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Architectural drawing as premise for a PhD project

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Abstract: As an architect I have been drawing a lot in my education. Now, in my ongoing PhD project about architectural drawing I use drawing as a way to drive and shape the project, not unlike how I have used drawing when I studied. I try to draw the PhD project forth as both drawing and theory and see drawing and theory as practices that inflict upon and develop each other, but try to avoid that one practice is subjugated to the other.

When describing this way of working as the project's method, it resonates with how I think architectural drawing works; how it becomes producing in a design process. So, peculiarly, the method of the project and the way architectural drawing can be producing have similarities. Both a research process and a drawing process are epistemic environments (Rheinberger, 2010, Bovelet, 2010) in the way that they are used to produce something new, new knowledge or new architectural drawing. But despite this similarity there are important differences between them; differences that have to do with what we aim at. Drawing can take place in processes of becoming of a work, as an animated process, where the goal of the process is not necessarily defined in advance. A research process should have a goal defined in advance, but also be open enough for this goal to be redefined as you go. The outcome of the research process in my project, the theoretical part of it, is the construction of terms and arguments, which are different from the construction of a drawing.

In this paper I present my PhD project, where I approach architectural drawing, especially orthogonal drawing, as a collection of double conditions, such as analogue and digital notation, the hand and the computer, projections and notations, figures and scores, icons and codes, indeterminacy and determination. To see drawing as double condition is a way to show how opposing trajectories co-exist and can be producing for each other.

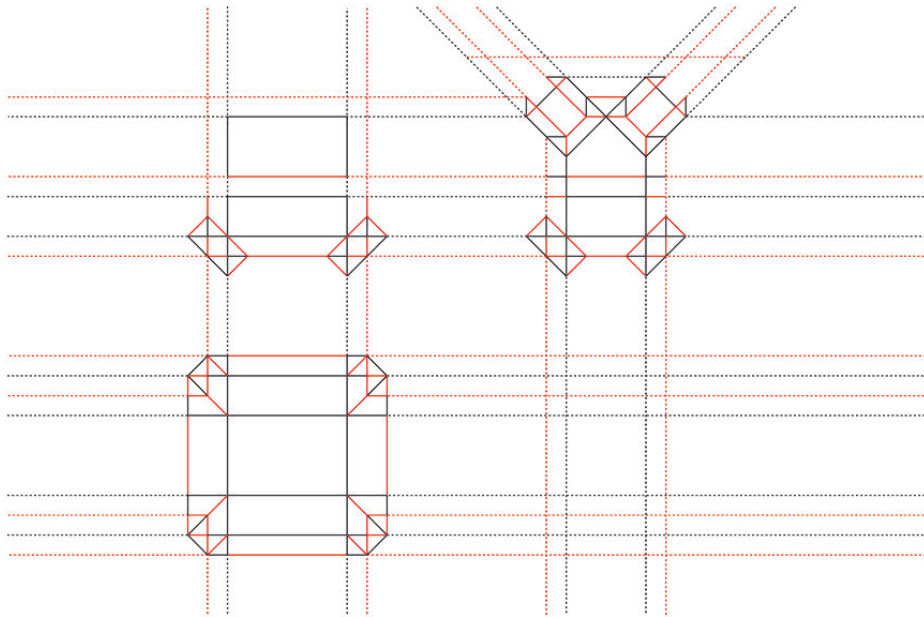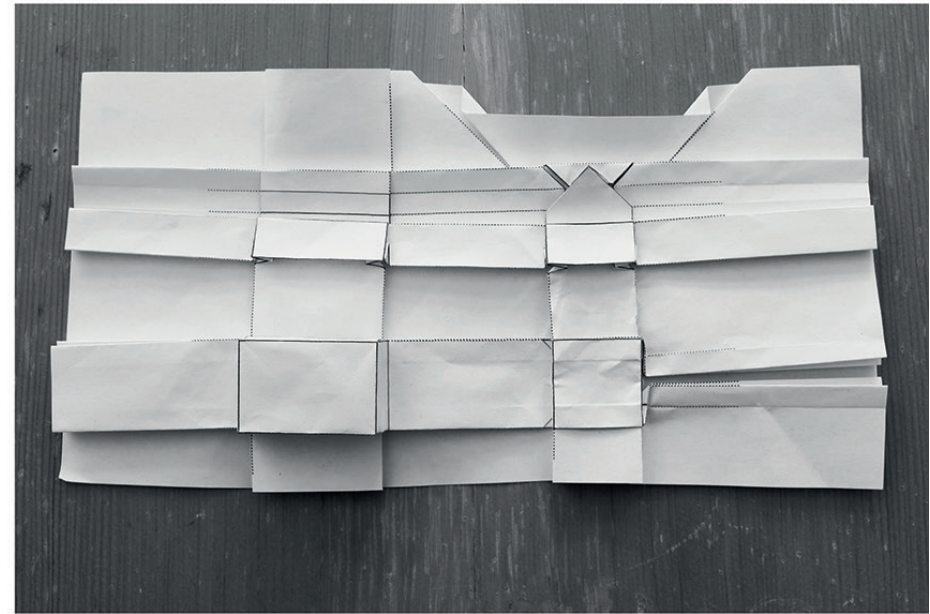**Keywords:** Double conditions; Drawing and Theory; Sketch and Diagram.

Figure 1.

The living drawing

"It's alive. It's alive!" (Frankenstein, 1931)

Architectural drawing is alive!

Throughout my PhD project I am hunting the animations of traditional, orthogonal architectural drawing, which I think are related to its diagrammatic affordances. When we draw a plan, section or elevation there is an animated situation at stake because of the way the architectural drawing system works; its mechanisms and systematic rules which are also open. The animation is a play of becoming, where one link in the chain triggers something more than the translation of intent. There is an animation between the architect and the drawing which does not belong to the one or the other alone, but to the interplay between them. And that is not the only animation; when the drawing is handed on to the next agent in the chain of architectural design a new animation happens, because the drawing carries signs and instructions, typically, for making a building. When a building is finished it makes up a frame around life, and the interplay between the building and the people who live with it makes up yet another animated relation.

Drawing has been the prevalent architectural medium for centuries but today the situation has changed because architects usually design with computers. That affects the way buildings are designed and subsequently

built. As Robin Evans has described, there is an intricate play between many factors and projections in the creation of architecture, invisible parameters in the gap between architect and building (Evans, 1995); the gap which is explored by drawing and, today, computer drawing. It is important that architects have a good understanding of what happens in the gap that our working media inhabit, and my project contributes to enhance this understanding.

As a medium, architectural drawing binds processes of thinking together with processes of material orchestration; an affordance that can be called diagrammatic. When we work on a diagram we work two-folded. We work on a visualisation of what we sense, think and imagine, and the visualisation works back at us. We negotiate our thoughts and sensations in a material guise which allows us to catch sight of our thoughts. In architectural drawing there is an operational momentum which makes it different from "just drawing", because it is used to orchestrate buildings, but, at the same time, the drawing cannot help being a context of its own, an artefact itself. The drawing itself is a site of creation, imagination and invention. Sometimes a drawing falls into oblivion after building is finished because it was a means to an end, where as other times, it becomes autonomous and disconnected from building, more like an individual work of art. This is a fundamental double mode of operation of architectural drawing: to be able to hold many different aspects of the sensed, the thought and

the imagined together in a drawing artefact "here and now" and at the same time be used to transform the physical world "out there". In order to orchestrate the world "out there" architectural drawings work by shared notational conventions such as scale, measurements, geometry and through understandable graphical signs and system which enables building. Drawing therefore can be a technical facilitator that grants reversibility between the drawing and building as check list, however, there is more to drawing than that. The sketching process where imagined spaces come into being happens in drawing, and is not too concerned with measure and control. We take liberties when we sketch and are free to continuously ask "what if" and postpone the "then" (Cooker, 2011). Sketching allows us to cultivate ideas and sensations, which can be directed towards an already given goal. But sketching can also be a way of inventing the very goal as we draw (Bertram, 2013). These two processes that drawing can facilitate are closely related to, but not exactly the same as the difference between drawing as technical facilitator vs. imaginary drawing.

When architecture became a distinct profession different from building during the Italian Renaissance, the gap between architect and building was occupied by drawing and its projective systems. It made it possible for architects to control building through drawing, but, paradoxically, it also made it possible for drawing to detach itself from building and still remain architectural. That both things are possible has to do with the shared

conventions of architectural drawing, which makes up a system of graphical communication. As long as we use the conventions there is an entry back into the realm of building no matter what we draw. This does not mean that the transformation of an imaginary drawing into a building drawing happens seamlessly or goes unnoticed, but it means that things usually outside of architecture can be let into architecture through the drawing. Inspirations, for instance, which might not have anything to do with architecture, can enter the world of building through the drawing medium and be transformed with it. Another way of letting something usually outside of architecture into architecture is to develop the conventions of the medium, that is, its notational system, because it makes it possible to transport something into architecture through other channels than the usual ones. To question conventions, then, is to question the usual chains of dependency of the medium and to be aware that a medium co-forms that which we use it to orchestrate (Bovelet, 2010).

Drawing + Theory, Sketch + Diagram

The negotiation of drawing conventions and the way architecture becomes by drawing is related to the methodology of this Ph.D. It is an artistic research project which is a relatively unconventional and young branch of research. The mechanisms and dynamics of becoming are of main interest both in relation to the project's understanding of architectural drawing and to artistic research methodology. Therefore, the projects theme,

architectural drawing, and the way knowledge is produced and handled in the project, are quite similar. I approach both areas as being related to sketching and diagramming, phenomena which can be considered to be epistemic practices of architecture as well as science (Rheinberger 2010, Bovelet 2010).

In drawing's two-fold character of being itself an artefact and orchestrating an artefact outside itself, we can retrieve a range of relations between notational forms and agencies that may seem opposing but nonetheless co-exist and depend on each other. I try to capture the relations between terms that are often considered to be opposing, such as analogue and digital, but not for that reason cancel each other out. Drawing's most basic two-folded-ness is that it is both an act and an object. Architectural drawing is basically double, because it is used to orchestrate building, but at the same time is an artefact in itself, as already mentioned. In architectural drawing analogue and digital notation, the hand and the computer, projections and notations, figures and scores, icons and codes, indeterminacy and determination meet; these are pairs of terms that are often thought of as opposing or even cancelling each other out, but I approach them as being co-existing and mutually influencing. These double modes should be seen on the background of drawing prevailingly being done with computers today.

- SCORE	●	ARTEFACT -
- DIGITAL	●	ANALOGUE -
- NOTATION	●	PROJECTION -
- COMPUTER	●	HAND -
- CODE	●	ICON -
- DETERMINACY	●	INDETERMINACY -

Figure 2.

I see these pairs as tendencies in a continuum and not either-or states, which means that two opposing trajectories are able to co-exist despite their diverging forces, and this diversity can even be reciprocally producing, producing architecture and meaning. Exactly this double nature, I think, is a key to why architectural drawing is animate and generative; because the different forces affect each other as they are orchestrated by architects.

I try to describe these meetings and what they do, especially by constructing a definition of architectural drawing as sketch diagram, which is a way to describe the general, precise, systematic and yet open capacity of the orthogonal, architectural drawing system. But is also a way of outlining some specific affordances connected to some architectural

drawings and projects from the 1960ies to the 1980ies, the years just before the computer as we know it entered architecture, but where it was already anticipated. To this adds that I also use the term to describe my own drawings, which are not typical building drawings. They could be thought of as maps or open works (Eco, 1989), meaning that they are finished and at the same time unfinished, architectural openings. Yet some of the drawings are just sketches that I made in order to learn a new drawing technique or software.

Since my drawings are situated on the threshold between traditional, orthogonal architectural drawing and computer techniques, they share some features with the other group of drawings from the 1960ies-1980ies. What they share is, for instance, to draw digitally with analogue tools or to draw analogously with digital tools; to draw icons with code or to use structures as a motif. Some of them are also about animation techniques, and are used to question when animation is a property of the human, when it is a property of the medium and when it is a property of the building.

In all these meetings between media, techniques, general rules and subjective tendencies it is hypothesized that there are some diagrammatic possibilities and mind-sets at stake in orthogonal, architectural drawing, which assert themselves independent of drawing tool. That is, so to speak,

qualities that belong to drawing as abstract diagram and not to any tool as such. This may sound as if the drawing tool, then, does not matter, but that is not the conclusion. Rather, I suppose that there is an often overlooked balancing act going on between abstract rules, technical equipment, situated authors and socio-cultural desires that work as an invisible and almost undefinable parameter in the production of architecture (inspired by Evans, 1995).

The meeting between the direct and indeterminate hand sketch and the precision of the diagram, often emphasized by computational, architectural practices, is sought to be illuminated with the idea of the sketch diagram, where traditional, orthogonal drawing techniques meet and hybridize with notational techniques in a shared migrational drawing space. As a theoretical construct the sketch diagram is an understanding of orthogonal drawing as a double-condition, which can hold both digital and analogue notation, a composition and an instruction, be a material condition and a system of distribution, which aims at distributing space. This theoretical construct, then, is illuminated from different angles; by looking at the already mentioned drawing projects and by my drawings. This is relevant because it describes the meeting between an "old" and a "new" medium, and, hopefully this could give architect's a better understanding of their working media, which eventually will leave a mark on the world.

"Patterns make reality, and media patterns – like the circuits on a computer chip, the divisions on a map, the fields in a database, the sections of a Wikipedia page, and the mechanics of a game – shape reality by providing the templates by which we exchange meaning with one another. Games are a fundamental building block for design-ers because they ritualize behaviour. But playfulness is even more important because it disrupts ritual patterns and reconfigures reality" (Murray, 2012, p. 405).

Sphere of implications: double view

In the project I work with two practices, a drawing practice and a theory practice. Being a practitioner of drawing and of theory gives me a double view on drawing. It could be called a diagrammatic practice, because diagrams, which have can stage text and images in relation to each other in ways where it produces meaning, require two persons, when you are working on a diagram you are talking to yourself (Stjernfelt, 2011b). Within a general taxonomy of PhD projects it is the theory produced that is the projects the knowledge; but this knowledge is explicitly conditioned by the drawings, which embody another kind of "knowledge". But whether the drawing's "knowledge" can be qualified as the knowledge required in a PhD is insecure.

DRAWING PRACTICE　　　　　　　THEORY PRACTICE
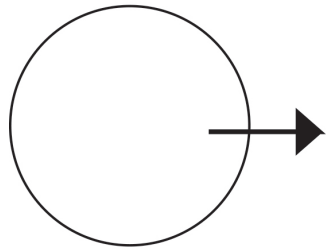
- proposing
- delimits a field of drawings with shared characteristics
- challenges theory practice
- plane of composition
- creates works
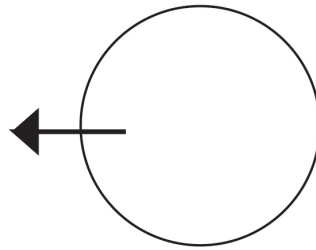
- argumentative
- makes available terms and concepts
- challenges drawing practice
- plane of reference
- creates terms and knowledge

Figure 3.

