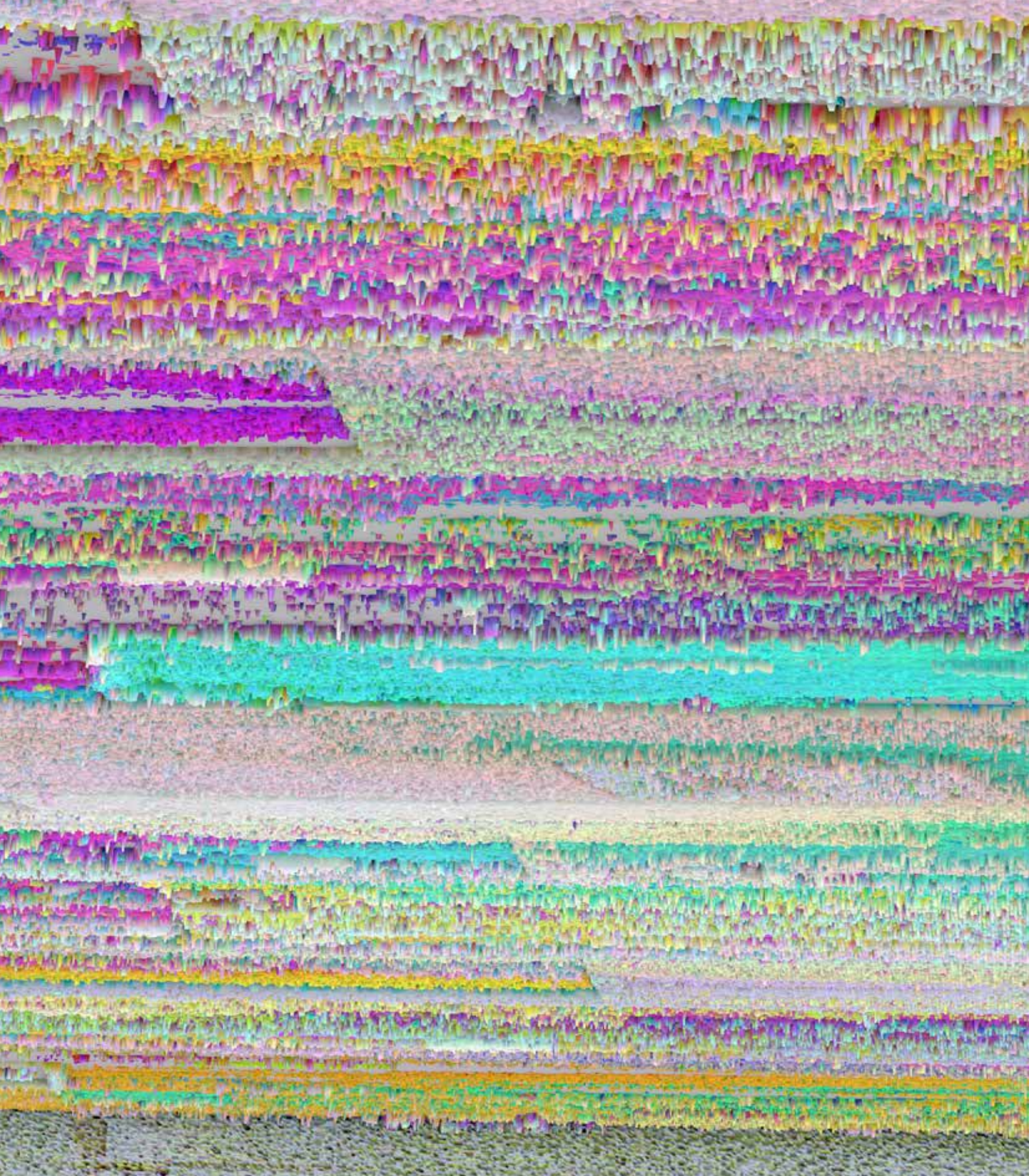
ARCHITECTURAL GLITCHING, AMBIGUITY AND THE ATTACK ON PERFECTION

THIS IS AWKWARD

MYRRA LINDHOLM
Examiner/Jonas Lundberg
Supervisors/Daniel Norell and Karin Hedlund
Chalmers School of Architecture/Department of Architecture and Urban Design



THIS IS AWKWARD

ARCHITECTURAL GLITCHING, AMBIGUITY AND
THE ATTACK ON PERFECTION

Myrra Lindholm
Master Thesis Spring 2018
Examiner: Jonas Lundberg
Supervisors: Daniel Norell and Karin Hedlund
Master Program: Material Turn
Chalmers University of Technology:
Department of Architecture and Civil Engineering
Göteborg, Sweden

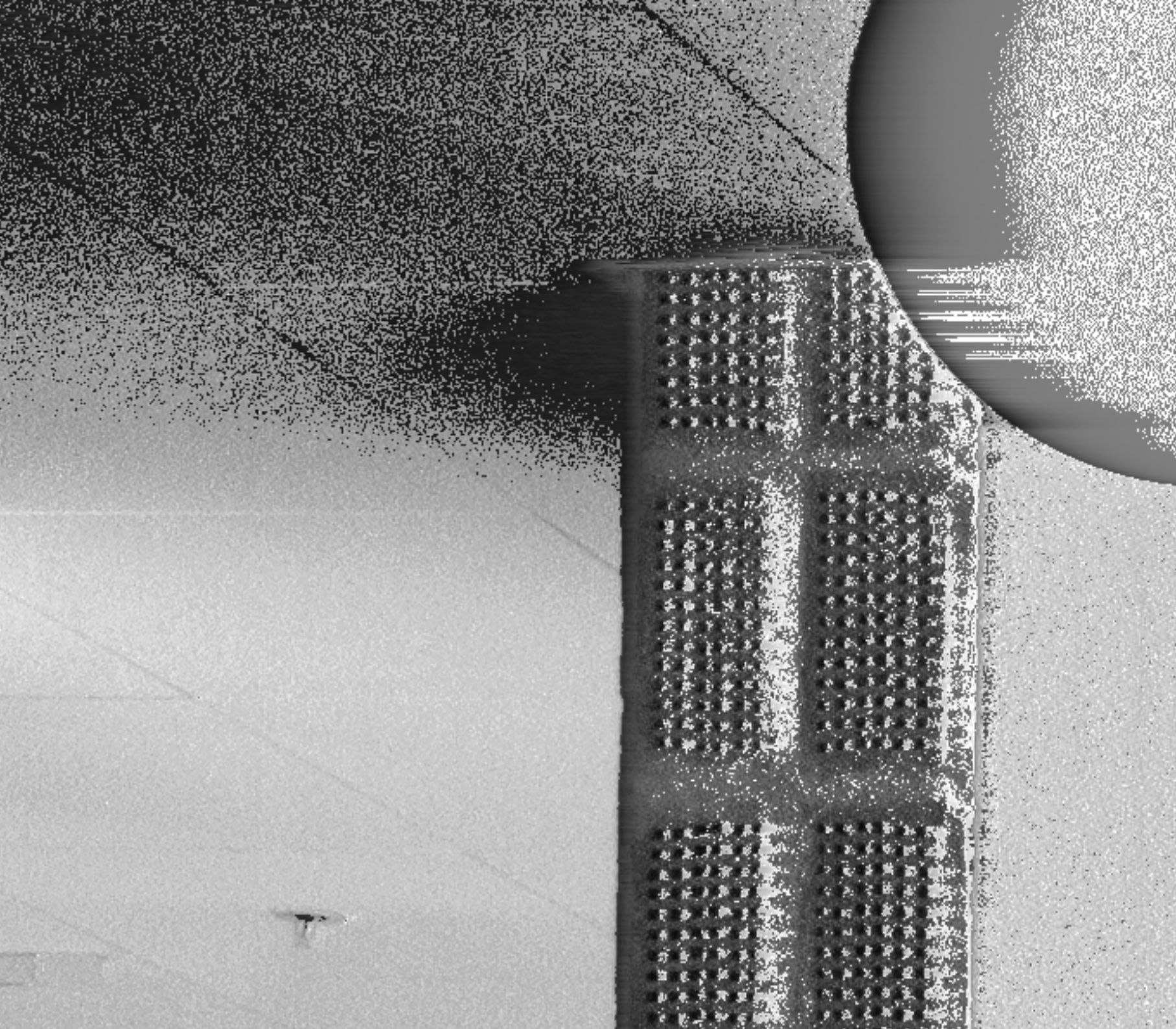
Peter Wollen writes about the twentieth century culture; "In the end, purism leads towards stasis...". Modernism has been critiqued for its over fondness of perfection and systematization, two aspects no longer just ideals but consequences of technology advancement. The increasing role that technology plays in architectural development has made way for faster and more efficient processes, often coupled with calculated and controlled results. The lack of tension and uncertainties that follow makes a poor position for side-stepping convention. Contemporary architecture has inherited modernism's issue with stagnation.

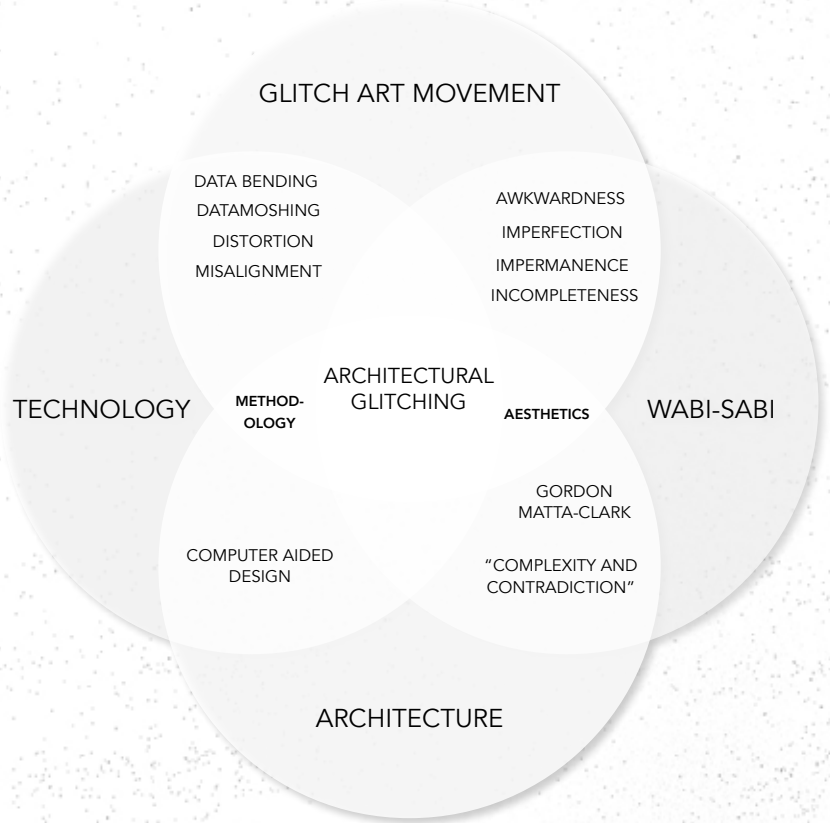
The aim of this thesis is to discuss instrumental control and question the strive for 'perfection' in the architectural tradition. With departure in wabi-sabi - a Japanese aesthetics and philosophy that embraces imperfection - and the glitch art movement - an art form centered around utilizing and highlighting mistakes - this thesis set out to explore awkward aesthetics and unconventional design methods.

Intentionally awkward situations are increasingly present across several creative fields. As a bumpy variation of - rather than in opposition to - the 'correct', the awkward suggests a new set of aesthetic rules. While the awkward has a central position in wabi-sabi and glitch art, it has yet to prove its place in the architectural discourse. This thesis explores the presence of awkwardness in historic and contemporary architecture while showcasing the awkward's ability to interfere with our habits and presumptions.

The introduction of glitch art to the architectural discourse, does not only present an alternative aesthetic but also novel design methods. This thesis examines a selection of glitch techniques and develops a method for 'architectural glitching'. Theory and method come together in *Misaligned* - a short film portraying applied glitching and reworking of the Architectural building at Chalmers.

This is Awkward leaves a commentary in the discussion about 'correctness' and 'perfection' within architecture and demonstrates the awkward's potential of enriching architecture with tension and ambiguity. By introducing glitching to the architectural design process, instrumental control and spatial clarity can be removed from the digital drawing. This incorporates ambiguity and unpredictability into the design process, which provide a fruitful environment for novel insights.




GLITCH ART MOVEMENT
DATA BENDING
DATAMOSHING
DISTORTION
MISALIGNMENT
AWKWARDNESS
IMPERFECTION
IMPERMANENCE
INCOMPLETENESS
TECHNOLOGY
METHOD-OLOGY
ARCHITECTURAL GLITCHING
AESTHETICS
WABI-SABI
GORDON MATTA-CLARK
COMPUTER AIDED DESIGN
"COMPLEXITY AND CONTRADICTION"
ARCHITECTURE

The Japanese philosophy wabi-sabi suggests that beauty is found in imperfection. Honesty. Awareness of everything's incompleteness and impermanence is manifest in faults and cracks. Wabi-sabi is a way of life that embraces the odd, the misshapen. The awkward. Unease and discomfiture are often synonymous with awkward situations. However with a wabi-sabi mindset such situations might be valued differently. According to Andrew Zago (Zago Architecture) there is an increasing presence of intentionally awkward situations across several creative fields (2010, p. 205), suggesting an emerging aesthetic that ignores established expertise, without opposing it. This spurs an interest of the awkward's potential to influence the architectural profession.

Another field that, like wabi-sabi, takes a position outside the mainstream, is the glitch art movement. This process-oriented art form centers around utilizing and exploiting errors, which occurrence is elsewhere seen as problematic and undesirable. The glitch aesthetics are associated with vibrant color schemes and intense, almost disturbing elements, seemingly very far from the muted naturalness that can be identified in wabi-sabi. The glitch, however, expresses the nature of technology, revealing its language and building blocks. Glitch art shares the honesty in wabi-sabi and takes an equally awkward position.

The process of glitching amounts to deliberately arranging for a surprising outcome. By stretching the boundaries within a chosen media, glitching explores possibilities beyond 'intended' functionalities and operate outside the sphere of prediction. In the introduction of *Ignorance and Surprise - Science, Society, and Ecological Design*, Matthias Gross writes that 'novel things always include elements of surprise, uncertainty, and the unknown' (2010). The unknown is initially perceived as 'incorrect' since it does not align with established knowledge, but seen from a new angle or with a different mindset, it can provide novel insights. Learning from glitch art and techniques of glitching can be a way of expanding the architect's traditional toolset and, perhaps, extend and twist the possibilities of architecture.

Incorporation of glitching into the architectural design process is, so far, uncharted waters. There are no established rules or conventions of how to use glitching or how to interpret glitch material in architecture. This retains a potential for exploration of how the glitch can influence the architectural design process. The rattling character of the glitch disrupts not only the drawing but also the architect's custom of reading the architectural drawing. This opens up for unrestricted interpretation of strange and unpredictable elements that occur in the glitch material.

This thesis analyzes historic and contemporary occurrences of the 'awkward', integrating philosophical ideas with architectural precedences and discussing the role of 'awkwardness' in architecture. With departure in the Japanese philosophy wabi-sabi and current discussions about awkwardness in design, the initial theory development phase (chapter 2 - *Awkward*) examines possibilities of awkwardness in architecture with the purpose of questioning the strive for 'perfection' in the architectural tradition. In pursuit of deconstructing ideals of beauty and architectural organization, this thesis set out to search for ambiguity and novelty within the intentionally awkward.

Following chapter - *Breeding error* - expand on how to exploit error in the design process, introducing the reader to the glitch art movement and techniques of glitching. A foundation for why and how to implement glitching into architecture is formed by discussing and building an understanding of the glitch art movement's objectives and techniques.

THESIS QUESTIONS

_What is Awkwardness in Architecture?

_What can Awkwardness add to the Architectural Discussion?

_How can Glitching influence the Architectural Design Process?

Figure 1. SB-building, Chalmers Johanneberg. Author's own copyright.

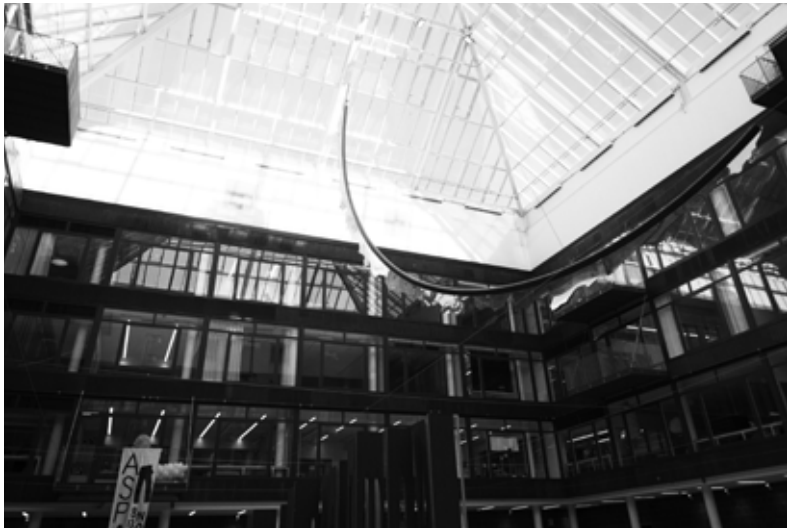


Figure 2. Atrium (SB-building), Chalmers Johanneberg. Author's own copyright.

Thesis questions and objectives come together in *Misaligned* - a deconstruction based on applied glitching and reworking of the Architectural building at Chalmers, portrayed in a 3.40 min film. The purpose of the deconstruction is to exemplify thesis findings and provide a platform for discussion.

The school of Architecture and its physical manifestation - the Architectural building (SB-building) - was an intuitive choice as the subject for design implementation of this thesis. The deconstruction and reinterpretation is not a consequence of a formulated criticism nor a questioning of the architectural qualities of this particular building. The building merely act as a canvas on which to try out gathered tools and concepts. Furthermore, the character of the canvas is beneficial in the pursuit of demonstrating awkwardness. The robust and near symmetrical brick building represents permanence and systematic order, where main structural elements and physical appearance stand intact even after the recent refurbishment (completed in 2017). The building's readability makes the deconstruction and reworking easier to discriminate and evaluate. The SB-building is also a familiar environment to the main audience of this thesis - students and teachers at Chalmers school of Architecture - which adds to the readability of the deconstruction.

Thesis questions and objectives have been explored in investigatory work carried out in three phases; theory development, method development and the final design implementation. The first phase concludes literature findings treating the thesis questions 'What is Awkwardness in Architecture?' and 'What can Awkwardness add to the Architectural discussion?' with the purpose of formulating design criteria for the design phase. The design criteria are expressed as 'outcome' and demonstrated through case study analysis. Secondly, an orientation of the glitch art movement and the process of glitching is presented. The thesis question 'How can Glitching influence the Architectural Design Process?' is discussed.

The second phase - the method development found in chapter 5 - *appendix* - attend to design investigations in relation to glitching and ways of interpreting glitch material. The focus has been on digital techniques such as digital glitching and digital collaging. One theme was executed in a physical model experiment in order to exemplify the 'glitch to matter' approach found in the theory development about glitching (glitch textiles). All studies conclude how to perform the study (workflow), input- and output-format as well as the visual output of the study. The evaluation of the process and visual output was done with attention to usability for the design implementation, the third and final phase where theory and method come together in a series of 'glitch elements', presented in the short motion sequence *Misaligned*.

The process of glitching and reworking of glitch material into 'glitch elements' has been carried out according to the following workflow;

1. Glitching of plan and section drawing of the subject building.
2. Interpretation and reworking of glitch drawings into three dimensional form. Focus on the larger scale and organization.
3. Glitching of imagery of interior spaces of the subject building.
4. Interpretation and reworking of glitch imagery into three dimensional form. Focus on the smaller scale; textures, materiality and light.

