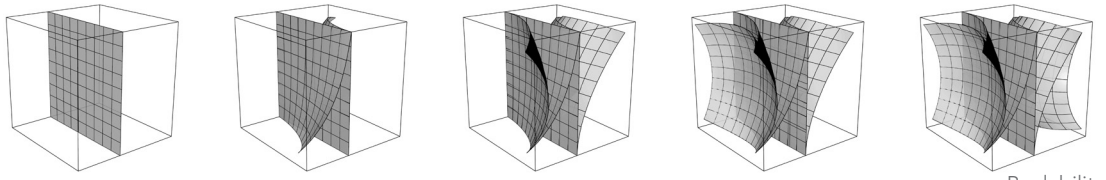
Intersectionality

Interiority specifically references connectivity, but also pulls form intensity and continuity. Where connectivity morphed two opposed planes in the middle, Interiority starts with two planes directly on top of one another, pulling the control vertices away from one another, creating a different interior space. This concept explores the idea of a surface that simultaneously frames and contains space. The idea of starting with multiple planes instigated a new, unforeseen potential, one of infinite layering.



Interiority

Peelability is the first attempt at exploring the potentials of framing space from one plane consisting of infinite layers. After many iterations of actualizing this concept, some rules began to form for this specific virtuality. The first of which was that the framing of space would be achieved by peeling each layer back at the corners. No two layers could intersect, and each new peeled layer would become the new surface to peel from. The result was an unpredicted vaulted dome like form which appeared to have come from one single plane. The methods that were set aside in order to achieve Peelability instigated a new virtuality.

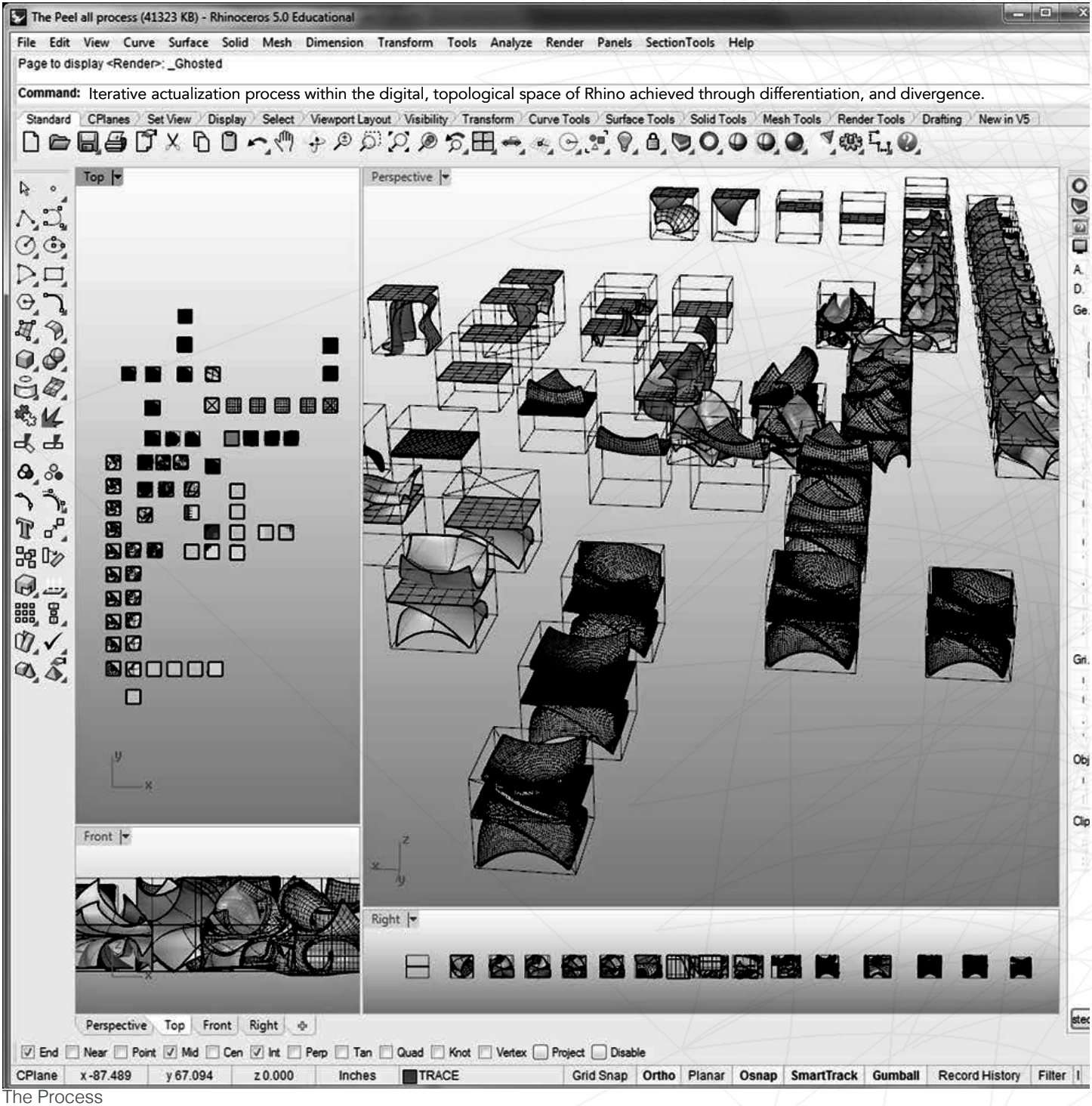


Peelability

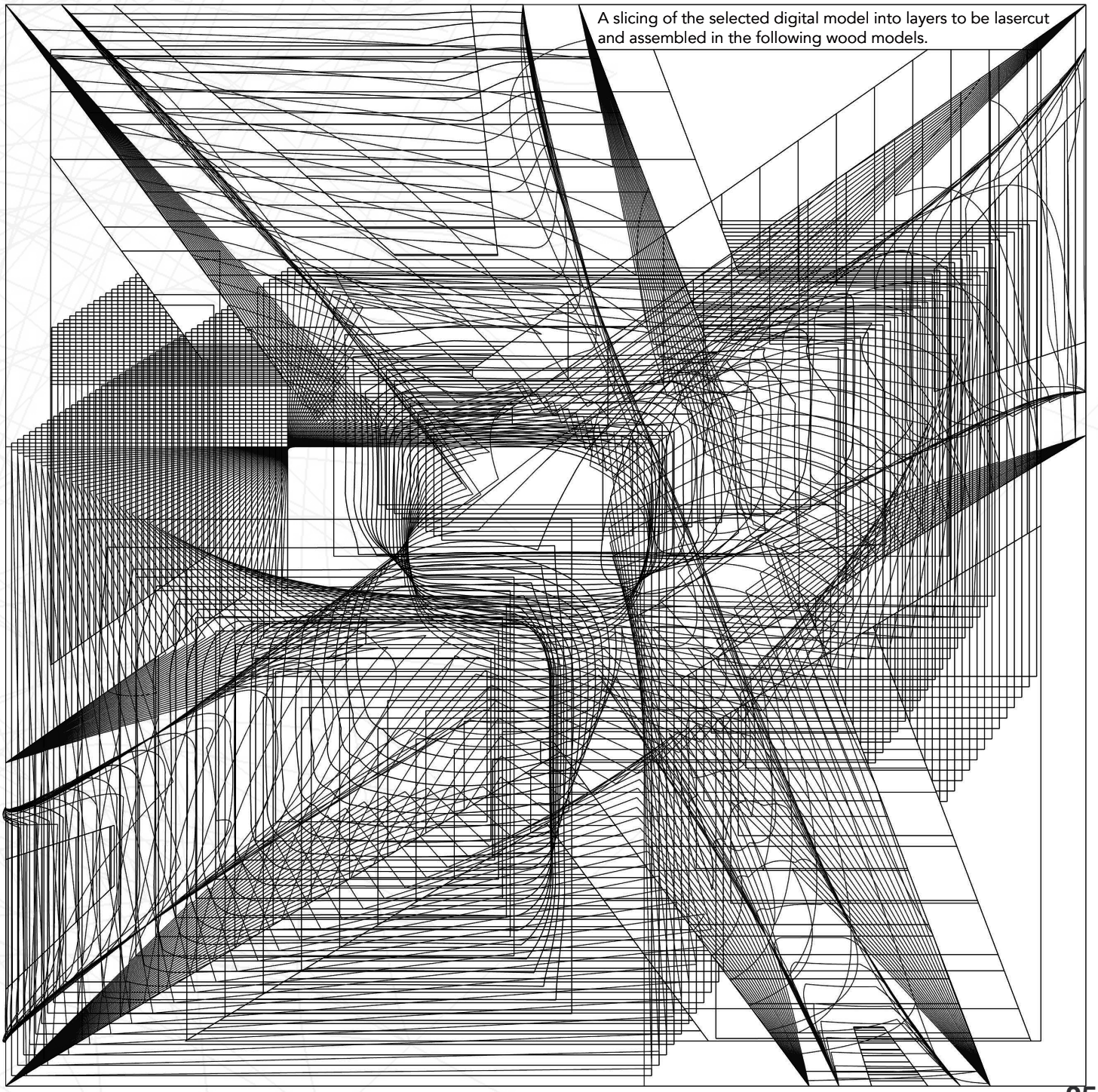
Strataficity… coming soon

Closing

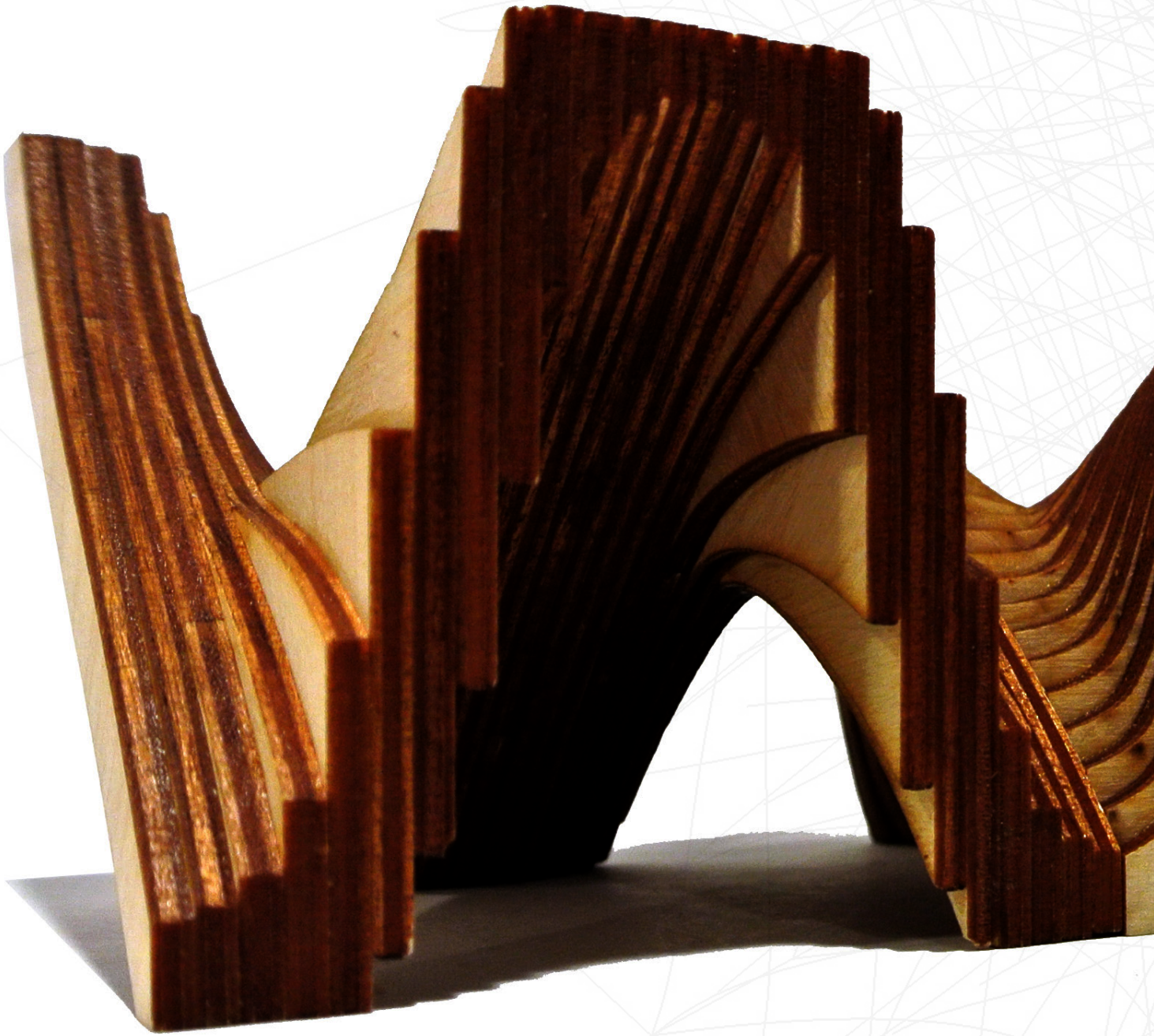
In the pursuit of discovering new architectural processes for cultivating an architecture of emergence, one must first de-familiarize themselves from any preconceived notions about architecture, space, and time as being stuck in a homogenous, static space of Cartesian coordinates. Once Space is understood as temporally dynamic, where force and duration are integral, we can enter the inflection and explore potentials. In reframing the conventional understanding of function in architecture from its unpredictable, always changing program to its abstract function as a frame, we can begin to reveal new images. "Philosophy makes us ripen quickly, and crystallizes us in a state of maturity. How, then, without "dephilosophizing" ourselves, may we hope to experience the shocks that being receives from new images, shocks which are always the phenomena of youthful being? When we are at an age to imagine, we cannot say how or why we imagine. Then, when we could say how or why we imagine, we cease to imagine. We should therefore dematurize ourselves."[39] When space is understood as a realm for the play of virtualities as time is, then architecture too can become something other, something new and shocking.


The Peel all process (41323 KB) - Rhinoceros 5.0 Educational
File Edit View Curve Surface Solid Mesh Dimension Transform Tools Analyze Render Panels SectionTools Help
Page to display <Render>: _Ghosted
Command: Iterative actualization process within the digital, topological space of Rhino achieved through differentiation, and divergence.
Standard CPlanes Set View Display Select Viewport Layout Visibility Transform Curve Tools Surface Tools Solid Tools Mesh Tools Render Tools Drafting New in V5
Top
Perspective
Front
Right
Perspective Top Front Right
End Near Point Mid Cen Int Perp Tan Quad Knot Vertex Project Disable
CPlane x -87.489 y 67.094 z 0.000 Inches TRACE Grid Snap Ortho Planar Osnap SmartTrack Gumball Record History Filter

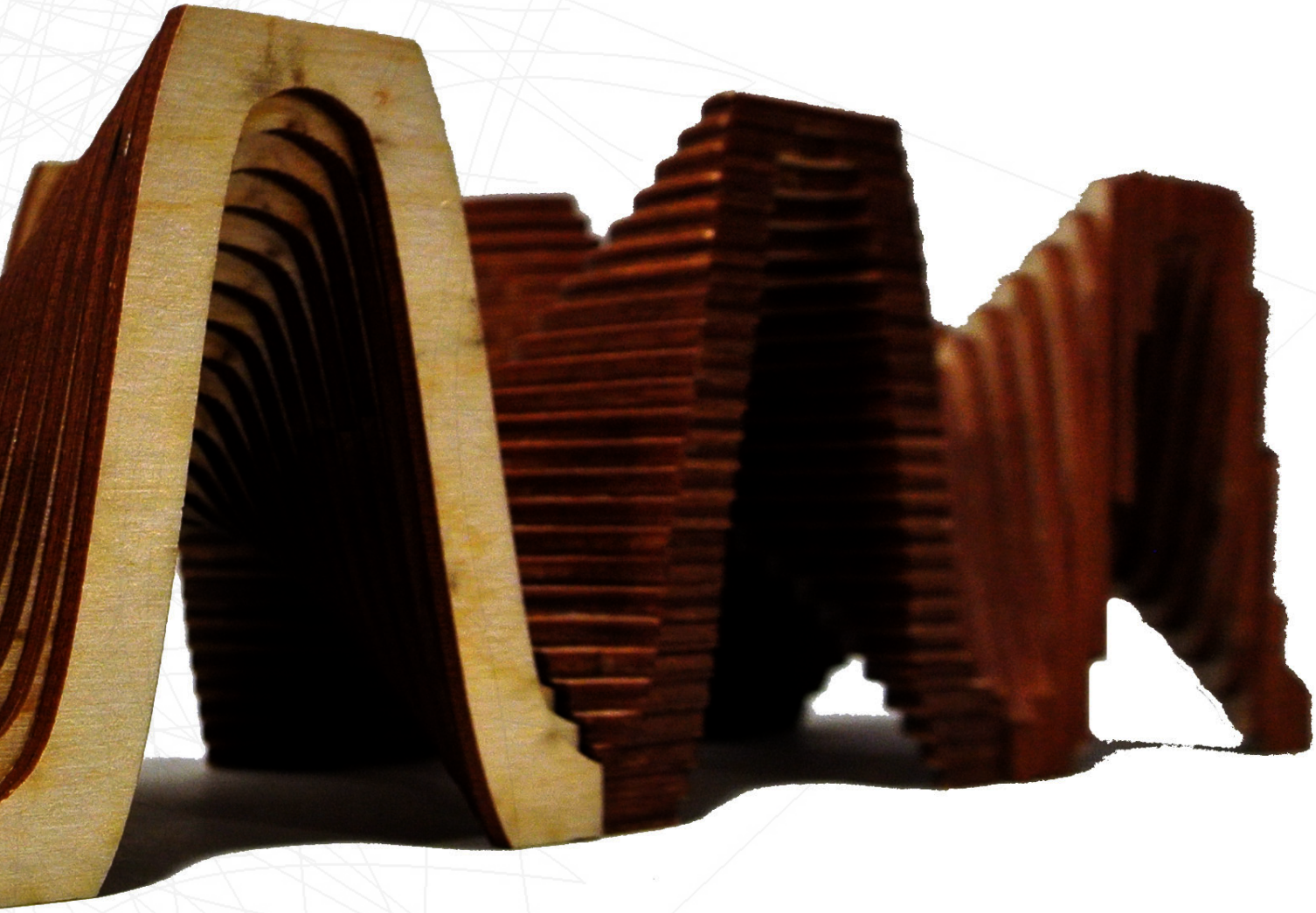
The Process



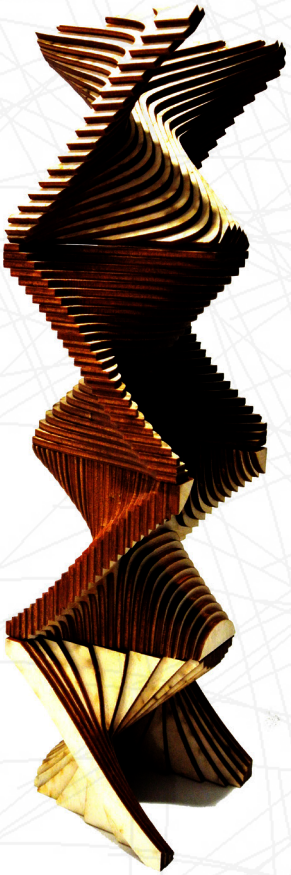
A slicing of the selected digital model into layers to be lasercut and assembled in the following wood models.

