objectiles in flux
— the oscillation of interior elements through superimpositioning

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1. Introduction

An experience is always in a state of *becoming* as you through movement and memory, perceptions and qualia assemble it into its virtual construct. According to philosopher and architecture theorist Bernard Cache who dwells on Henri Bergson’s notion of perception and memory.

Even the smallest perception is itself already composed of a multitude of vibrations. Bergson [Henri] reminds us that the simple fact of seeing a colour or hearing a sound is already an act of memory of which contracts a quantitative multitude into a quantative multiplicity.¹

Through Bergson’s idea of memory and perception we realize that the “vibrations” that Cache mentions generates a virtuality between the environment and an experiencing subject. It’s within this oscillation between present and memory that all experiencing unfolds. This virtuality is fascinating to me as an interior architect, as it suggests that the environments we build aren’t as static as one might think.

The potential for this idea in regard to architecture is defined by philosophy professor Giovanna Borradori, who describes virtuality as “an active and differenting dimension rather than homogenizing”². In the act of differentiating — a transitional state of becoming unfolds.

1. Deleuze and Architecture — Cache, Bernard (edited by Helene Frichot)
2. Virtuality, Philosophy and Architecture — Borradori, Giovanna
1:1 — Thesis Questions

— Can the perception of an interior element oscillate between multiple logics of geometry?

— What happens to the perception of interior elements when multiple geometrical logics are superimposed?
2. Theory

In this chapter I’ve collected a series of ideas in relation to experience, becoming and the built environment. Without drowning myself in the contemporary discourse of philosophy, I’ve found it rewarding to let myself be influenced in ideas regarding matter and memory, the image and objectile by philosophical thinkers such as Gillez Deleuze, Henri Bergson as well as architect and philosopher Bernard Cache as their ideas have served as a theoretical context to the practice I’ve been conducting.

1. Earth Moves, Bernard Cache
2. Projectiles, Bernard Cache
3. The Elements of Color, Johannes Itten
4. Deleuze and Architecture, Helene Frichot and Stephen Loo
5. Matter and Memory, Henri Bergson
6. Måleriets Rum, Häkan Nilsson
The current between memory and present has been described by Bergson’s idea of Matter and Memory. He argued that we are either ‘in’ memory or ‘in’ perception.

As we intentionally try to recollect something, we step into the past and its virtuality, and we navigate it, not rationally but intuitively, until we meet the virtual current that is pushing it along the memory we are looking for.  

Applied to everyday experience, “perception and memory becomes indistinguishable because any perception unfolds through time.”

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3. Virtuality, Philosophy and Architecture — Giovanna Borradori

fig — Bergson Cone — The essence of the general idea . . . is to be unceasingly going backwards and forwards between the plane of action [P] and that of pure memory [AB]. Let us refer once more to the diagram . . . traced above. At S is the present perception which I have of my body, that is to say, of a certain sensorimotor equilibrium. Over the surface of the base AB are spread, we may say, my recollections in their totality. Within the cone so determined the general idea oscillates continually between the summit S [the now] and the base AB [the then]. In S, it would take the clearly defined form of a bodily attitude or of an uttered word; at AB, it would wear the aspect, no less defined, of the thousand individual images into which its fragile unity would break up. - Henri Bergson, Cone of Memory, from “On the Survival of Images,” Matter and Memory, trans. Nancy Margaret Paul and W. Scott Palmer (1896; 1908; New York, NY: Zone Books, 1988) 162, ch. 3
By adding another axis that reaches into the future, or as described in neuroscience as predictive processing, we gain another potential for oscillation. Meaning that we don’t only experience through past and present, but we’re also constantly predicting sensory input. Andy Clark, professor in philosophy at the University of Edinburgh, describes the idea as

The key idea is that while our brains are constantly predicting sensory input, this is intimately tied to action. Perception is active, not passive, and there is an ongoing loop between perception, attention and action.

**fig** - My iteration of the Bergson Cone, that include an additional axis
The idea of oscillation is introduced, and can be experienced by the bunny-duck illusion in which one's perception oscillates between seeing the different animals.

What I call oscillation is what Bernard Cache refer to as vibrations. “Even the smallest perception is itself already composed of a multitude of vibrations” 3. In my project I work with oscillations of multiple geometries that oscillation in their predominance through one's experience of the object while being in movement.

fig - Another iteration of the Bergson Cone that describes the oscillation that occur in every experience.
In my project I’ve attempted to strain the tensions of the past and present. To do this I’ve worked with multiple superimposed sequential logics of geometry and color. Through the elements multilayered colmplexity, where the logics emerges and disappears, depending on the visitors relative position to the object, they form a new relation to an experiencing subject.