EVALUATION METHOD

Theory and case studies act as reference for evaluation of the glitch elements presented in *Misaligned*. Analysis of the case studies nuance the notion of awkward by concluding;

_DESIGN ELEMENT(S). Building/physical elements that the study object is focusing on.
_TOOL(S). Treatment of the design element.
_VISUAL OUTPUT. Visual appearance present in the study object.
_OUTCOME. Result from the relationship between design elements, tools and visual output.

A comprehensive vocabulary concluding the intended reading of tools (concepts and techniques), visual output, glitch elements and outcome used throughout this thesis are listed on the following page (Vocabulary).

TOOLS

_CONCEPTS

_DECONSTRUCTION. Breaking apart or cutting into an image/object physically or analytically.
_INTERPRETATION. (subjective or algorithm driven) Translating/rendering of meaning/appearance of an image/object.
_RE-ORGANIZATION. Changing the visual/physical organization of an image/object.

_TECHNIQUES

_COLLAGING. Fragmentation of an image/object and reorganizing the fragments in a new composition.
_DATA BENDING. (with text editor) Manipulation of a digital file's information.
_DATAMOSHING. (with Avidemux) Manipulation of a video clip's I-, P- or B-frames.
_DISTORTION. (technique). Digital or physical tweaking, pulling or deformation of an image/object.
_MISALIGNMENT. (with Audacity) Opening an image, video or object file in an audio editor and treating the file as an audio file.

VISUAL OUTPUT

_ABNORMAL PROPORTIONS. Unfamiliar proportional relationships.
_ARRAY. (diagonal, horizontal or vertical). Copying and placing a shape/object multiple times on a diagonal, horizontal or vertical line.
_BRIGHTNESS. Increased brightness value.
_COLORATION. Emergence of colors not present in the input image/object.
_COLOR INVERSION. Replacing a color with its complementary color.
_DARKNESS. Decreased brightness value.
_DISTORTION (effect). Deformation of an image/object.
_DISPLACEMENT. Relocation of an image/object.
_DIAGONAL DISPLACEMENT. Diagonal relocation of an image/object.
_FADING. Decreased intensity (opaqueness) and distinction.
_CONTOUR FADING. Decreased intensity (opaqueness) and distinction towards the edge(s) of an image/object.
_PARTIAL FADING. Decreased intensity (opaqueness) and distinction in part of an image/object.
_FRAGMENTATION. Erasing part of an image/object.
_NOISE. Visual pixilation of a surface.
_ROTATION. Turning an object along its midpoint.
_180° ROTATION. Turning an object 180° along its midpoint (upside down).
_SATURATION (high or low). Intensity of color.
_SKEW. Give an oblique direction to an image/object.
_SMUDGE. Spreading out an image/object in a smeary manner.
_SPLIT. Separating an image/object into two parts.
_TACTILITY. Feeling of something being responsive to stimulation of the sense of touch (textural qualities).
_TINT CHANGE. Changing the tint value in an image/object.
_MULTIPLE SPLITTING. Separating an image/object into multiple sections.

GLITCH ELEMENTS

_CLIMB DOOR. An opening/door that is placed on a wall to instruct a climbing motion over the threshold.
_DECAYING ELEMENT. An element that appear to be in decay/fading away.
_EXPOSING ELEMENT. An element that exposes former hidden activities/elements.
_INACCESSIBLE ELEMENT. An element that has been made physically hard/impossible to reach.
_IRIDESCENT ELEMENT. An element showing lustrous colors that change with movement and light.
_LIGHT ELEMENT. An element that generate and emit light.
_SHADING ELEMENT. An element that provide shade.
_TEXTURED ELEMENT. An element with textural qualities.

OUTCOME

_DECAY. Feeling of impermanence (in the presence of signs of time and use).
_DIPLOPIA. Sense of seeing double (double vision).
_DISCOMFORT. Feeling of unease in an unfamiliar environment.
_DISORIENTATION. Lack of readability of a space in the aspect of orientation.
_INCOMPLETENESS. Feeling of an on-going process.
_SELF-AWARENESS. Entering a state of introspection, becoming aware of oneself as an individual separate from the environment and other individuals.
_TENSION. Interplay between two or more opposing phenomenon.

The focus for this thesis has been directed towards finding, understanding and acquiring awkwardness in architecture. The process development has focused on the introduction of glitching into the design process. The thesis has not attempted to solve any particular systematic, programmatic or technical issues in the architectural proposal (design implementation), which solely acts as a platform for discussion concerning 'perfection', awkwardness and instrumental control within architecture. Acquiring and discussing 'awkwardness' has been leading in both design and theory development, while other aspects of design/aesthetics have been intentionally bypassed.

The method development for this thesis' design implementation has centered around exploring methods and techniques that generate surprising, unpredictable and/or 'awkward outcome'. With the glitch art movement as lead in the method development, it was natural that most design investigations and the final implementation became limited to a digital format. One small physical experiment was made, acting as a demonstration of the 'glitch to matter' approach. However, the emphasis for this thesis has been directed to digital deconstruction and manipulation.

1
MISALIGNED

Design implementation:
Presenting glitch elements in images accompanied by extracts from bibliography

2
AWKWARD

Theory development:
Awkward aesthetics, tension and ambiguity in architecture

3
BREEDING ERROR

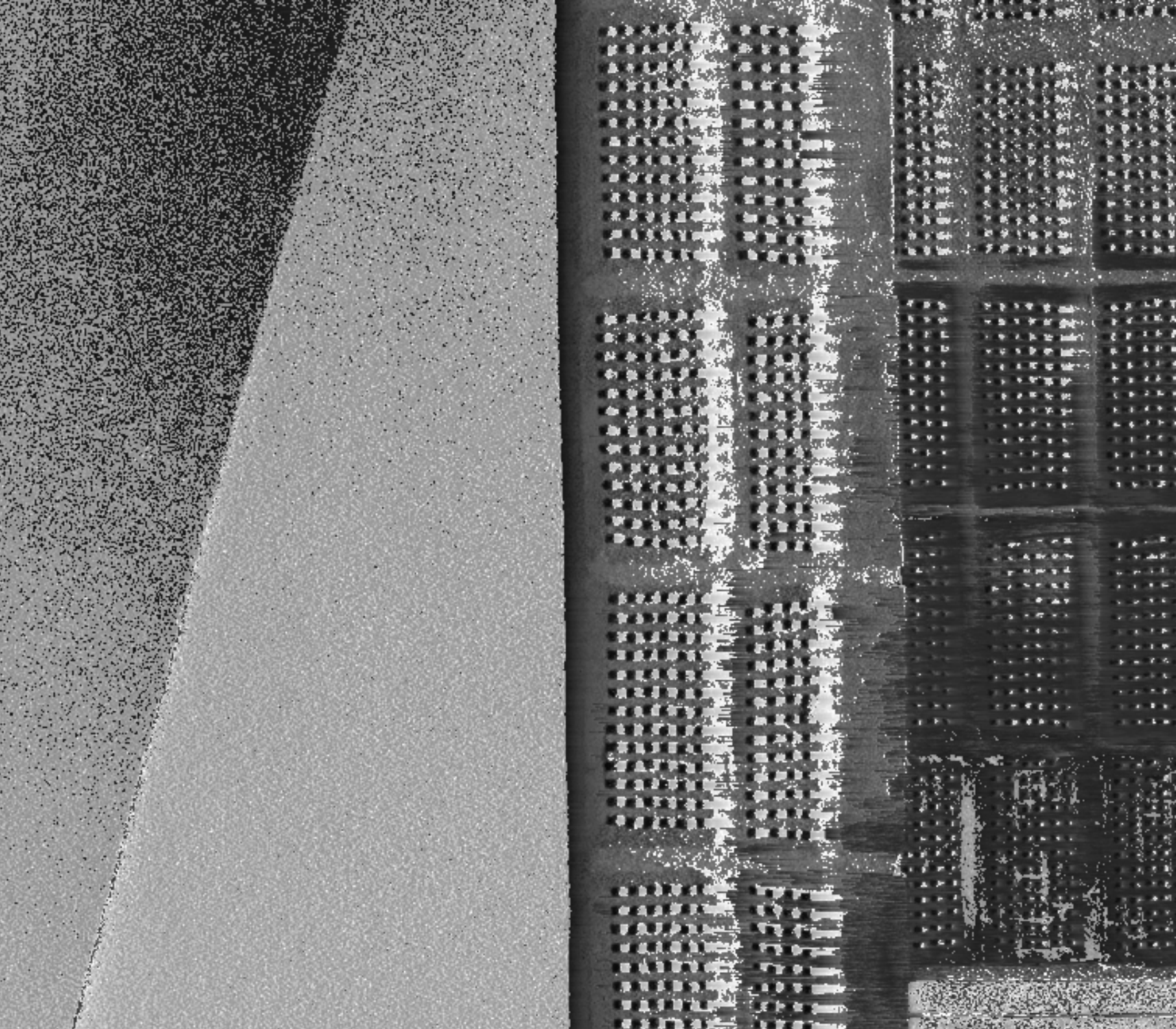
Theory development:
Exploring instrumental control in light of the glitch art movement and the process of glitching

4
DEMONSTRATION

Design implementation:
Presenting, discussing and evaluating the process and outcome of glitch elements in relation to theory

5
APPENDIX

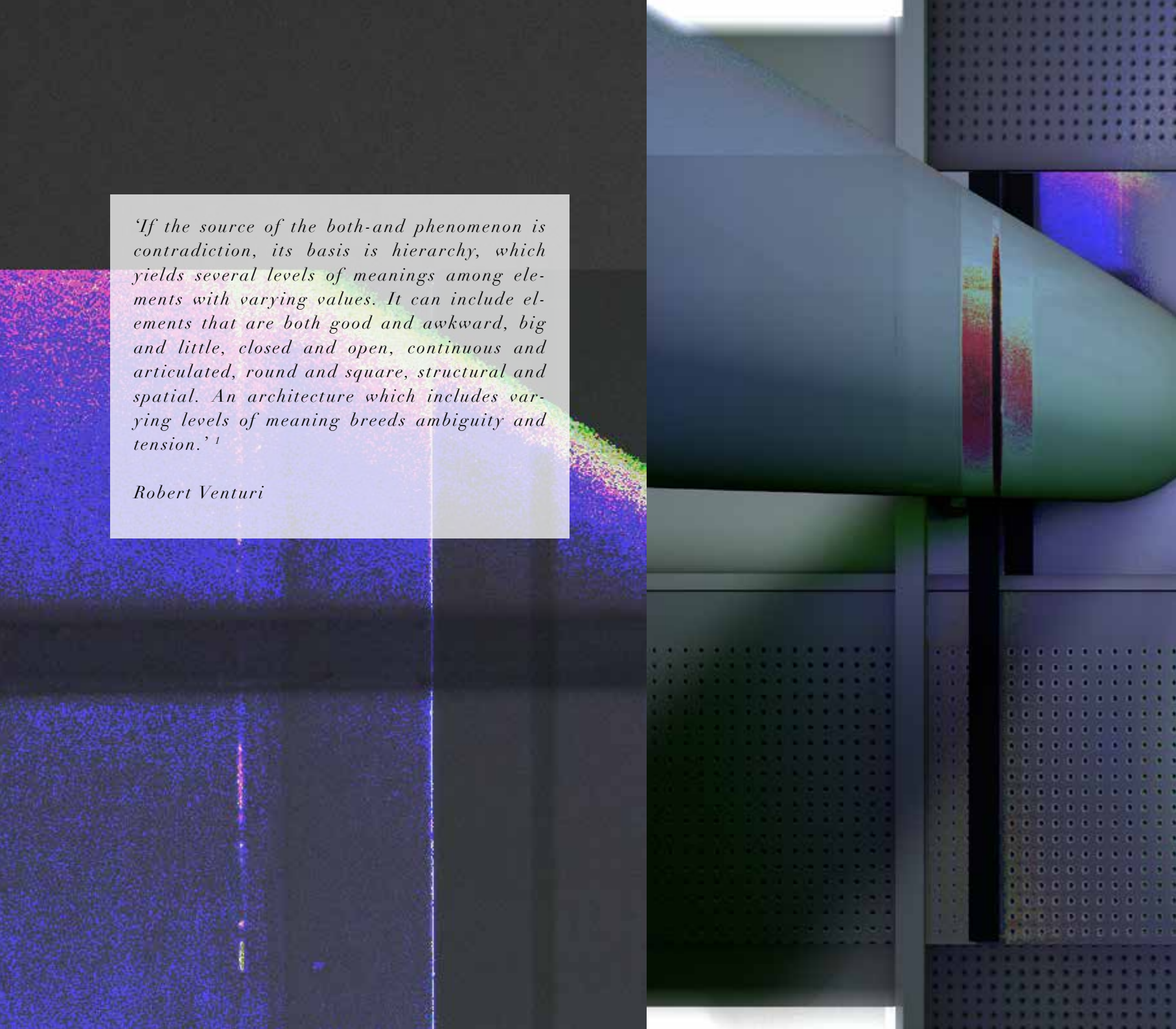
Method development:
Design investigations, glitching techniques and interpretation of glitch material



I

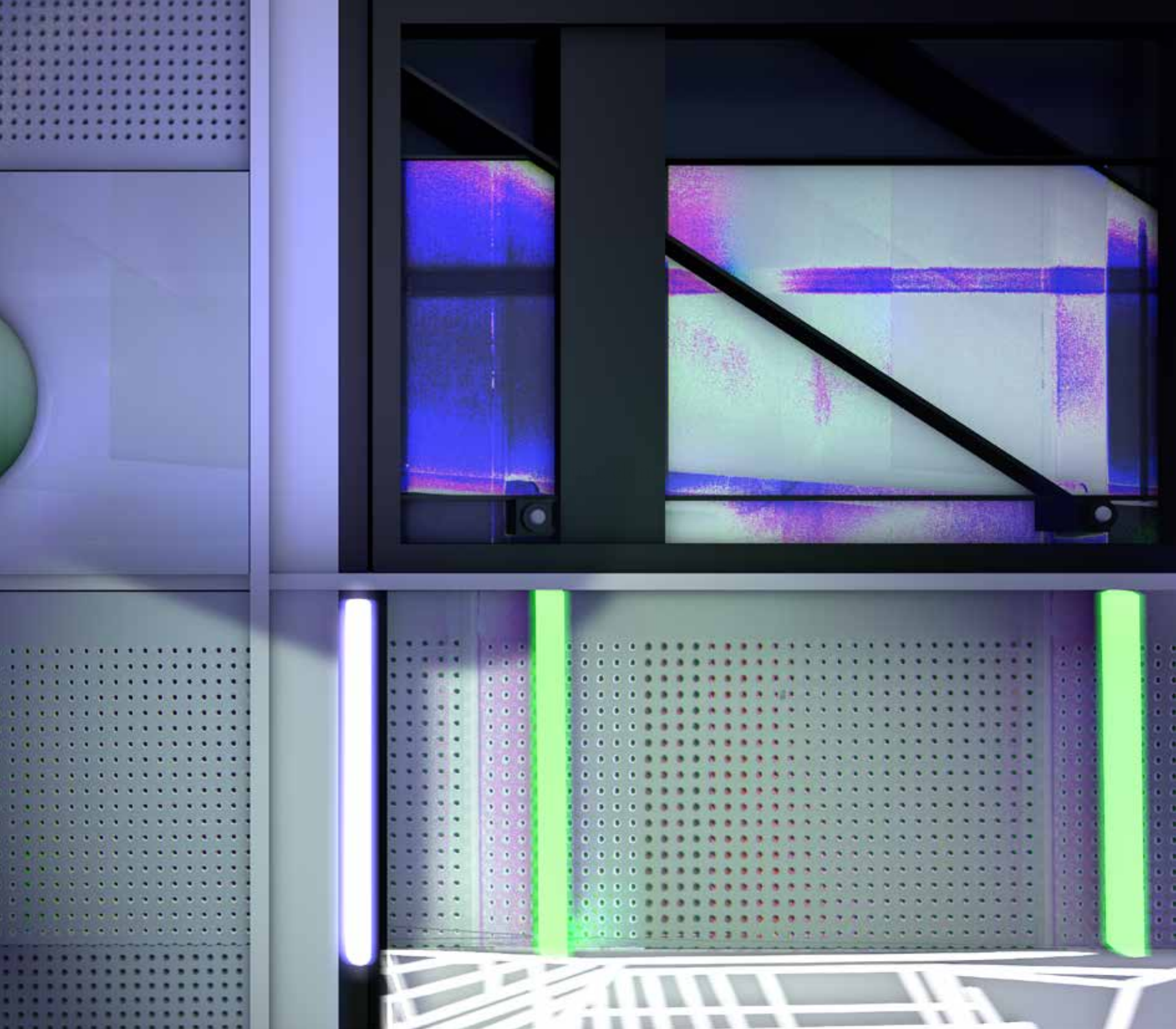
DESIGN IMPLEMENTATION:
PRESENTING GLITCH ELEMENTS IN
IMAGES ACCOMPANIED BY
EXTRACTS FROM BIBLIOGRAPHY

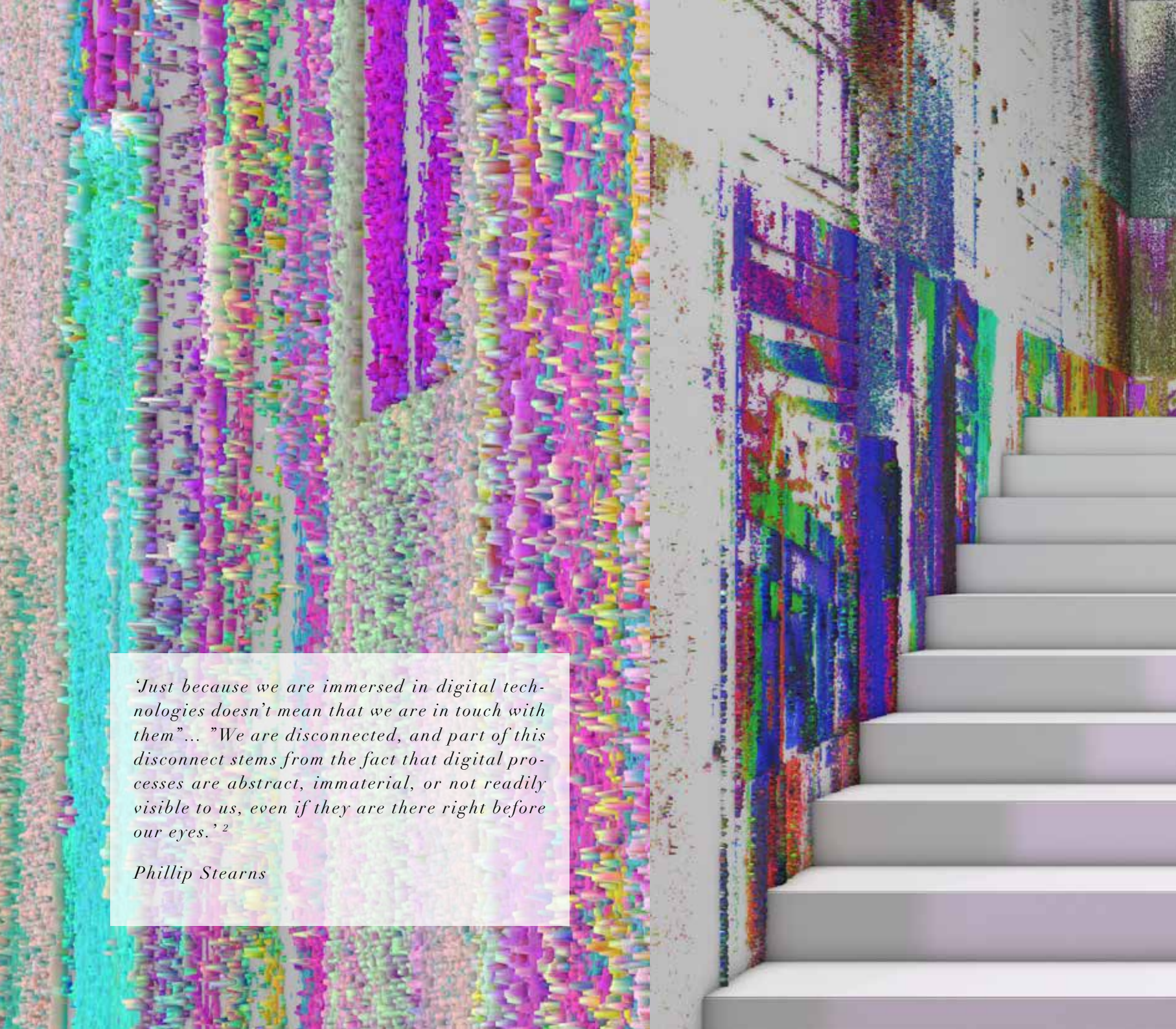
MISALIGNED



'If the source of the both-and phenomenon is contradiction, its basis is hierarchy, which yields several levels of meanings among elements with varying values. It can include elements that are both good and awkward, big and little, closed and open, continuous and articulated, round and square, structural and spatial. An architecture which includes varying levels of meaning breeds ambiguity and tension.' [1]