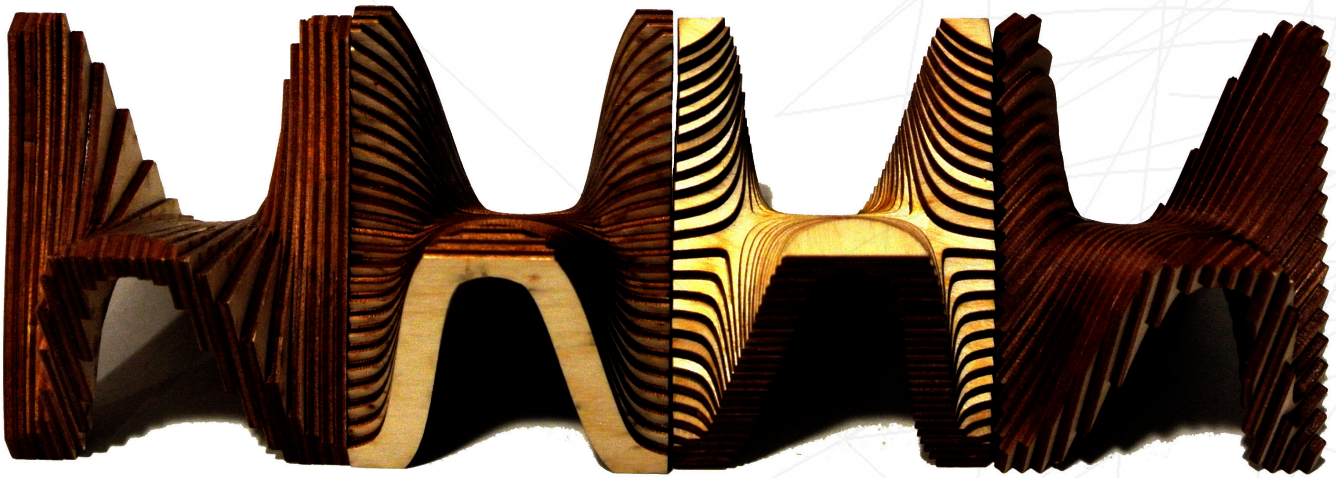


Singularity

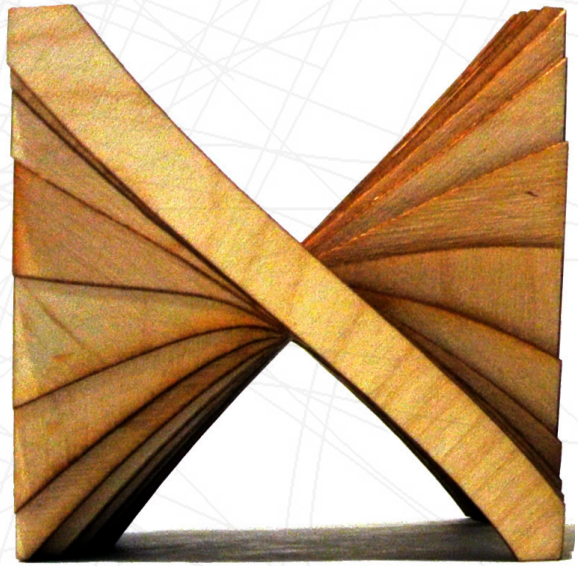


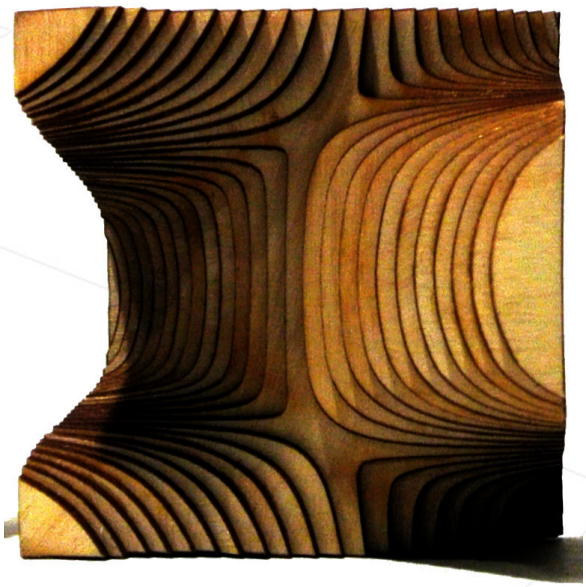
This initial study serves as an extraordinary diagram for the rest of this thesis in the sense that each object is a solution to the same problem, yet each is unique in relation to them all. Through a process of repetition, difference, variance, and selection, each object reveals a solution to the problem of framing space, yet does so through the lens of the virtuality it spawned from giving it an identity all its own. "The singular is not a given point, but a set of points on a given curve. A point is not singular in isolation, but becomes singularized on a continuum."[35] Leaving us with an open sequence of new methods for framing space, reveling an architecture of becoming.