The orthogonal drawing system is diagrammatic in the sense that it is open enough for changes to happen and systematic enough to grasp and handle what does not yet exist (Leeb, 2011, p. 31) with a shared notational system and make it intelligible. Both the orthogonal drawing system and a research method are frameworks in which something new can be produced. Such frameworks are epistemic environments (Rheinberger, 2010, Bovelet, 2010) and co-shape the artefacts that are produced in them. Despite this similarity, the aim of an architectural drawing project and a research project are usually not quite the same; where drawing may aim at producing a singular, architectural work or proposal, research aims at producing intelligible, shareable knowledge, arguments, terms and definitions. Nonetheless, the two practices can be fertile for each

other, and the orthogonal drawing system can cross over between being a measurable, technical facilitator and a context of creation.

The way drawing works and the way theory is produced in my project coincide without merging. Therefore, to conclude the paper, I will talk about my own drawings.

Gameplay drawing

When I try to describe architectural as a double condition which I call sketch diagram it can be compared to games and plays, because it has to do with rules and how rules change. Games and plays are dynamic, behavioural and material constellations built up around more or less clearly formulated rules and sensations. Game and play processes outline two tendencies: a goal oriented tendency where the player sets out to win, ludus, and a more leisure oriented kind of activity like playing just for the sake of playing, paidia (Jensen, 2013 quotes Callois, 1961). Roughly said ludic activity follows clear rules whereas paidic activities are more chaotic and instinctive. More often than not, the two tendencies cannot be completely separated and take place within each other to various degree. A play process typically moves from the paidic and indeterminate situation towards a ludic situation with clear rules for gaming, but when the ludic becomes too rigid the paidic can break it down again; consequently the process can run in both directions (Ibid.). The goal of a ludic game

is formulated in advance and the game only allows actions that lead to winning or losing, whereas a paidic game does not have a predefined goal. Nonetheless, a paidic game can be governed by unambiguous rules and structures which enable open-ended possibilities of actions, although pre-definied. These kind of open-ended games, then, are more like toys, like Lego or, in a digital version, like The Sims, which has an open-ended, bottom-up gameplay. Such toy-like games allow players to have a fairly large amount of possibilities, but not to change the very rules of the game.

When we move between the paidic and the ludic in drawing we are in a position where we can both negotiate within the realm of the allowed possible actions of a particular system, such as orthogonal drawing with its already given rules and shared conventions and we can negotiate the conventions themselves, that is change the laws of the drawing system, as, for instance, Tschumi did in The Manhattan Transcripts (1976-81).

It is typical that when architects want to make new departures in their discipline, they develop the design medium, traditionally drawing, and anticipate that new ways of drawing will lead to new ways of building. Tschumi adopted Sergej Eisenstein's filmic notation techniques and combined them with existing drawing conventions and collage techniques, and in that way he developed the drawing medium in his quest for new architecture, and The Manhattan Transcripts wandered into the realm of building via Parc de la Villette (1984-87). He thus developed both architecture and the drawing system by ways of making.