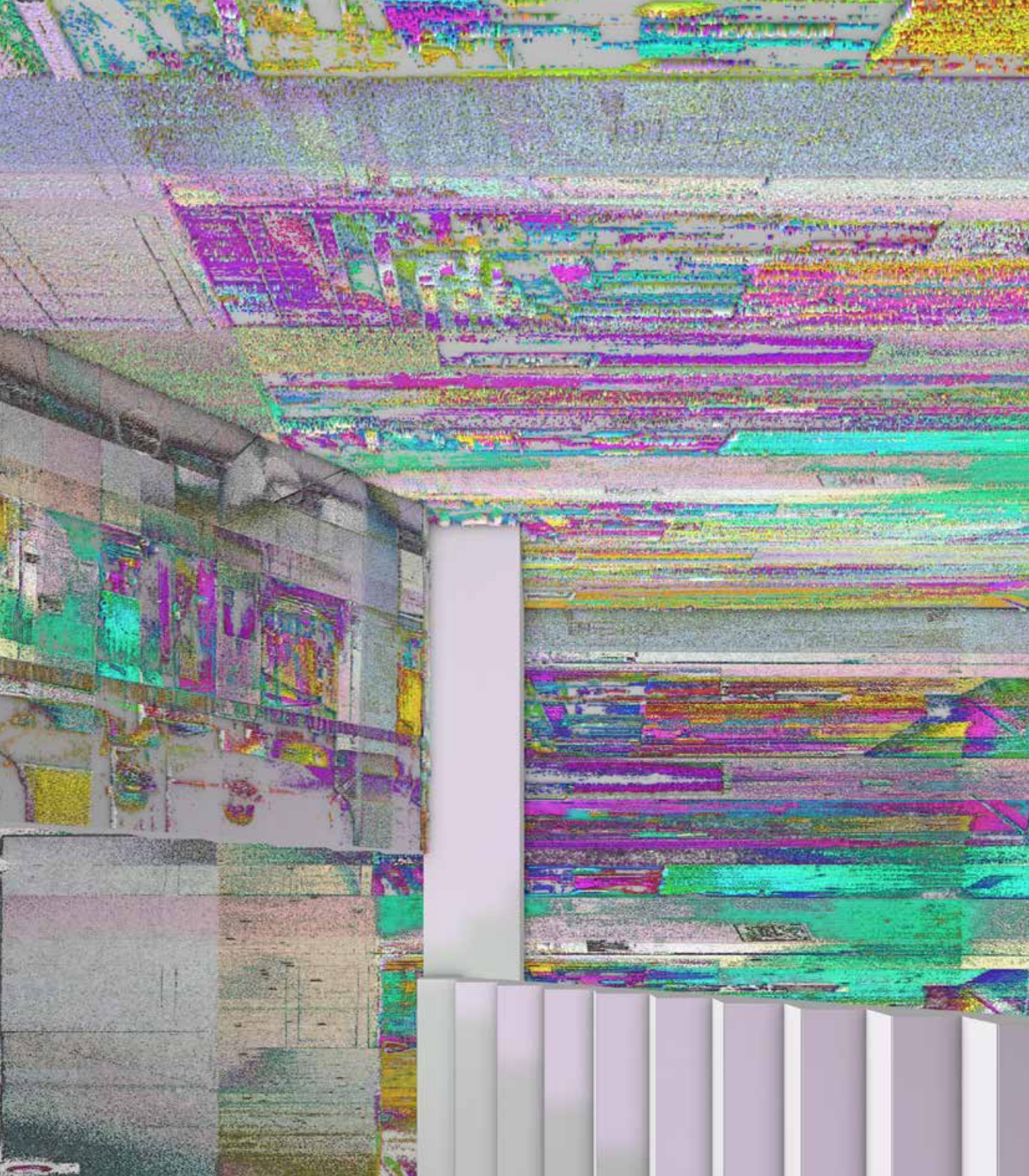
Robert Venturi





'Just because we are immersed in digital technologies doesn't mean that we are in touch with them"... "We are disconnected, and part of this disconnect stems from the fact that digital processes are abstract, immaterial, or not readily visible to us, even if they are there right before our eyes.' [2]

Phillip Stearns

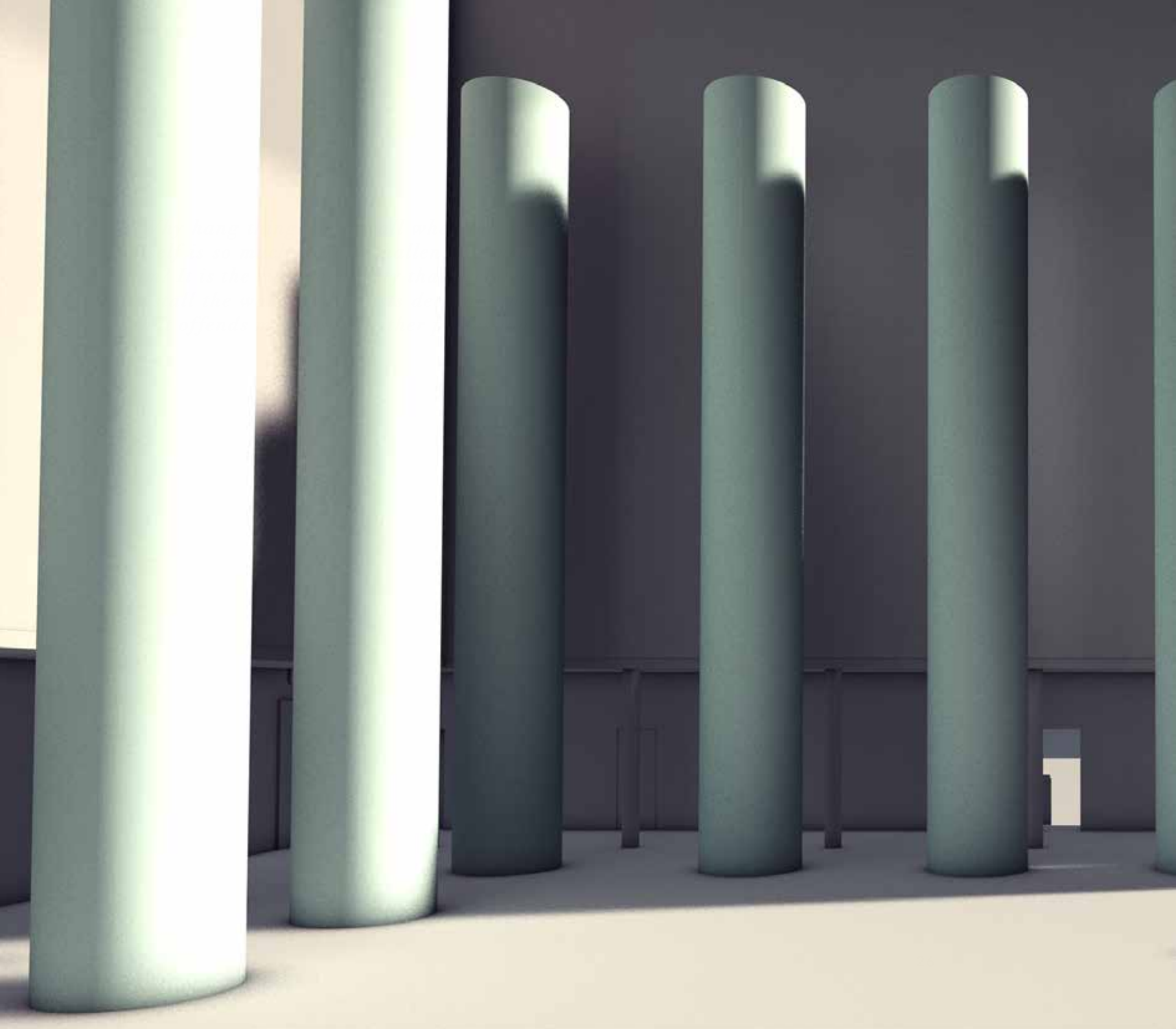


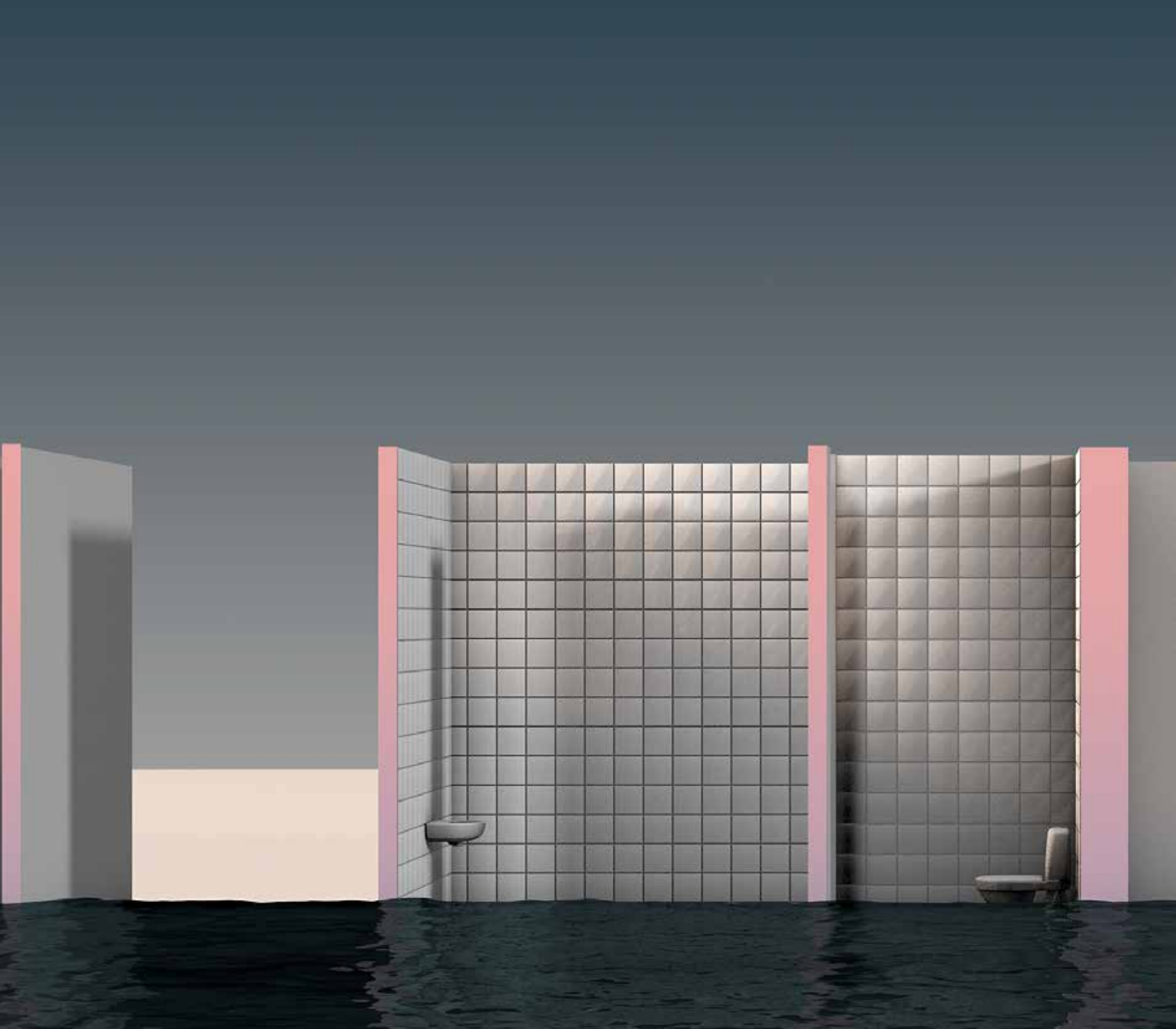
'In equivocal relationships one contradictory meaning usually dominates another, but in complex compositions the relationship is not always constant. This is especially true as the observer moves through or around a building, and by extension through a city: at one moment one meaning can be perceived as dominant; at another moment a different meaning seems paramount.' [3]

Robert Venturi

'Why hang things on a wall when the wall itself is so much more a challenging medium? It is the rigid mentality that architects install the walls and artists decorate them that offends my sense of either profession' [4]

Gordon Matta-Clark



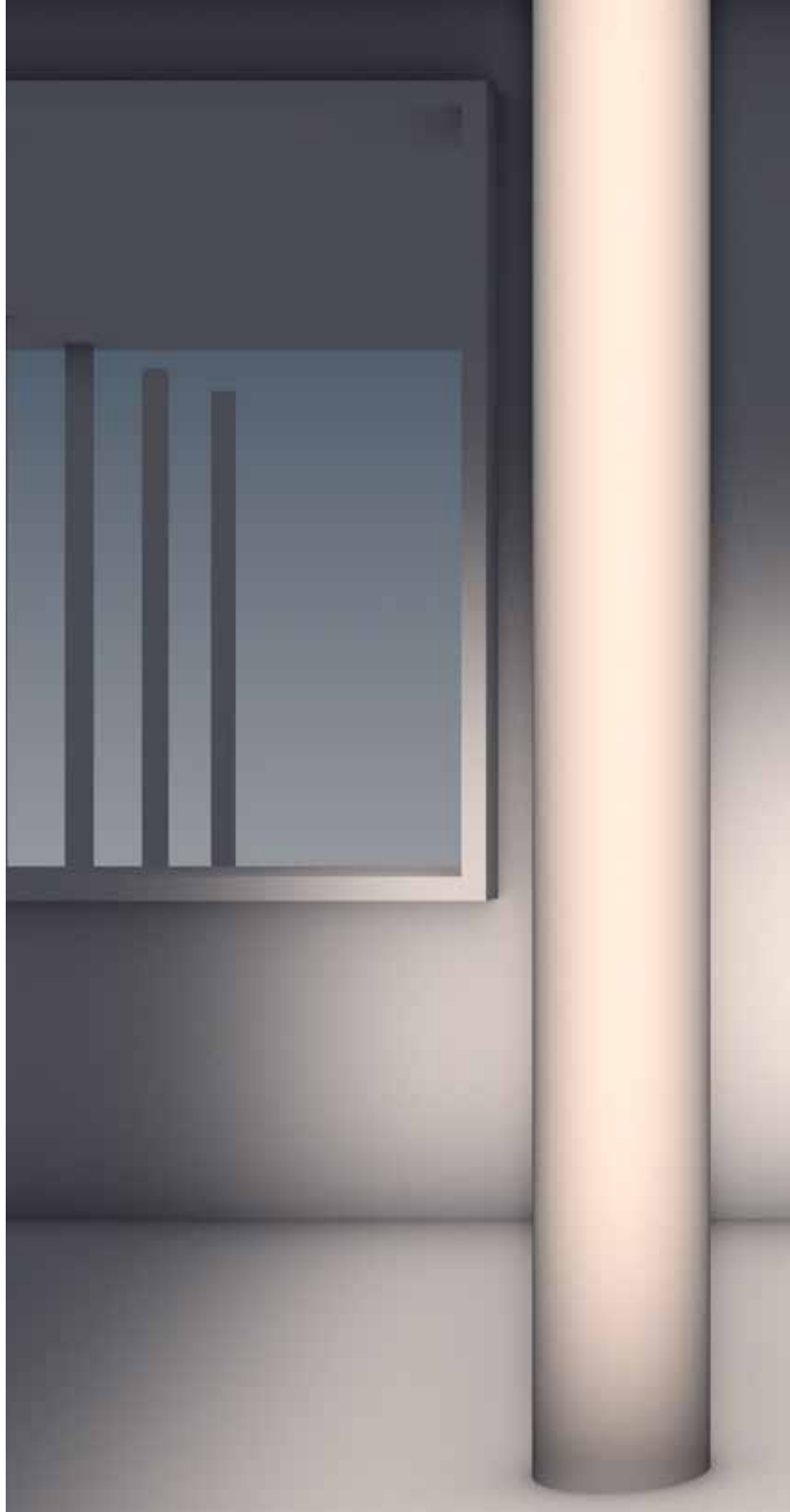


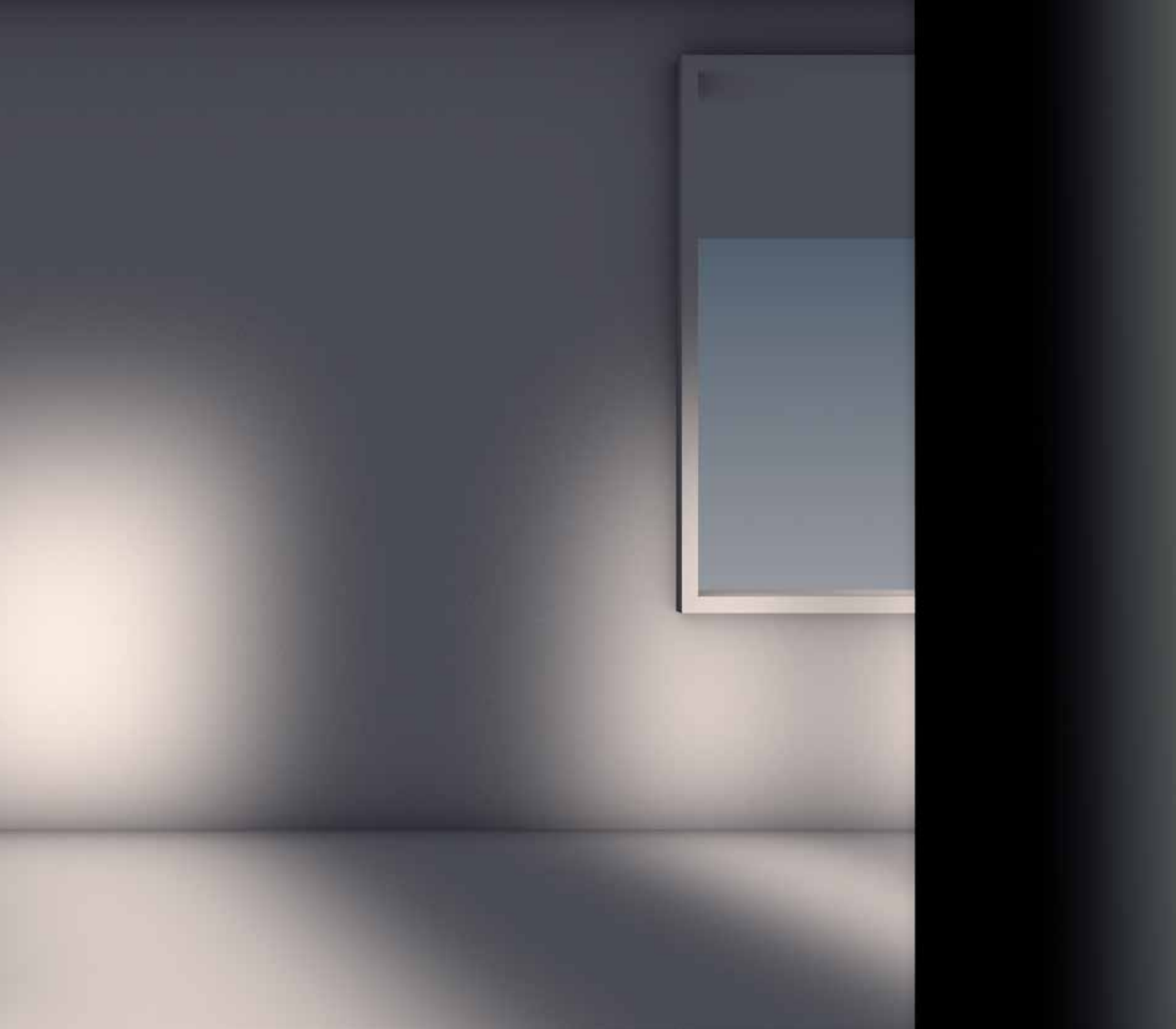
'Usually the thing that interests me is to make a gesture that in a very simple way complicates the visual area I'm working in. Looking through the cut, looking at the edges of the cut, should create a clearly new sense of space. But the cut also must reveal a portion of the existing building system, simply as that which exists.' [5]