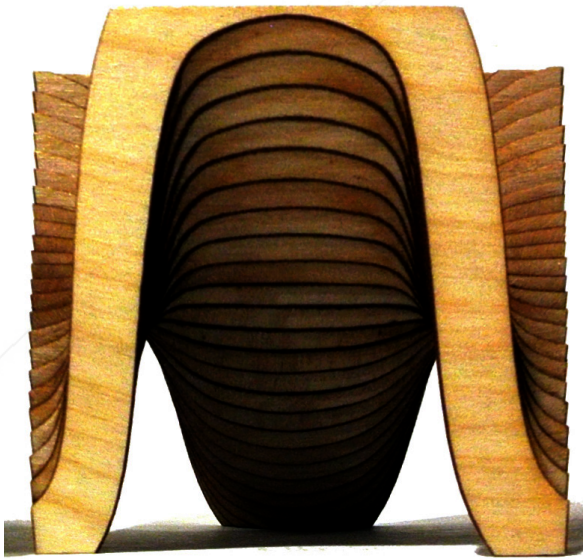


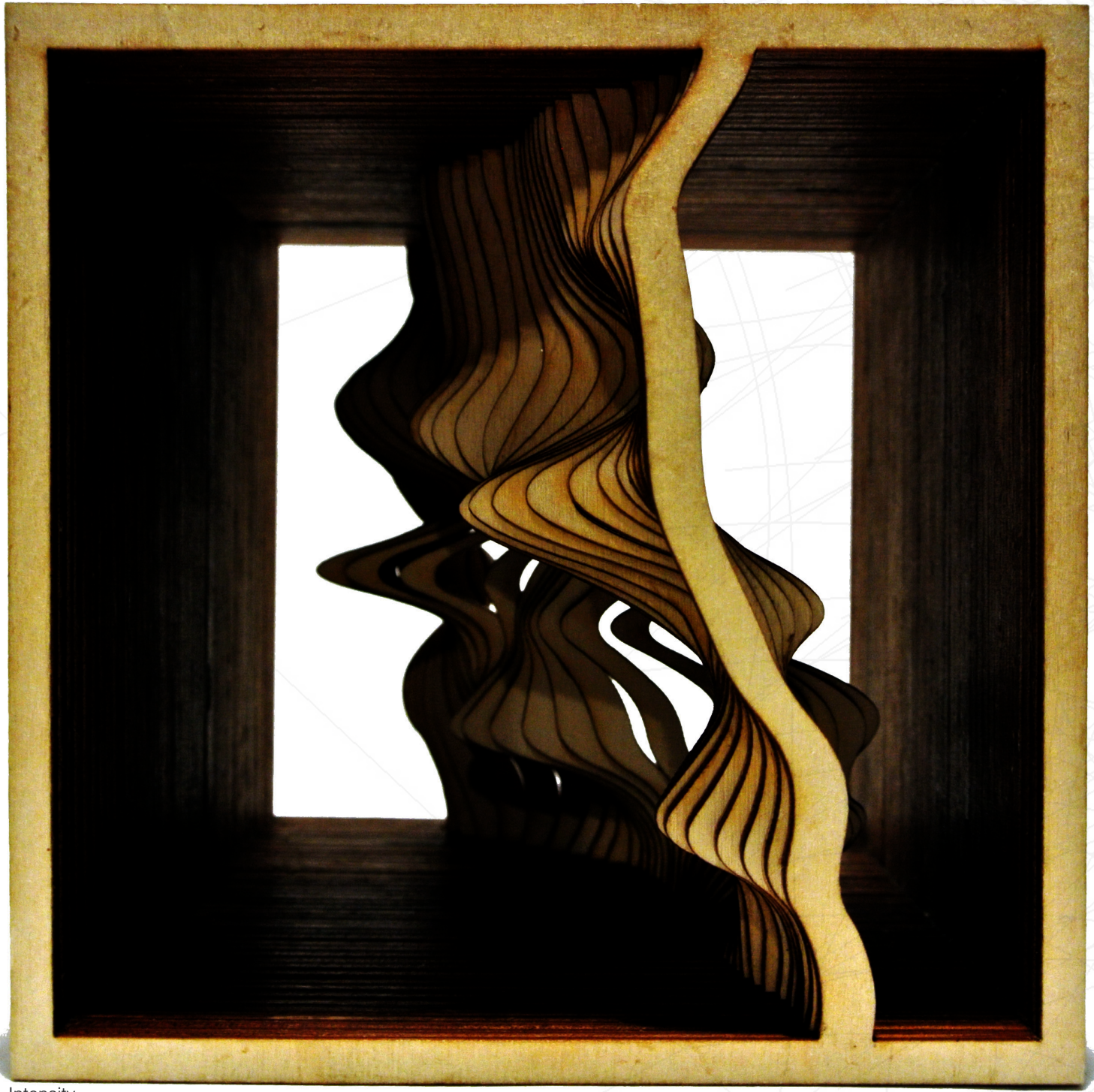


Singularitiy

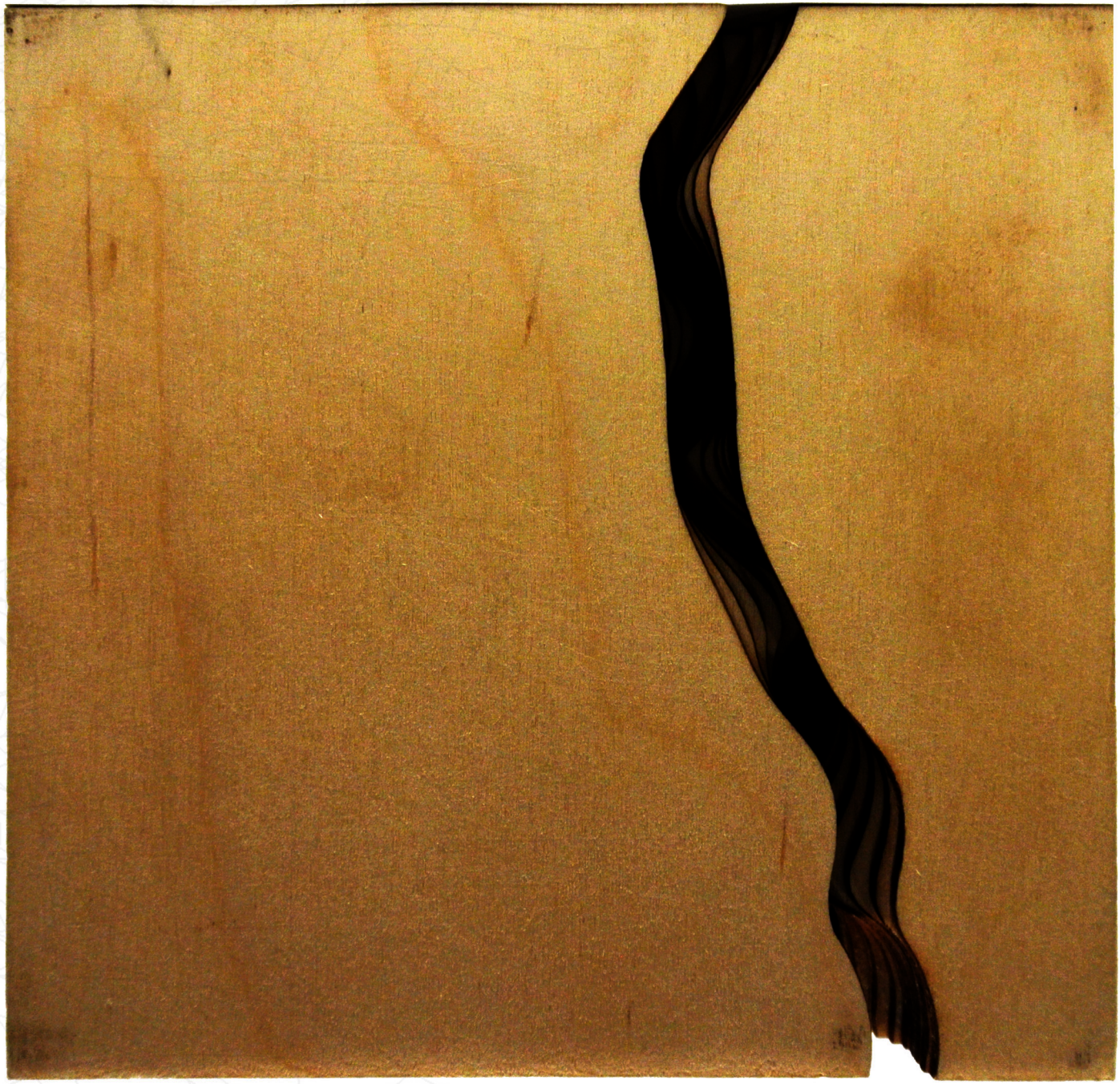


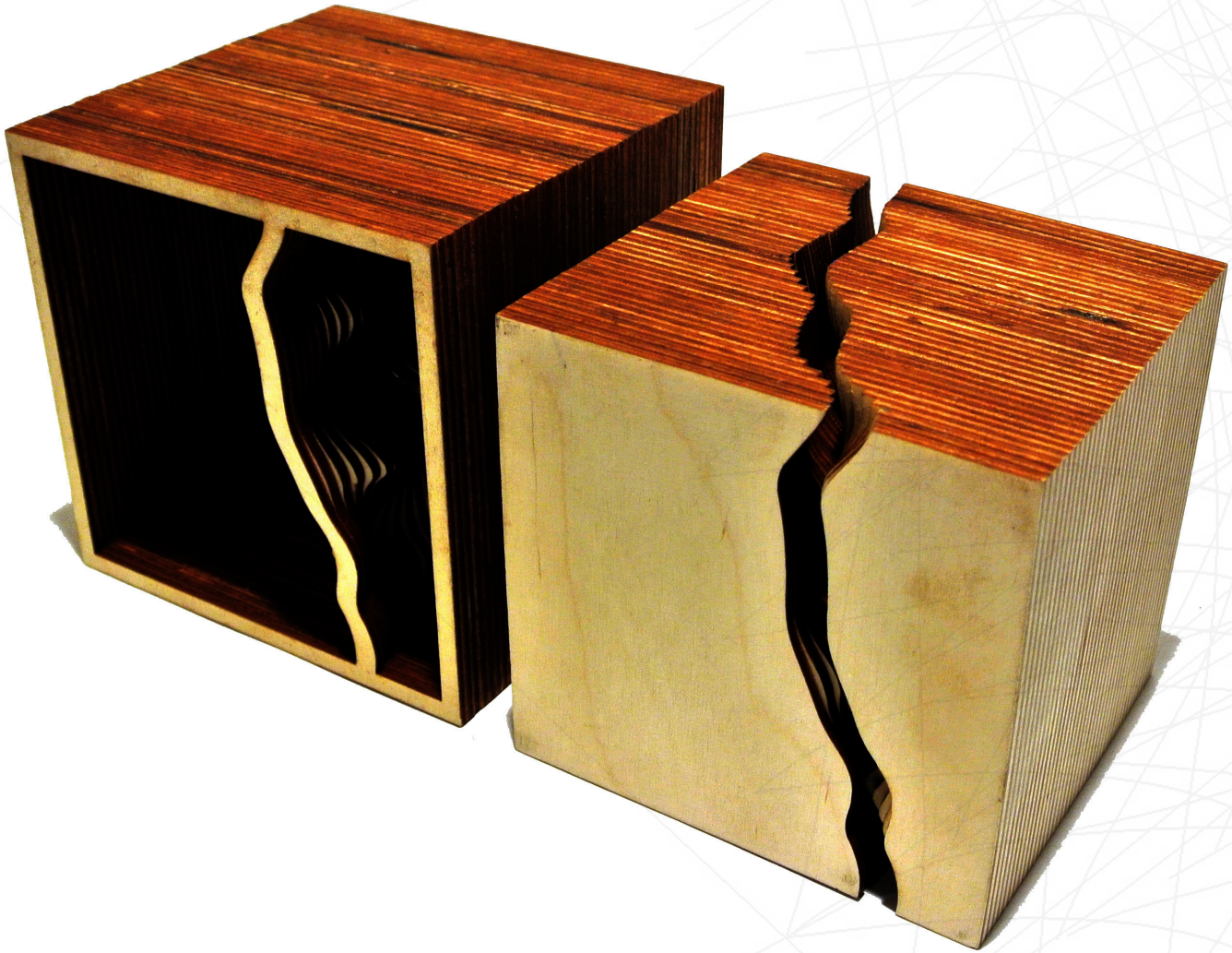




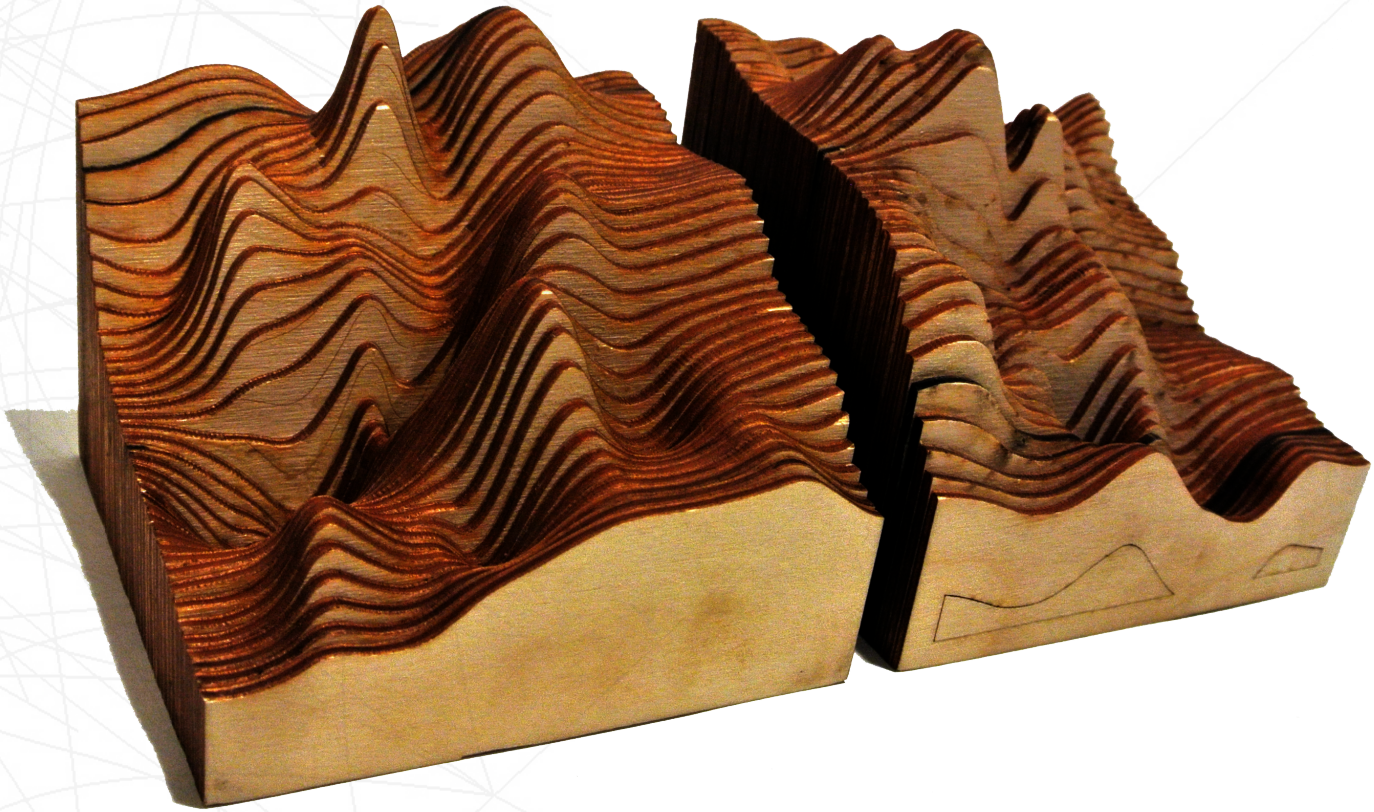


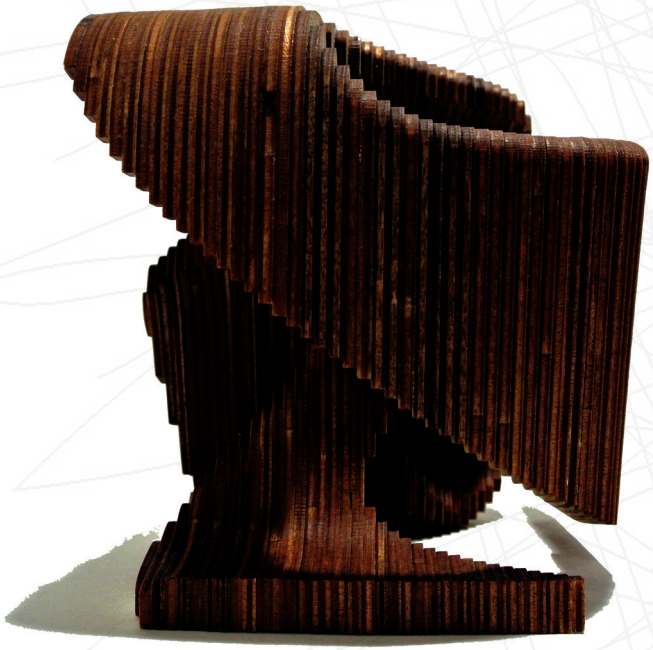
Intensity



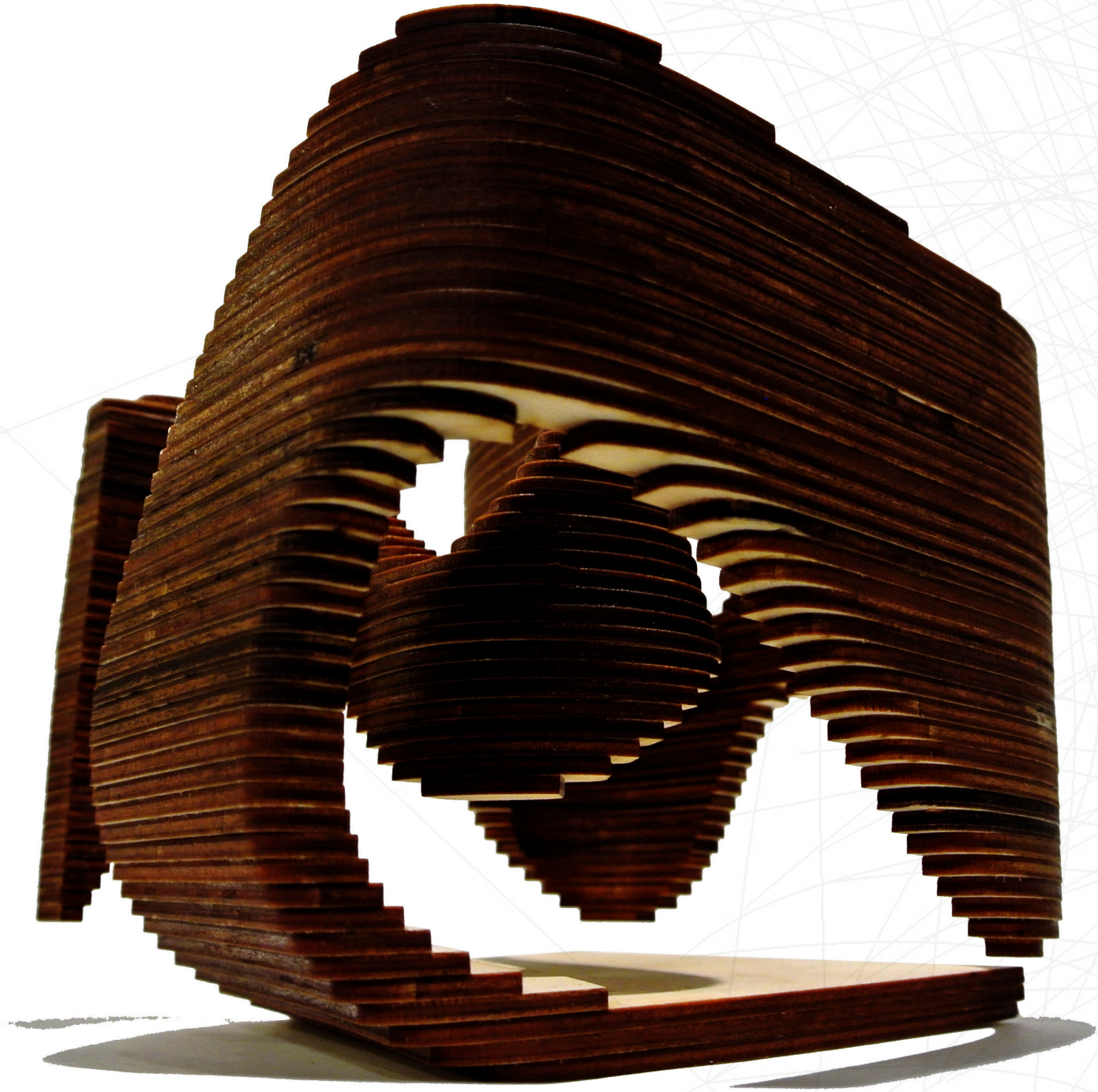


Intensity

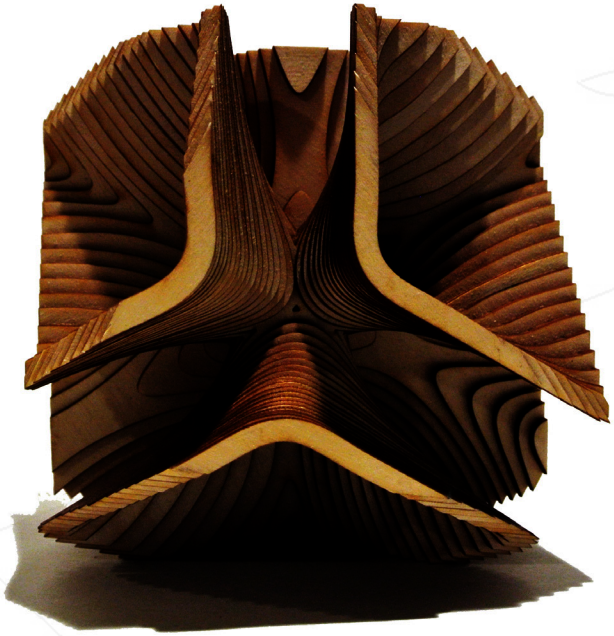


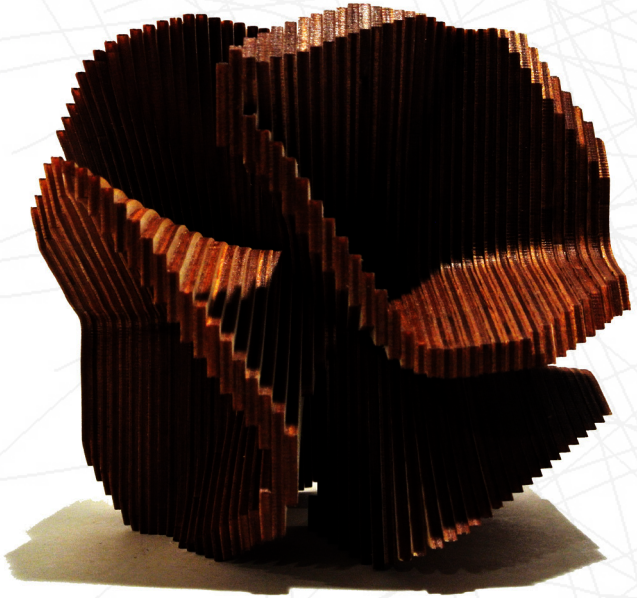


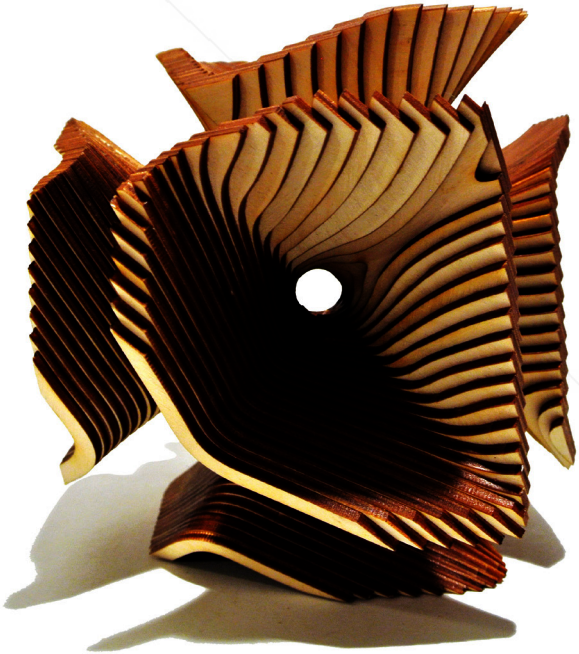
Continuity