In relation to drawing I see this as parallel to a stringent diagrammatic structure (ludus) which can be broken down by an opening sketching gesture (paidia). A gameplay that unfolds in drawing as negotiation of rules in the way a material is composed. In The Memory series (Figures 4 to 23) I started sketching quite casually and later divided the sketch up with a grid. This started a drawing process, which is much like a compositional game with rules and yet no rules in search of a flexible motif (Deleuze, 1990, p. 59-60). The drawings are inspired by a toy snake; a generic, spatial element, which can be folded in a range of ways. The drawing series is still in progress but shows a setting where I play out flexible elements and structures in relation to each other.
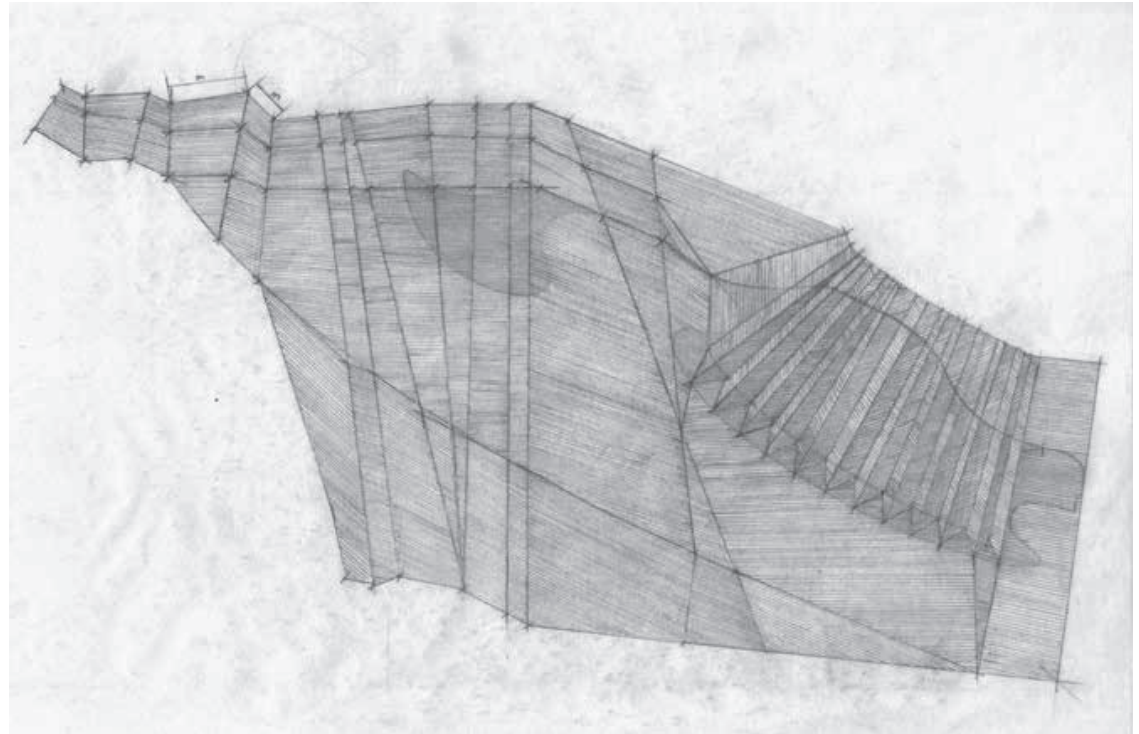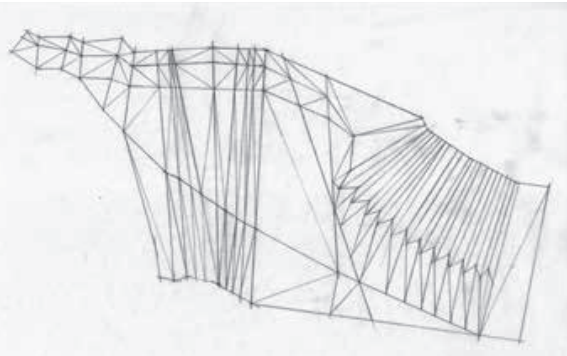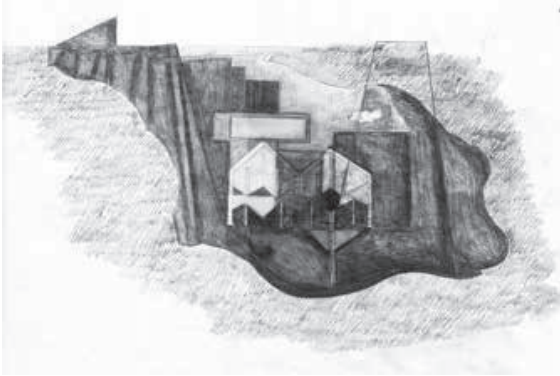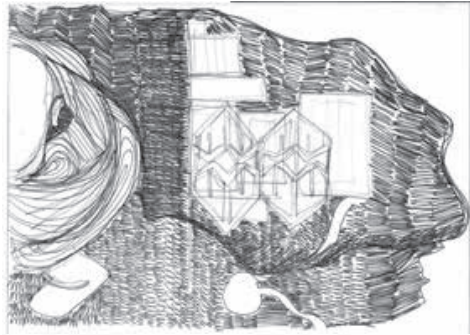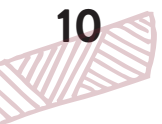
Figure 4: Start up sketches, pencil on tracing paper, ruler, set-square.