Gordon Matta-Clark

'However we analyze the difference between the regular and the irregular, we must ultimately be able to account for the most basic fact of aesthetic experience, the fact that delight lies somewhere between boredom and confusion.' [6]

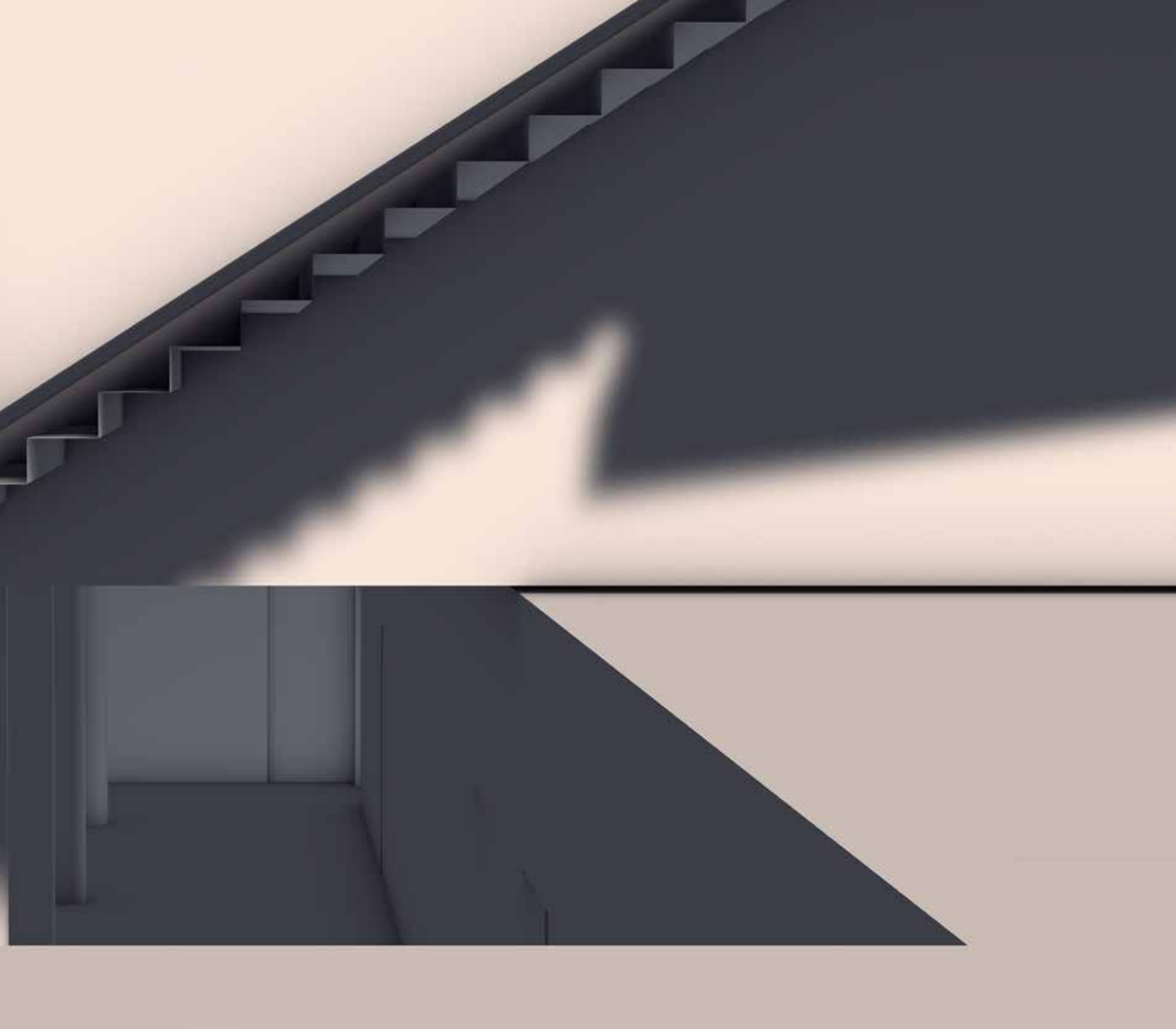
Ernst Gombrich





'Beauty can spontaneously occur at any moment given the proper circumstances, context, or point of view. Beauty is thus seen as an altered state of consciousness, an extraordinary moment of poetry and grace.' [7]

Leonard Koren



<<<
Scan to view Misaligned or visit:
https://vimeo.com/279466620

IMAGES

PAGES 18-19
Light element. Author's own copyright.

PAGE 20-21
Textured element. Author's own copyright.

PAGE 22-23
Iridescent element. Author's own copyright.

PAGES 24-25
Decaying element. Author's own copyright.

PAGES 26-27
Shading pillars. Author's own copyright.

PAGE 28-29
Exposing element (toilette). Author's own copyright.

PAGE 30-31
Climb door. Author's own copyright.

PAGE 32-33
Inaccessible element (stair). Author's own copyright.

TEXT

1: Robert Venturi in *Complexity and Contradiction in Architecture*, p. 23 (1966)

2: Phillip Stearns cited by Clair Voon in *Translating Computer Algorithms into Tangible Fabrics.* Article in Hyperallergic (2014)

3: Robert Venturi in *Complexity and Contradiction in Architecture*, p. 32 (1966)

4. Gordon Matta-Clark, cited by Stephen Walker in *Gordon Matta-Clark; Art, Architecture and the Attack on Modernism*, Introduction p. 3 (2009)

5: Gordon Matta-Clark, cited by Walker in *Gordon Matta-Clark; Art, Architecture and the Attack on Modernism*, p. 15 (2009)

6: Ernst Gombrich cited by Rosa Menkman in *The Glitch Moment(um)*, p. 29 (2011)

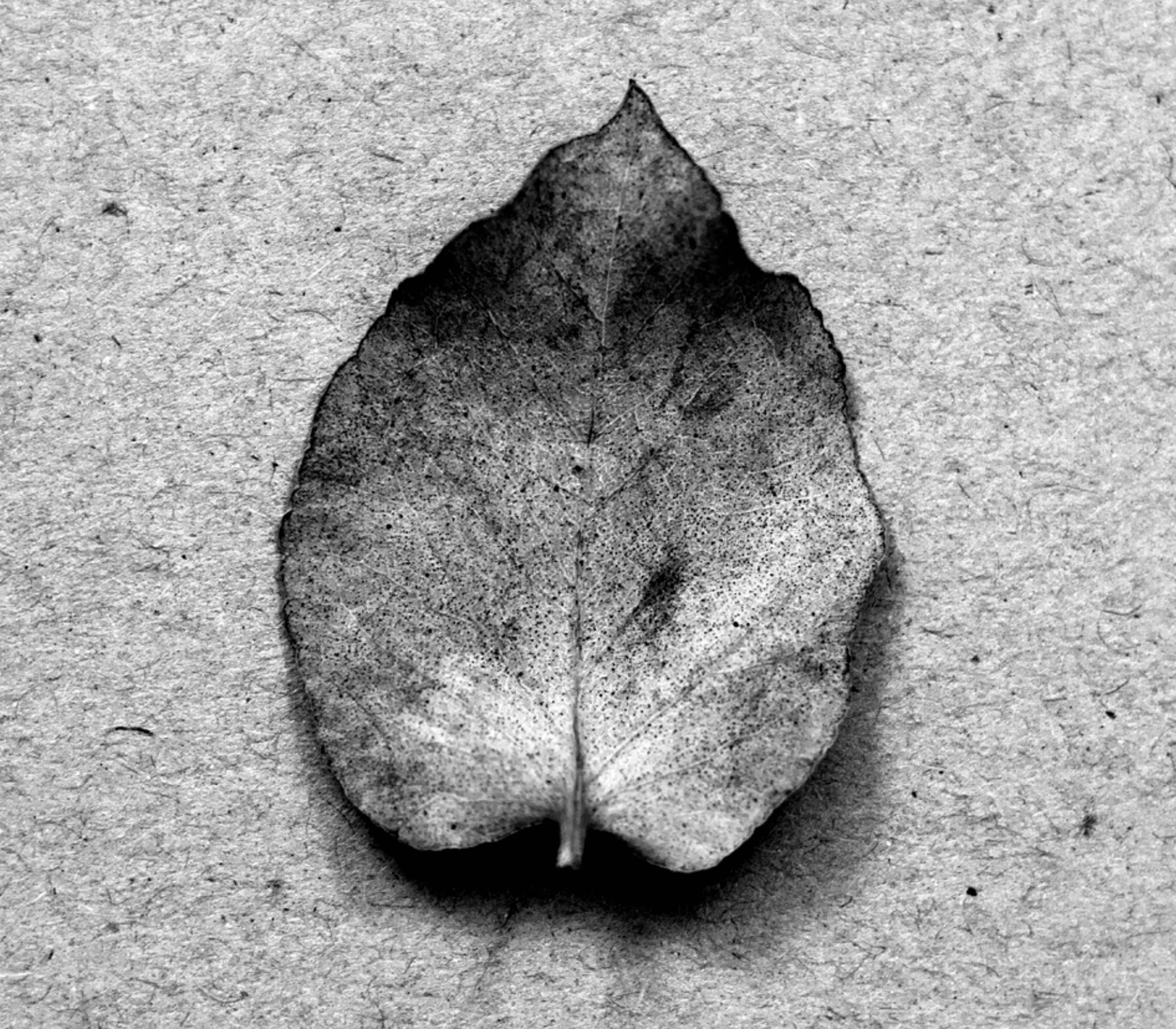
7: Leonard Koren in *Wabi-sabi for Artists, Designers, Poets & Philosophers*. p. 51 (1994)

REFERENCES

2

THEORY DEVELOPMENT:
AWKWARD AESTHETICS, TENSION
AND AMBIGUITY IN ARCHITECTURE

AWKWARD



In *Awkward Position* Andrew Zago argues that an increasing presence of intentionally awkward situations suggests an emerging aesthetic distinct from refined elegance and critical opposition (2010, p. 205). Zago points out that the misfit with conventional circumstances should not be seen as an accidental byproduct, but rather as what defines these awkward occurrences (2010, p. 205). In the Japanese philosophy wabi-sabi, the awkward has had a central position for centuries, continuously highlighting the indifference to conventionally accepted aesthetics (Koren, 2008, p. 62). Wabi-sabi provides a way of relating to natural processes in life where imperfection, impermanence and incompletion are valued rather than being thwarted.

Beauty in imperfection

Wabi-sabi is made up by wabi, expressed through imperfection and simplicity, and sabi, shown in the effect time has upon an object. Together they form an image of a simpler life, with no claim for purity or unnecessary material objects (2008, p. 21-29). This unpolished and honest attitude distinguishes wabi-sabi from contemporary ideals of beauty and 'perfection'. An example of this tendency is 'kintsugi', translating to 'golden joinery', a method used to repair broken ceramics by highlighting the cracks with gold, silver or platinum lacquer (Wikipedia, 2018). The act of joining broken pieces together with valuable metals demonstrates an acknowledgment of the crack as a part of the object's history instead of something to be disguised and forgotten.

Wabi-sabi philosophy is ambivalent about separating beauty from ugliness. Instead of shunning non-beauty, embracing it is a way of coming to terms with what you consider as ugly. Beauty is explained as a dynamic event occurring between you and something else that can appear at any time, given the proper circumstances. Beauty is thus seen as a state of consciousness rather than specified attributes (2008, p. 49). This idea of beauty makes wabi-sabi aesthetics hard to distinguish or describe in words, which adds to its richness in tension and ambiguity.

Wabi-sabi in architecture

A parallel to this idea of beauty is seen in traditional Japanese tea house architecture. 'The way of tea' or the tea ceremony was an important social activity among wealthy merchants, samurais and aristocrats when wabi-sabi emerged in Japan in the 15th century. The architecture to host the ceremony developed alongside wabi-sabi ideas of beauty and came to resemble a medieval farmer's hut, very simple in its appearance. To people accustomed to the Chinese tea ceremony standards of refined, gorgeous, and perfect beauty, the Japanese tea room were initially perceived as ugly. Yet, in the proper context and understanding of wabi-sabi, the Japanese tea room took on exceptional beauty (2008, p. 51).

Besides the use of natural materials, like wood and mud, that signal simplicity and connection to nature, the layout of the tea room is asymmetrical and shows wooden pillars and joist that do not line up perfectly. Traces of craftsmanship are bedded in the mud walls down to the very utensils used for the tea preparation, demonstrating careful and yet effortless beauty.

Figure 1. Kintsugi: Translated vase, Oeuvre de Yee Sookyung (Dalbéra, 2015). CC-BY.

Figure 2. Yugao Tei Teahouse at Kenroku-en (Spackman, 2002). CC-BY.

A crawling entering

A particularly awkward detail of the Japanese tea house is the entrance to the tea room. Called the 'crawl door', this simple design features a square opening, not high enough to go trough standing up. The humbling motion of having to crawl into the tea room was aimed to deconstruct social hierarchies and make everyone equal during the ceremony. The narrow opening also restricted samurais from bringing their swords into the tea room, disarming them from status and power (2008, p. 51).

The abnormal proportions of the door illustrates an architectural element performing, not against nor in line with the 'correct', but rather presenting an alternative logic. The much too low lintel is 'wrong' in relation to normative understandings of what a door is, yet it still functions as a door enabling you to enter the tea house, just with a bit of effort. The extra struggle fits its purpose, instructing a physical motion that ideally causes the visitor to adopt a gentle attitude. This attitude change can be linked to a self-awareness that appears when forced into a slightly uncomfortable situation. The awkwardness occurs when you are put in the unusual act of crawling. In this moment, a higher sense of self-awareness is likely to follow, reminding you of how you and your actions are perceived by and effect others.

Andrew Zago writes about the awkward that 'Its strategic deployment, however, requires that it appear, at first, incorrect, that it offend refined sensibilities, and that, as a latent reading, it create an unexpected and novel effect.' (2010, p. 212). This is how the crawl door appears, initially strange and out of proportion, but understood in its context it gains value and adds to the architectural qualities of the tea house.

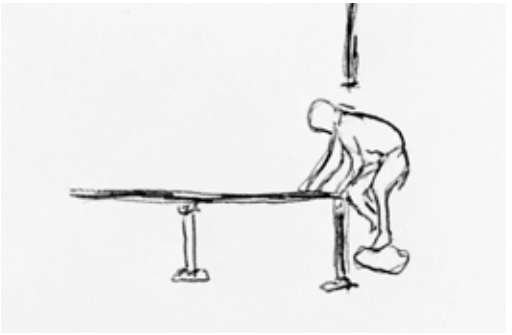


Figure 3. Entering through the crawl door. Author's own copyright.

CRAWL DOOR
Design element(s): Door
Tool(s): Lowering the lintel and rising the threshold of the door
Visual output: Abnormal proportions (too small)
Outcome: Self-awareness

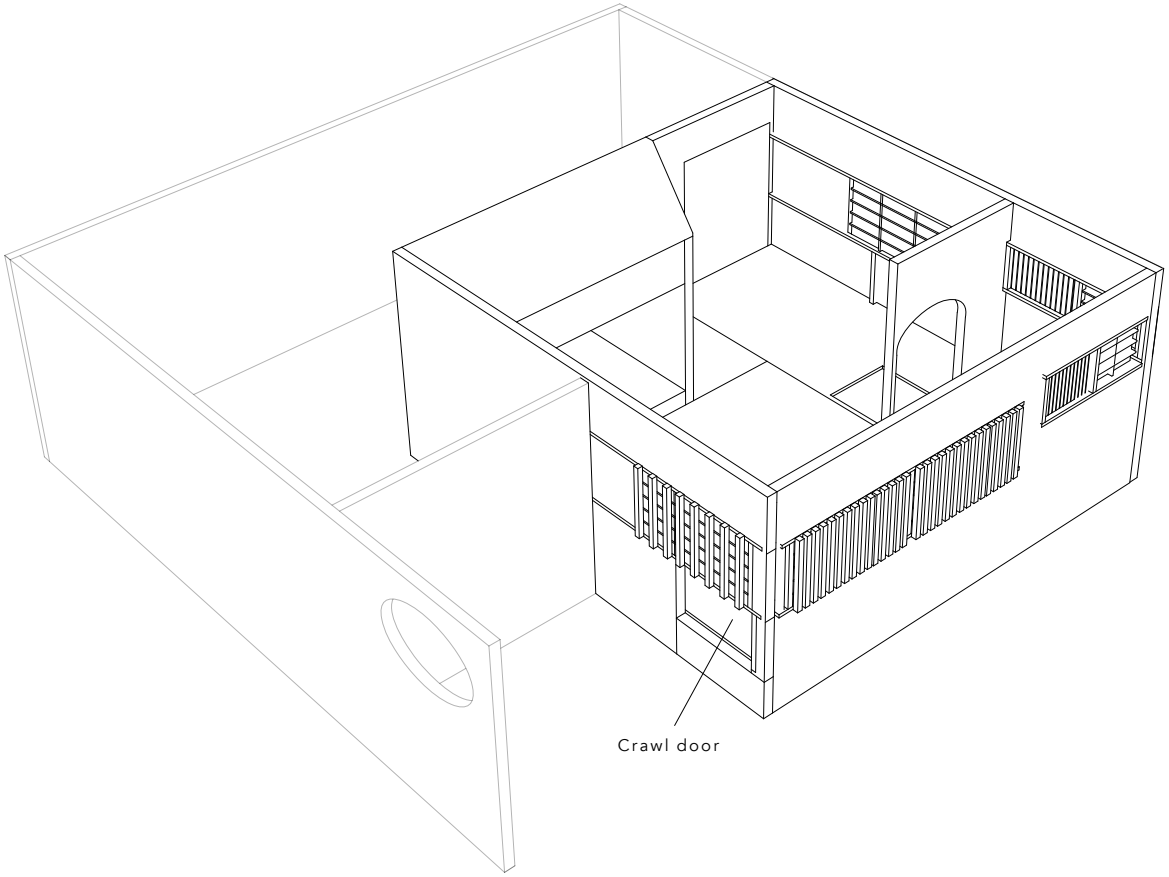


Figure 4. Typical layout of a traditional Japanese tea room. Author's own copyright.