The project has carried me through color interactions and geometries, layering and patterns, models and diagrams. I’ve studied repetition through computational design and difference by introducing clashing logics to the same system. Together the multiple logics produce a tension between them and the amodality\(^4\) of experience.

\textit{fig.} The diagram shows a composite of ideas but mainly describes the multiplicity of bergson cones (from Matter and Memory) distributed around the objects as the form takes on different figures depending on ones relative position to it.

\(^4\) Amodal perception is the perception of the whole of a physical structure when only parts of it affect the sensory receptors.
Through the notion of color interaction, another aspect of virtuality emerges. With color composition, a flat surface can appear spatial and in the meeting of colors a vibration can be produced.

In the book Måleriets Rums, Håkan Nilsson discusses the use of color with german-swedish sculptor and painter Gert Marcus. “Color is in first hand the experience of color, and the experience is both subjective and objective”

The spatial relations Marcus explores in his work with color where about the distances and spaces the colors expressed. The borders of the colors creates a complex structure. Some color strives outward, other inward.

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fig. Bagarmossen Subway Station, Gert Marcus
5 and 6. Måleriets Rum, Håkan Nilsson, 2009 (my translation)
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In the same book, painter Mari Rantanen reflects on her work as a progressive reading that ties in with the previous ideas about matter and memory.

There is a deceptive symmetry in the canvas’ configuration that makes one see the repeated patterns as identical. But on closer inspection one sees that even the repetitions changes, square by square, curl by curl. When the viewer therefor has constructed a context, new relationships emerges.7

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*fig.* Mot Ljus, Mari Rantanen — Luleå University, 1999

7. Måleriets Rum, Håkan Nilsson
3. Design process

During my project I’ve worked with the format of a screen as it in its composition can suggest a directionality on which to directs movement and therefor allows for a progressive reading of it. In a progressive experience aspects such as perspective, rhythm and relative proportion becomes relevant for my design research. A screen is generally also composed of many geometries in repetition, which can be used to impose my geometrical sequences onto.

My process can be divided into four chapters. The first one being about patterns and color, in which I studied how patterns and colors can produce spatial qualities through repetition of curves, relief and layering. These studies carried me to my second chapter, in which I applied the repetition of curves to a spatial structure. This chapter is more focused on computationally generated forms through extrusion, physics simulation, bending and blending.

In my third chapter the focus is on how the repetition is generated. Going from flat patterns to three dimensional form allows me to elaborate the sequential logic of the repetition. In the fourth chapter I’ve let go of the arrayed repetition of division and instead let multiple geometrical sequences generate the form of the spatial elements.
To get my design process started, I continued exploring a technique I developed in my prior studies. The technique is a way to produce a lenticular pattern through CNC-routing machines. In my earlier projects, I had produced transparent objects onto which systematic patterns were milled. As the milled patterns were painted in a certain order and with different colors, the lines displayed three different colors depending on from which angle they were perceived. The patterned sheet where layered and curved which resulted in interactions between the patterns that together produced a combined pattern (moire) that danced around the objects in an unpredictable way. I started to look into systematic patterns and discovered the works of Bridget Riley. In her works, she produces a virtual depth to a flat surface by manipulating curved patterns in a systematic way. The technique was exercised during the 50s and 60s fascination of optical art, but mostly active within the field of art. As a mean to translate the technique to the field of interior architecture I began replicating and produce my own ‘spatial patterns’.

*fig.* spatial pattern by tweening curves
As I CNC-Milled the patterns onto sheet material, some spatial qualities emerged. The most apparent being how the systematic tweening between the different curvatures suggested a depth. Another aspect that is apparent in the second picture is in how the wood reflects light differently depending on at what angle the wood fibres are cut.

As the milling tool generates two surfaces to each line it’s possible to emphasize the lenticular aspects by painting the whole surface and then milling a slightly offset pattern on top of the painted surface. By doing so the wood is exposed onto one of the surfaces. This generates a pattern that shifts in color and materiality as you perceive it from different angles.
A way for me to transition the processed sheet materials into a spatial context is to work with transparency and layering. A simple explanation of the idea can be produced by superimposing and slightly tilting the pattern displayed from p.11. This operation produces a new phenomenenon where the two patterns are read as one. The combined pattern (moiré) relates to distance and angles and will shift and dance as you move around it.

*fig. Superimposed patterns*
In this part of the design process I explored different methods of generating spatial form that would be sliced by an array of surfaces. Thereby rendering a spatial pattern of curves.

*fig.* Process — Generating form
One method for me to generate form was through draping. In this particular exercise, I computationally designed the qualities of a textile material and let it fall onto a collection of geometries. I would then pause the animation mid fall, and excavate the geometries into a design software. In the process of letting the cloth fall, I managed to generate geometries that in their form relates to gravity, folding and tension. The outcome of this exercise was however too complex to continue with as the creases and folds intersected and was nearly impossible to slice.