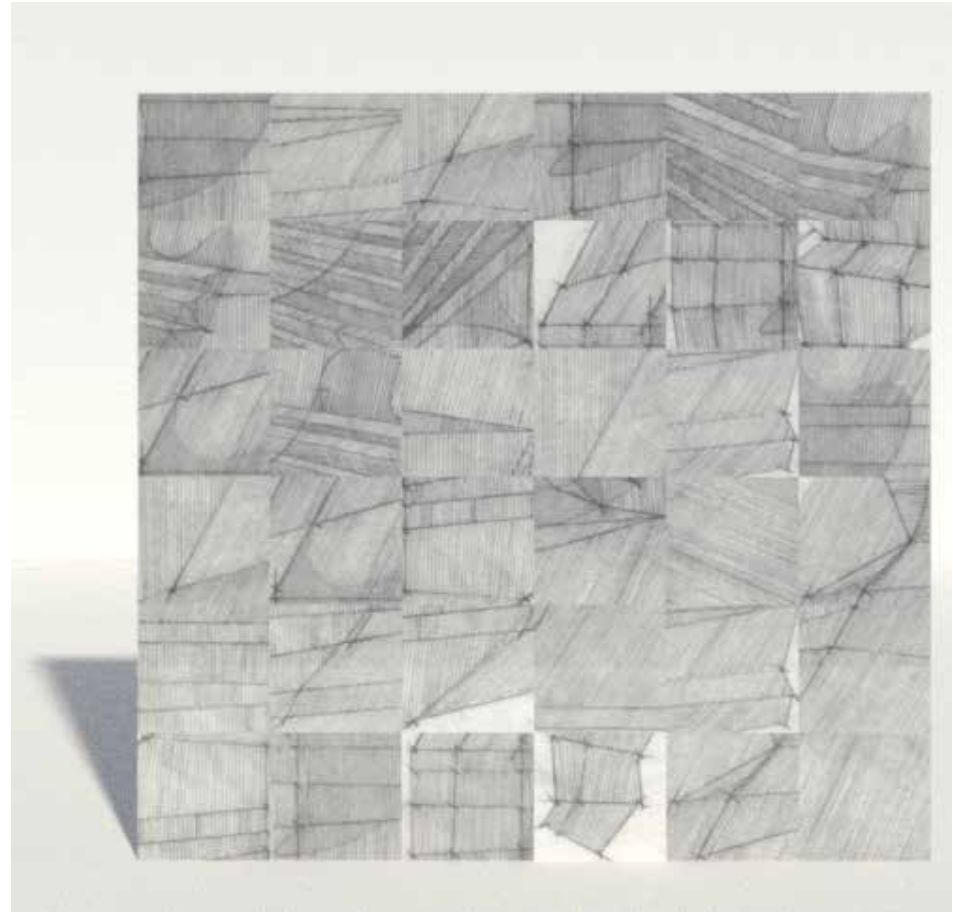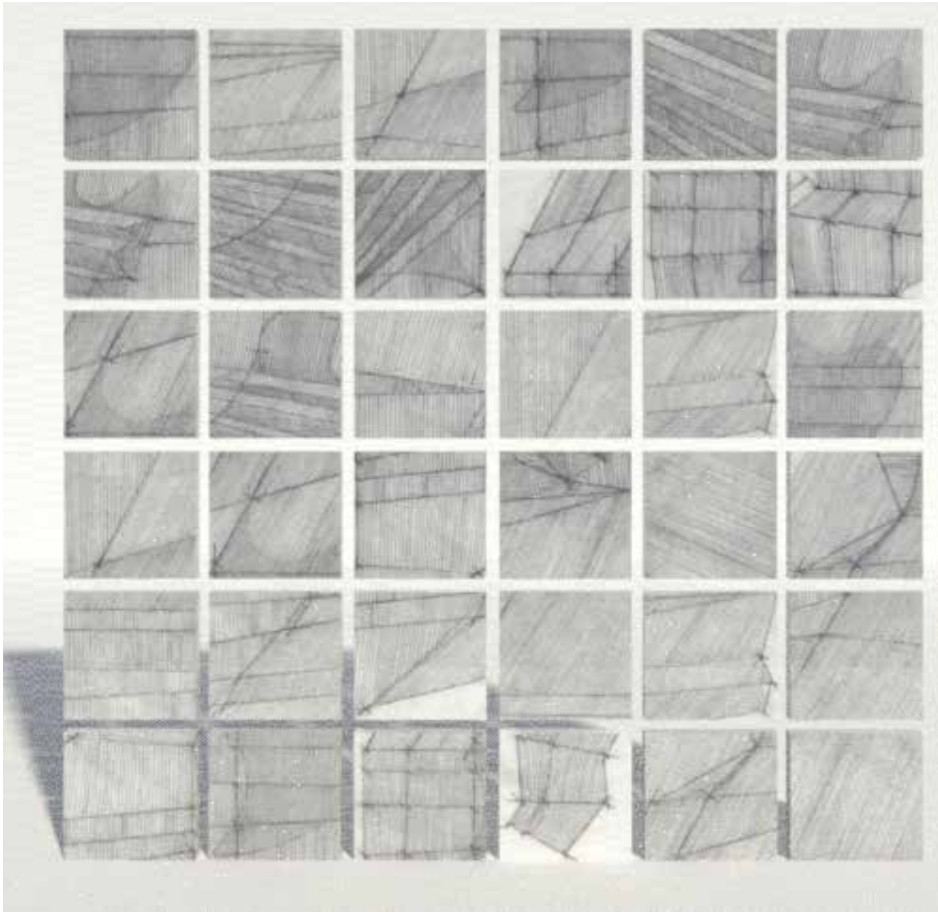
Figure 5. I divided the previous drawing with a grid and rendered it. It reminds me of an absurd game of Memory, since no two pieces are alike.
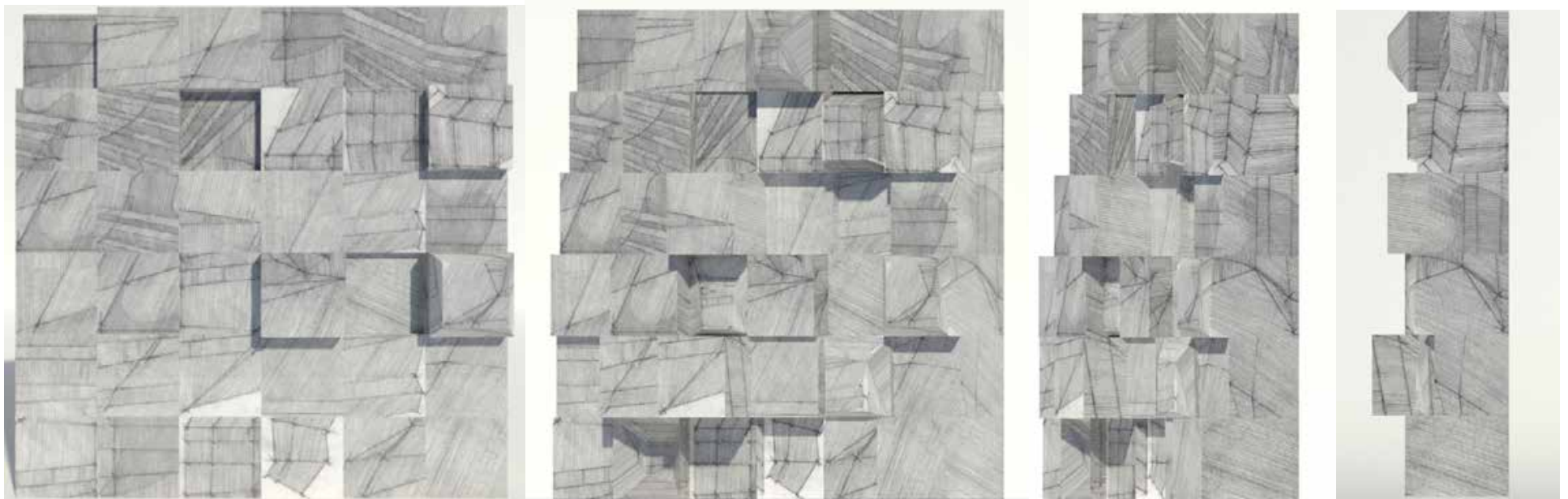
Figure 6. The pieces of the game are extruded. Left: front elevation, right: right elevation.
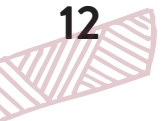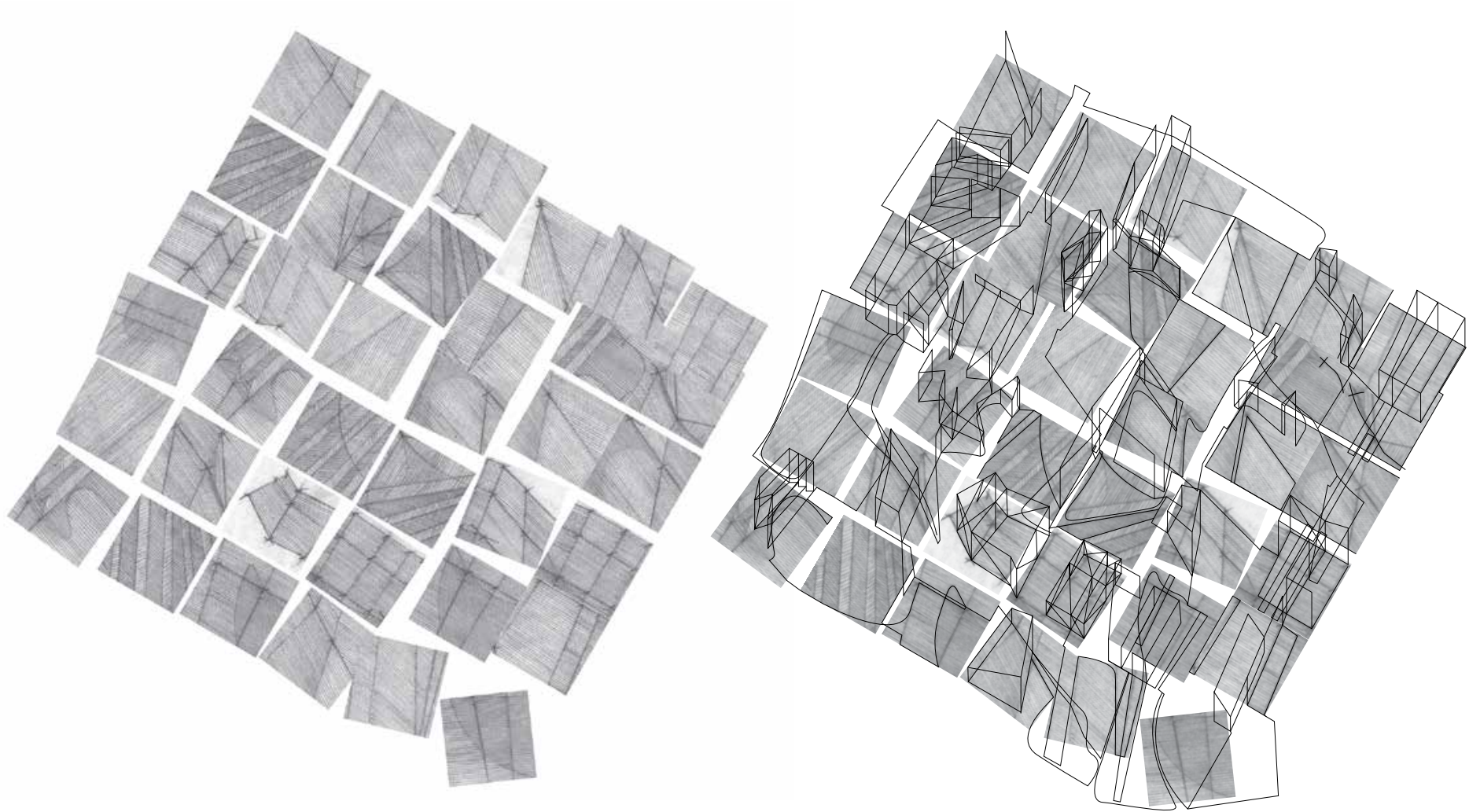
Figure 7. Left: Another way of laying the pieces. Right: The pieces are tied together with a layer of lines. The motif will change if you reposition the pieces.
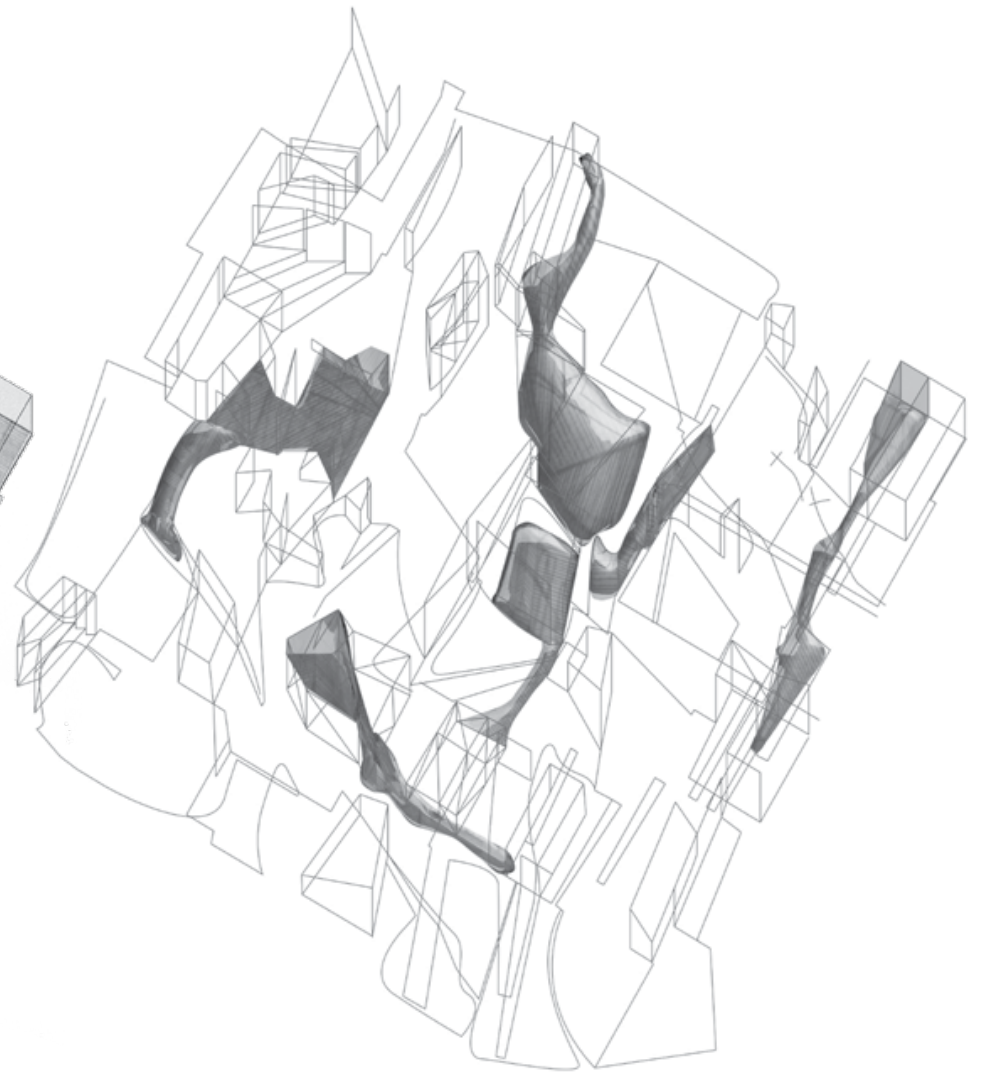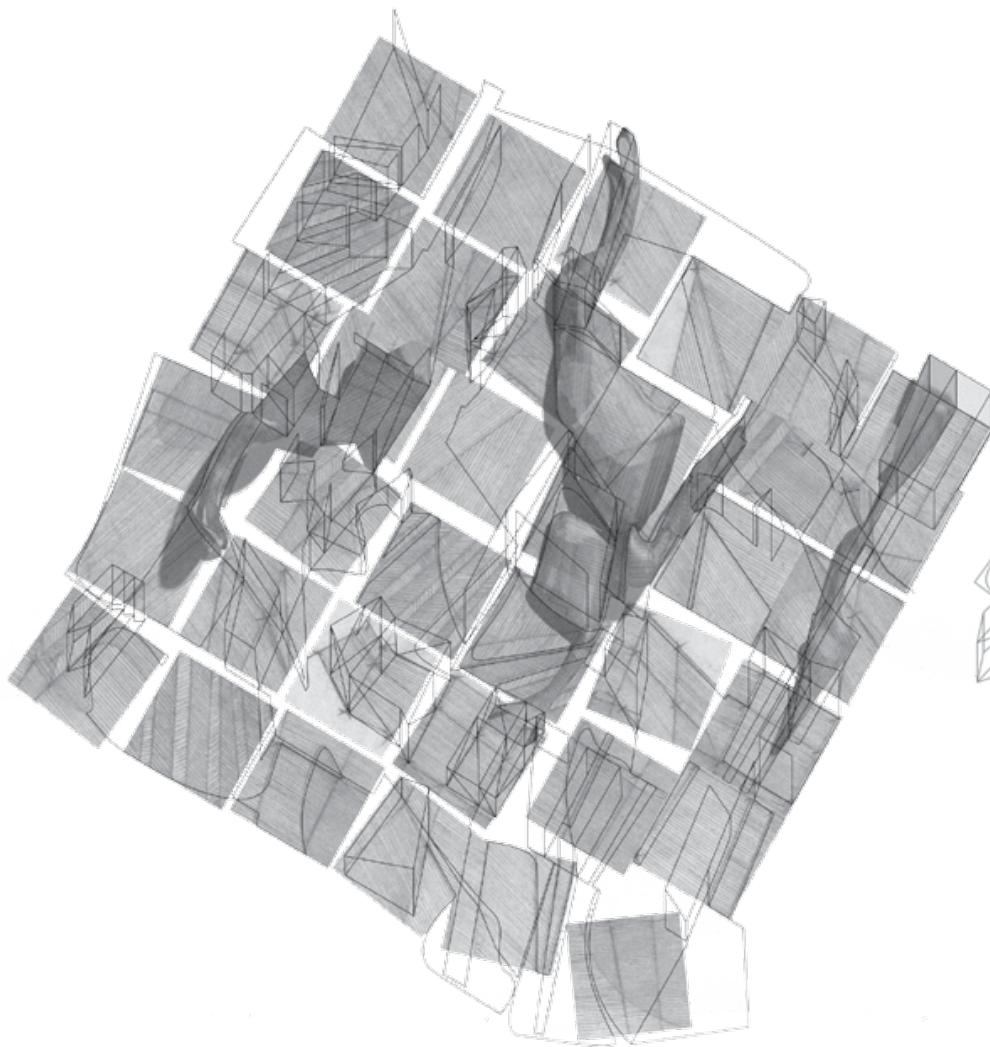
Figure 8. Yet another a layer of elements fills in the web of lines as.
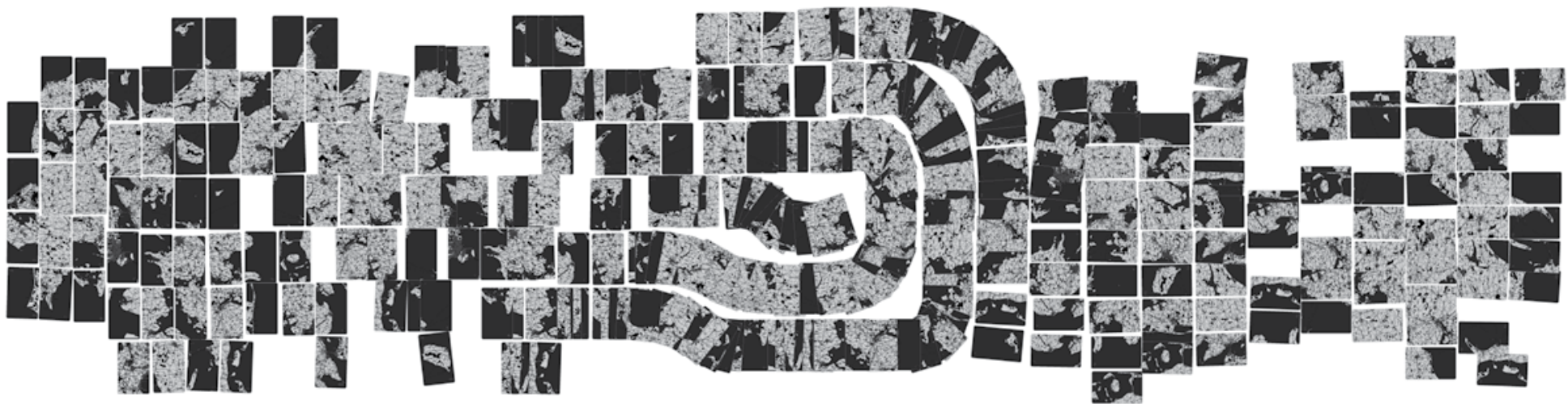
Figure 9. A similar approach but a map as motive.
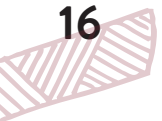
Figure 10. Foldable toy snake.
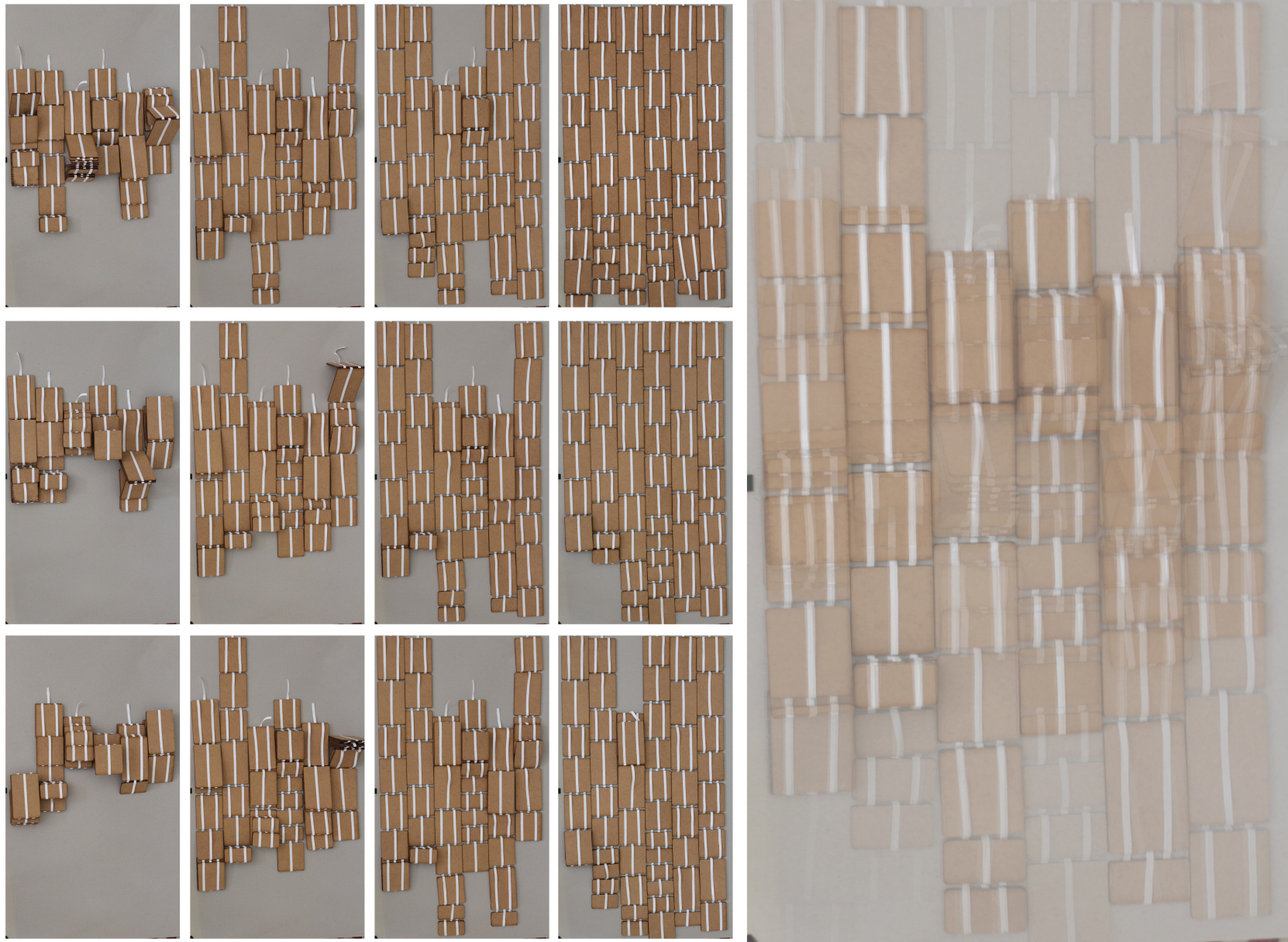
Figure 11. Pieces from the previous drawing were laser cut and braided together.
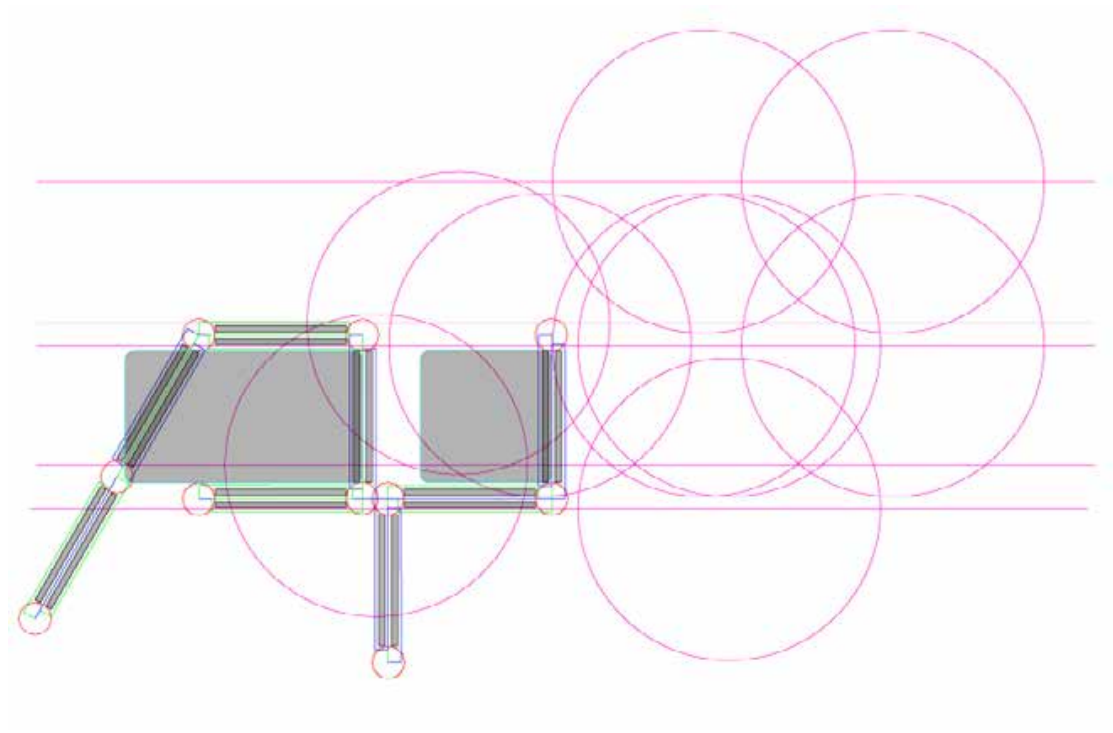
Figure 12. Drawing of the snake.