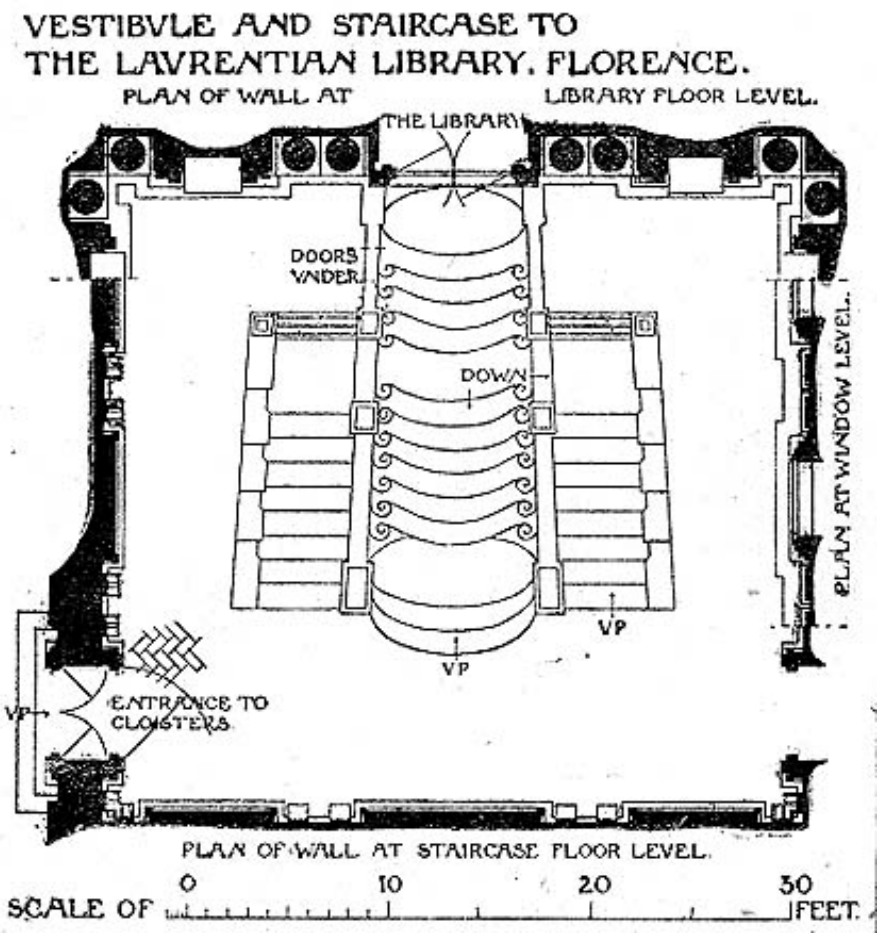


Figure 5. Plan of the vestibule of the Laurentian library (Michelangelo). PD-US

A stair out of proportion

Another historic, awkward situation is found in the Laurentian library in Florence, where Michelangelo designed a peculiar stair in the vestibule. Robert Venturi uses the stair as an example in *Complexity and Contradiction in Architecture* showcasing the concept of both-and in contrast to either-or that has characterized orthodox modern architecture (1966, p. 23). The either-or demands articulation and clarity, both foreign concepts for architecture of complexity and contradiction according to Venturi. Both-and, instead builds on contradiction and a hierarchy of multiple levels of meaning (1966, p. 23). The contradiction lies in the presence of elements 'that are both good and awkward, big and little, closed and open, continuous and articulated, round and square, structural and spatial.' (1966, p. 23).

The stair is divided in three parallel paths where the outer thirds are 'abruptly chopped off and lead virtually nowhere´ (1966, p. 25). The size of the stair seems initially too large in relation to the size of the vestibule, however considering the bigger context, the added outer thirds creates a balanced proportional relationship with the spaces beyond. The awkward endings of two thirds of the stair are consequences of this exaggeration of proportion. Leading nowhere, they do not provide the expected function of a stair, causing disorientation and confusion. However, they are needed to fit the stair's proportions to the bigger context. You could say that the stair is both too large and well proportioned, functional yet awkward. The relationship between the ambiguous proportions and the confusing, chopped endings builds a tension in the architecture that adds to its complexity.

Figure 6. The triple staircase of the vestibule of the Laurentian Library, one of the unusual features of Michelangelo's design for this building. (Hamilton, 1984). *CC-BY.*

STAIR IN THE LAURENTIAN LIBRARY
Design element(s): Stair
Tool(s): Exaggeration
Visual output: Abnormal proportions (too big)
Outcome: Disorientation, tension

Transparent privacy

A contemporary precedence of the both-and phenomenon is Sou Fujimoto's public bathroom in Ichihara, Japan. The toilette, embraced with glass walls placed in a fenced garden, is both open and closed, public yet private. The social demand of privacy while going about your business is combined with the desire of 'freedom from architecture'. A play with proportions make its presence again. Fujimoto creates an abnormally large bathroom where the opaqueness of regular bathroom walls has moved multiple meters away from the toilette, leaving only the transparent glass as shield for weather. In this case the disproportion creates a value of freedom and closeness to nature while withholding the toilettes intended function. In theory. The blurred line between private and public may come with a grain of discomfort. Although the fence holds a door with a lock, the experienced level of exposure might cause the user to feel, at least, a bit awkward. The spectacle that the unusual toilette has provoked further limits the sense of privacy.

FUJIMOTO'S PUBLIC TOILETTE
Design element(s): Toilette
Tool(s): Separating wall layers (transparent inner walls and opaque outer walls).
Visual output: Abnormal proportions (too big), openness
Outcome: Tension, self-awareness, discomfort

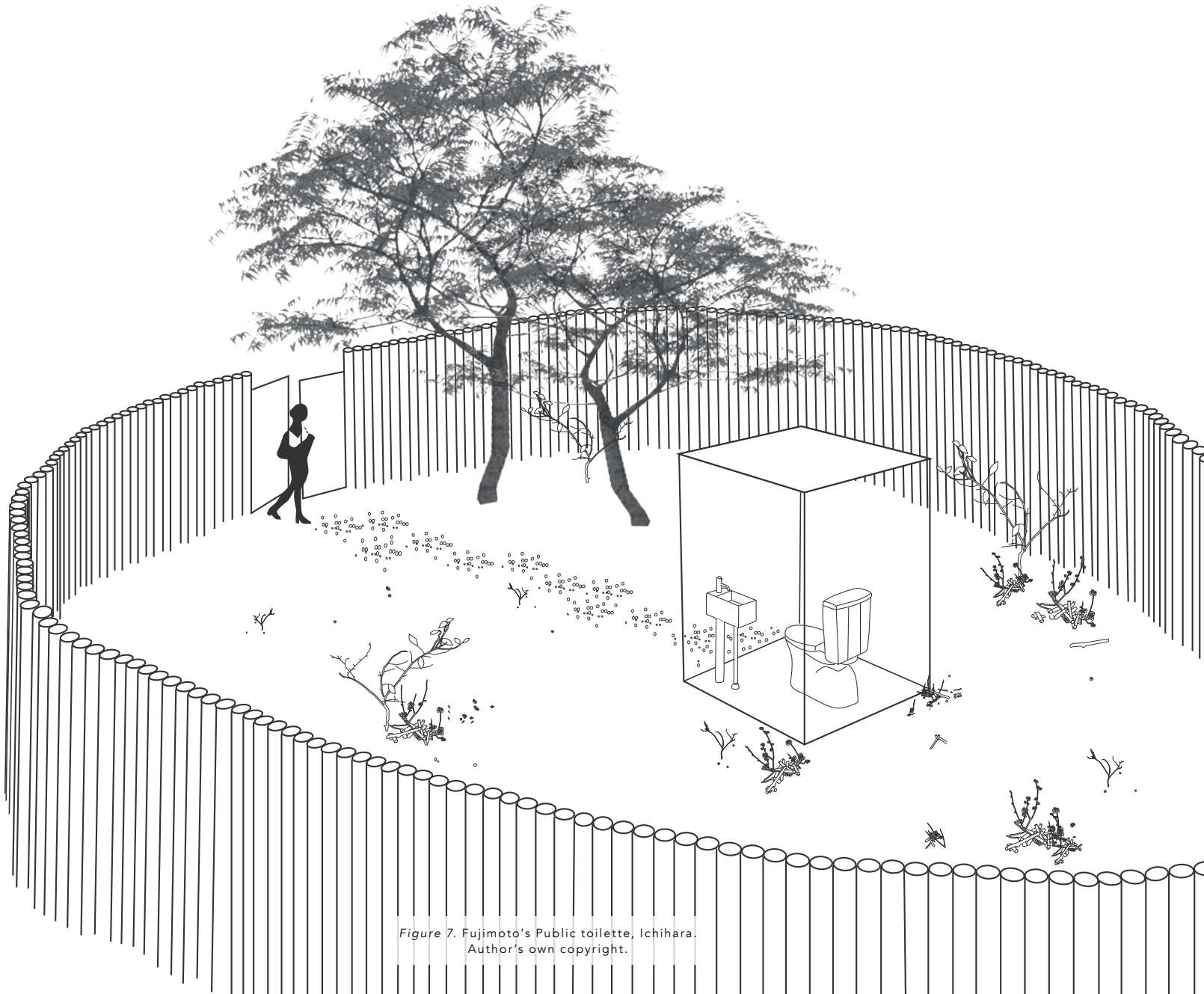


Figure 7. Fujimoto's Public toilette, Ichihara.
Author's own copyright.

Figure 8. Interior work space, *La Fabrica*, Barcelona. (Forgemind ArchiMedia, 2014). CC-BY.

Figure 9. Process, *La Fabric*a, Barcelona. (Forgemind ArchiMedia, 2014). CC-BY.

"Slowly, with the valuable help of Catalan craftsmen, the Cement Factory was transformed, but it will always remain an unfinished work"

(Bofill, 2015)

Decorative decay

1973 architect Ricardo Bofill found a disused cement factory, an industrial complex from the turn of the century and decided to turn it into his private home and studio for his architectural office. The factory is full of huge but useless spaces of weird proportions, however they become magical because of their tension and disproportion (Bofill, 2015).

La Fabrica was shaped through selective demolishment of the old structure (fragmentation) reveling surrealistic staircases that lead nowhere and former concealed forms that appear to have been sculptured out of the concrete. The result is unique and irregular spaces along with a rustic aesthetic feel relating to wabi-sabi philosophy. The signs of time are many and Bofill sees *La Fabrica* as a constantly changing, impermanent project (Bofill, 2015). This ever-changing atmosphere blends with a feeling of decay. In wabi-sabi philosophy it is said that things are either moving toward, or evolving from nothingness (Koren, 2008, p. 40). These two antipodes coexist in the ambiguous *La Fabrica*.

LA FABRICA
Design element(s): Cement factory
Tool(s): Reduction
Visual output: Abnormal proportions (too big), fragmentation
Outcome: Decay, incompleteness, tension

Gordon Matta-Clark was an artist (trained architect) who reacted strongly against modernist ideals of purism and systematization with his violent building dissections. His aesthetics are usually described as awkward and similar to what Bofill did with *La Fabrica*, Matta-Clark used reduction as a mean of deconstructing and fragmenting architectural space. Matta-Clark's manner was however brutal and demonstrates a critique on completeness.

The attack on modernism

Matta-Clark received formal training as an architect at Cornell University in 1962-68. However, Matta-Clark did not practice architecture since he considered it a pretentious enterprise. Instead he sought "anarchitecture", an alternative use of buildings that involved a rejection of functionalist aspects of, what he called 'past-due Machine Age moralists' (MoMA, 2012). In *Gordon Matta-Clark; Art, Architecture and the Attack on Modernism* Stephen Walker captures Matta-Clark's reaction to the internal ambiguity of modernism's own attempts of definition and his forceful attack on rigidity;

> 'My initial decisions were based on the avoidance of making sculptural objects and an abhorrence of flat art. Why hang things on a wall when the wall itself is so much more a challenging medium? It is the rigid mentality that architects install the walls and artists decorate them that offends my sense of either profession'.
>
> (2009, p. 3)

Gordon Matta-Clark reacted against the modernists' general strive for purism and systematization in particular. He thought that a single work could be interesting and valuable, but to raise the particular to a general rule was to Matta-Clark "organized monopoly". In architecture, the effect of this monopoly that most concerned him was the systematization inherited in the machine tradition (Walker, 2009) - a systematization that is perhaps even more stressing in today's technology driven society. His ideas resonate with things wabi-sabi, even though Matta-Clark came from a different standing point. The origin of wabi-sabi was a reaction to the Chinese florid ornamentations and extravagance (Koren, 2008), while Matta-Clark reacted and worked in the purism of modernism.

Ambiguity

Matta-Clark sought to stretch the boundaries of architectural space established by modernism. Walker refers to a quote by Matta-Clark where he, like Venturi, expresses an interest in ambiguity;

> '... the things we studied [at Cornell] always involved such surface formalism that I had never a sense of the ambiguity of a structure, the ambiguity of a place, and that's the quality I'm interested in generating what I do...'
>
> (2009, p. 8)

Looking at Matta-Clark's oeuvre, particularly his building dissections, it is easy to argue that his work demonstrates simplistic anti-formalism and an attack on his education (2009, p. 8). As Walker however points out, Matta-Clark's work was inspired by an interest of ambiguity rather than an 'outright attack on architectural form' (2009. p. 8).

Figure 10. Dissected building, Gordon Matta-Clark
(Gaynor, 2012). CC-BY

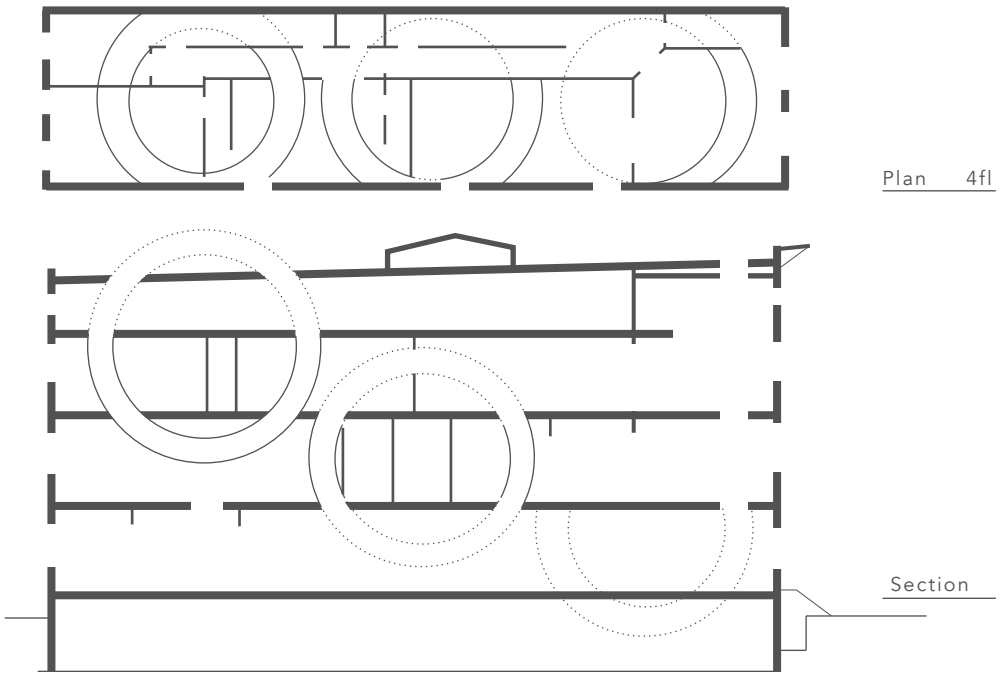


Figure 11. Recreation of a drawing of *Circus* - plan and section. Author's own copyright.

A new sense of space

Matta-Clark's work bares witness of his search for a new sense of architectural space. An eloquent illustration is Matta Clark's last finalized building dissection - *Circus* (or the *Caribbean orange*). Completed in 1978, *Circus* presents a reworking of the MCA building (Museum of Contemporary Art) in Chicago. The dissection was executed as a series of three circular cuts along a diagonal axis in the section. Three corresponding circular cuts were made in the roof's plane so that the alignment of the cuts implied three spherical volumes, 'peeled away' from the structure (Altice, 2012). The work, cut and carved into a disorienting and gravity defying structure, demonstrates a discrete violation on the visitor's sense of value and sense of orientation.

The method of 'design' is central in Matta-Clark's work. The circular cuts were placed cautiously, however their execution is of a more impulsive, aggressive character. The cut reveals the nature of the building materials and creates a distinct contrast between the perfection of the wall surface and the imperfection of the cut - highlighting the break with conventional aesthetics. Equal to *La Fabrica*, a sense of decay and incompleteness coincide in the fragmented structure.

CIRCUS
Design element(s): MCA building
Tool(s): Circular cuts in plan and section
Visual output: Fragmentation
Outcome: Disorientation, decay, incompleteness, tension

3

THEORY DEVELOPMENT:
EXPLORING INSTRUMENTAL
CONTROL IN LIGHT OF THE GLITCH
ART MOVEMENT AND THE PROCESS
OF GLITCHING

BREEDING ERROR

Figure 1. Glitch art using Processing: Cosmic Winds - IC 2944 The Running Chicken Nebula. (Stearns, 2015). CC-BY.

A contemporary interest in deconstruction and unconventional aesthetics similar to Matta-Clark's explorations, is found in the glitch art movement - a process oriented art form centered around exploiting errors. The search for instrumental and material honesty connects glitch art to ideas of wabi-sabi. The break with the expected - not unusually generating awkward outcome due to the misalignment with accepted knowledge (e.g. the crawl door and Michelangelo's stair) - positions glitch art as an experimental art form that continuously stretches the boundaries of design and aesthetic experience.

Data bending

It is said that wabi-sabi can be gained through 'accidents' or letting things happen by chance. One example is lifted in *Wabi-sabi for Artists, Designers, Poets and Philosophers* where Koren mentions a technique of creating irregular fabrics by sabotaging the computer program of a textile loom (2008, p. 67) - a technique residing in the glitch art movement. The act of intentionally corrupting digital information (or physically manipulating electronic devices) is within glitch art known as 'data bending' or 'data manipulation'. Data bending is usually performed through binary-numeric code, hexadecimal and (less commonly) ASCII structural representations (Austin, 2016, p.14). In other words, the corruption of digital information is the act of transforming a file's linear sequence representations. This is done by opening the subject file in a text editor and revealing its information for manipulation through re-organization, scripting or use of programming languages such as *Processing*. The manipulation causes malfunctions and interruptions in the treated media (2016, p. 14). These interruptions are known as glitches. An experimentation with data bending can be found in chapter 5.1 - *Data bending with text editor* (appendix).

Reconnect

While contemporary communication strive for transparent immediacy in order to make the user forget about the presence of the medium (Menkman, 2011) glitches does the opposite. Often coupled with retro aesthetics, glitches create a nostalgic window reminding us of a less perfect past. The nature of the glitch also resembles the inherent imperfections in ourselves (Roy, 2014), making glitch media relatable in the same way as a crack in a vase.

Rosa Menkman, art theorist and glitch artist, lifts the discussion of the strive for perfect communication in *The Glitch Moment(um)*, concluding that it is a counterproductive endeavor (2011, p. 29). In the pursuit of immediacy in communication, signal speed has been increasingly prioritized. Earlier development in audio and video technologies focused on the reduction of noise in order to improve the experience of the media, a motif that seems to be of secondary importance today according to Menkman. Perfecting the speed of communication also perfects the experience of the information, perhaps to the extent that the experience becomes bland and generic. Menkman quotes Ernst Gombrich;

> "However we analyze the difference between the regular and the irregular, we must ultimately be able to account for the most basic fact of aesthetic experience, the fact that delight lies somewhere between boredom and confusion".
>
> (2011, p. 29)

The interplay between surprise and uniformity keeps us from experiencing something as artificial or boring. A parallel is seen in digital music production where composers add noise to their compositions in order to make the music more pleasant to the human ear.

Technological power

Glitch artist Phillip Stearns, known for turning technology glitches into tangible fabrics (Glitch textiles), said in an interview with Claire Voon that;

> "Just because we are immersed in digital technologies doesn't mean that we are in touch with them"... "We are disconnected, and part of this disconnect stems from the fact that digital processes are abstract, immaterial, or not readily visible to us, even if they are there right before our eyes."
>
> (2014)

Stearns shifts the perspective from the glitch as nostalgia to the glitch as a way of understanding the digital technologies that surround us. Working with glitches demands an understanding of technology and technological power (Vavarella, 2015) which carry an opportunity to question that technological power. *In Glitch it good: Understanding the Glitch Art Movement* Mallika Roy writes that "Glitch art starts conversations that traditional art forms can't really access, just by the nature of how it's created." (2014), concluding the relevance of the glitch art movement in today's technology driven society and its unique opportunity for timely cultural commentary.