*fig.* Process — Cloth Simulation
In this edition I’ve repeated an irregular shape along a circular curve, thereby creating an interior and an exterior. The irregularity is, however, lacking as the ridges of the form becomes apparent and the combined pattern isn’t as unpredictable as I anticipated. An interesting aspect of this method is that it could be repeated (arrayed) on a more complex curvature.

*fig.* Process — Revolved sequence
In this method of generating the form, I went back to the cloth simulation, but by using a different software with a lower resolution. This resulted in a systematically irregular form that, when bent generates an interior as well as an exterior. As I sliced it with the revolved sequence, the combined patterns of the intersected sequences danced around in an unpredictable way. Working with this method helped me generate a couple of designs, each with different tweaks to their systematic repetition and overall logic.

*fig.* Process — draping, bending, slicing
This part of the design process didn’t lead to any final physical manifestations. I tried producing a model with the latest technique of generating form, but as I realized that model had some structural and resolutonal problems I abandoned it. It did however lead me to the next chapter of my design process in which I worked with the sequential logic of the arrayed repetition of surfaces.

*fig.* Process — elements for model
In an attempt to get away from strictly arrayed and sliced layers, I stumbled upon a sequence that showed a great amount of qualities. In this revolved sequence aspect such as depth and form can be generated by the way light hits each surface. Furthermore, in moving around the sequence, an unfamiliar transition in relation to transparency occurs, as it instead of just following one's movement, does so in an unpredictable yet intuitive way.
fig. Extruded Sequence
In this rough model of the extruded sequence, the illusion of depth that comes from how the light hits the different lamellas is clearly visible.
By introducing a billowy logic to the repetition of surfaces, the screen opens up in certain areas. From the side that the sequence has been cut, the billowy logic is perhaps too readable as it is perceived as one surface. This is interesting, but as I want to superimpose multiple logics onto it I continue with my intervention to the sequence.

*fig.* Process — extruded sequence with superimposed geometry
The scattering was produced by moving every other third lamel vertically up and its neighbouring lamel down thereby rendering three simultaneous patterns, that can be perceived after some attention. The scattering of form is interesting if the consistent forms can be experienced simultaneously. In this iteration, flickering is introduced as you move around, since the multiple patterns disrupts their neighbouring transparency when viewed from certain angles.

*fig.* Process — extruded sequence with superimposed geometry and scattered
I started testing the technique to see how it could be utilized in a large scale configuration that would render an immersive experience. Some of which I will continue to produce.
**IN FLUX SCREEN** An extruded array of revolved lines poses as the frame for imposing logics onto. By slizing it with a rectangle, a flat surface with a virtual depth is suggested by the way light hits each segment. As such a sequence contains features such as emergence and disappearance through the segments filtering quality, it gives an opportunity for ‘hidden logics’. My superimpositioned geometries affect the inside of the screen and the outsides. As two ‘spatial patterns’ (produced by blending different sinus curves) gradient from one side to the other intersects with the logic of the revolved sequence, a superimposed pattern is created. As each intervention will be more or less predominant depending on your relative position to the object, movement is enticed and emphasized. A virtual relation between you and the object emerges as it flickers and dances to the choreography of your movements.

*fig.* Process — process of designing IN FLUX screen
fig. top, axonometric rendition of the screen, with its structural frame — bottom, drawing 1:100 of lasercut pieces for in flux screen
When put together, the screen creates a fuzzy interior experience as it fades through the different logics and transperancies throughout the screen. In some instances, the screen appears to flicker as two sequential logics are visible at the same time through the corner.

*fig.* physical manifestation of the in flux screen
Another way for me to work with a sequential repetition of multiple geometries was achieved with an extruded single curved surface. As this method allows for multiple sequential logics such as scattering, rotation (in multiple axes) and curve composition, it allows me to superimpose a multitude of logics onto the same system. The method for materialization, I had developed in an earlier project in which I computationally unrolled single curved surfaces and added a fingerjoint structure to each edge that aligns with the connecting surface. In the earlier project, I learned that the ability to bend more narrow curves became an issue in relation to the material. For this reason, I knew that I wanted to produce larger scale structure, and I was also aware of the limitations in the bending limitations of the material. Another material aspect in relation to bending is that as a form constructed with multiple single curved surfaces comes together, it becomes more structural than if it would be produced with flat surfaces. This is partly because they lock eachother into place, but also because the curvature of the surfaces stabilizes the structure in a simillar way as with any corrugated surface.

**fig1.** GESTALT #2, project from 2017

**fig2.** Joinery, of FOLDS
In my first attempt to scale up this method I worked with 2mm, sheet MDF sheet material as it proved quick to process with a lasercutter as well as having some bending qualities. In this iteration, the form was produced by superimposing two different sets of offsetted and extruded curvatures. The combination of the two geometries produces a oddly corkshaped form, whos overall gestalt and experienced logic shifts as it is viewed from its different angles.