Figure 13. The braiding enabled flexible, spatial structures.
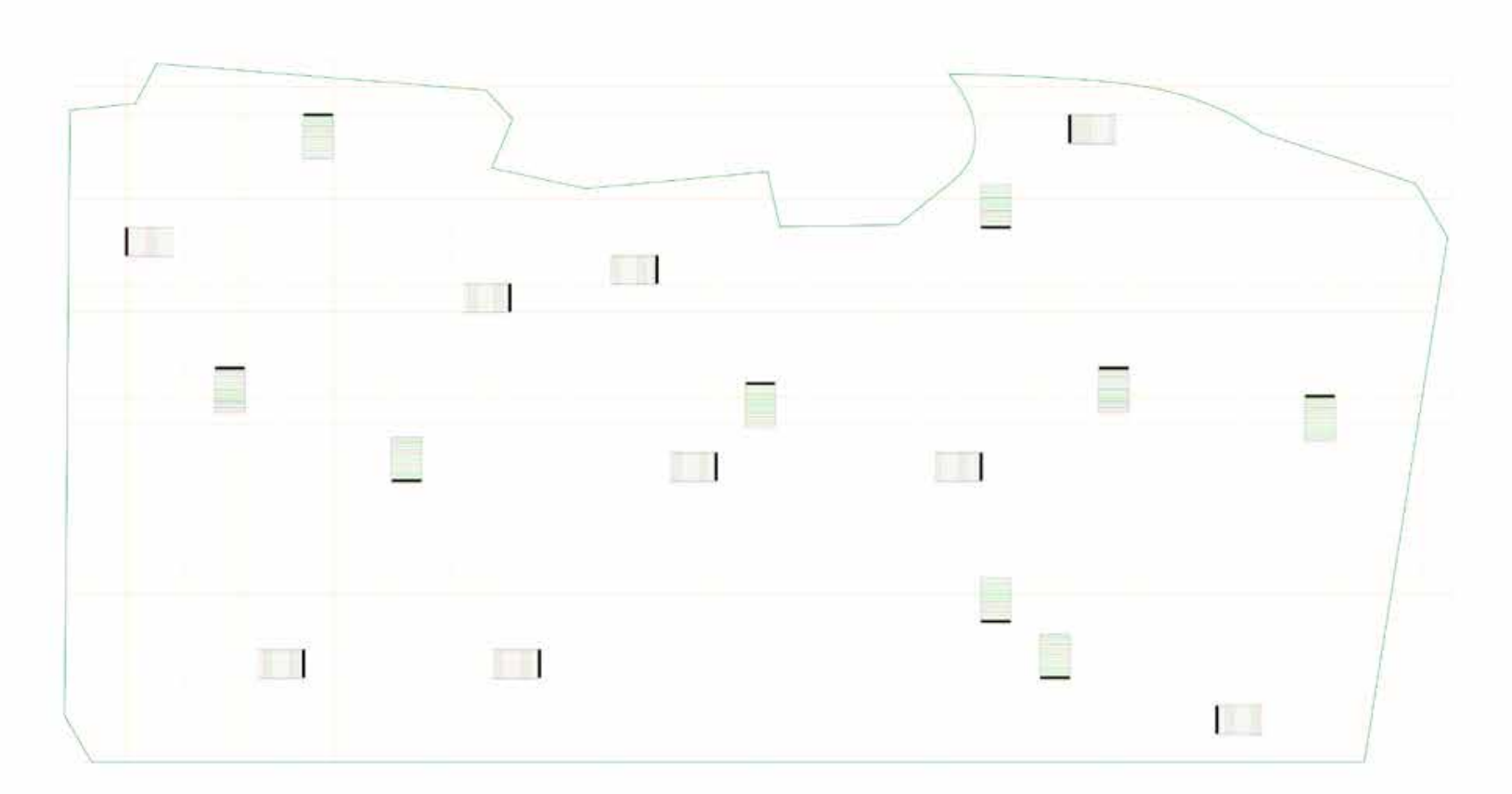
Figure 14. The structure imagined on a site. The structure is folded together.

Figure 15.The structure imagined on a site. The structure is opened.
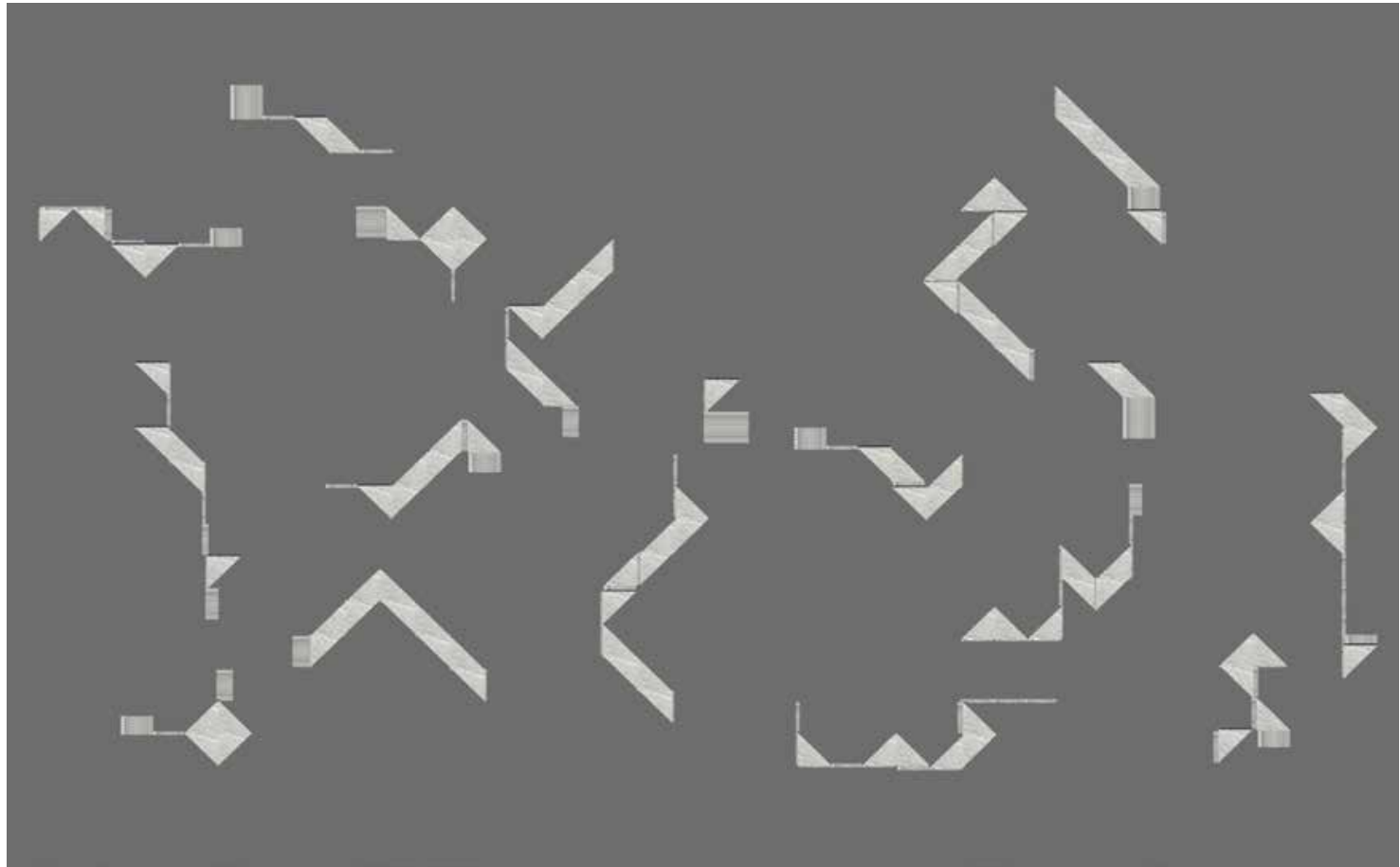
Figure 16.
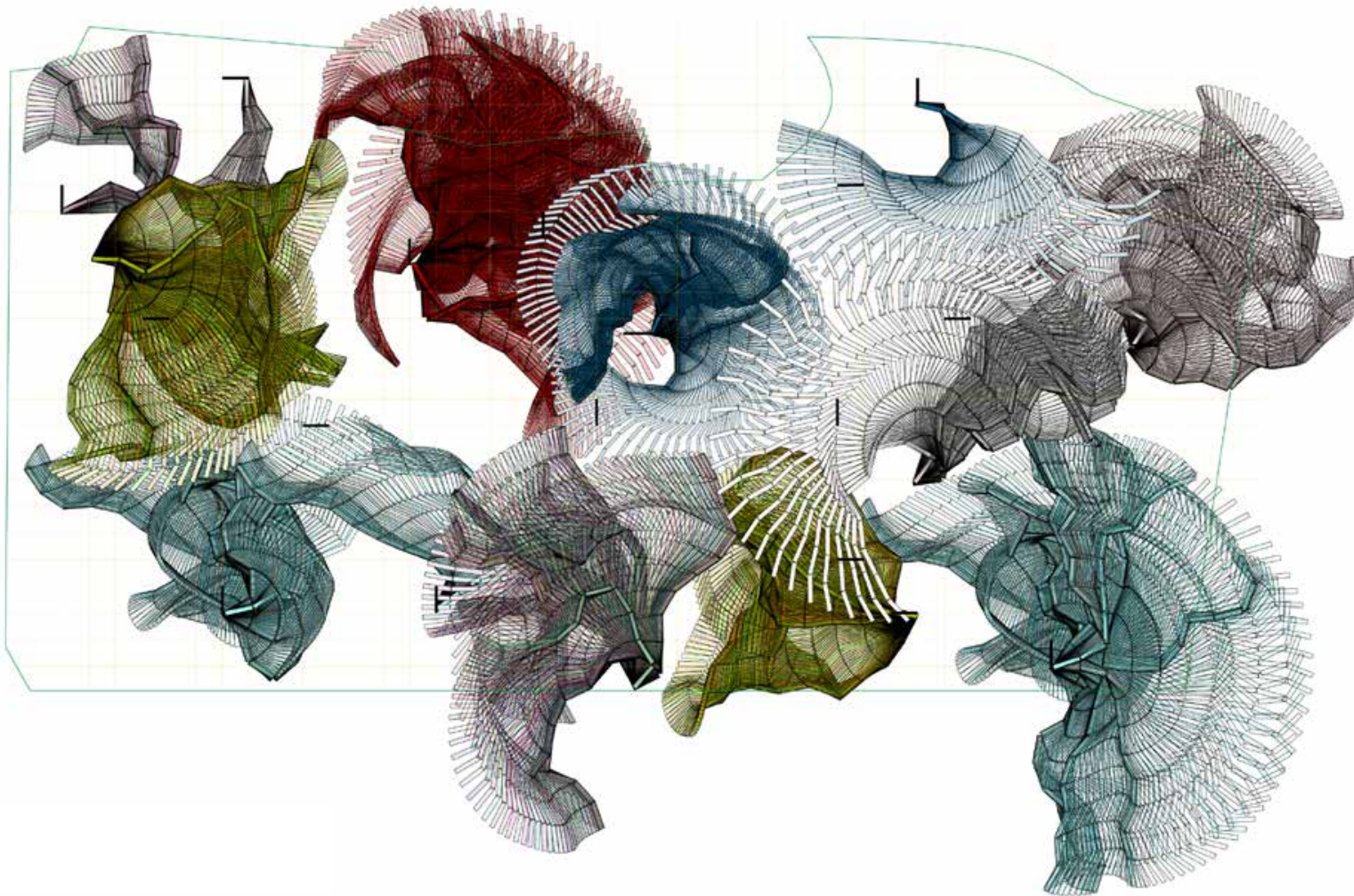
Figure 17. Sketches made with Processing - different attempts to simulate the movements of the snake on random sites.
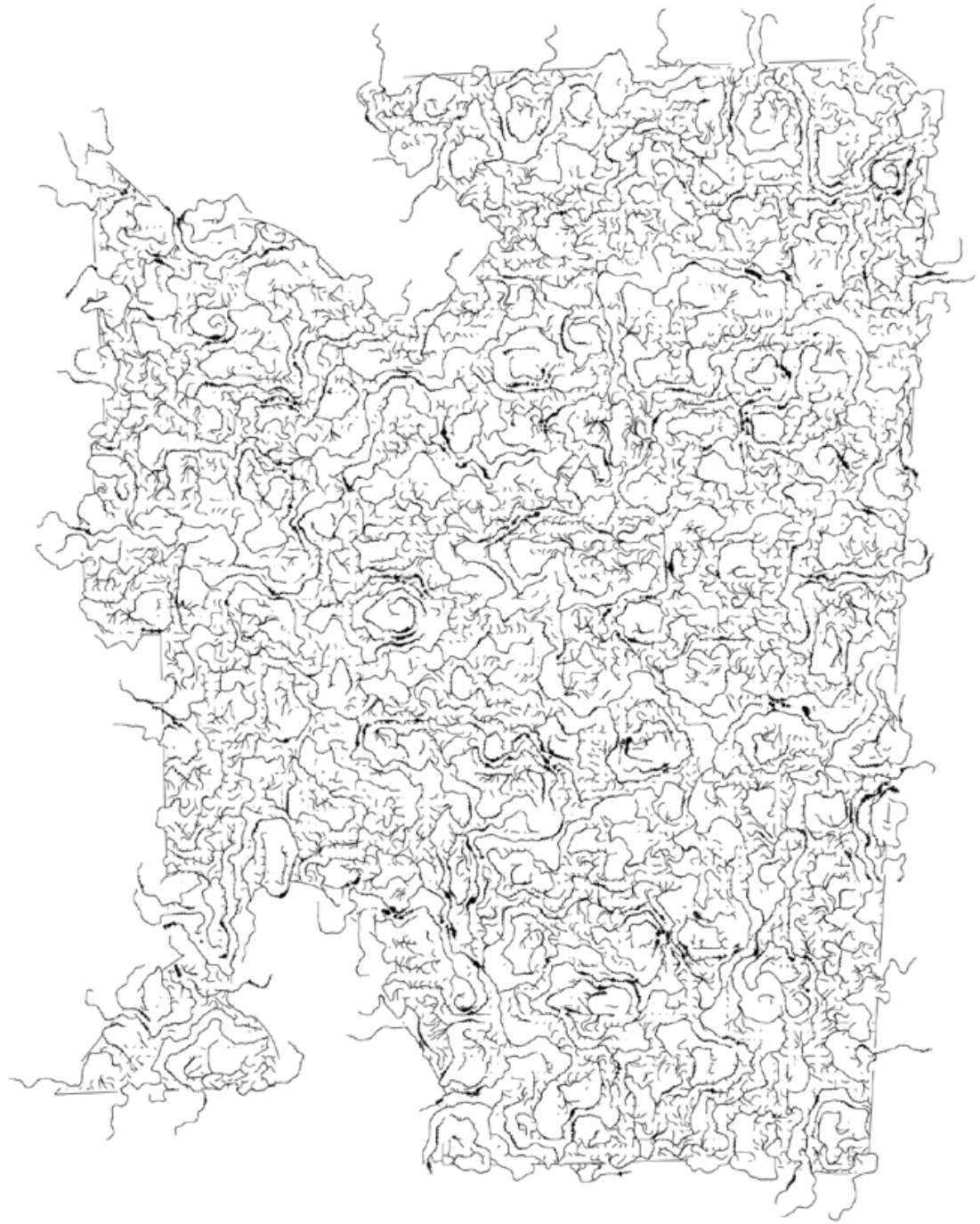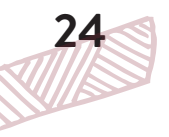
Figure 18.