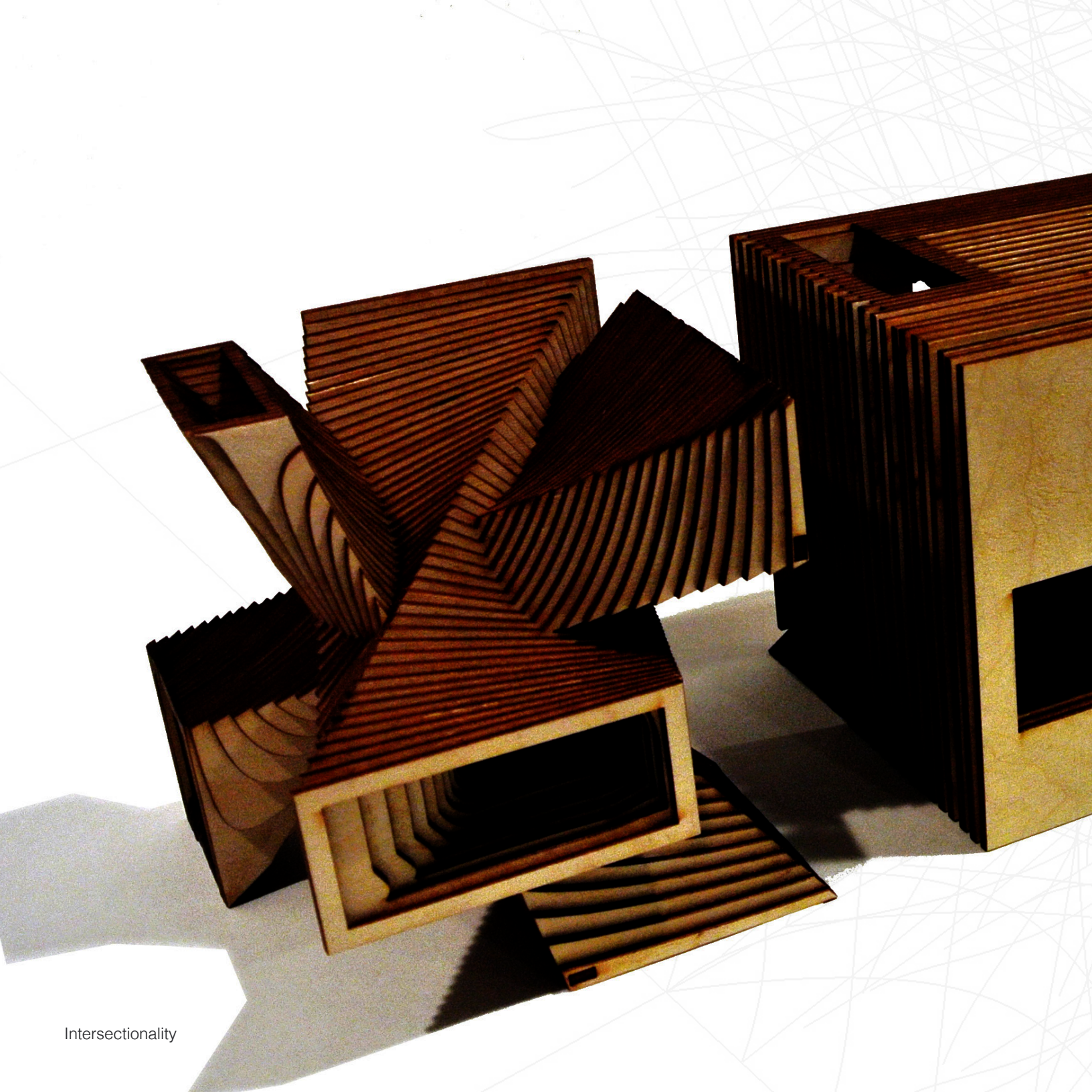
Continuity



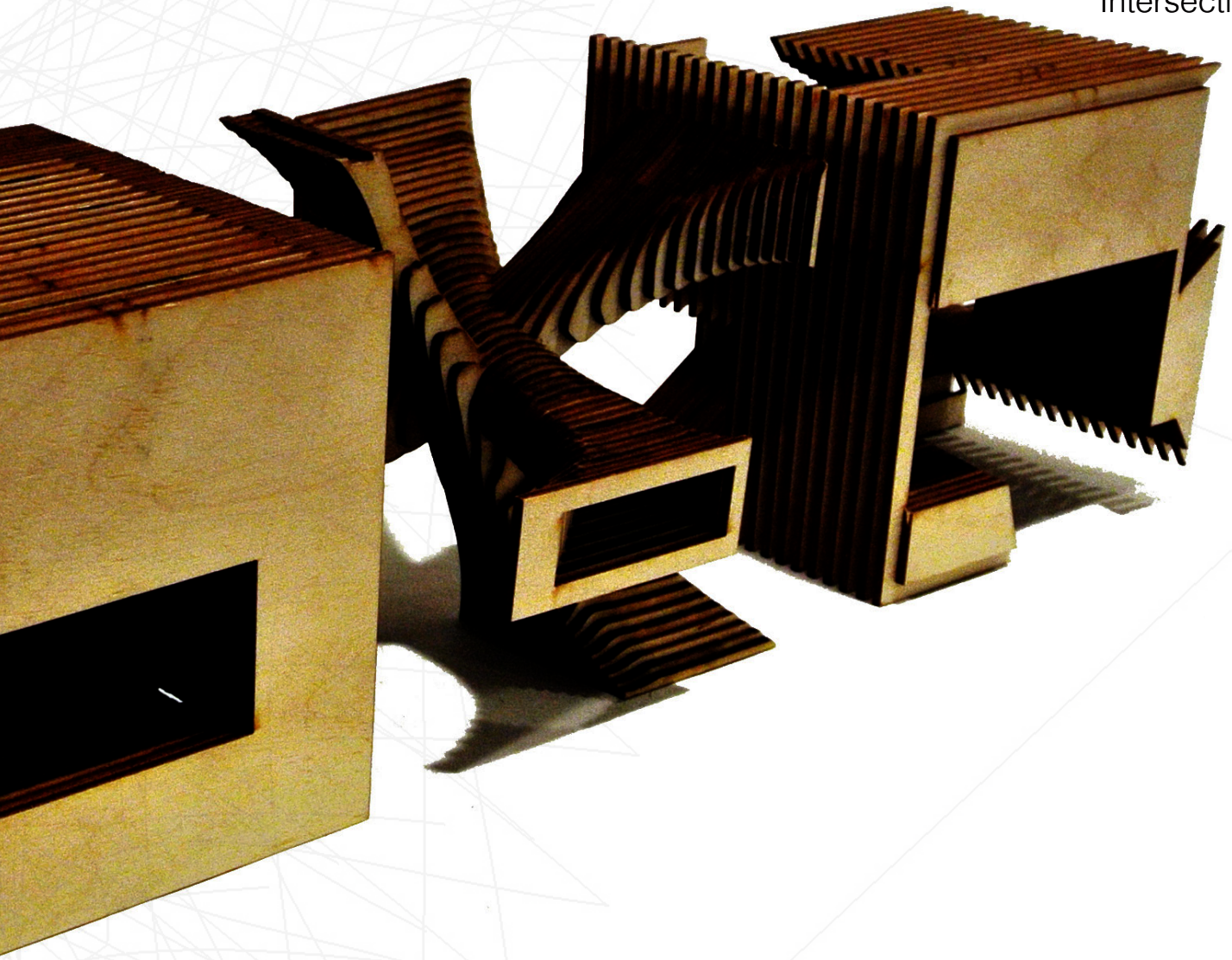


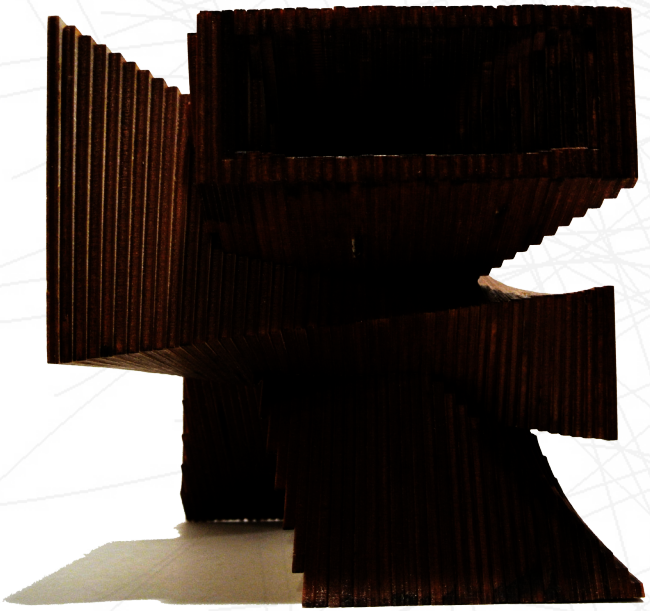


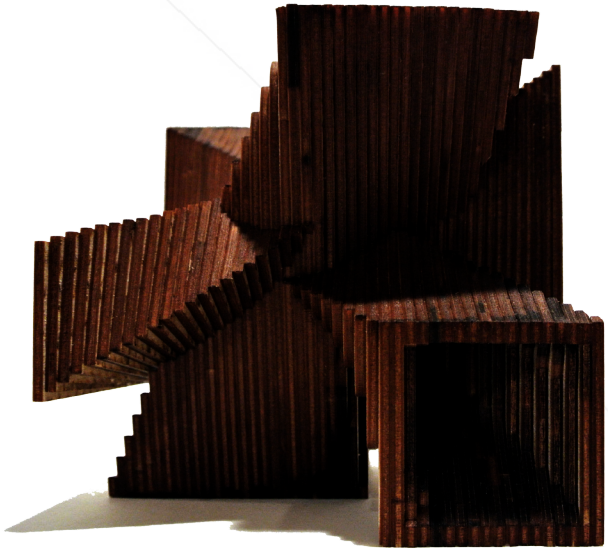
Connectivity



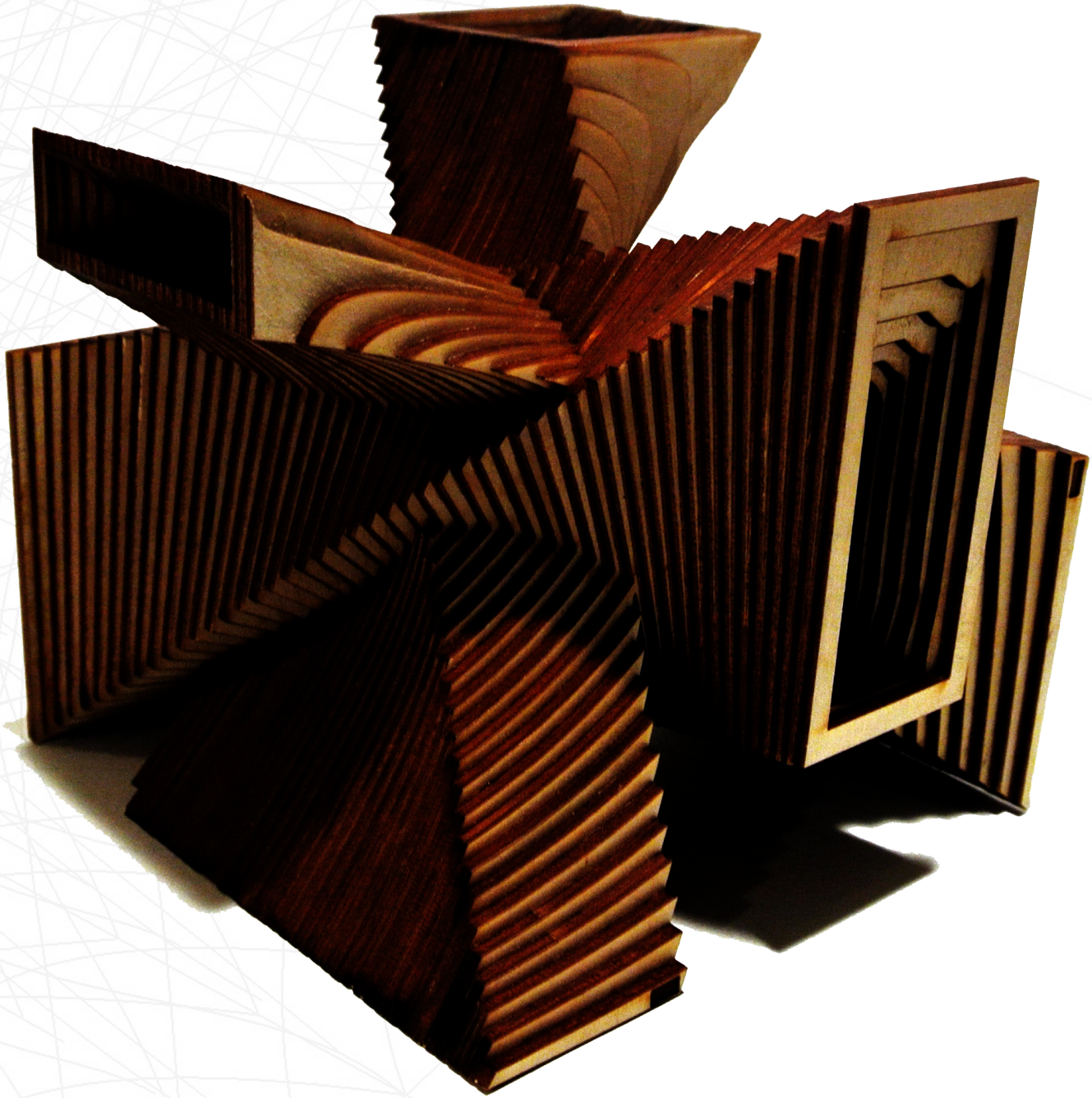
Intersectionality

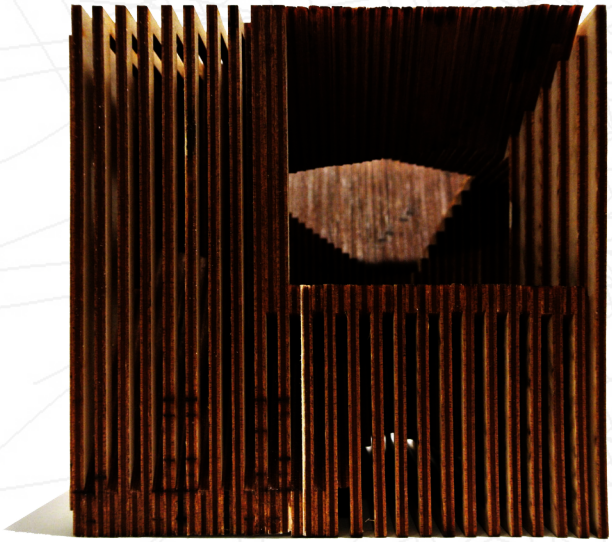


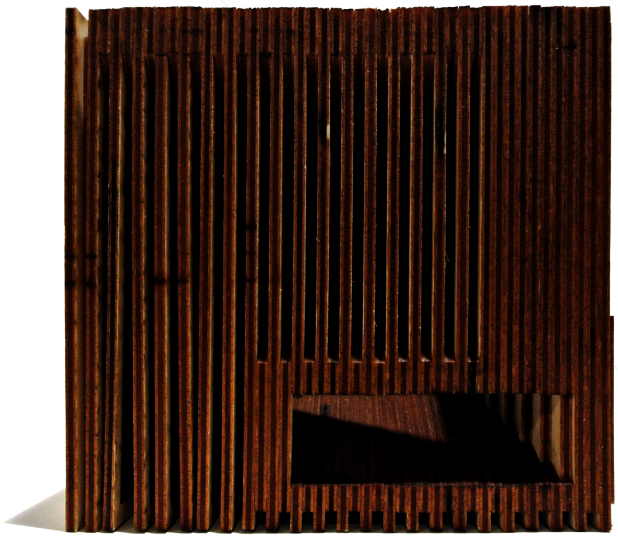


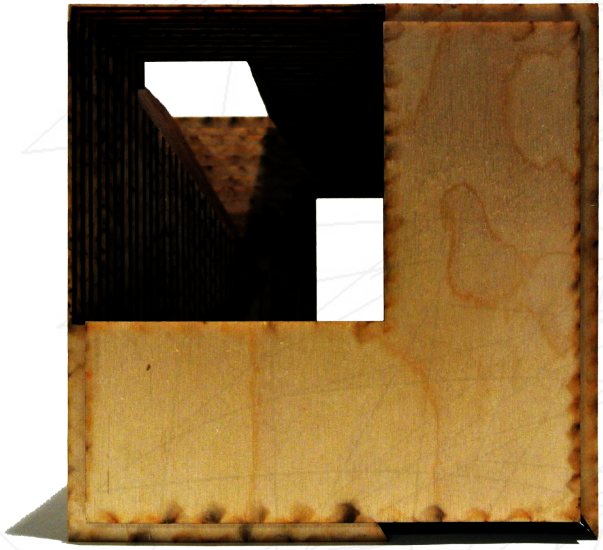


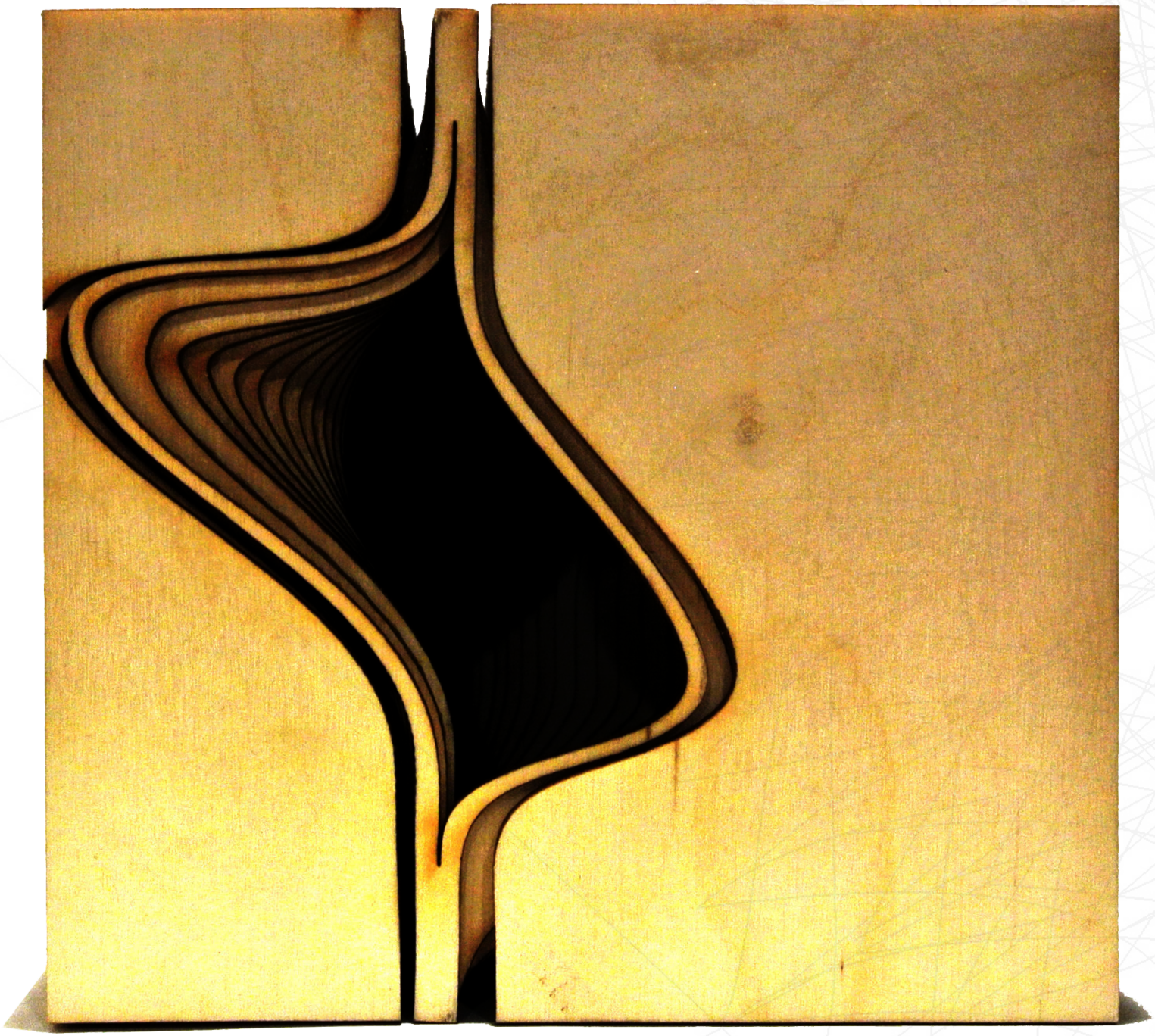
Intersectionality



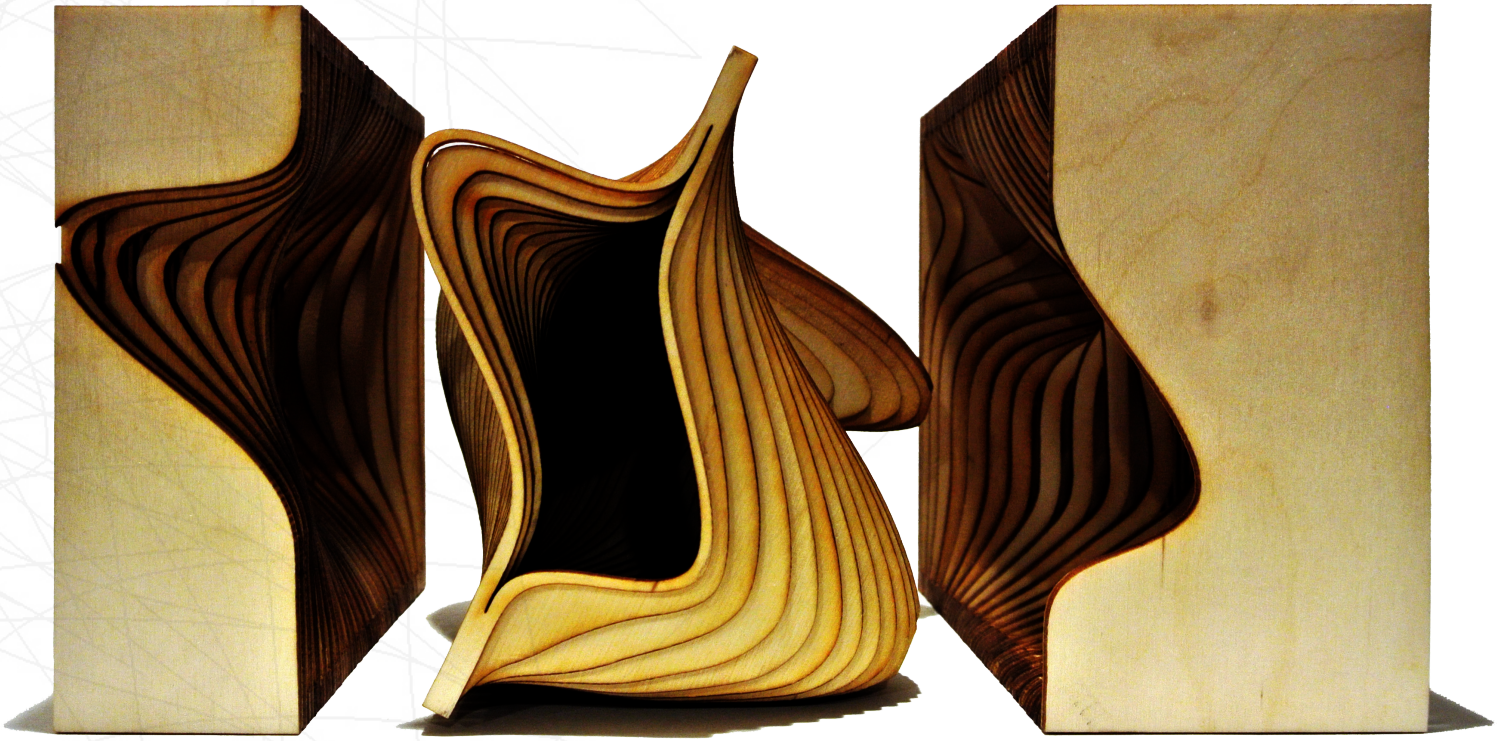