*fig.* Representation of design method and full scale mockup
To make a screen out of the previous iteration, I would have to repeat the single form with sequences of repetition and distances. Such a repetition would appear symmetrical and the logic of the repetition would perhaps be too predominant. Instead I continued with a sequence that would never repeat itself as each element would be designed in relation to the previous.

**FOLDS** In this outcome, that I call “folds”, a frame was produced by sequentially rotating an array of squares, onto which a vertically scattered geometry of extruded curves (sinus curve with an offset to imply thickness) was posed. The geometries where then systematically rotated parallel to the axis of the frame and where the geometries intersected, each extrusion becomes the back of the other. This method generates a sequence of unique volumes related by their multiple superimposed logics of geometry.

Due to the ridges and corners of the frame, an opportunity for lenticularity emerged. Each volume consists of 4 sides that if painted in different colors, would shift in their relative proportion as one moved around. Thereby activating some of Itten's contrasting functions.

*fig.* Representation of FOLDS design method
fig. 1:50 scale drawing of the pieces that makes up the volumes
After putting the volumes together, I tried them out in different compositions to see what the volumes could produce in regards to spatial qualities and sequential logics.

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*fig. FOLD volumes in different spatial configurations*
Next, I started to work with the color composition of the structure. I wanted a composition where two sets of contrasting colors would subtly gradient over the whole wall. While mixing the colors I noticed that a composition with strong complementary contrast where the colors are simultaneously similar in lightness produce the strongest vibration to the overall composition.

*fig.* Color Composition

*diagram.* Bridget Riley — Complementary Colors — 1992
**fig1.** Process of mixing colors

**fig2.** Final system of 14 different colors
When the volumes are put together and painted, the lenticular effect emerges. When it is viewed from one angle, the viewer experiences the fade from pink to apricot, whereas from the other side one experiences the fade between turquoise and blue. Another aspect that becomes apparent is the fade in relative proportion of colors also fades from one side to the other. To the left the predominant color scheme is the red/apricot while on the right side the blue/turquoise is dominant. This creates a tension within the spatial composition and fluctuates as one views it from different angles. To paint the wall, I painted with cross hatching, as such a technique captures light in a way that emphasizes the forms.

*fig.* Physical manifestation of FOLDS
4. Exhibition

For the exhibition I designed two more pieces. One ceiling with the In flux-sequence, and a bench with the FOLDS method. The reason for the ceiling is that I wanted to produce an enclosed space and the bench serves as a podium for my process book as well as a place for the visitors to sit and read it. As the ceiling and bench relates in their color composition, it helps to connect the large wall and the screen together of they’re aesthetic similarity.

*fig. IN FLUX CLOUD CEILING and FOLDED BENCH*
The result of everything together creates an immersive experience where each element shifts in a peculiar manor as you transit through the space. Since one is supposed to be able to experience the elements from a slight distance, I’m not satisfied with how everything is crammed together in this space. This is however a circumstance of the spring exhibition being crammed in general, and nothing I could change in this context. To emphasize the aspect of movement, I might have wanted to have a representation or animation that could communicate the idea. These aspects could be found in my process catalog, but not everyone takes the time to read it. In another context, I would also arrange the elements differently to ‘break’ the space by tilting them in relation to the existing architecture. As they are placed now, they appear to be striving to connect with the existing architecture.

fig. EXHIBITION
5. Reflection / Relevance

During my project I have developed methods for computationally producing spatial forms and thereafter techniques for materializing them. My project is reaching for for the tensions within our everyday experiencing. I have through contrasting — either by color compositioning or by superimposing multiple geometrical sequences, explored the tensions in our everyday experience of space.

In an attempt to break the tension of experience, I wanted to explore a new relationship between the built environment and its experiencing subjects. Within the new relation a potential merging could unfold, as the borders of the space becomes an extension of ones self. A state Deleuze describes as:

By means of the material, the aim of art is to wrest the percept from perceptions of objects and the states of a perceiving subject, to wrest the affect from affections as the transition from one state to another: to extract a bloc of sensations, a pure being of sensation.

I have, in my project attempted to push this notion to its limit through a progressive reading of juxtaposed colors or by superimposed geometrical sequences, because I wanted to explore the potential of the issue. By exploring these ideas, not only through art but also within the field of spatial design, my intention has been to introduce new aspects to consider when practicing spatial design. I believe that making the experience an issue of design (rather than function or aesthetic) would refine and cultivate our practice to more accurately reflect the actual relationship between the environments we build and the people that uses them. In an experience based spatial design practice, aspects such as perception, perspective and progression becomes crucial elements to the way we design and potentially represent our spaces.

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