Figure 19.
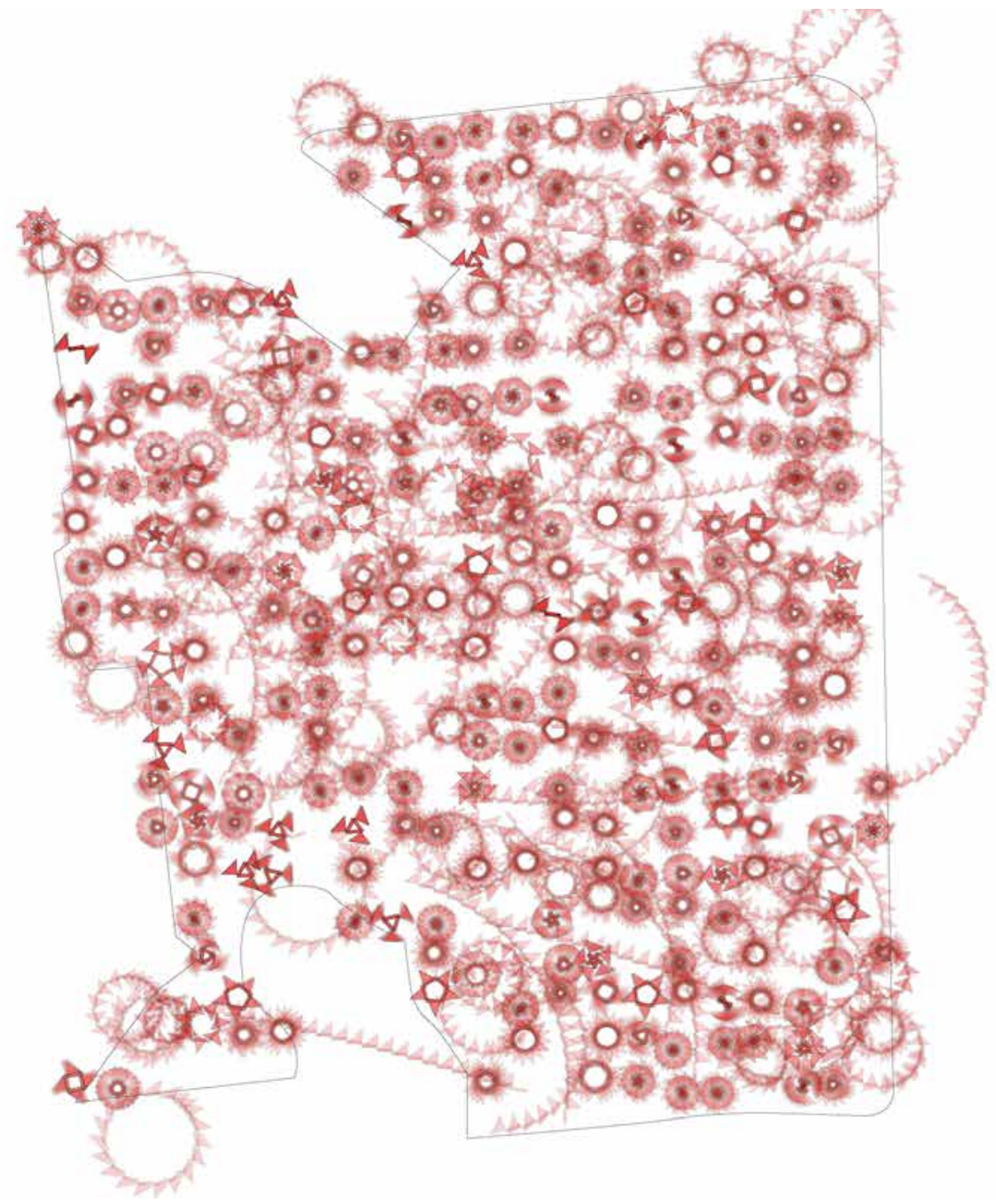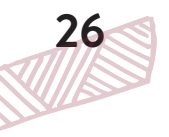
Figure 20.
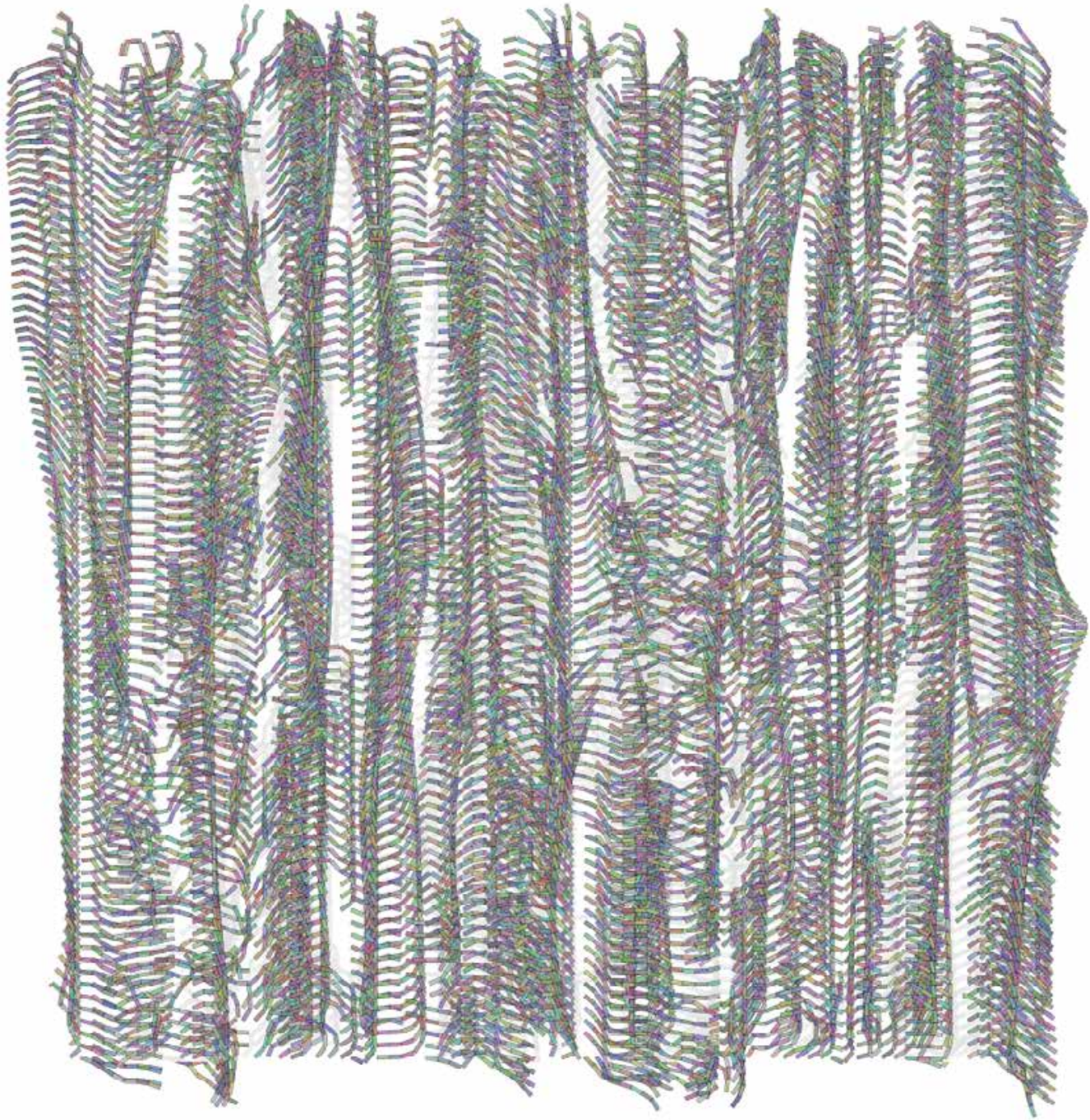
Figure 21.
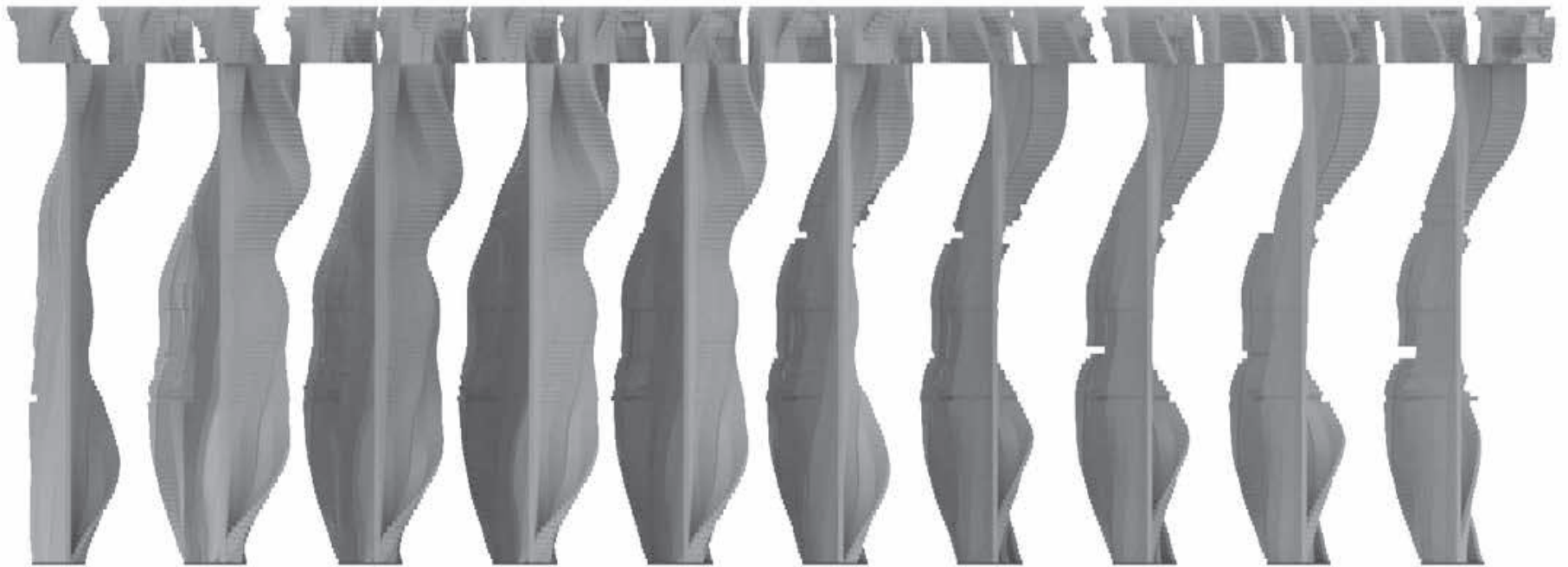
Figure 22. 3D geometry from Processing - rendering, elevation view.
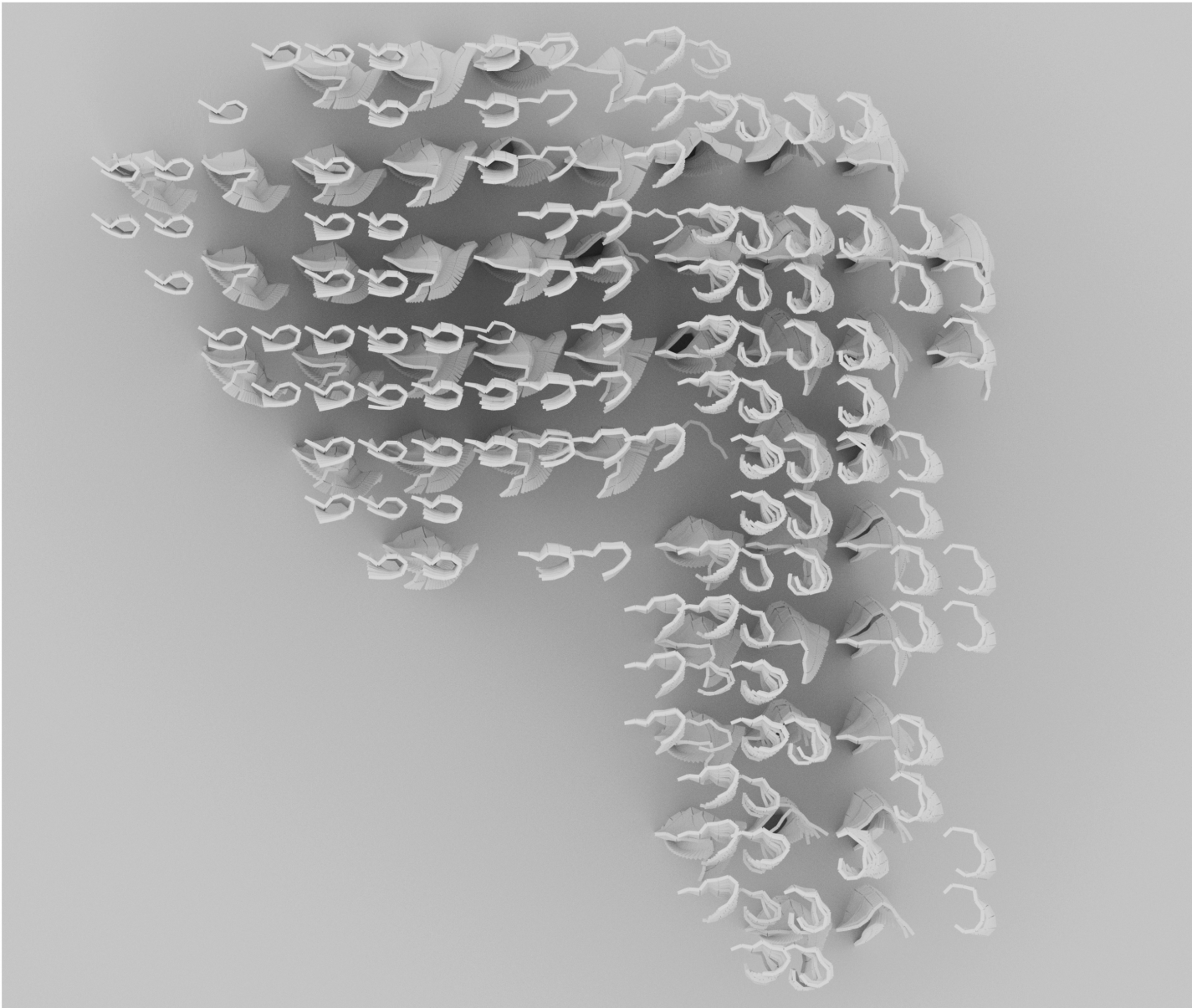
Figure 23. 3D geometry from Processing - rendering, top view.
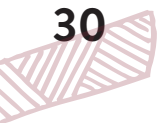
Orthogonal animation