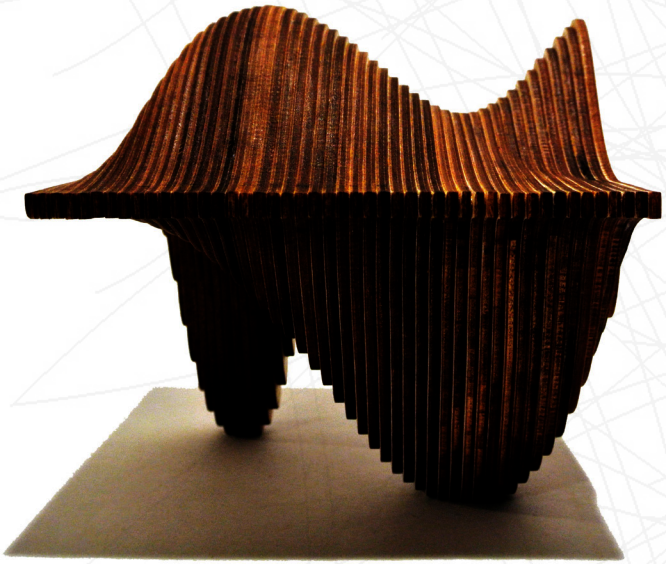


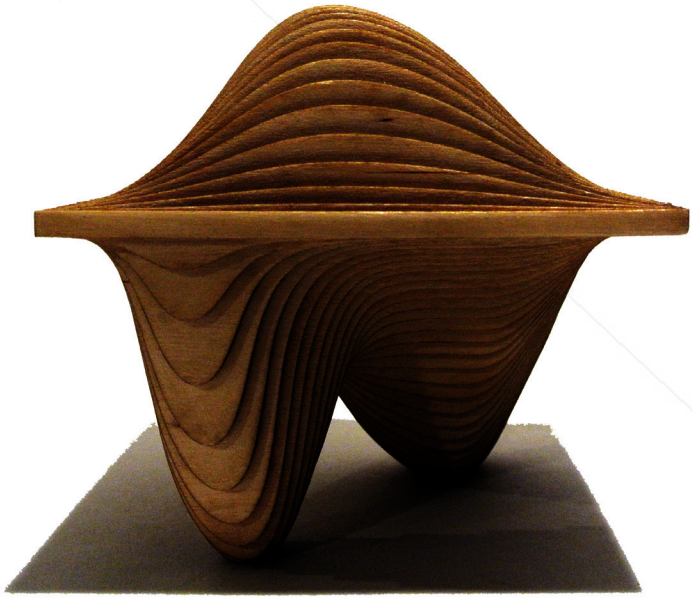


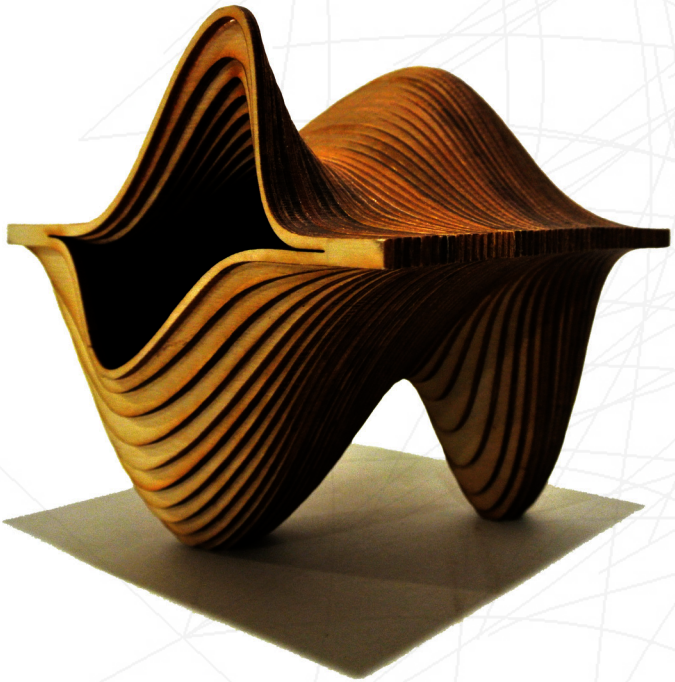


Interiority

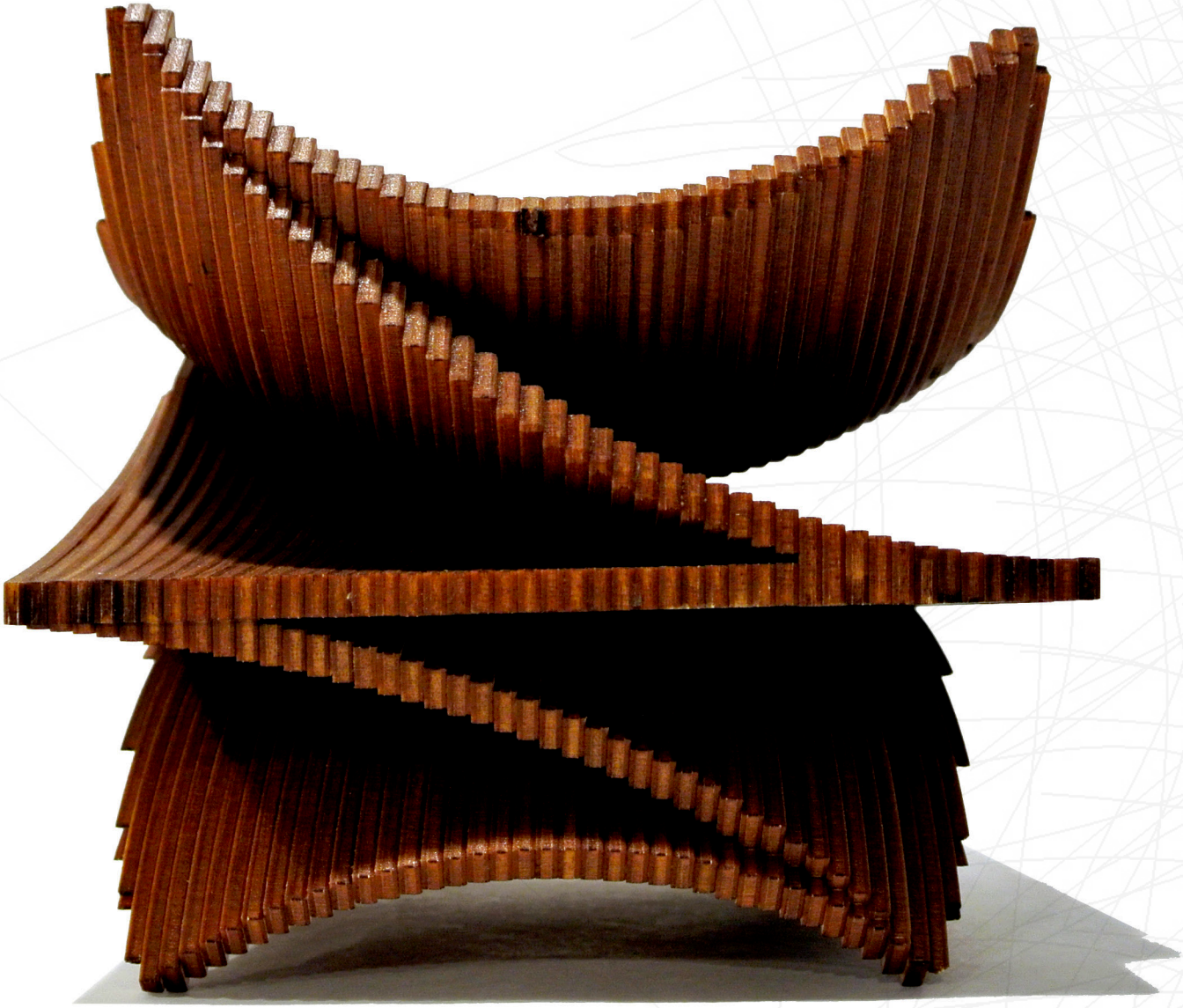




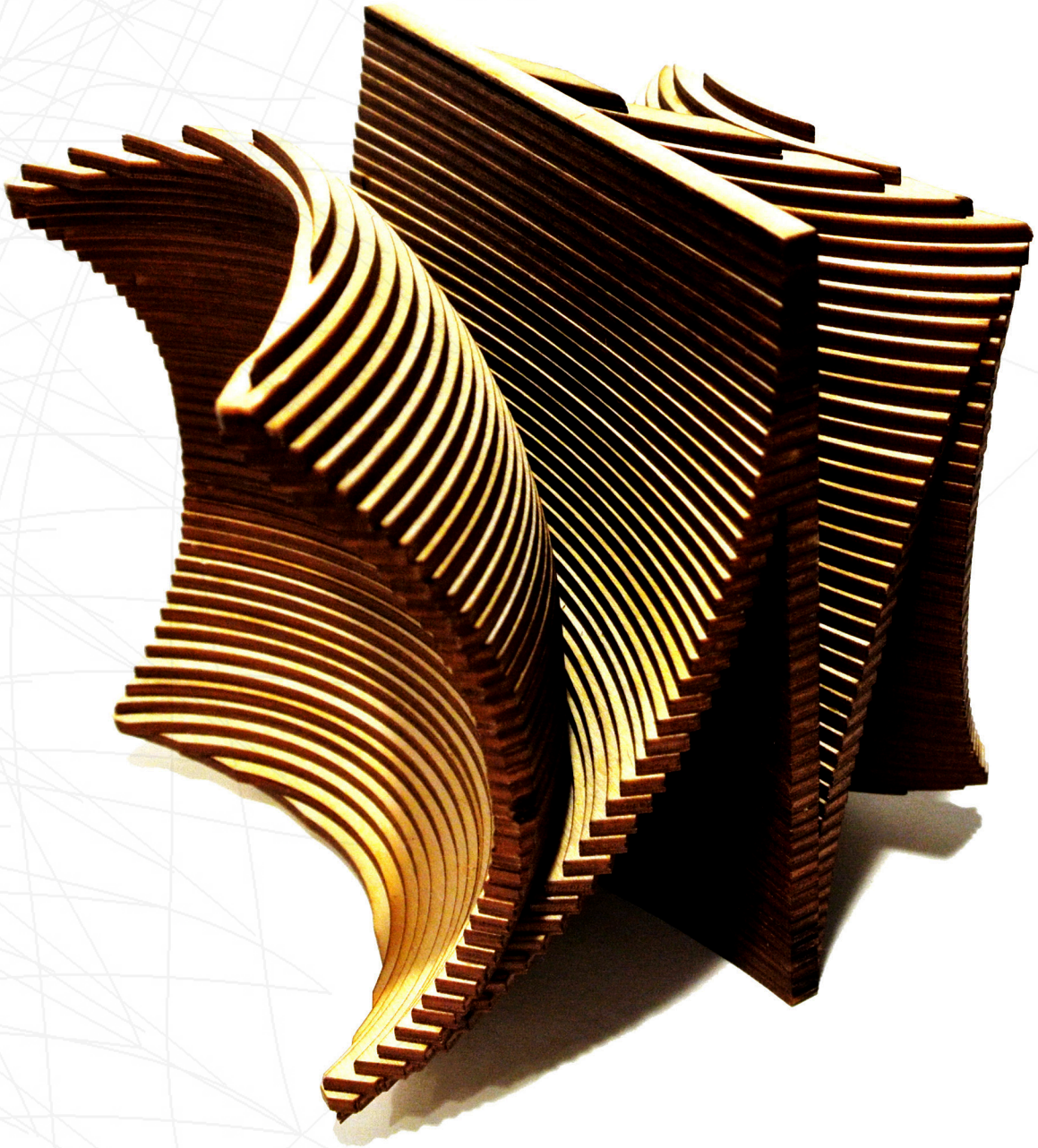


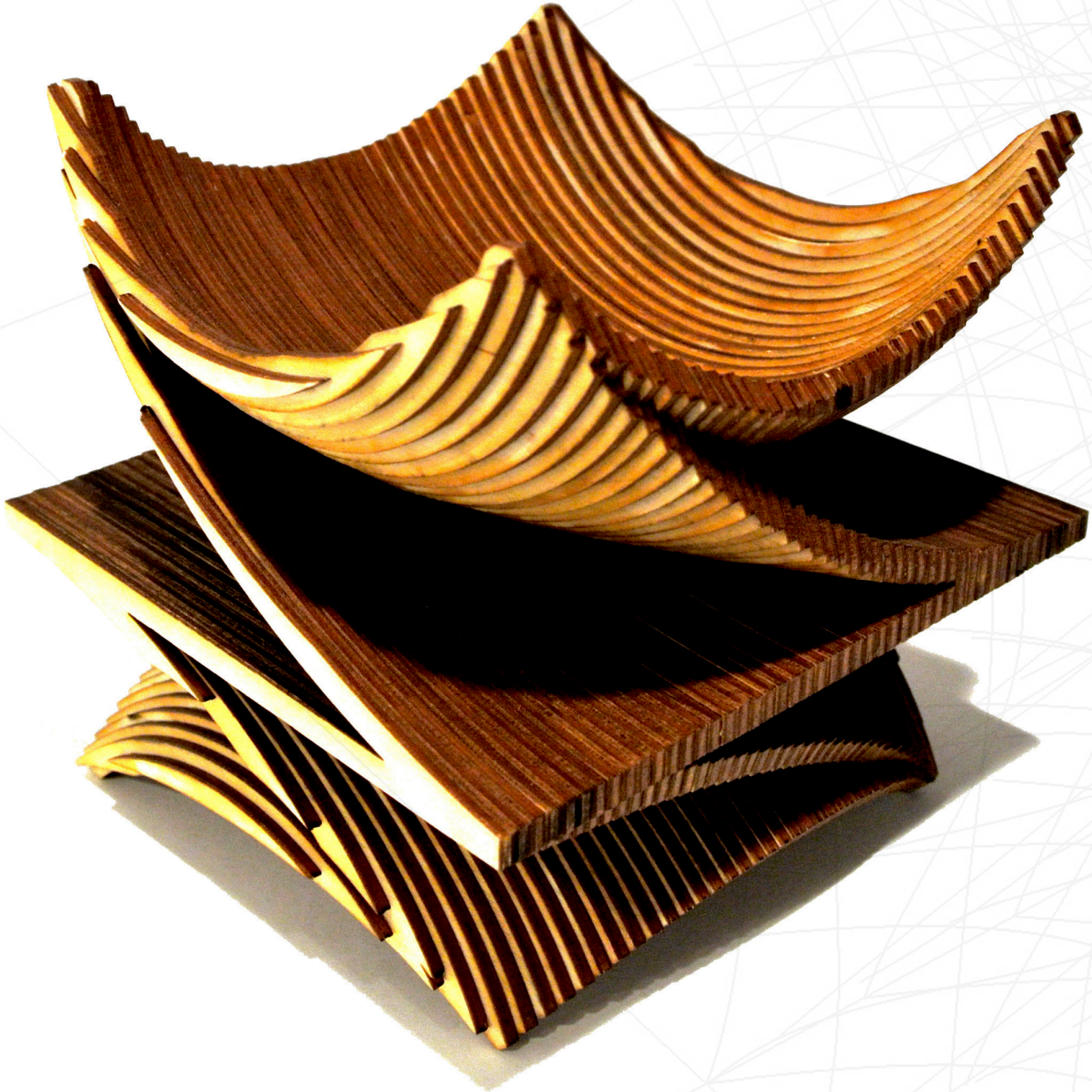


Interiority

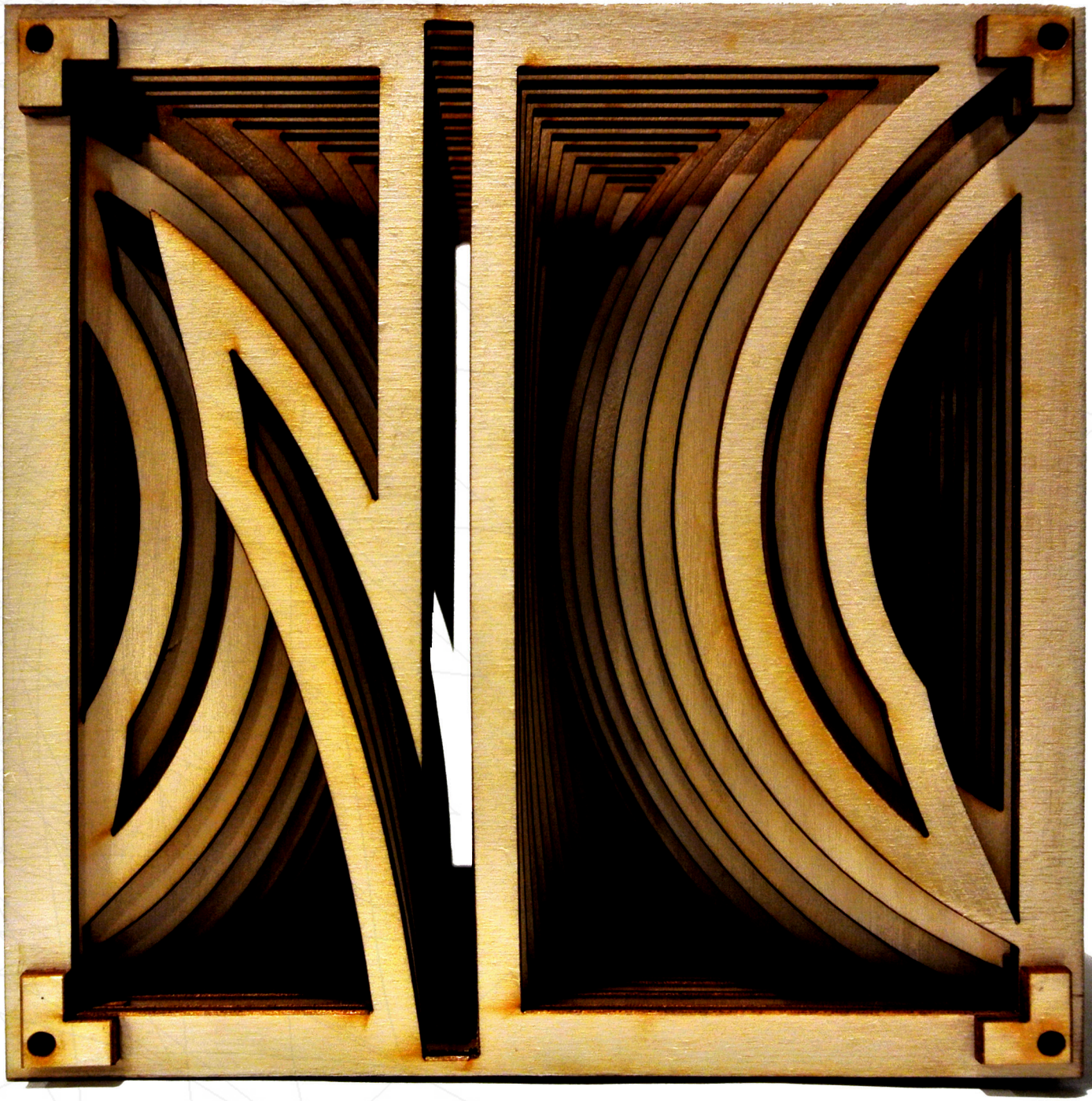


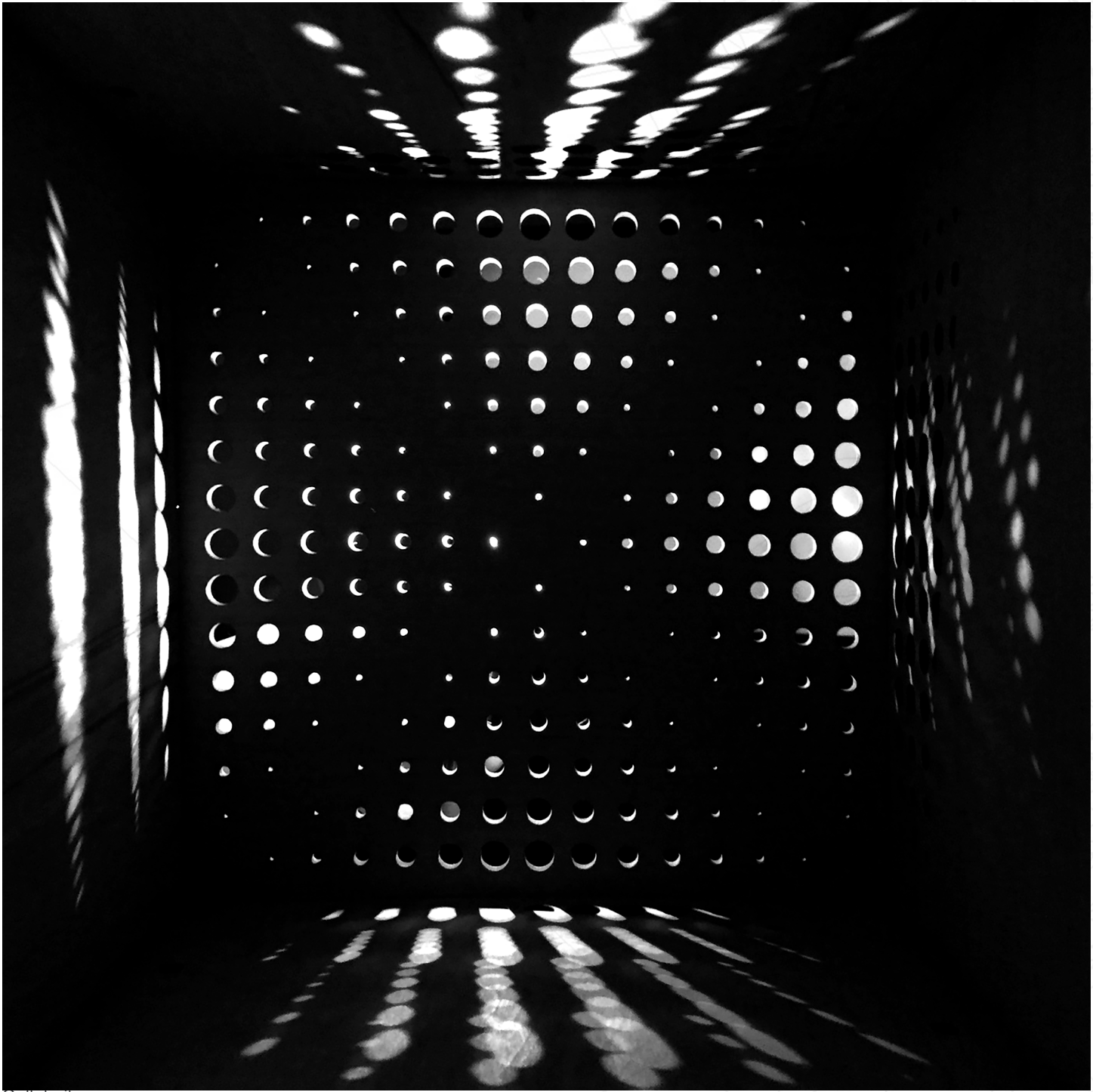
Peelability





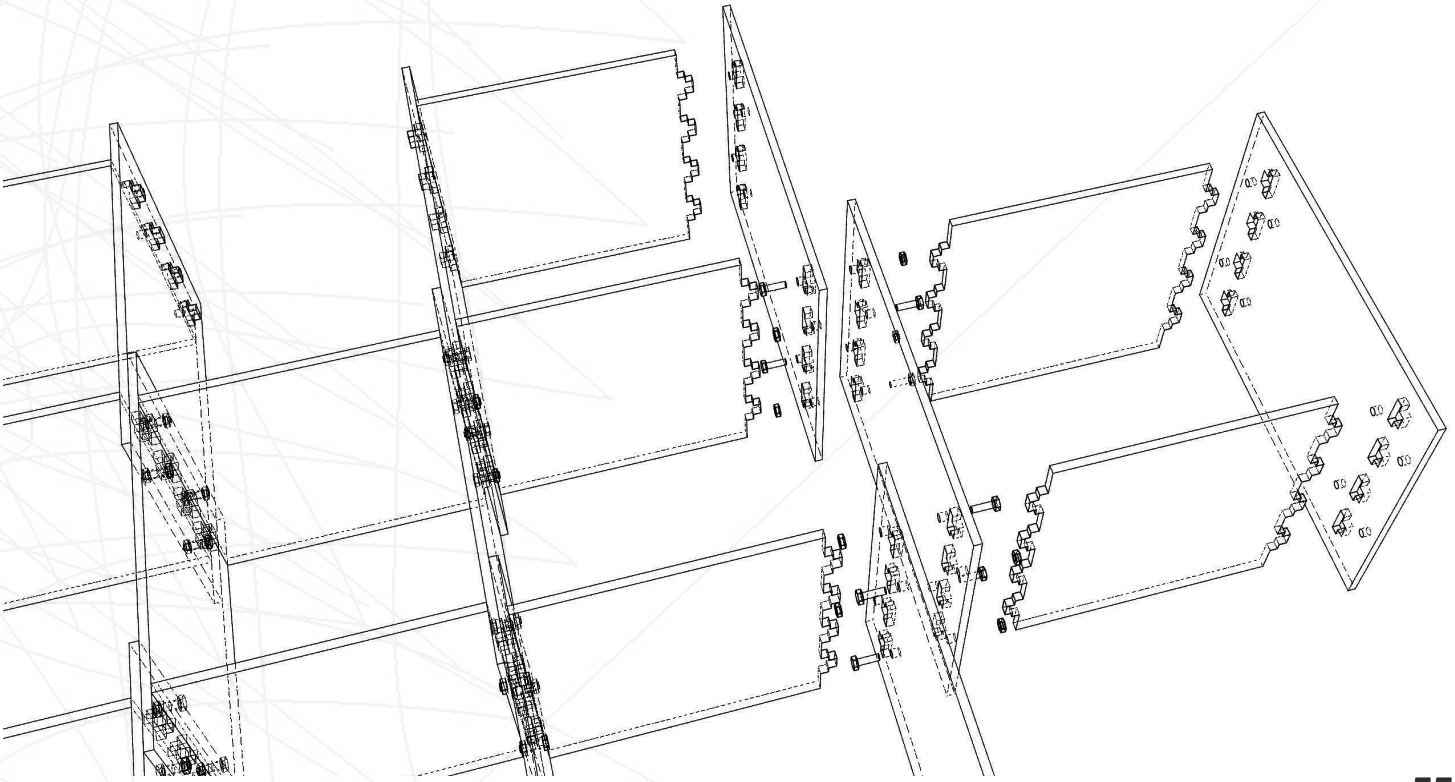
Peelability

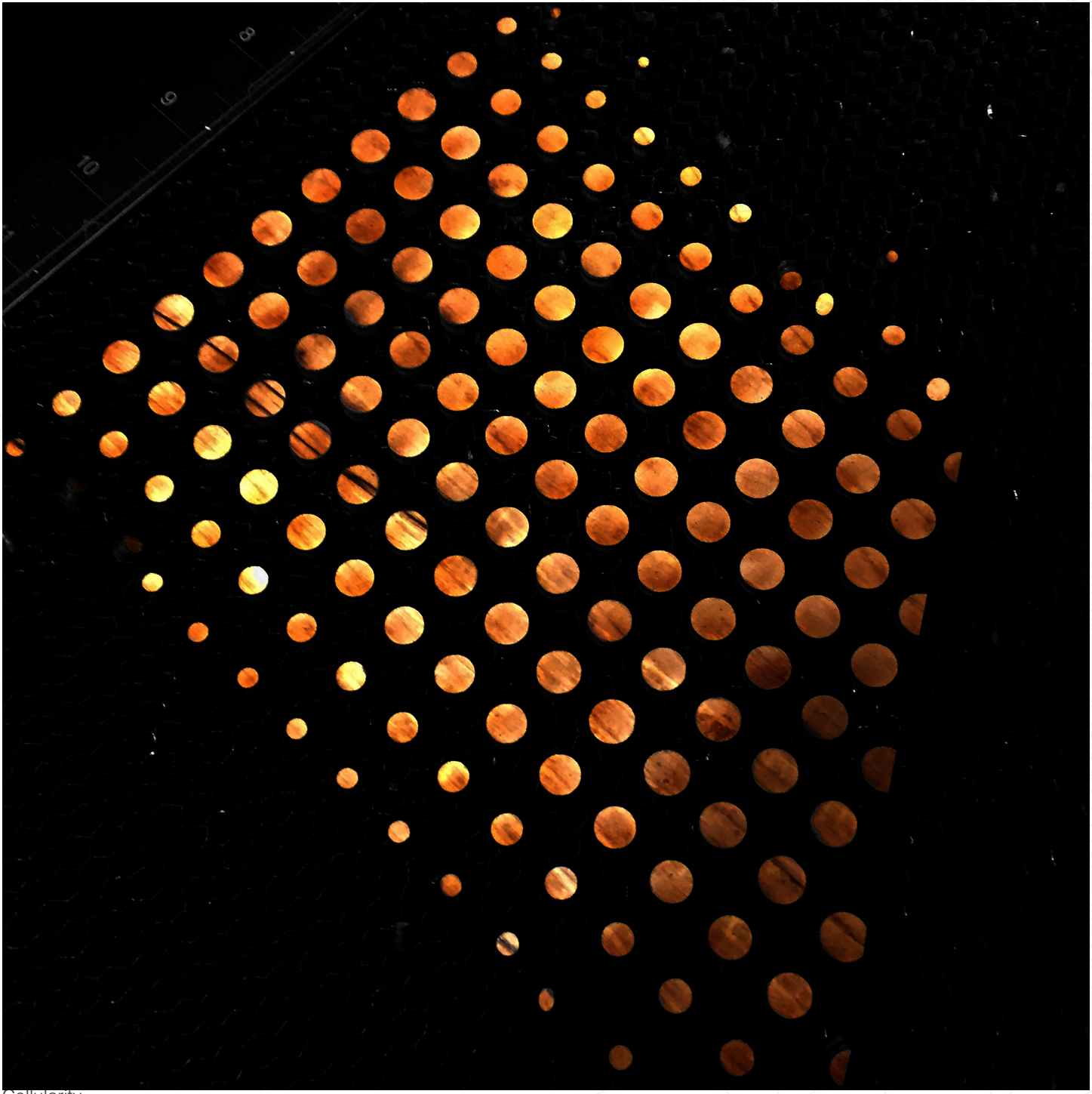