In the discussion about signal speed and strive for immediacy in communication, Menkman also explains the concrete consequences of that process. To enable faster and longer transportation of information, transfer protocols such as en/decoding and compression algorithms are used. A compression reorganizes the information, the time and space through which the elements of sound and images are communicated, by scaling, reordering and decomposing them, which lead to loss of information (2010, p. 15). This illustrates how understanding digital technology makes you aware of the consequences of, for example, compressing a RAW-file into a JPG-file. Compression is used in glitch art as a way of showing its impact on a file's performance.

Bending boundaries

The word 'glitch' can be traced back to the the Yiddish word glitsh or glitshn, meaning "to slip" (Zurko, 2016). To think of the glitch as a slip indicates a slippage or break with the expected. According to Matthias Gross "novel things always include elements of surprise, uncertainty, and the unknown, all of which are located outside the sphere of prediction" (2010, p. 1). Gross also writes;

> "Scientific methods thus should allow researchers to surprise themselves as well as their peers. What is needed for doing so is an interruption of the continuum between accepted knowledge and future expectations"
>
> (2010, p. 1)

Glitching is a way of provoking a slippage that generate surprising outcome. The surprise makes us aware of our own ignorance, makes way for new discoveries and reevaluation of current knowledge. A parallell to this was seen in the discussion about 'awkwardness' in previous chapter. Glitching also attempts to stretch the boundaries of design by exploring possibilities beyond the 'intended' functions of different media.

Misalignment

A telling example of bending boundaries is the glitch technique 'misalignment' which describes the act of opening a digital file in a program designed for a format other than the input's format. The typical workflow consist of taking, for example, an uncompressed image file and opening it in an audio editor that allows you to import any type of raw data. The program will express the image as an audio track in this case and allows

Figure 2. The Making of Glitch Textiles at Pure Country Weavers. (Stearns, 2016). CC-BY.

Figure 3. TIFF compression Gif.
(Menkman, 2010). CC-BY.

you to edit the image as if it was an actual audio file. When exporting the edited version back to its input format you should be able to see the glitch result. An exploration of misalignment can be found in chapter 5.2 - *Misalignment with Audacity* (appendix).

Datamoshing

Datamoshing is a form of data bending especially aimed at manipulating data in video files. The effect of this technique is popular in music video production, an example can be seen in the video for *Yamborghini High* with ASAP Mob. Datamoshing video can be done by removing or duplicating the i-, p- and b-frames that make up a video-clip, resulting in fragmentation and distortion in the video. For more details on datamoshing see chapter 5.3 - *Datamoshing with Avidemux* (appendix).

Glitch meets the drawing

The applications of glitching within art, music and video production are well known. Glitching and architecture are less commonly brought together, but there is an emerging interest in the marriage. In *Drawing the Glitch (Drawing Futures)* Matthew Austin and Gavin Perin argue that 'the introduction of glitches into the production of architectural drawing has the capacity to open up and transform what is understood to constitute digital-architectural production.' (2016, p.14), suggesting that glitching can develop the way we see the architectural drawing and how we produce architecture.

When introducing glitching to architecture one must first consider the input format. A traditional architectural drawing is a representation of a three dimensional reality while a 3D model is a more direct translation of the architectural configuration. A reworking into three dimensions is thus necessary if one chooses the planar drawing as input, while glitching of a 3D model could potentially generate a more 'finished' result. Glitching of 3D-objects are, however, problematic. This issue is discussed by Austin and Perin who conclude that three-dimensional drawing files are generally quite resistant to transformations due to the construction of the file (2016, p. 16). The obj-file is an ASCII based format which information is read as its literal textual interpretation, meaning that a point's Cartesian coordinates are exactly written in the file as their 'x', 'y' and 'z' values. Manipulation of these values is quite finicky and easily result in invalid geometry. Another issue is that you cannot distort the topology of an obj-file with code manipulation (2016, p. 16).

The linear perspective carries other difficulties, such as the question of how to interpret the transformed drawing into three dimensional geometry. Since glitching in architecture is still an uncharted territory, there are no directives on how to do this - but also no restrictions. This is perhaps where the possibility of the glitch lies for architectural use. Austin and Perin writes; "The lack of a clear and singular interpretation of the glitch drawing forces the architect to reconfigure and re-evaluate what these drawings mean spatially." (2016, p.16). A demonstration of a possible workflow for architectural glitching is presented in *Drawing the glitch*. The authors choose to start with a two dimensional representation of the Barcelona Pavilion. When imagining the three dimensional figure you could extrude the walls in a traditional sense which would result in a skewed building. You could also see the drawing as an axonometric (figure 6) where the skewed lines in the drawing are vertical projections (2016, p.16) which instead creates a building with multiple, narrow floors.

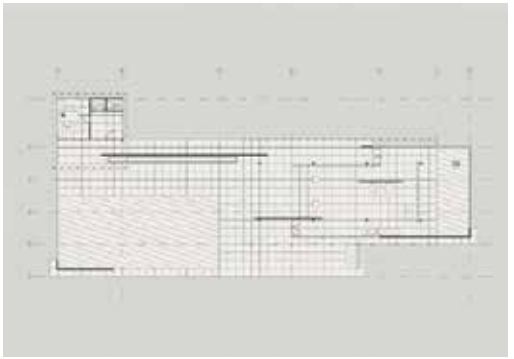


Figure 4. A redrawing of the Barcelona Pavilion by Kieran Patrick. (in *Drawing the Glitch*. Drawing Futures p. 17).

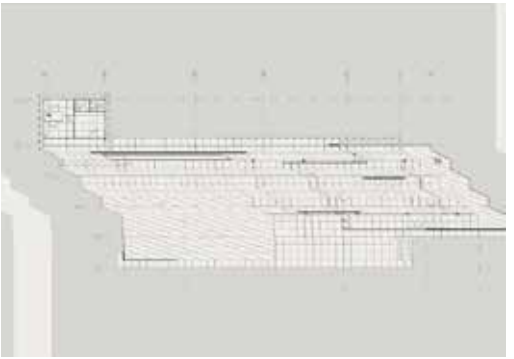


Figure 5. A study matrix of how the same figure of the plan reconfigures itself depending upon binary-numeric transformations of the plan. (in *Drawing the Glitch*. Drawing Futures p. 17).

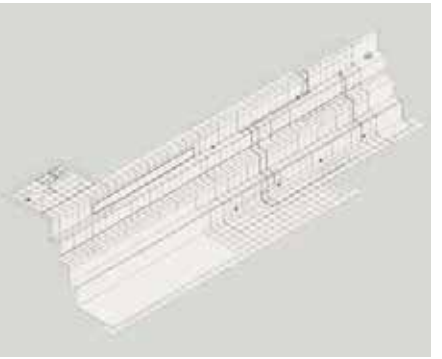


Figure 6. Three-dimensional reworking of a valid interpretation of the data-bent image of the plan of the Barcelona Pavilion. (in *Drawing the Glitch*. Drawing Futures p. 17).

The glitch disrupts not only the drawing itself but the viewer's custom of reading the architectural drawing - forcing an attempt to spatially make sense of bizarre, awkward moments in the drawing. Austin and Perin argue that the glitch drawing creates a distance between the drawing's author and the spatial conditions it represents. They see a parallel to how Eisenman used drawing as a method to deny himself spatial clarity and the glitches' potential to remove spatial clarity from a digital drawing (2016, p. 18), incorporating ambiguity in the design process itself. As Austin and Perin concludes; "The notational nature of drawing means that the glitch transforms it from "a work that is yet to be realized" to a work that cannot be realized without a reworking of what the drawing represents." (2016, p. 18). The reworking demands a new way of reading the architectural drawing. The reading of a glitch plan requires a reconsideration of the section and a glitch section demands a re-understanding of the plan. The glitch breaks the conventional relationship between the plan and section (or other representations), expanding the boundaries of architectural representation.

4

DESIGN IMPLEMENTATION:
PRESENTING, DISCUSSING AND
EVALUATING THE PROCESS AND
OUTCOME OF GLITCH ELEMENTS
IN RELATION TO THEORY

DEMONSTRATION

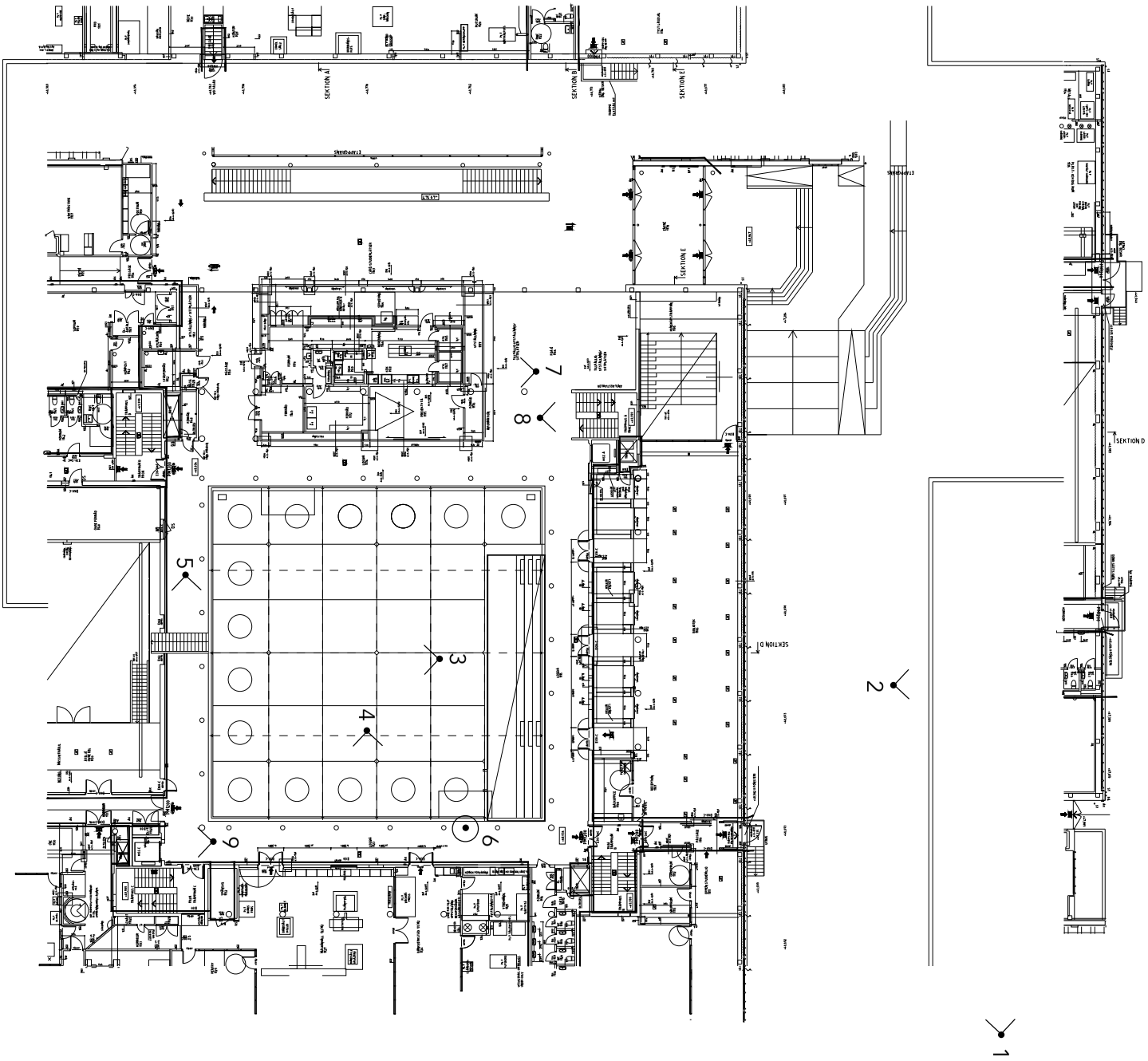


Figure 1. Reworked glitch plan with marked view points for glitch elements. Author's own copyright.

Misaligned portrays the result of applied glitching, interpretation and reworking of the Architectural building at Chalmers. The design process for *Misaligned* has been developed through design studies that explored a selection of glitch techniques and ways to turn glitch material into three dimensional form. The preference to work with two dimensional input in the glitching phase was based on previous chapter's elaboration on difficulties of glitching 3D-objects and experience from the design investigation with data bending obj-files, both concluding that the 3D format is quite resistant to transformation and sensitive to destruction. The reworking of two dimensional glitch material into three dimensions instead became a part of the design process.

Glitch technique
The glitching process for *Misaligned* has been done exclusively with the glitch technique misalignment with Audacity. This technique showed promising results in the initial design investigations when looking for re-organization properties and a variation of visual output. The technique works on a number of scales, from spatial organization to small scale detailing such as textures and light. It showed a balanced relationship between surprise and familiarity, both in the visual output and in the actual process. The technique also allowed experimentation without risking complete damage of the input.

Interpretation and reworking
The interpretation and reworking och the glitch material has been carried out in two phases. The initial phase dealt with the larger scale; re-organizing and re-shaping structural elements based on a glitch plan and section. The second phase focused on transforming qualities in glitch imagery into textures, materiality and light. The result is a motion sequence orchestrating dynamic qualities such as decay and light. *Misaligned* takes the viewer close to the glitch elements, bringing the appreciation of the tweaked structure, strange colorations and odd organization closer to a real time experience, searching for the awkward moment to occur like when entering a Japanese tea house with a crawling motion.

PHASE ONE
Workflow

1. Glitching of plan and section drawing, SB-building

Glitch technique: Misalignment with Audacity
Media: Audacity (2.2.1 for Mac)
Input: Uncompressed image file (.bmp); plan and section
Tool(s): Playing audio backwards and applying various effects from the 'Effect'-panel
Output: Uncompressed image file (.bmp); Glitch plan and section

2. Interpretation of glitch drawings

Interpretation technique: Subjective
Media: Rhino, Cinema 4D
Input: Glitch plan and section (output step 1)
Tool(s): Vertical extrusion based on shadow effect, horizontal extrusion in negotiation with glitch plan
Output: Motion sequence portraying glitch elements (based on 3D model)

PHASE TWO
Workflow

3. Glitching of imagery, SB-building

Glitch technique: Misalignment with Audacity
Media: Audacity (2.2.1 for Mac)
Input: Uncompressed image file (.bmp); photography
Tool(s): Playing audio backwards and applying various effects from the 'Effect'-panel
Output: Uncompressed image file (.bmp); Glitch imagery

4. Interpretation of glitch imagery

Interpretation technique: Subjective, algorithm driven
Media: Cinema 4D, Photoshop, After Effects
Input: Glitch imagery (output step 3)
Tool(s): Various (see individual examples)
Output: Motion sequence portraying glitch elements (based on 3D model and 2D imagery)

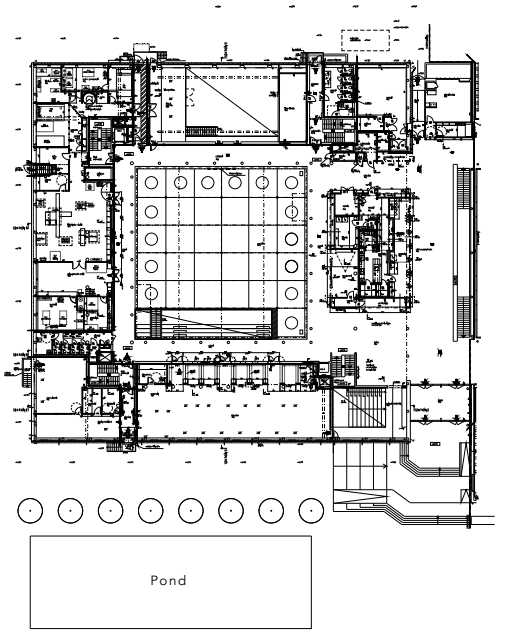
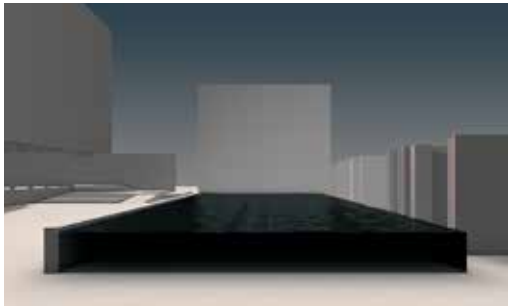
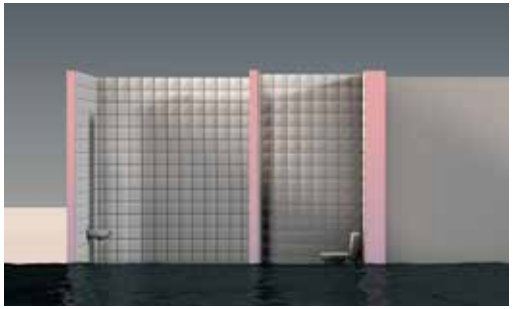
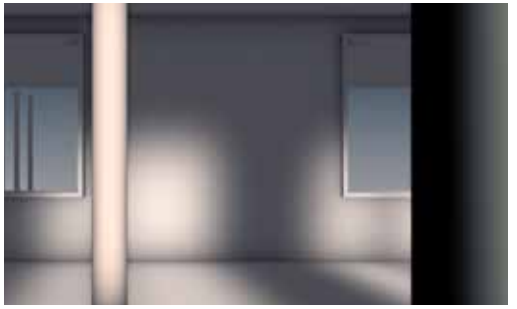
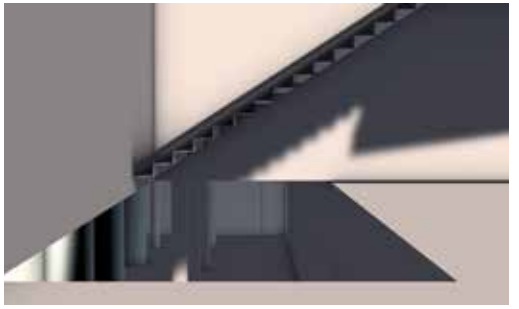
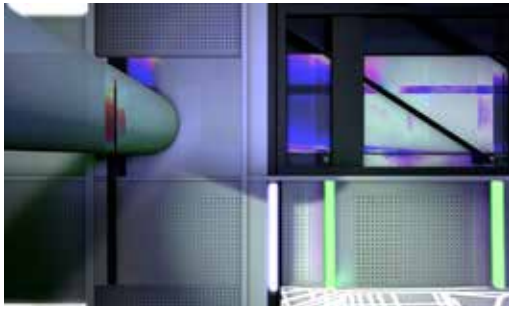
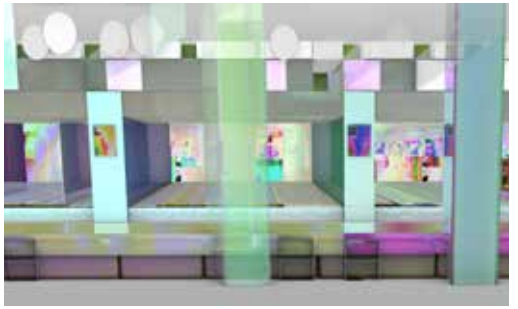
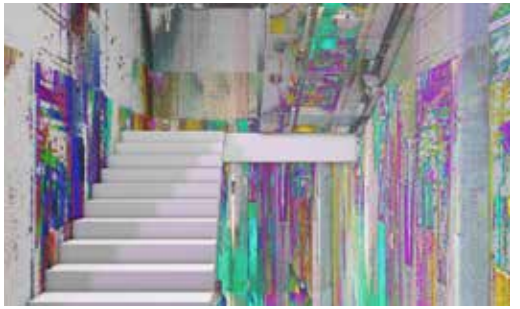


Figure 2. Ground floor drawing, Chalmers Architectural building (input for glitching). Provided by WHITE architects.