Another series of drawings were inspired by Robin Evans' essay The Developed Surface – The Brief Life and Death of an 18th Century Drawing Technique (Evans, 1997: 195-233). They have to do with different sorts of animations, both animation techniques and animations in the sense of how life unfolds in building and is are at stake in architectural design process. The developed surface drawing technique that Evans portrays works well together with a certain way of life in Britain in 18th century, and when the way of life changes, the drawing technique goes out of use. Did the technique determine the interior style or was the interior style simply facilitated by the technique? It is hard to say, but there was a relationship where each part animated the other. When the rules of society were changing and new social and architectural desires emerged, the interior style and the drawing technique went out of use, and usual plan and perspective drawing was reemployed. The developed surface technique is an interesting drawing technique, because although it is strictly orthogonal it also shows an idea of out-folded, flat spaces. So two ideas are grating against each other in the technique.

To develop a surface in descriptive geometry is both to fold a two-dimensional plane into a three-dimensional object, and to fold the adjoining faces of a three-dimensional object out so all faces lie flat (Ibid.: 202), which is like folding an origami figure and folding it out again. If we think of the technique as origami folding, then we have a sort of animation embodied in the paper between a flat and a folded state. I have played with that idea in the following drawings (Figures 24 to 34), where I used different kinds of software to draw my working room and make animations of it.
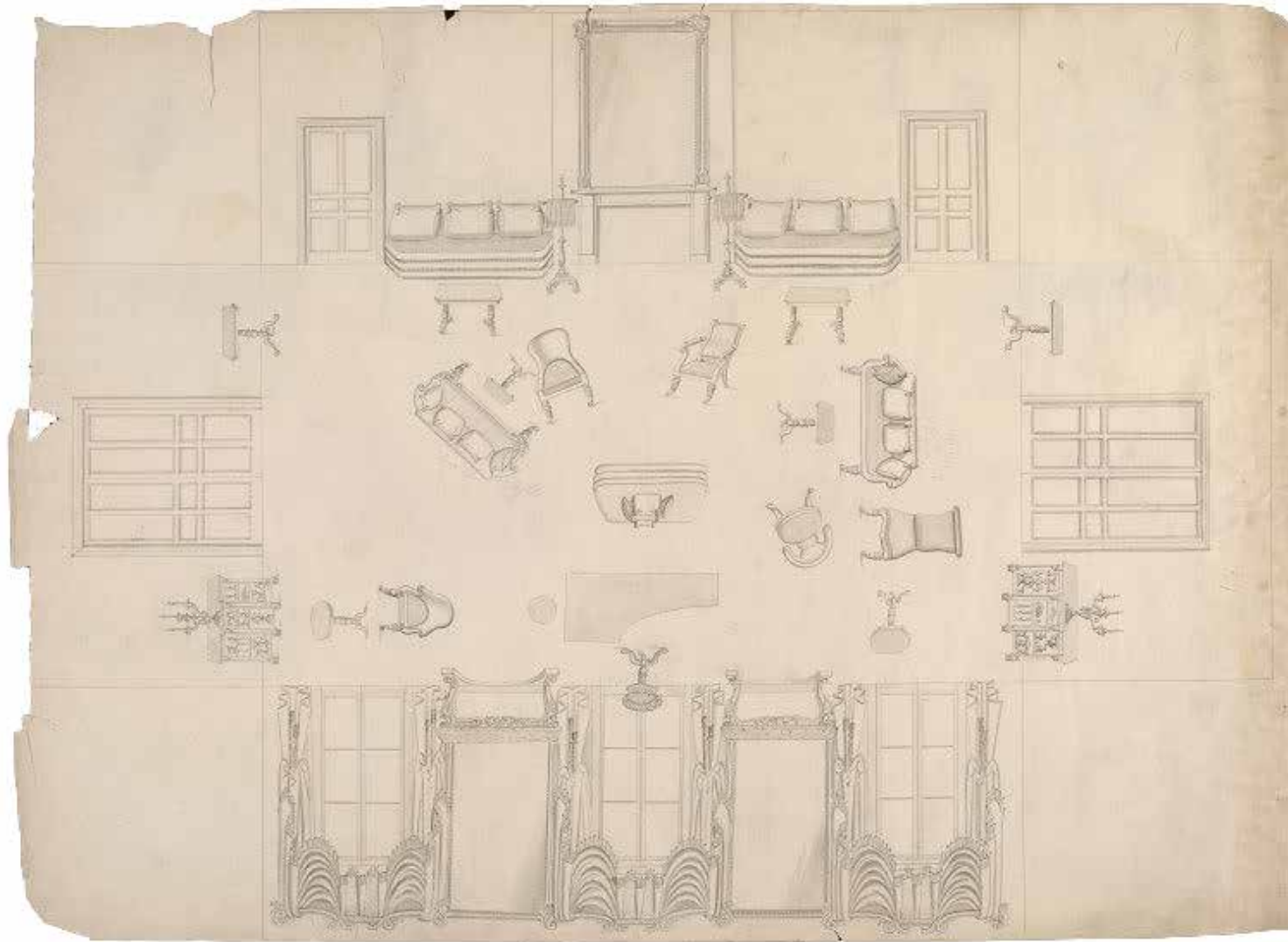
Figure 24. A developed surface interior by Gillow and co. from the early 19th century, but in a state of mutation as Robin Evans calls it. The spatial desire of the time was changing and people wanted to inhabit and furnish the floor, which had previously been left empty. The architects were looking for new ways of drawing the furniture in the rooms. The drawing looks like a doll-house, as if the furniture could be moved around and has not found its right place yet.
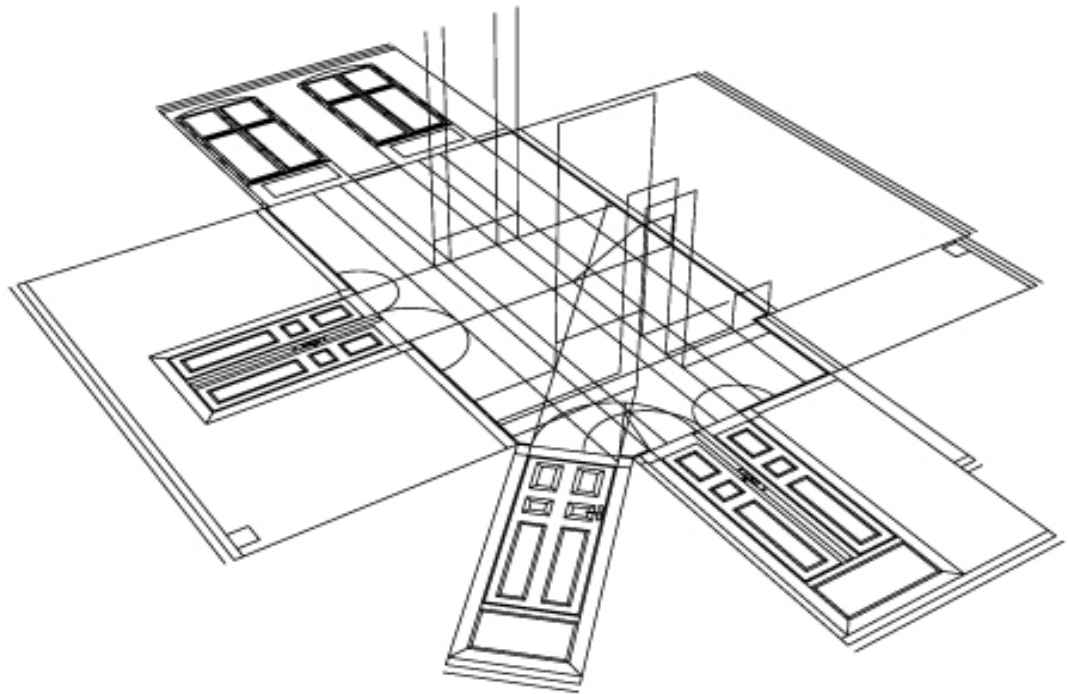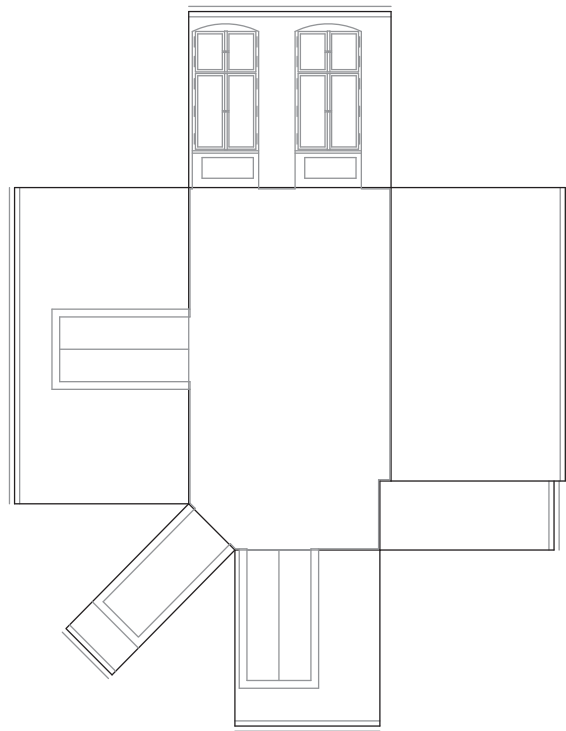
Figure 25. Left: My working room as developed surface drawing.
Right: The existing proportions in the room are drawn out and used to generate the box-in-a-box model.
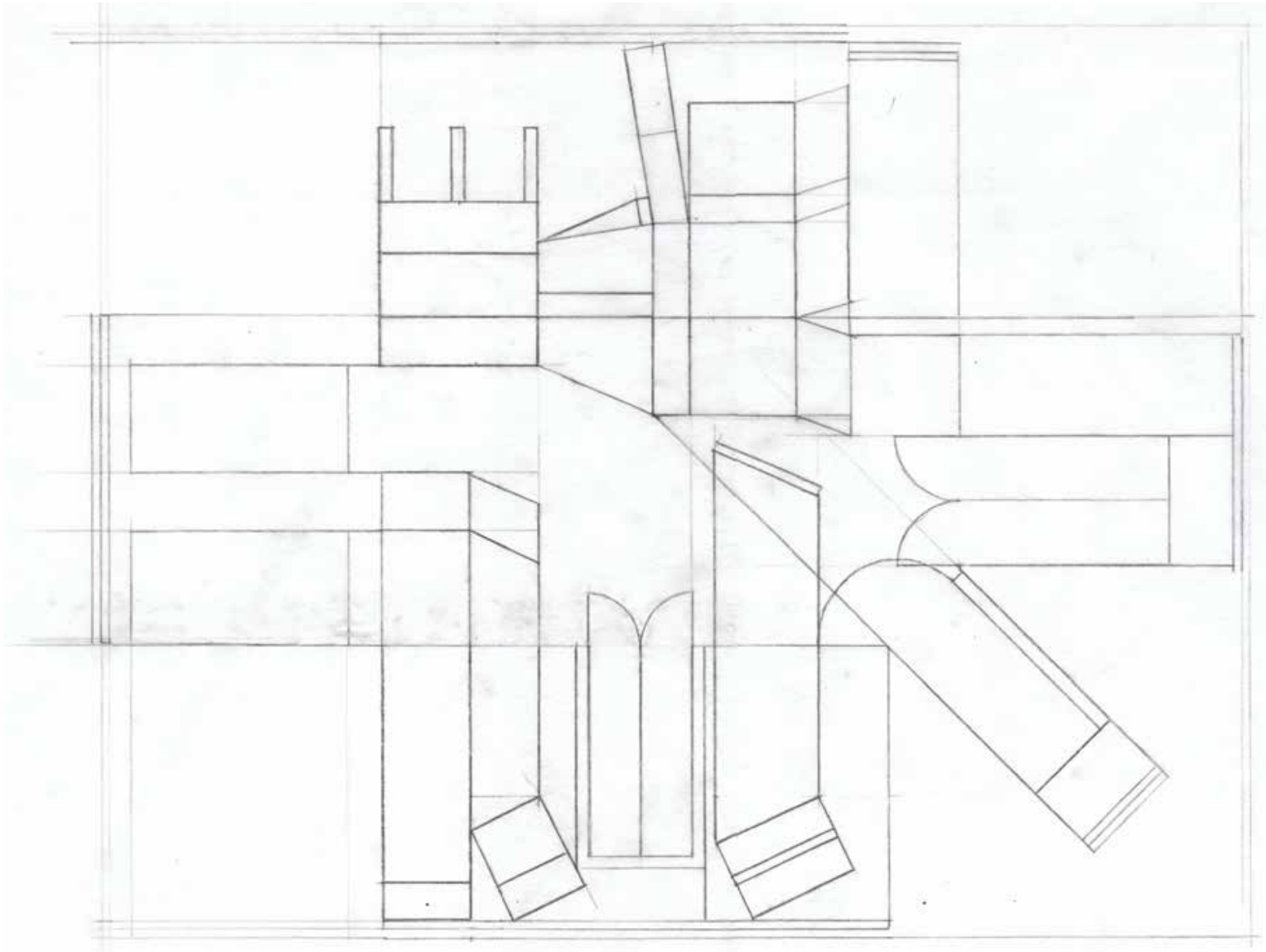
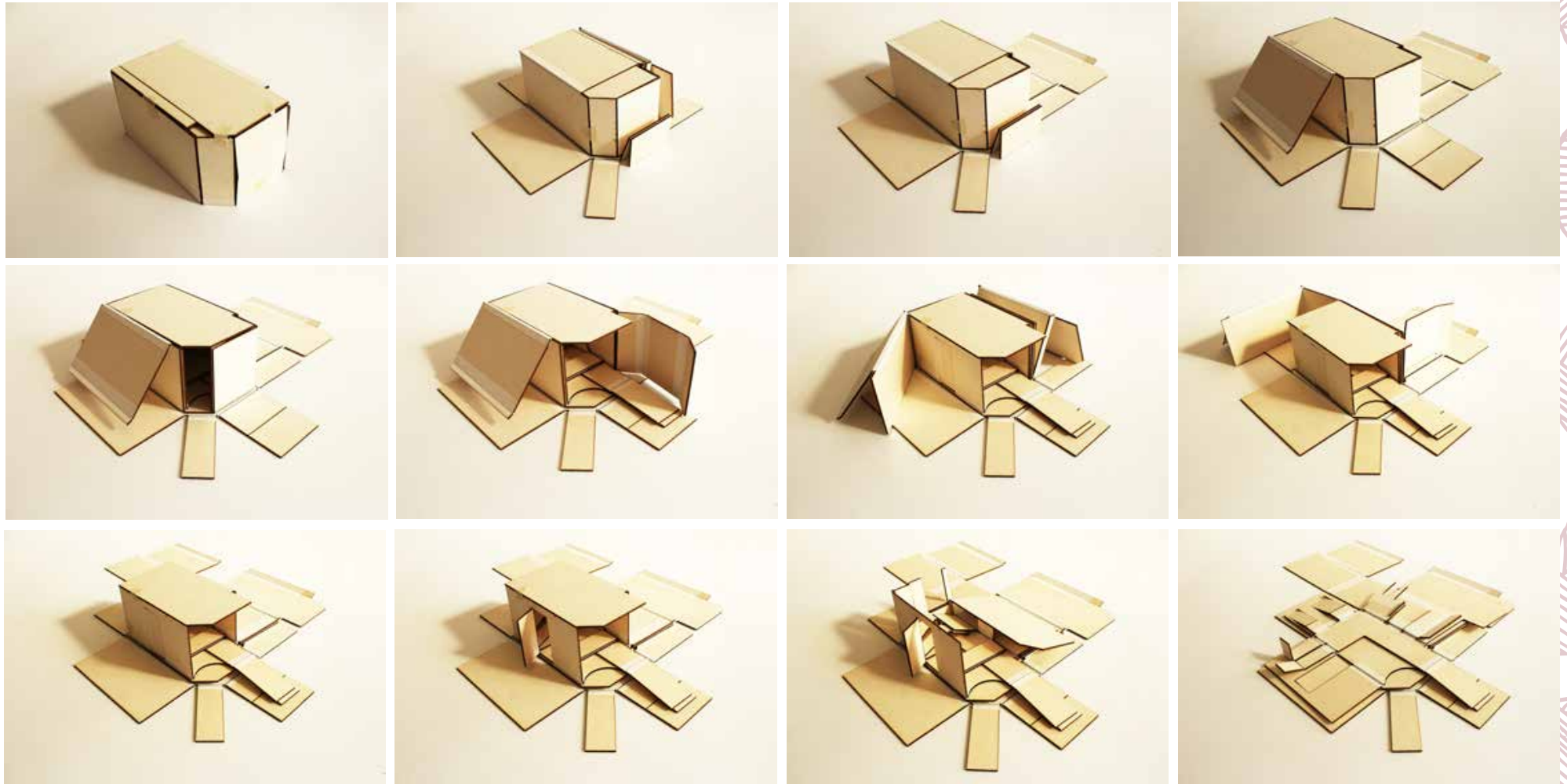*Figure 26. Handdrawn sketch.*
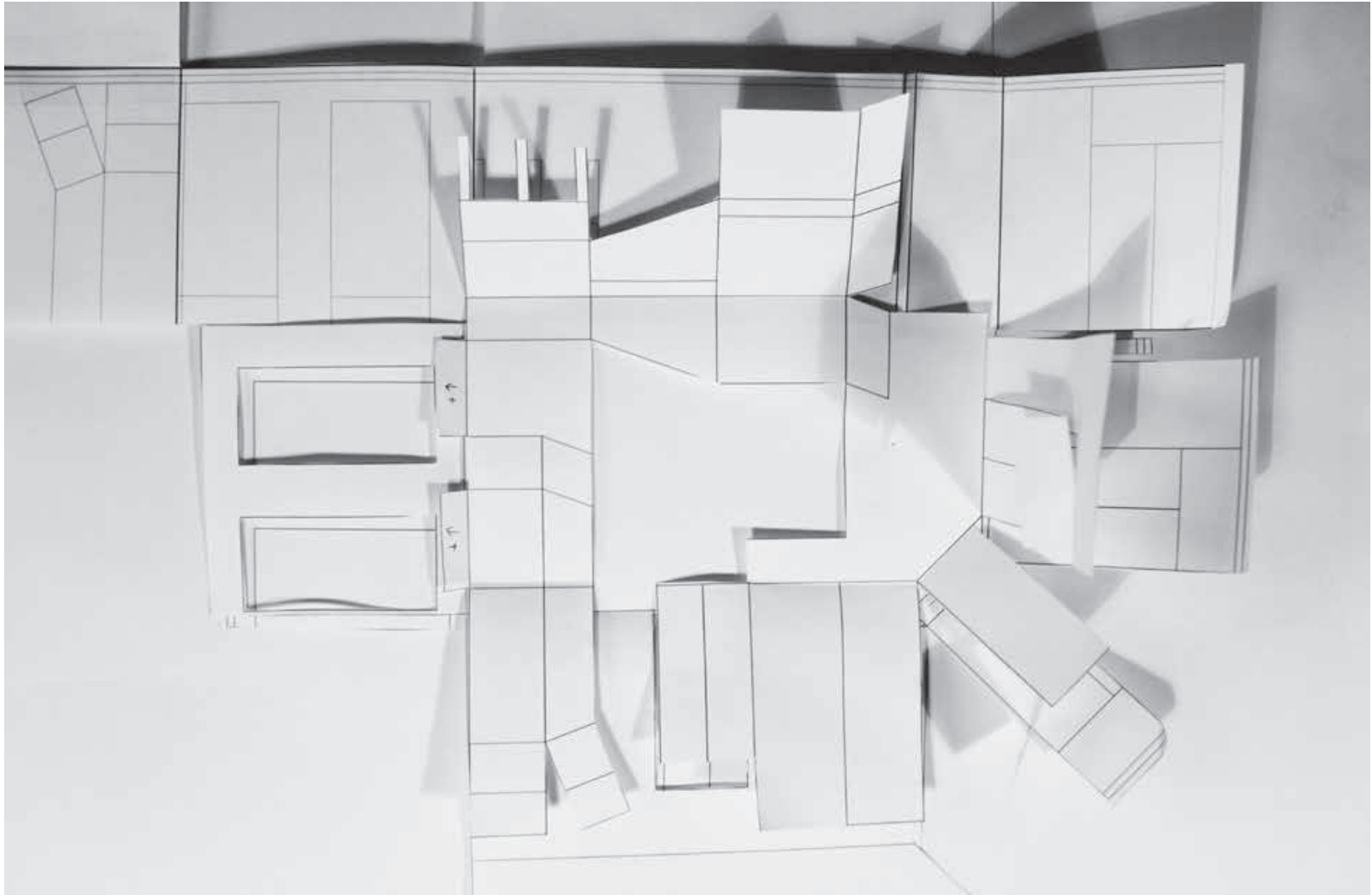
Figure 27. Paper model.
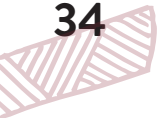
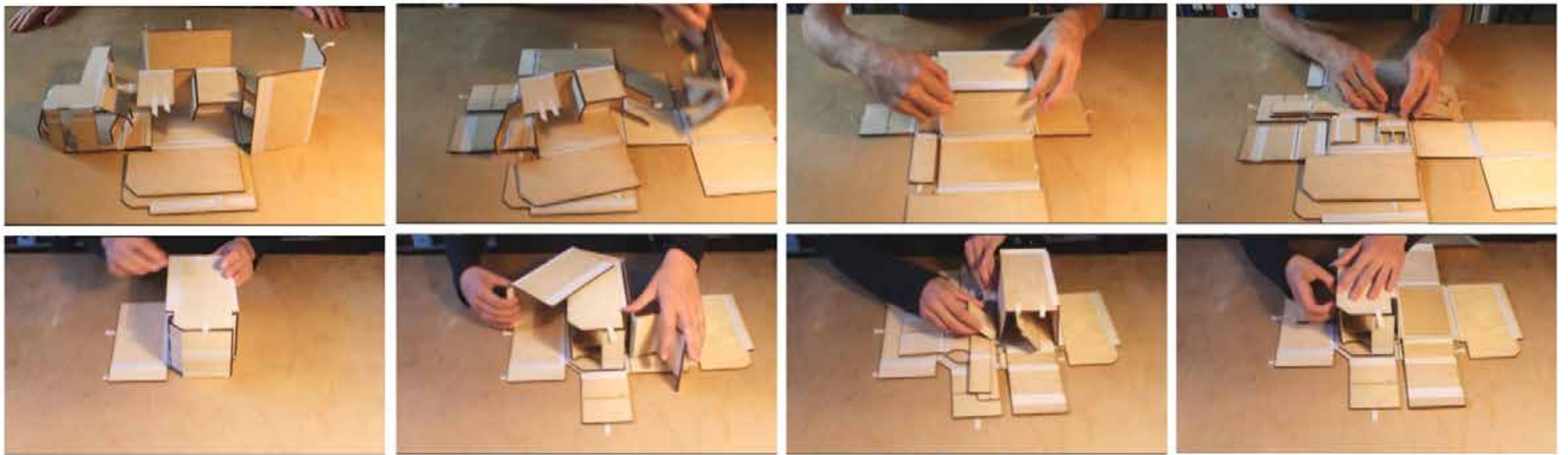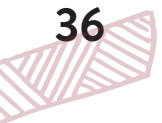Figure 28. Laser cut adjustable model.

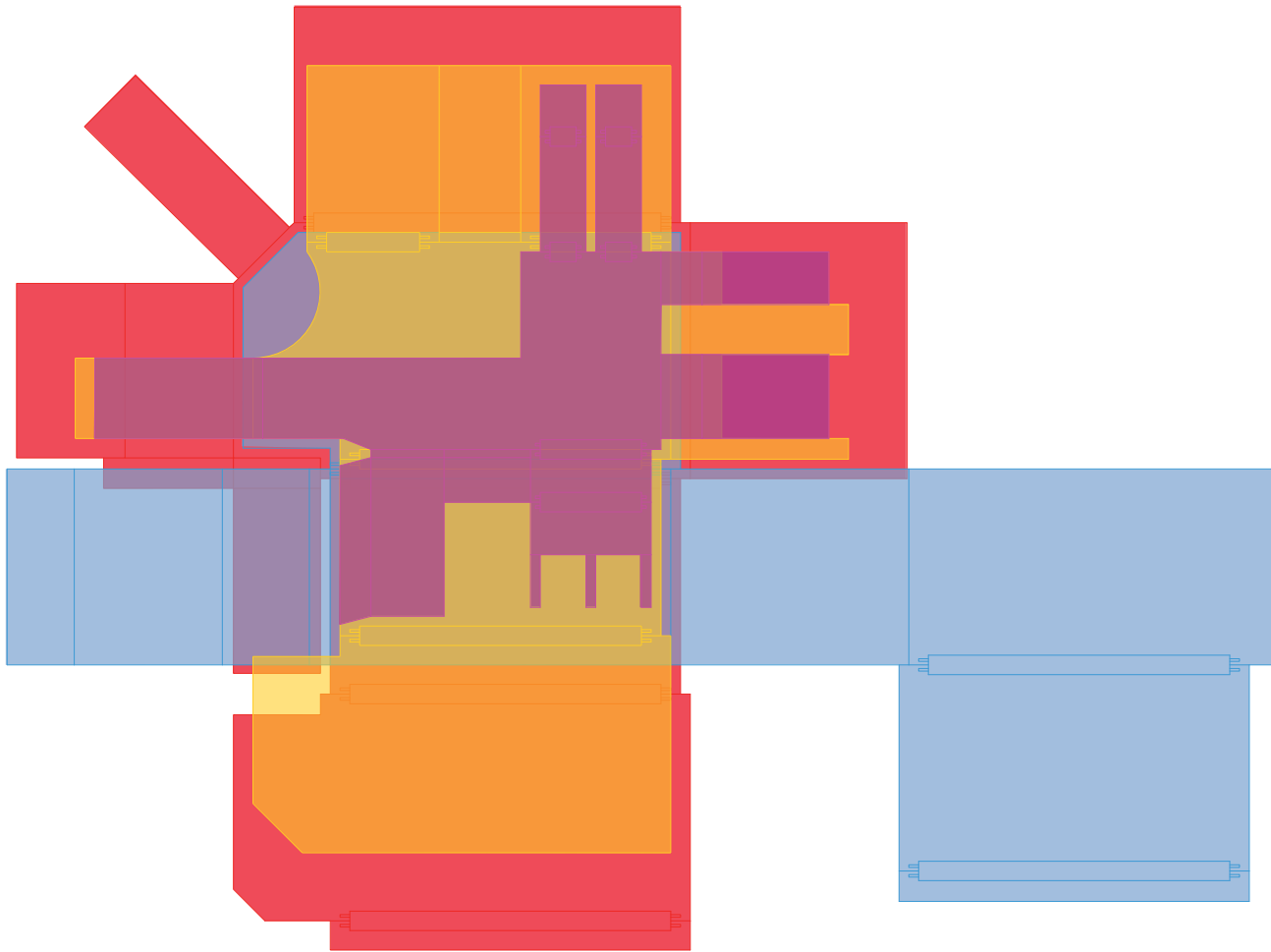*Figure 29. Laser cut adjustable model configured by different people.*