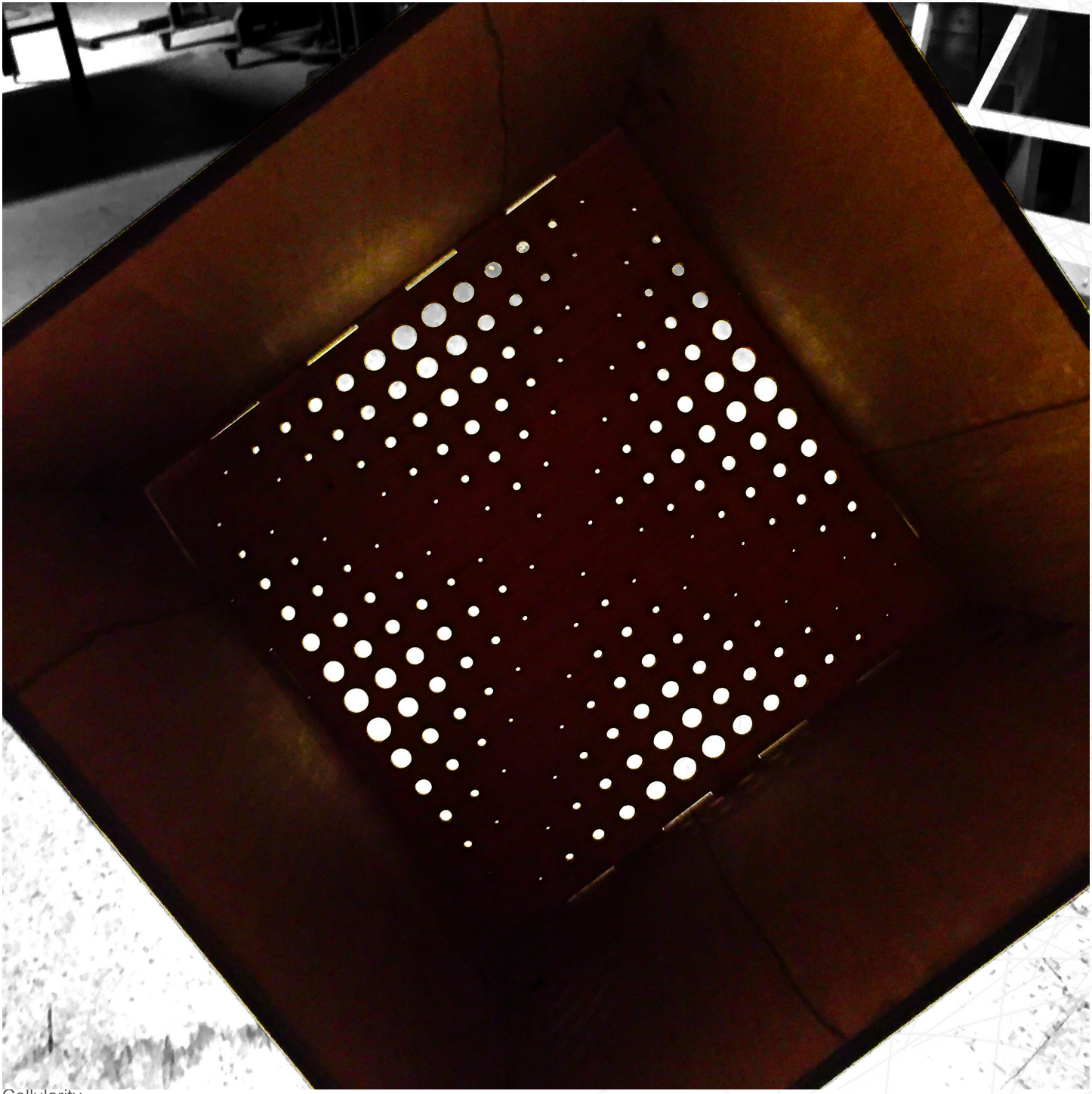
Cellularity

Cellularity was a full scale attempt at actualizing the virtual. The challenge being, transitioning from the 6”x6” cube of the original 7 virtualities, to full scale wall using the same tools. When scaling up, a transition in design and thus assembly was made form the original layering, to that of a cellular structure. Cellular in the sense that the entire wall is made of 10”x10” boxes, each with similar properties, yet unique in relation to them all. What makes each cell unique is the virtual surface of variable curvature used in the digital model to slice the face of the wall, giving it the appearance of subtle movement. Each cell interlocks at the corner with bolted connections to ensure its stability. The idea being that any and all the virtualities could be built at full scale with this system. However, when scaling up and transitioning form the layering to the cell, the surface of variable curvature dissolves in the voids.