1
EXPOSING ELEMENT (WATER)
Reworked glitch plan

Interpretation technique: Subjective
Input: Glitch plan
Tool(s): Vertical extrusion
Outcome: Incompleteness, tension

2
EXPOSING ELEMENT (TOILETTE)
Reworked glitch plan

Interpretation technique: Subjective
Input: Glitch plan
Tool(s): Vertical extrusion
Outcome: Incompleteness, tension, discomfort

3
SHADING PILLARS
Reworked glitch plan

Interpretation technique: Subjective
I**nput:** Glitch plan
Tool(s): Vertical extrusion in relation to shading effect
Outcome: Tension

4
CLIMB DOOR
Reworked glitch section

Interpretation technique: Subjective
Input: Glitch image
Tool(s): Horizontal extrusion
Outcome: Disorientation, self-awareness

5
INACCESSIBLE ELEMENT (STAIR)
Reworked glitch section

Interpretation technique: Subjective
Input: Glitch image
Tool(s): Horizontal extrusion
Outcome: Disorientation, tension

6
LIGHT ELEMENT
Reworked glitch image A

Interpretation technique: Subjective
Input: Glitch image A
Tool(s): Light fixtures, transparent material
Outcome: Diplopia, disorientation

7
IRIDESCENT ELEMENT
Reworked glitch image B1

Interpretation technique: Subjective
Input: Glitch image B1
Tool(s): Iridescent material, UV mapping, horizontal extrusion based on camera perspective calibration
Outcome: Diplopia, disorientation, abnormal proportions

8
TEXTURED ELEMENT
Reworked glitch image B2

Interpretation technique: Subjective, algorithm driven
Input: Glitch image B2
Tool(s): Material displacement
Outcome: Tension

9
DECAYING ELEMENT
Reworked glitch image C1-C30

Interpretation technique: Subjective, algorithm driven
Input: Glitch image C1-C30 and variations of glitch image C1
Tool(s): Sequence composition, photo manipulation
Outcome: Decay

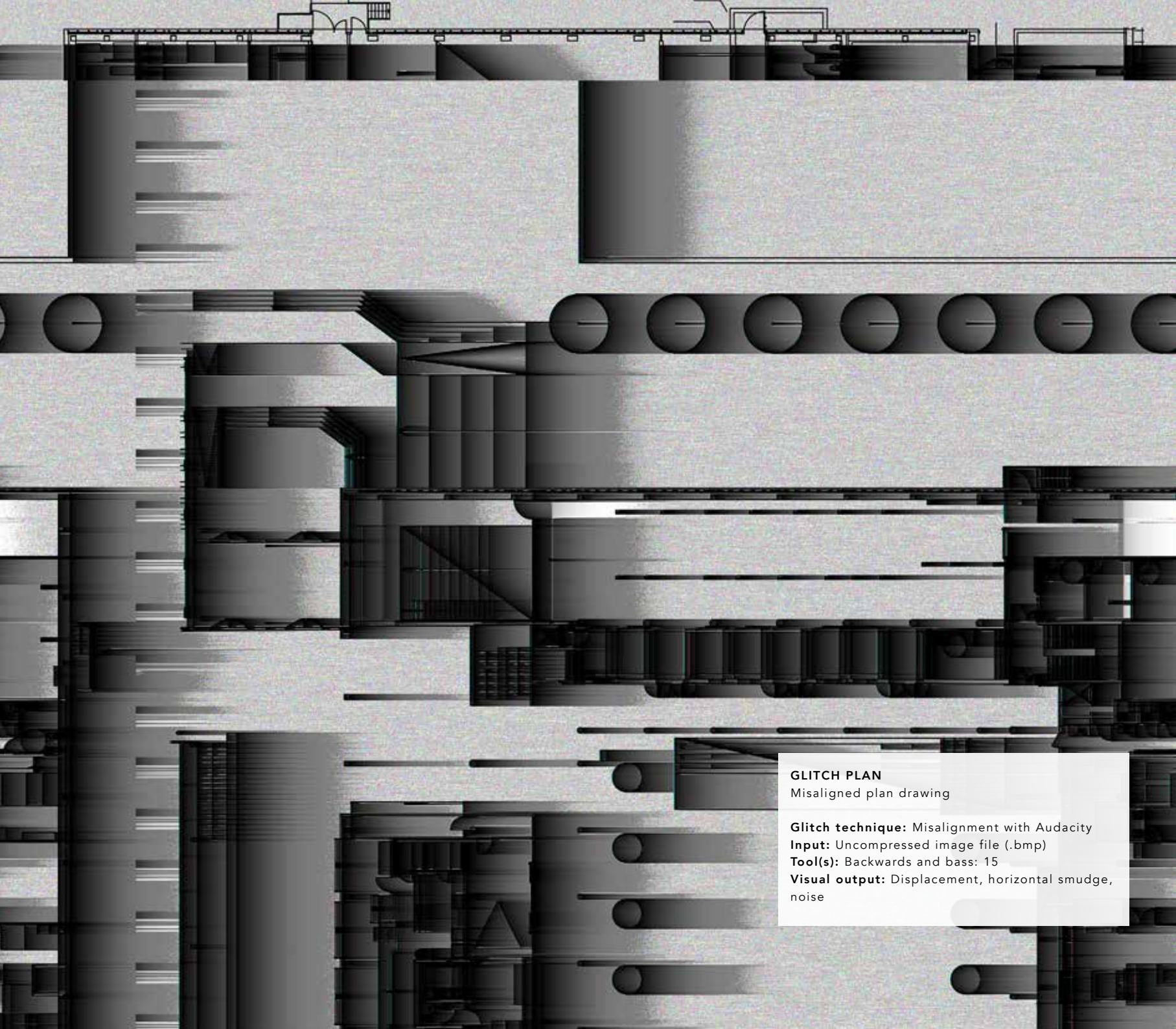
<<<
Scan for sequence of the 'Exposing elements' or visit:
https://vimeo.com/279455258

PHASE ONE

Glitch plan
An original drawing of the ground floor of the SB-building (figure 2) was turned into an image bmp-file and imported to Audacity. A part of the drawing was then played backwards, causing re-organization of the plan. The main part of the drawing was rotated 180°, placing the entrance of the school on the opposite side of the building. Walls were displaced, creating an ambiguous indoor/outdoor situation by the entrance. The bass value was then increased to 15 in Audacity, generating a horizontal smudge effect.

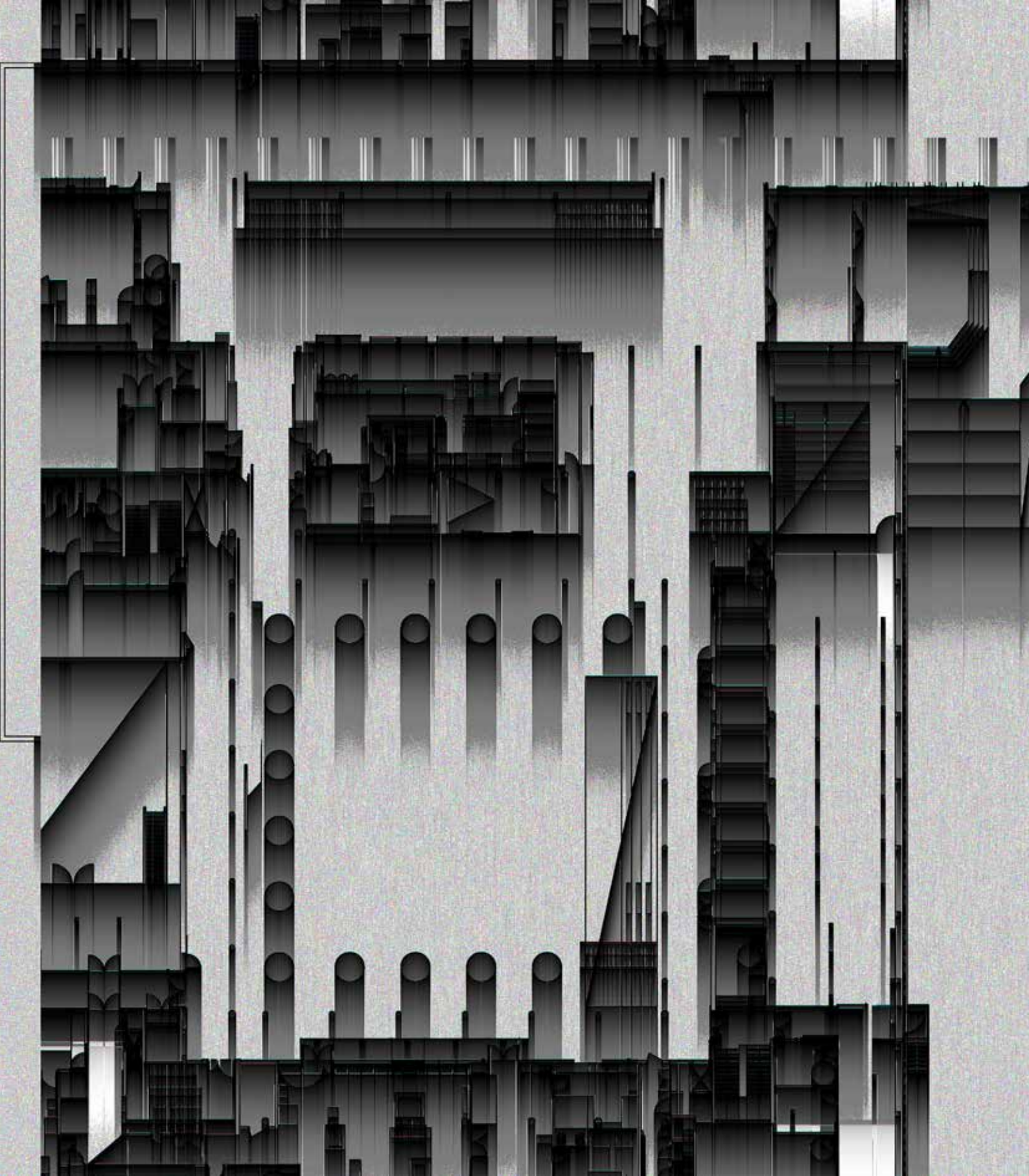
Exposing element - water (1)
The line displacements in the glitch plan were interpreted in a traditional sense when imagining the vertical shape. The outcome, however, is far from ordinary. At the top of the glitch plan, two of the lines representing the edges of the pond has been displaced. If imagining that the remaining lines are extruded vertically and that the water stays in the same place, two edges of the water would be missing. While only the surface of the water was visible prior the glitch, its volume is now revealed. This occurrence has been called an 'Exposing element'. The water in the pond act as an ambiguous, gravity defying phenomenon, a quality seen in Matta-Clark's deconstruction of the MCA building (*Circus*) which left the visitor with questions of its constitution. The appearance of the exposed, gravity defying water element arouse curiosity as it acts in conflict with common understandings of how water behave in nature. The phenomenon is easily portrayed in *Misaligned*. To realize the illusion in the physical world one can imagine the water being contained by transparent walls.

Exposing element - toilette (2)
Another exposing element was found just beside the pond where a toilette was placed without a shielding wall. The exposed toilette becomes an extreme version of Fujimoto's toilette in the fenced garden. The missing wall of the exposed toilette allows a nice view for the user in the same way as the glass walls does for Fujimoto's toilette. The water distances the user from people passing by, however not as effectively as Fujimoto's opaque fence. The openness and awkward placement in the middle of the school yard arguably limits the exposed toilette's usability. Instead, it transcends towards a sculptural object. The composition has a character of displacement and incompletion, resembling traits seen in *La Fabrica*. Bofill carved out and exposed former concealed forms of the old factory and functionalities became sculptural objects that enriched the architecture with tension and ambiguity. The exposed toilette rise questions, but ultimately it becomes a quirky ingredient in the school yard.



GLITCH PLAN
Misaligned plan drawing

Glitch technique: Misalignment with Audacity
Input: Uncompressed image file (.bmp)
Tool(s): Backwards and bass: 15
Visual output: Displacement, horizontal smudge, noise



Shading pillars (3)
The horizontal smudge effect shown in the glitch plan encourages a variety of possible interpretations. For the development of *Misaligned*, the smudges were interpreted as shadows. The sun was placed at a straight angle from the west in a modeling software and the vertical extrusion of the plan was made in order to achieve similar shadow effects as interpreted in the plan. A result of this method is the shading pillars in the atrium. Similar to the outer thirds of Michelangelo's stair that provided something else than the common expectation of a stair, these shading pillars provide shade instead of the common load bearing function. The abnormal proportions and questionable function generate a feeling of displacement - however subtle compared to the exposed toilette by the entrance. This interplay between curiosity and confusion creates tension, just like Michelangelo's awkward stair.

Glitch section
A section from the SB-building was treated in a similar way as the plan in Audacity. When working the glitch plan and section into a coherent entity, negotiations had to be made. For instance, the reworking of the section only considered the displacement while the smudge effect was ignored in order to simplify merging of the two interpretations. The footprint of the building was not reconsidered to follow the horizontal misalignment of the lower part of the section (figure 4), re-shaping of the section instead focused on changes inside the atrium.

Climb door (4)
The lower part of the section was rotated 180° in the glitch drawing. This caused the doors on the entry floor to misalign with the mullion grid on the upper levels of the building. Here the section was allowed to dominate over the plan and the doors have been moved on the wall as seen in the reworked glitch section. They were also placed vertically on the wall to follow the glitch section. The new elements have been called 'climb doors' as you would have to climb over the threshold to enter the space beyond. The parallel to the crawl door is evident. The moment of hesitance that the unusual door provokes, transitions into a sense of self-awareness in the visitor when instructed to the awkward climbing position.

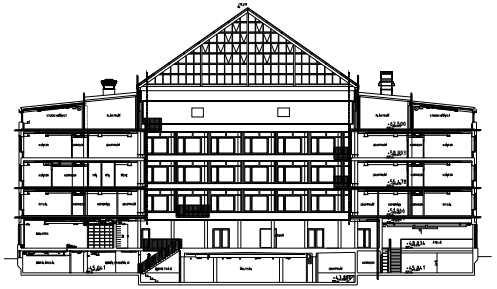


Figure 3. Section D-D drawing, Chalmers Architectural building. Provided by WHITE architects.

Figure 4. Reworked glitch section drawing. Author's own copyright.

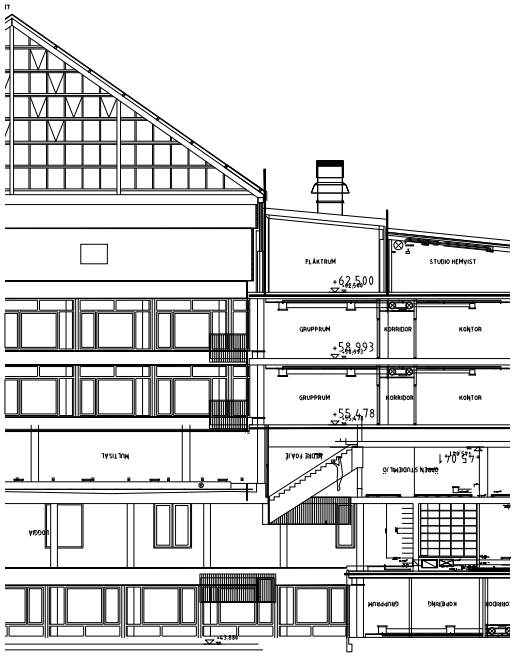


Figure 5. Reworked glitch section drawing - close up. Author's own copyright.

<<<
Scan for sequence of the 'Shading pillars', the 'Climb door' and the 'Inaccessible element' or visit:
https://vimeo.com/279457619

Inaccessible element (5)

The 180° rotation and horizontal displacement also effected the stair in the atrium, originally leading down to the basement. The stair has been moved between the second and third floor, turned upside down and made inaccessible. In Bofill's *La Fabrica* we saw a similar occurrence where stairs ended up as inaccessible objects rather than functional, architectural elements. However, there is a difference in their characters. The outcome of perceived incompleteness and decay in *La Fabrica* is missing in the glitch interpretation where the stair has been made inaccessible due to it being turned upside down. This signals an error in the design process rather than incompletion. Both stairs, however, bare witness of the elements' history of creation.

When merging the reworked glitch plan and section, yet another element was made inaccessible. Since the stair to the basement was moved to follow its position in the glitch section, consequently it was relocated in the plan, leaving the path way to the basement without access.