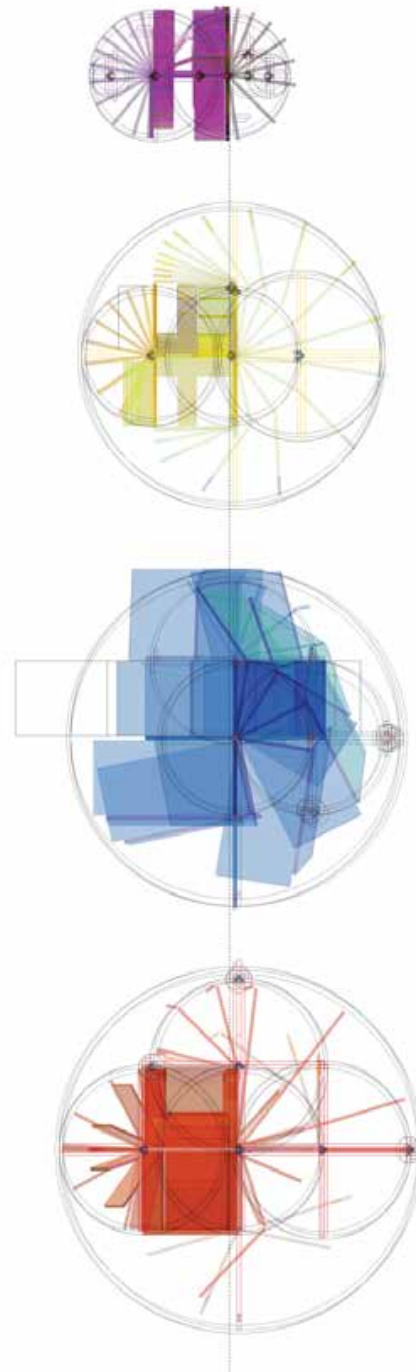*Figure 30. Plan drawing where we see all layers unfolded flat and lying static on top of each other.*
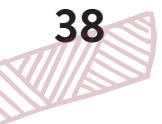
Figure 31. Elevation drawing where we see every layer represented as movable object. Each coloured layer corresponds to a colour in the plan and shows key frames from a computer animation of the model, while the line drawing shows the range of possible movements of the box's sides as full circles.
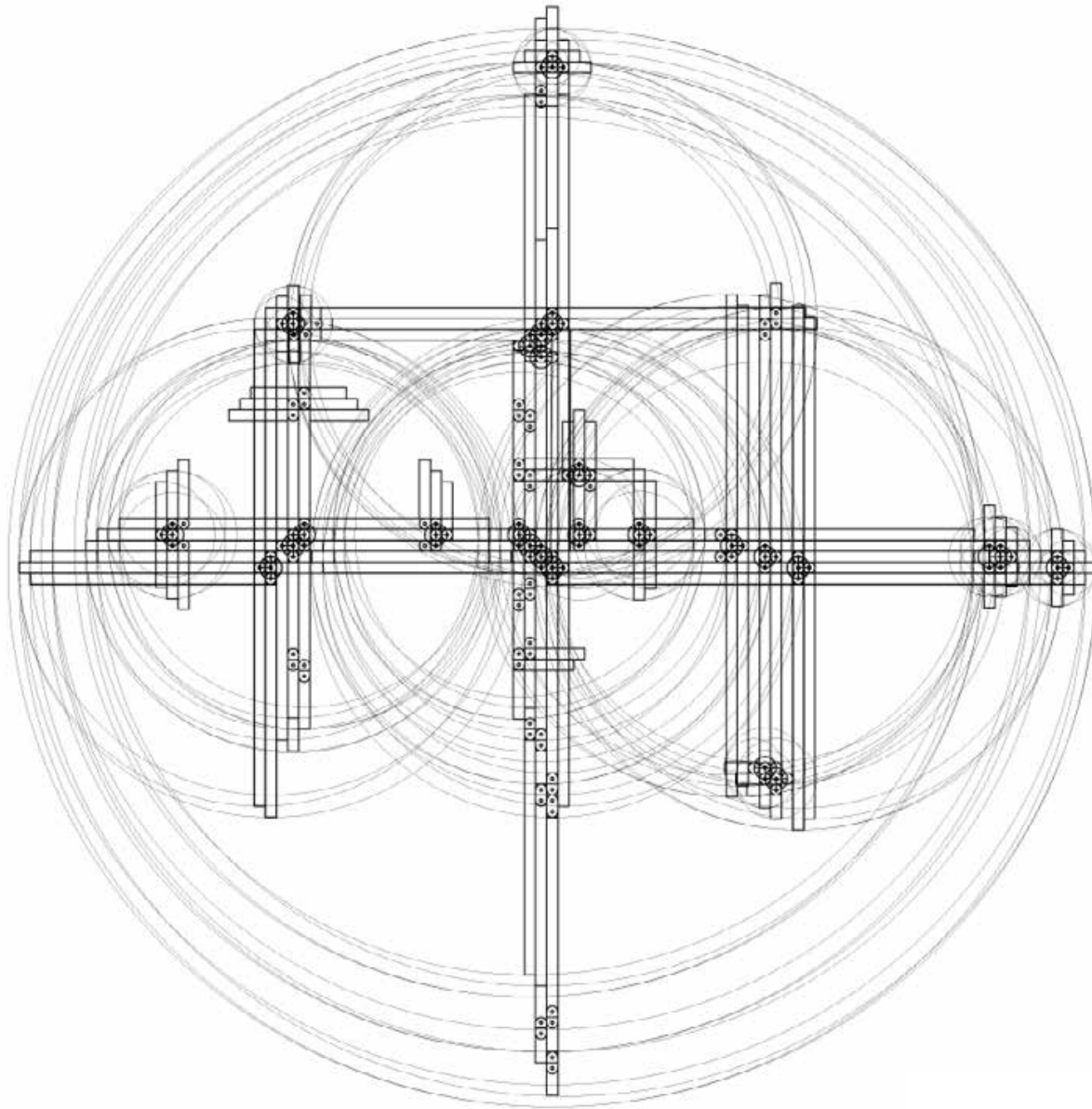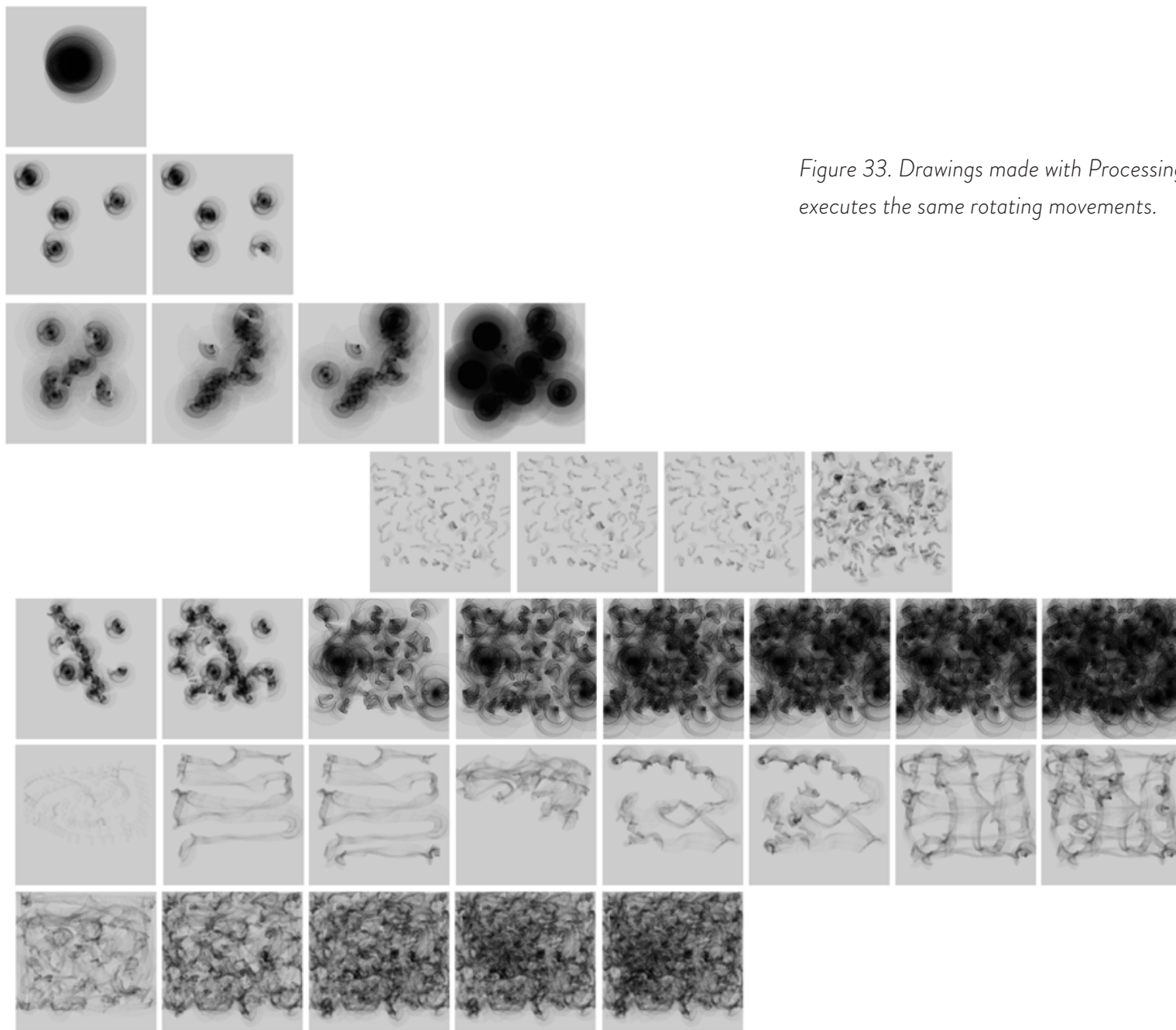
Figure 32. All possible movements in one view.

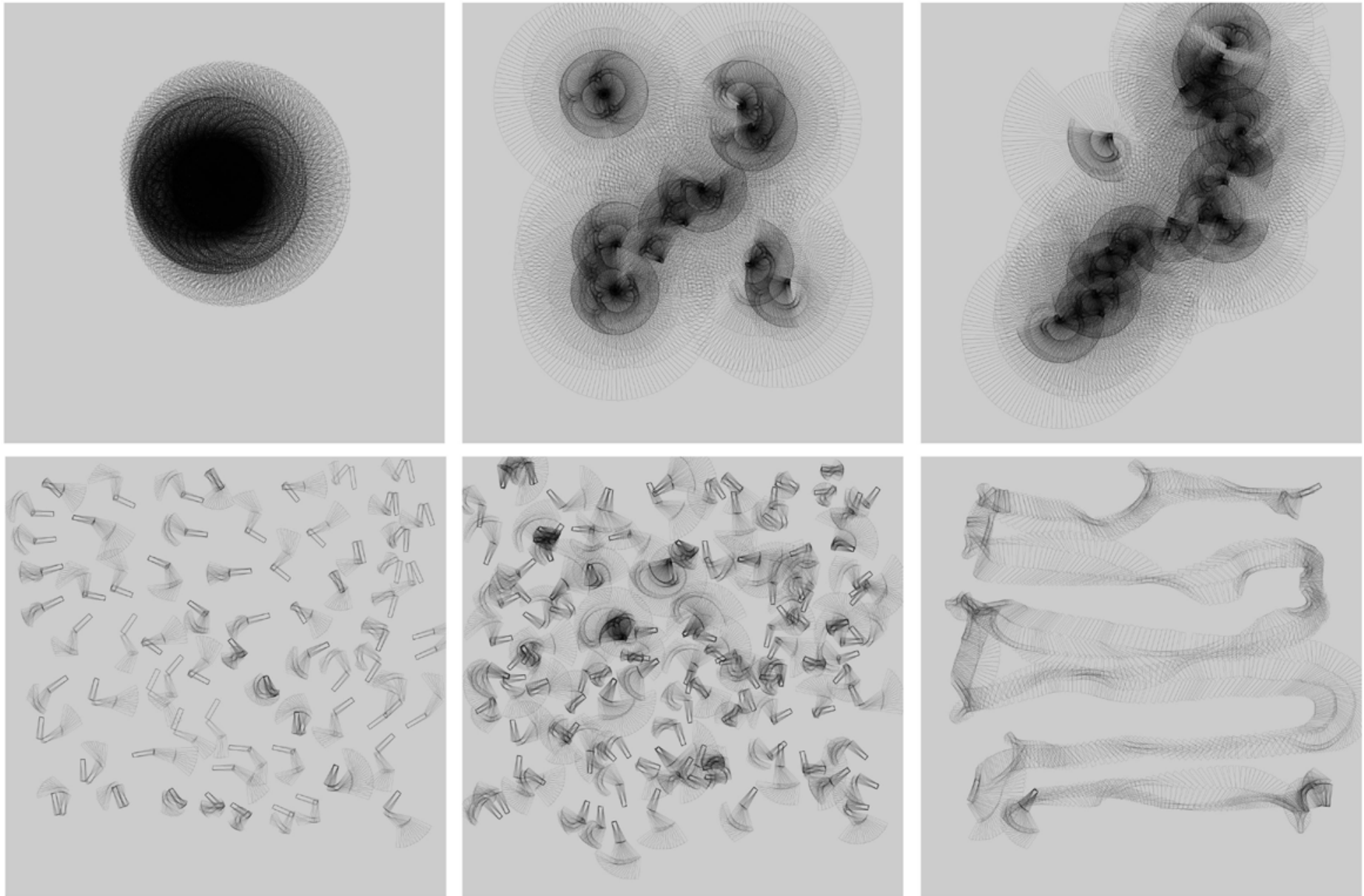*Figure 33. Drawings made with Processing that executes the same rotating movements.*

Figure 34.

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