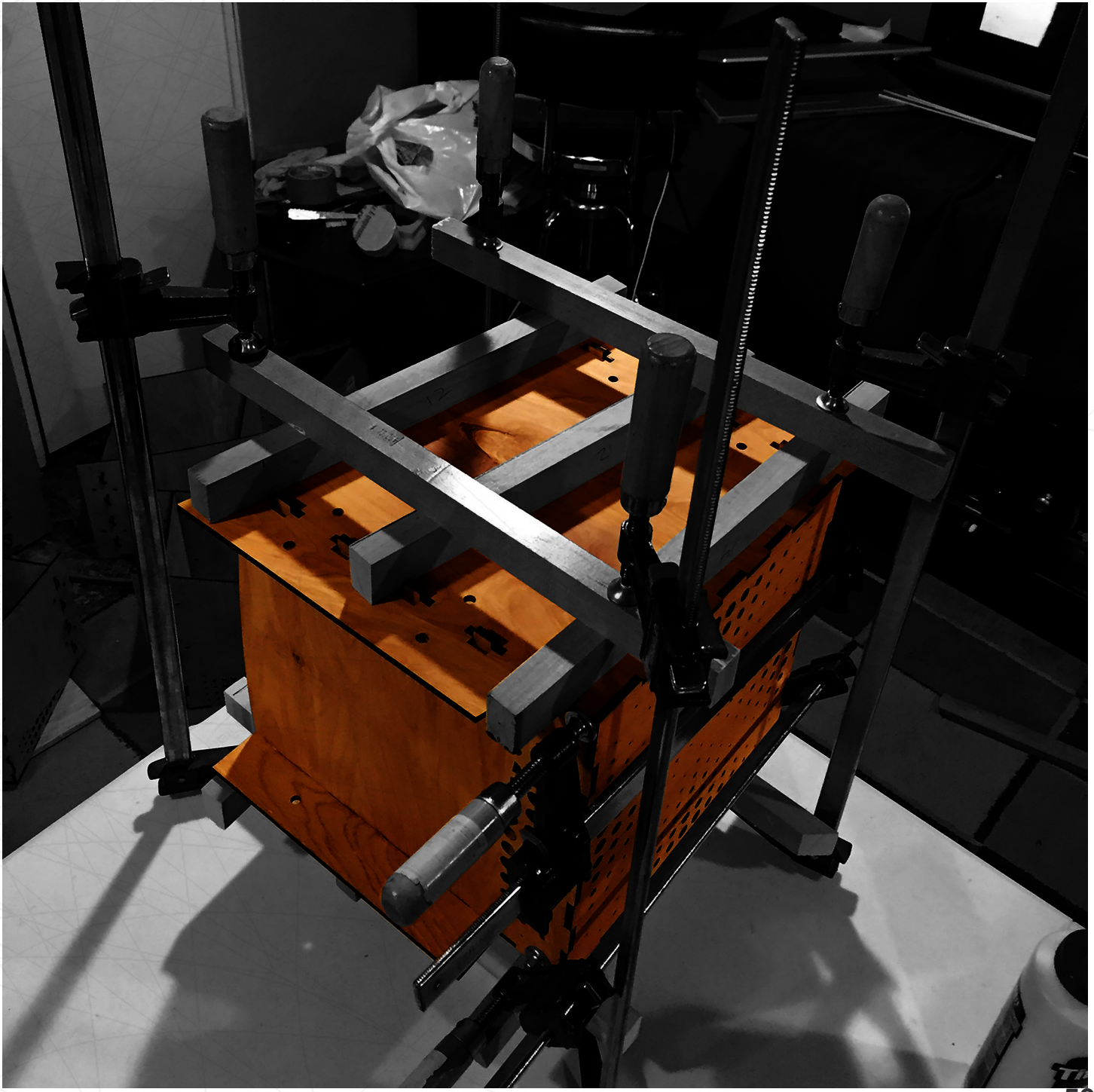


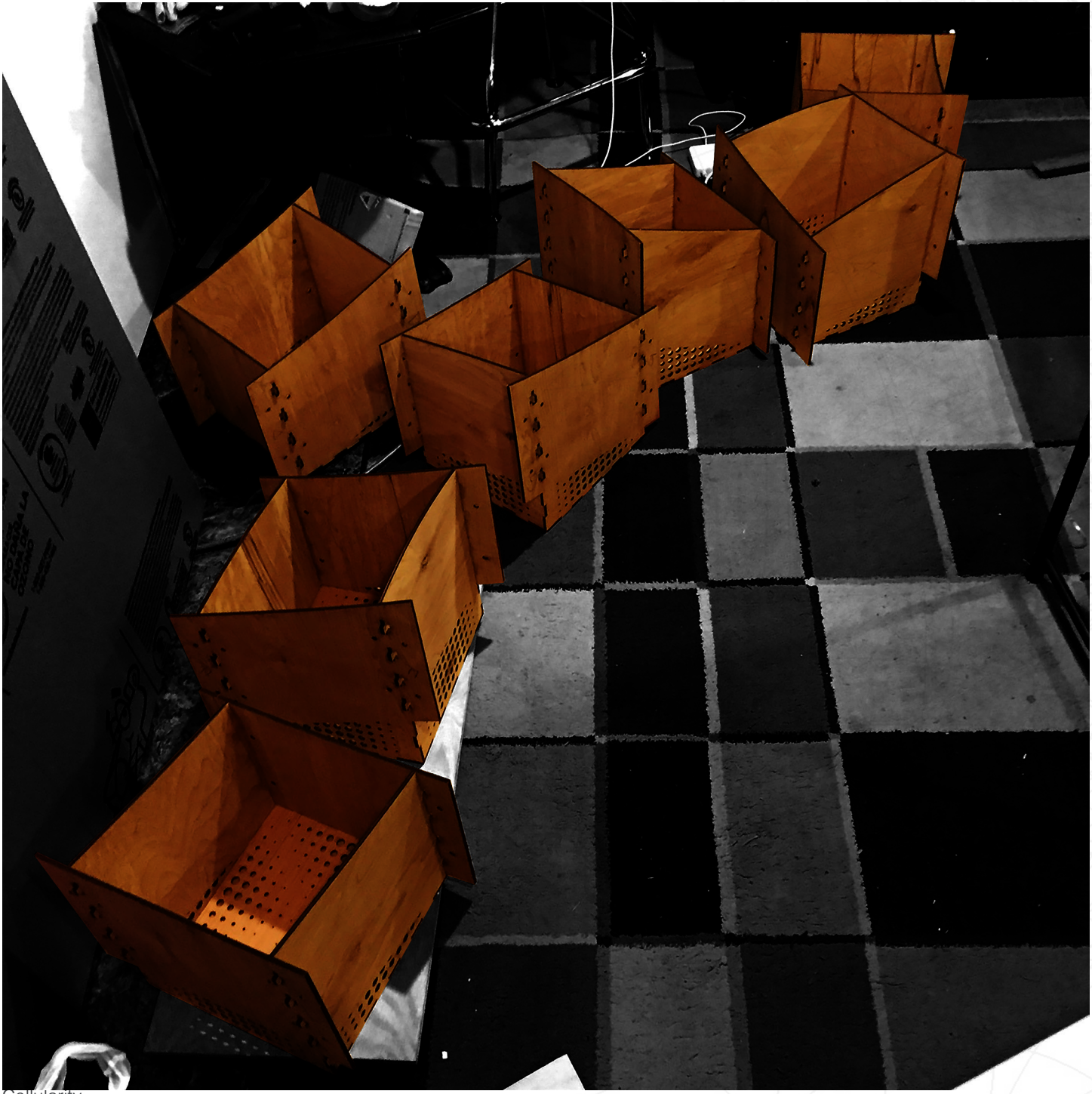


Cellularity



Cellularity

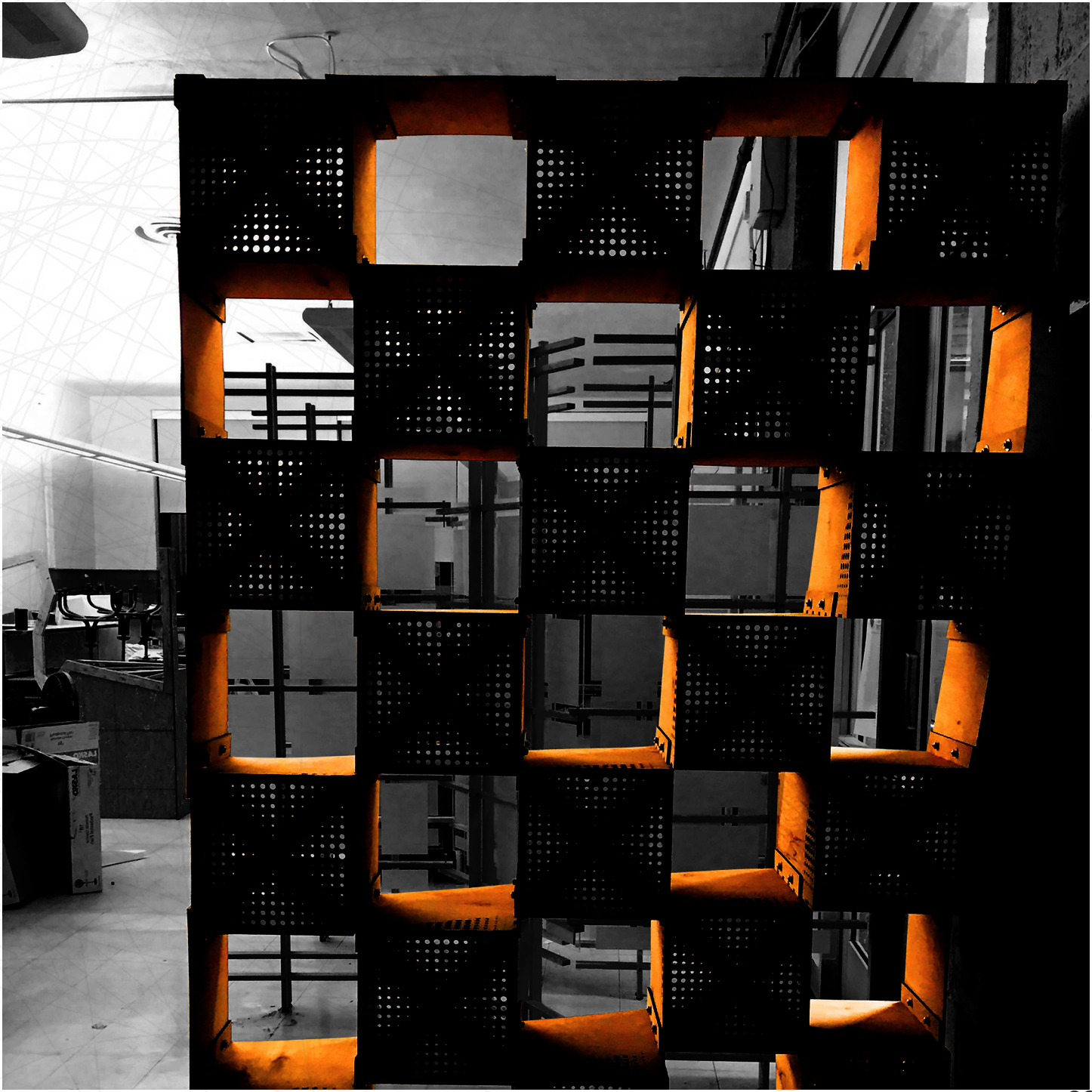


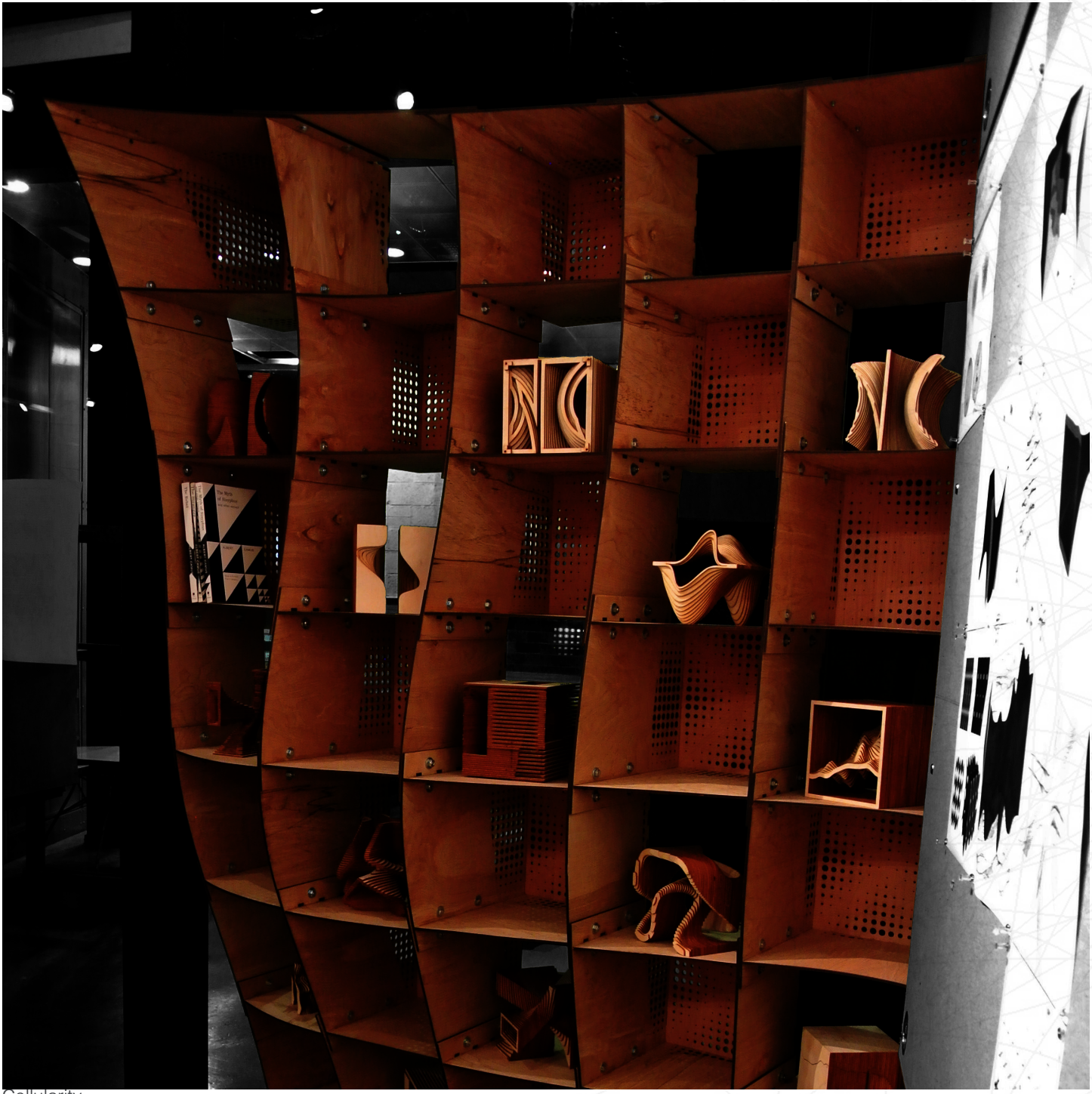


Cellularity

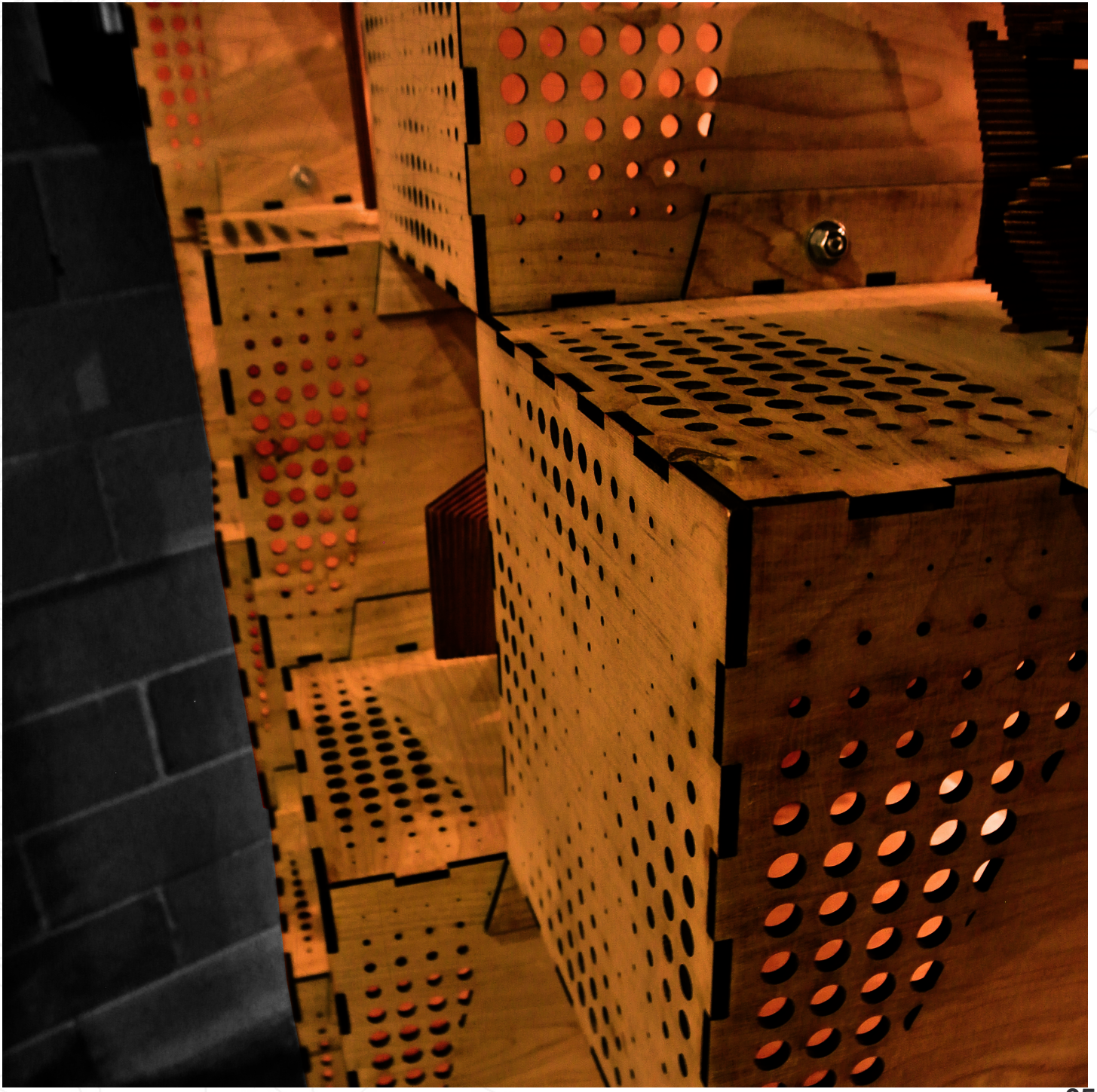
ond
MATE

Cellularity

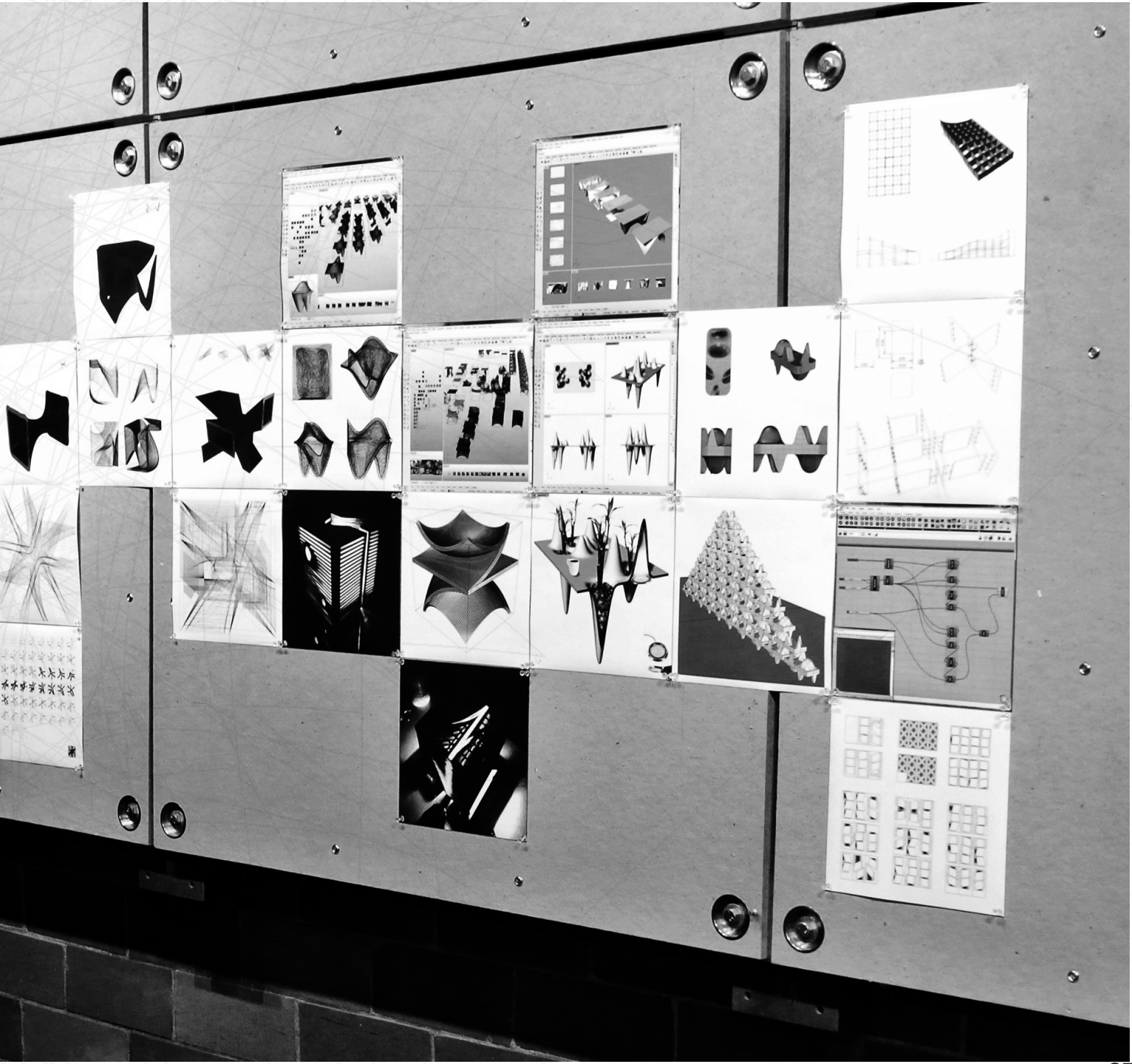




Cellularity



Cellularity



01 Lynn, p 11
02 Lynn, p 13
03 Lynn, p 15
04 Lynn, p 20
05 Lynn, p 15
06 Grosz, p 115
07 Grosz, p 117
08 Cache, p 17
09 Grosz, p 93
10 Cache, p X
11 Grosz, p 116
12 Lynn, p 10
13 Cache, p XIV
14 Grosz, p 129
15 Cache, p XIV
16 Grosz, p 129
17 Cache, p XIV
18 Grosz, p 129
19 Grosz, p 129
20 Corbusier, p 271
21 Lynn, p 20
22 Pallasmaa, p 14
23 Pallasmaa, p 67
24 Rybczynski, p 4
25 Cache, p 29
26 Cache, p 23
27 Cache, p 25
28 Kubler, p 30
29 Grosz, p 173
30 Grosz, p 175
31 Grosz, p 111
32 Grosz, p 111
33 Grosz, p 125
34 Grosz, p 125
35 Cache, p 62
36 Cache, p XII
37 Cache, p XII
38 Cache, p XIV
39 Bachelard, p 236

Bachelard, Gaston, and John R. Stilgoe. The Poetics of Space. Trans. M. Jolas. Boston: Beacon, 1994. Print.

Cache, Bernard, and Michael Speaks. Earth Moves: The Furnishing of Territories. Cambridge, MA: MIT, 1995. Print.

Camus, Albert. The Rebel: An Essay on Man in Revolt. New York: Vintage, 1956. Print.

Camus, Albert. The Myth of Sisyphus, and Other Essays. New York: Vintage, 1955. Print.

Camus, Albert. (1991). The plague. New York: Vintage Books.

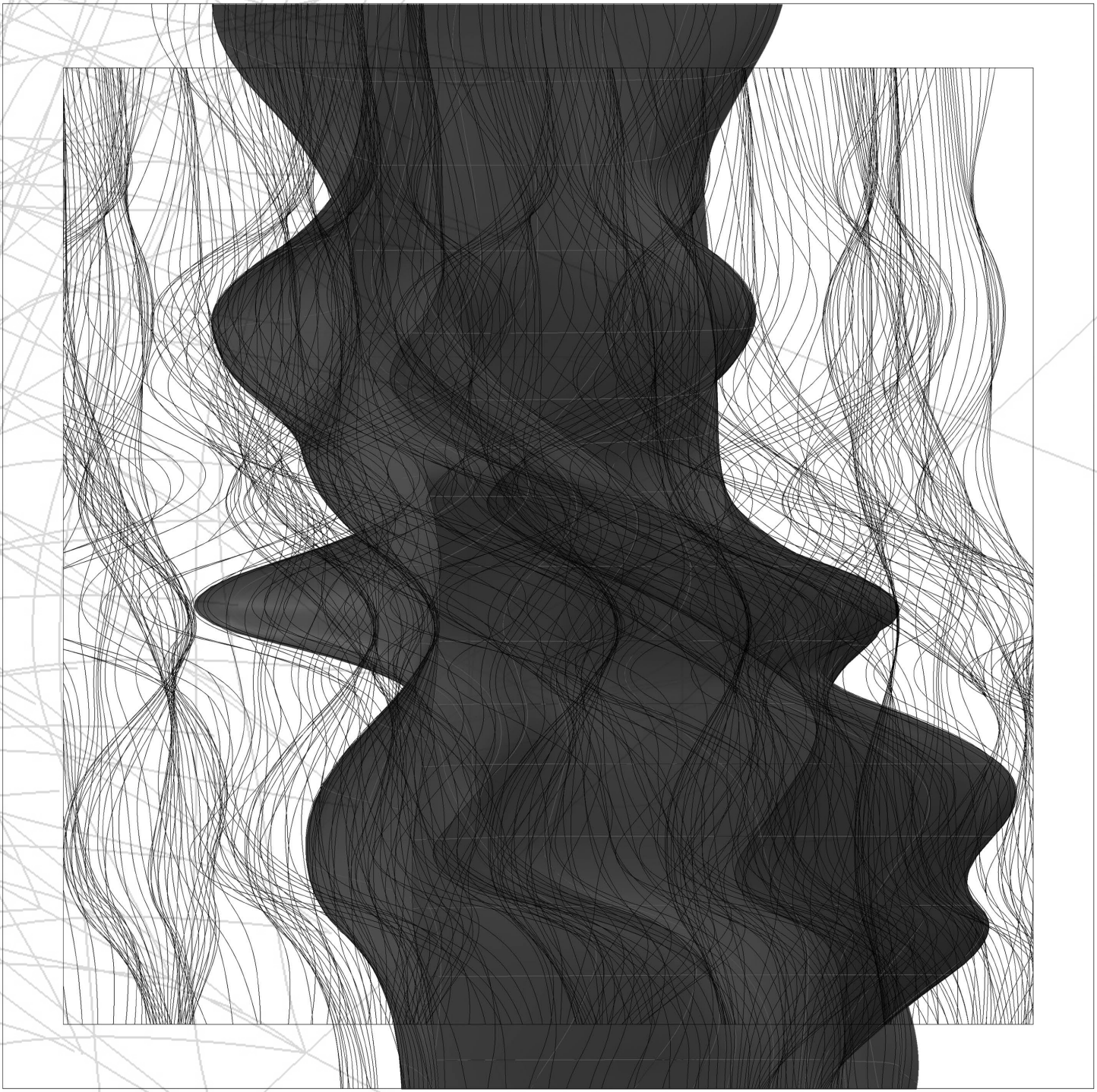
Corbusier, Le., & Etchells, F. (1946). Towards a new architecture. London: Architectural Press.

Grosz, E. A. (2001). Architecture from the outside: Essays on virtual and real space. Cambridge, MA: MIT Press.

Kubler, George. (1962). The shape of time: Remarks on the history of things. New Haven: Yale University Press.

Lynn, Greg. Animate Form. New York: Princeton Architectural, 1998. Print.

Pallasmaa, Juhani. The Eyes of the Skin: Architecture and the Senses. Ed. Helen Castle and Miriam Swift. Third ed. Chichester: John Wiley & Sons, 2012. Print.

Rybczynski, Witold. (2001). The look of architecture. New York: Oxford University Press.

Tedeschi, A., Wirz, F., & Andreani, S. (n.d.). AAD, Algorithms-aided design: Parametric strategies using Grasshopper.