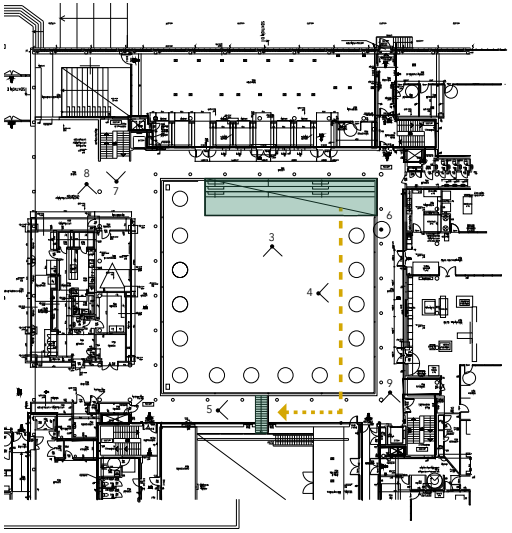
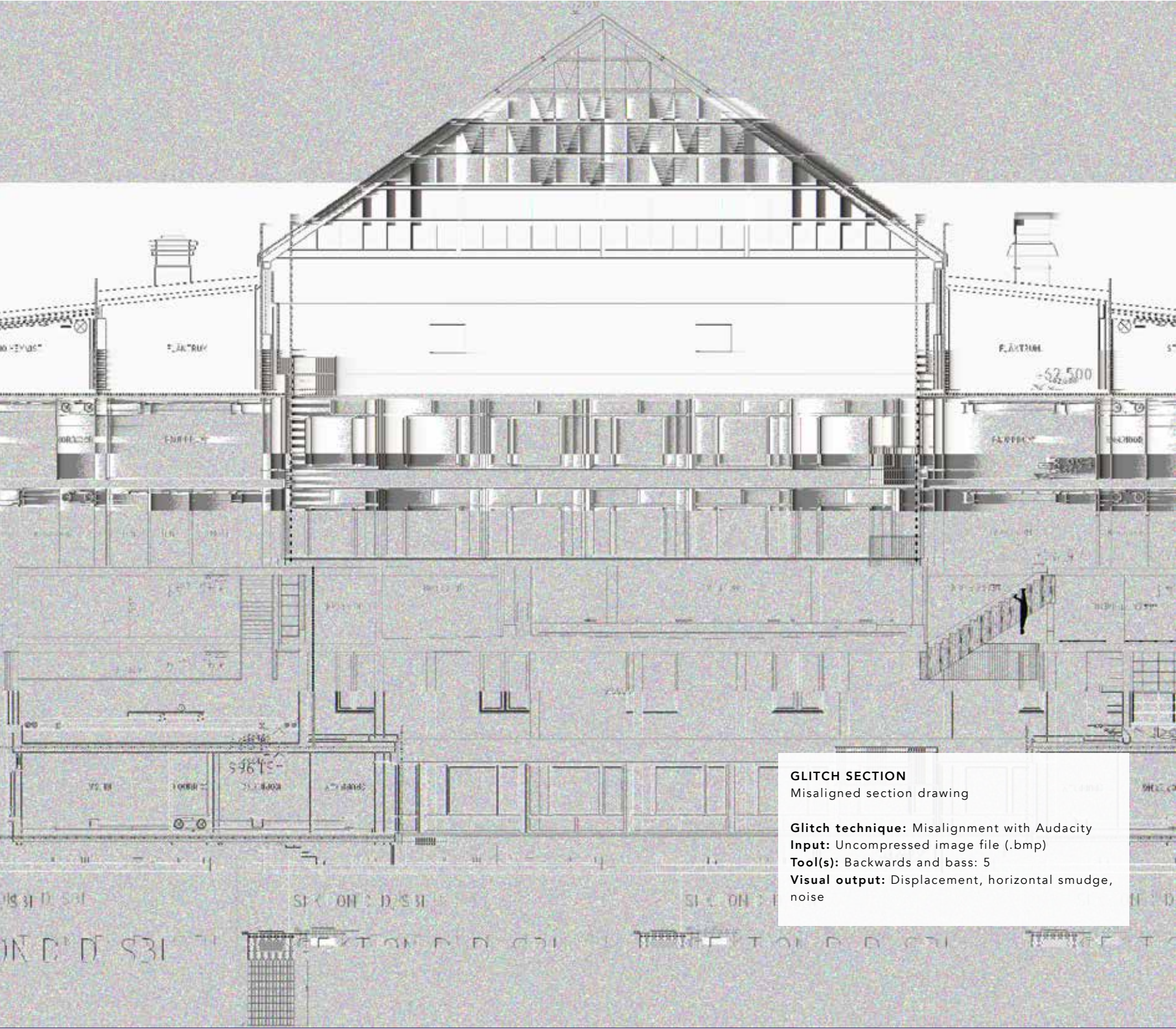
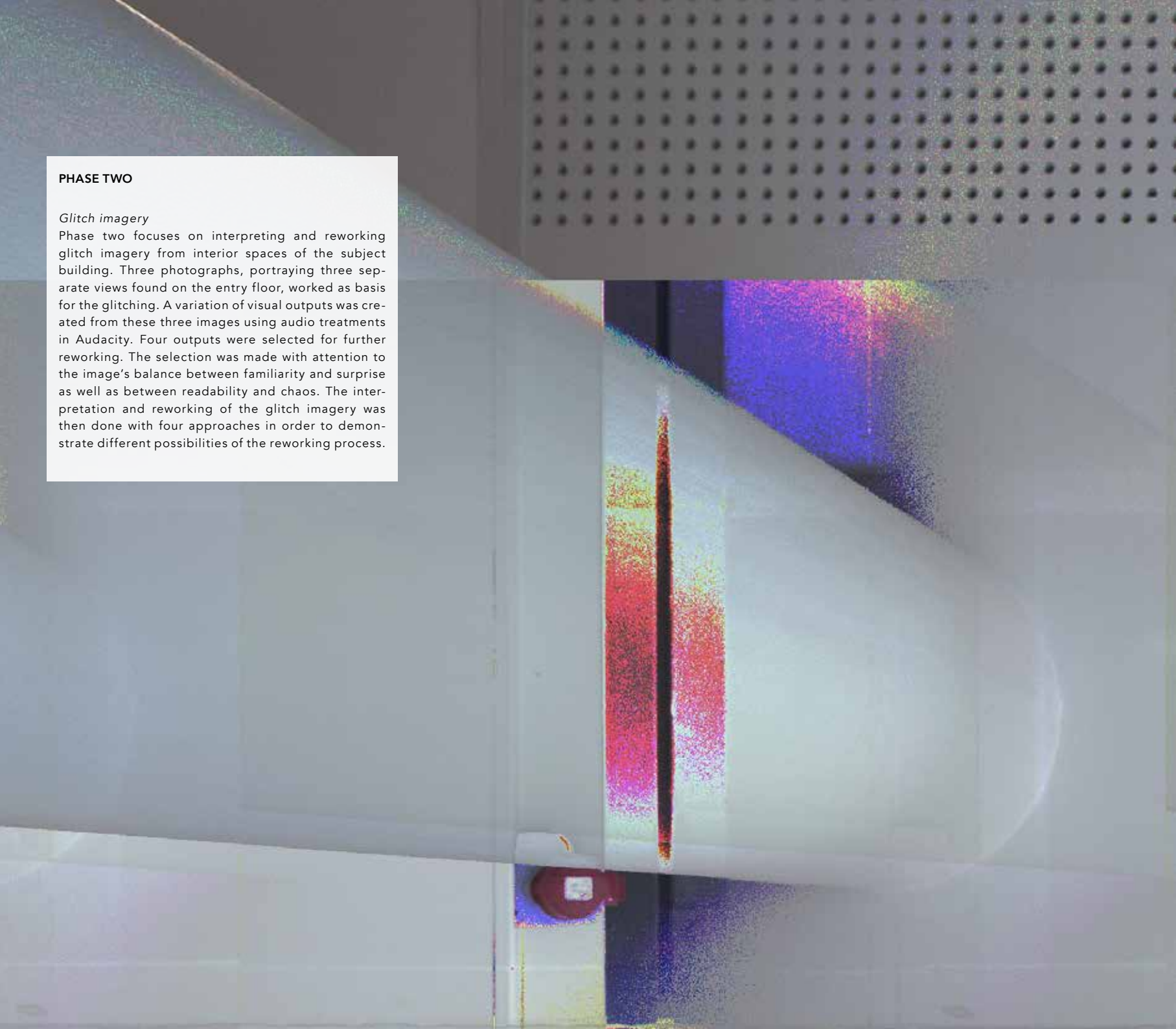


Figure 5. Inaccessible elements (stair and basement). Author's own copyright.



GLITCH SECTION
Misaligned section drawing

Glitch technique: Misalignment with Audacity
Input: Uncompressed image file (.bmp)
Tool(s): Backwards and bass: 5
Visual output: Displacement, horizontal smudge, noise



PHASE TWO

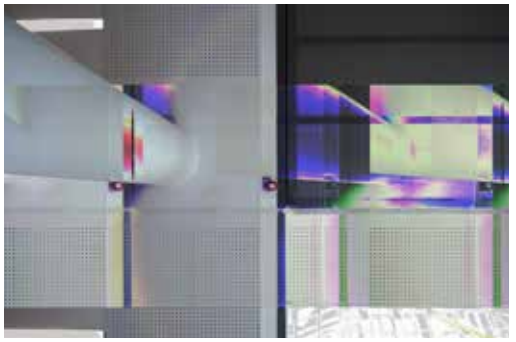
Glitch imagery

Phase two focuses on interpreting and reworking glitch imagery from interior spaces of the subject building. Three photographs, portraying three separate views found on the entry floor, worked as basis for the glitching. A variation of visual outputs was created from these three images using audio treatments in Audacity. Four outputs were selected for further reworking. The selection was made with attention to the image's balance between familiarity and surprise as well as between readability and chaos. The interpretation and reworking of the glitch imagery was then done with four approaches in order to demonstrate different possibilities of the reworking process.

>>>
Scan for sequence of the 'Light element' or visit:
https://vimeo.com/279258627

Light element (6)
The first input, image A, was taken underneath a balcony in the atrium, capturing the ceiling plane and the bottom of the balcony. The image was treated with an echo effect in Audacity, resulting in horizontal array and coloration. The reworking demonstrates a way of using light in order to achieve the aesthetic feeling of the glitch. The vibrant, glowing colors in the glitch image were mimicked by the use of neon lights and colored glass. The performance of the light element is, in contrary to the shading pillars and the inaccessible stair, in line with expected functions. The element includes light fixtures that emit light and transparent material that transmit light. The appearance, however, showcases a typical glitch aesthetic, withholding a sense of diplopia and disorientation that the glitch input suggests. By animating the light fixtures, *Misaligned* portrays the temporal and flexible quality of artificial light adding a dimension not seen in the glitch image.

IMAGE A



GLITCH IMAGE A

GLITCH IMAGE A
Misaligned image A

Glitch technique: Misalignment with Audacity
Input: Uncompressed image file (.bmp)
Tool(s): Echo effect
Settings: Delay value: 0,8; decay value: 0,5
Visual output: Horizontal array, coloration, noise

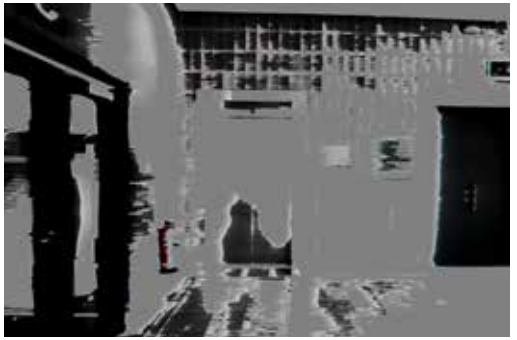
IMAGE B

GLITCH IMAGE B1

GLITCH IMAGE B1
Misaligned image B

Glitch technique: Misalignment with Audacity
Input: Uncompressed image file (.bmp)
Tool(s): Echo effect
Settings: Delay value: 0,5; decay value: 0,5
Visual output: Horizontal array, coloration

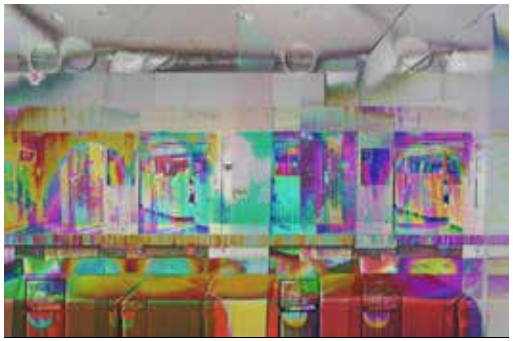
IMAGE C



GLITCH IMAGE C15

GLITCH IMAGE C1-30
Misaligned image C

Glitch technique: Misalignment with Audacity
Input: Uncompressed image file (.bmp)
Tool(s): Bass and descant effect
Settings: bass: 1-30 (descant: 0; volume: 0)
Visual output: Fragmentation, coloration (low bass values), low saturation (high bass values)



GLITCH IMAGE B2

GLITCH IMAGE B2
Misaligned image B

Glitch technique: Misalignment with Audacity
Input: Uncompressed image file (.bmp)
Tool(s): Echo effect, bass and descant effect
Settings: Delay value: 0,5; decay value: 0,5 and bass: -10 (descant: 0; volume: 0)
Visual output: Horizontal array, coloration, tactility

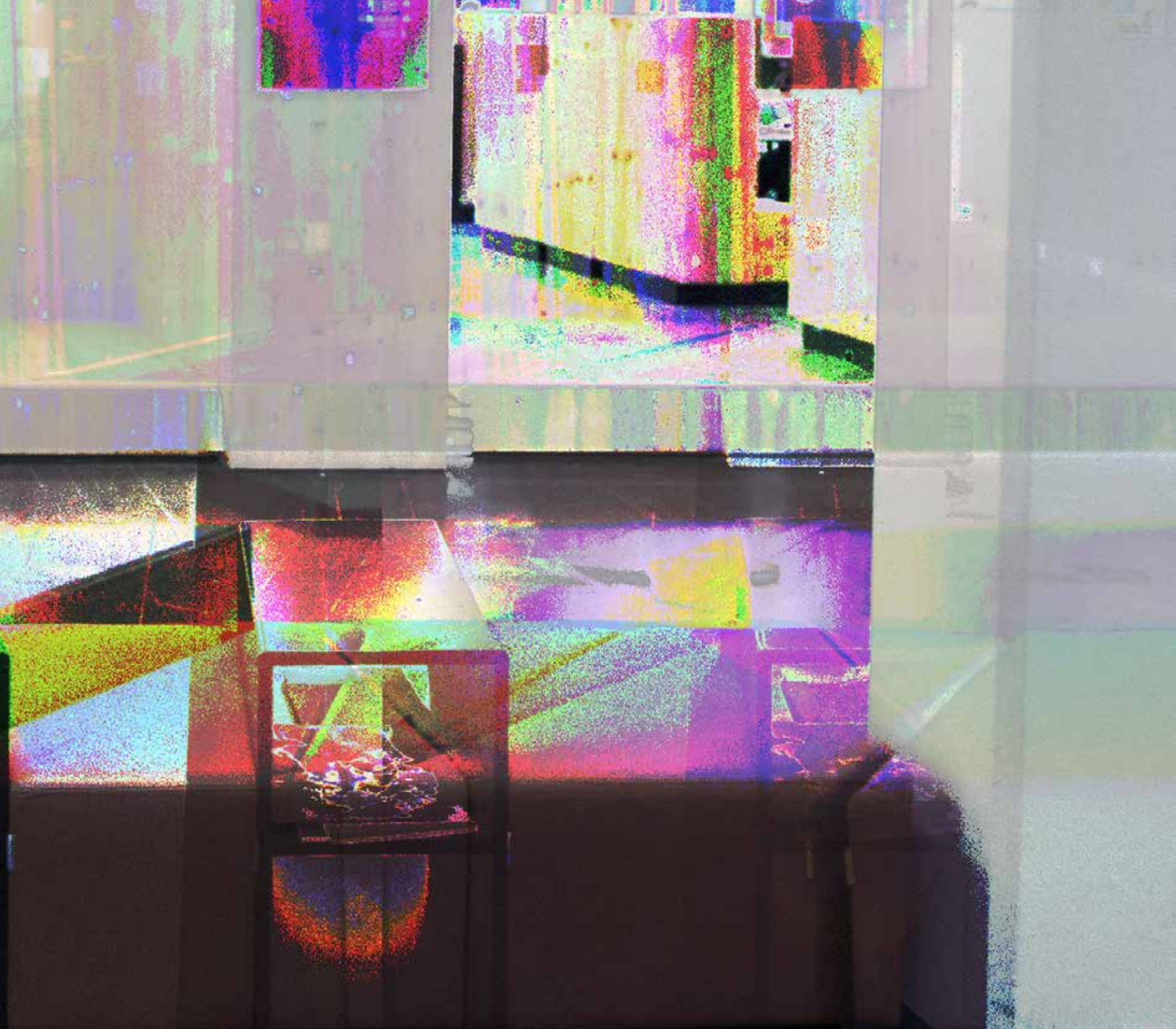
<<<
Scan for sequence of the 'Iridescent element' or visit:
https://vimeo.com/279462033

Iridescent element (7)

A similar treatment as applied for image A was done to image B (generating glitch image B1), a photo of the foyer of the SB-building. Horizontal array and coloration occur, this time interpreted as an iridescent quality. The appearance of glitch image B1 was attempted through the use of iridescent and transparent material in a modeling software. Pieces of the glitch image was mapped onto surfaces in the model to further mimic the iridescent and disorienting qualities seen in the glitch image. The horizontal shape was instructed from a camera calibration to match the perspective of the glitch image. The horizontal array in the image disrupts a straight forward interpretation of the perspective which caused a faulty calibration. The result is an exaggerated, elongated horizontal shape (see figure 6).

Venturi spoke about the both-and phenomenon, saying that elements can have a deceiving appearance at first sight, such as the stair in the Laurentian library, and the determination of something's value or dominance is depending on the angle of perception. This means that one element can hold double meanings interacting as the dominant and subordinate. The iridescent material interacts as green and pink, providing separate appearances depending on light and movement. The interplay with transparency and reflection in the reworked glitch adds to the dynamic qualities and generate feelings of diplopia and disorientation. The geometry appear to have 'normal' dimensions seen from the lead perspective, however viewed from a different angle the strange, prolonged shape is revealed.

Figure 6. Iridescent element (reworked glitch image B1. Shifted perspective view. Author's own copyright.



>>>
Scan for sequence of the 'Textured element' or visit:
https://vimeo.com/279460028

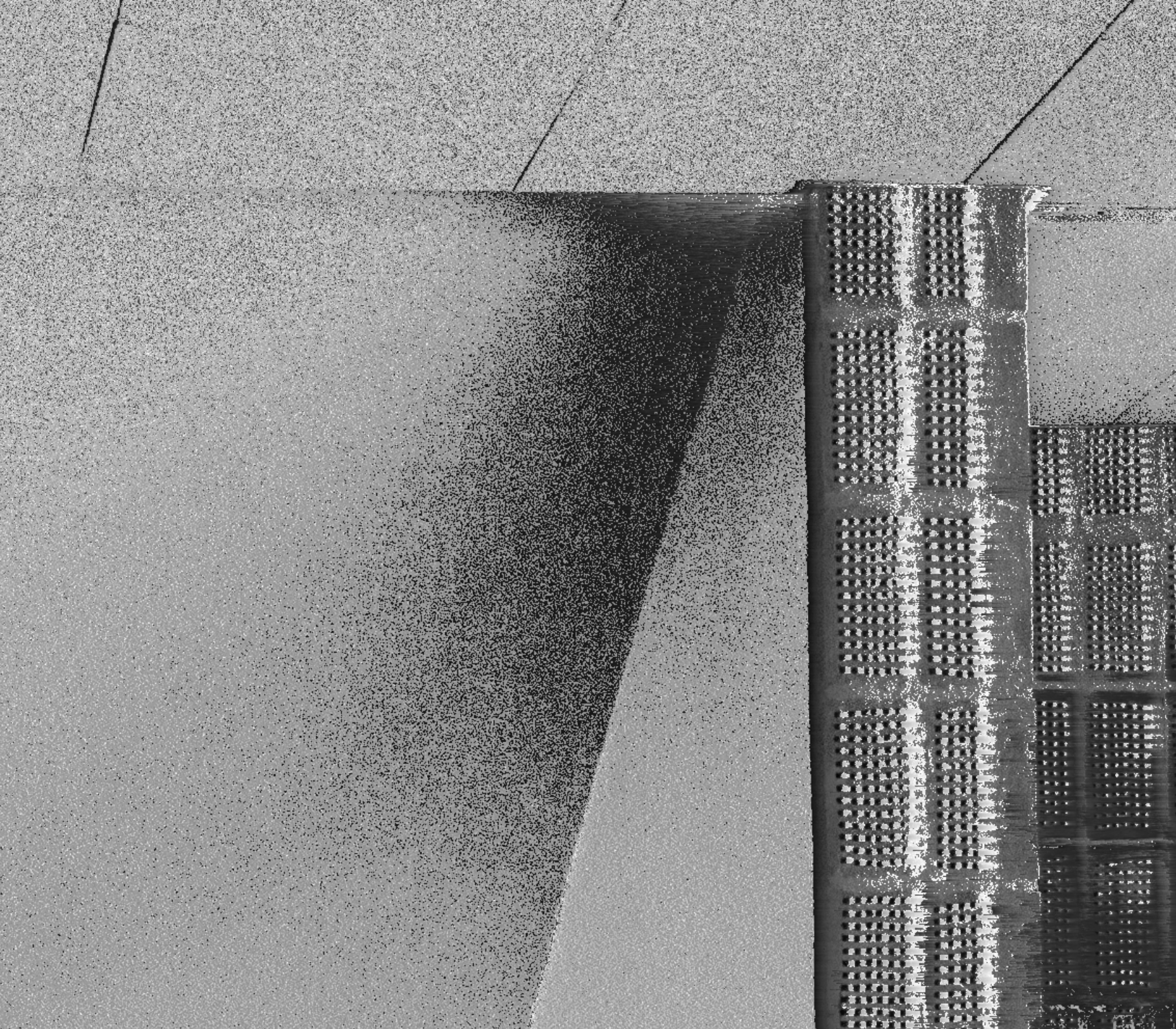
Textured element (8)
Glitch image B2 is a result of further glitching of glitch image B1. The bass value was set to -10 after the applied echo effect of glitch image B1. This created a more dense coloration and a flatter, texture-like appearance. The transformation of the textural quality was done through algorithm driven interpretation, using glitch image B2 as displacement and color source for a digital material. While the input photo - image B - portrays the display area in the foyer of the SB-building, the displaced material was applied in the opposing staircase shaft. The enclosing environment of the shaft highlights the unusual surface treatment and provides a moment of surprise when you turn the corner to enter the stair. The surface treatment is of an ambiguous character: Is it soft or hard, friendly or hostile? The visual effect is striking, without being too disturbing or too controversial.

Materialization of the glitch has been demonstrated by glitch artist Phillip Stearns in chapter 3 - *Breeding error*. Stearns let a textile loom weave fabrics based on glitch imagery as a way of materializing technology. A similar approach could be adopted for the 'textured element', for example by letting a 3D printer transform the 'glitch material' into physical form.

<<<
Scan for sequence of the 'Decaying element' or visit:
https://vimeo.com/279464427

Decaying element (9)

Image C was treated 30 times with bass values varying from 1-30 (row 2-7 on following page). The higher bass values showed a visual output of de-saturation and fragmentation which brought a feeling of decay. The intention of the reworking was to portray this decaying feeling and to capture the gradual transformation from 'normal' to 'glitch'. A sequence was formed out of the 30 glitch images and transition images was created to fill the gap between image C and glitch image C1. The resulting sequence shows an elevator gradually fading away. The transformation could be perceived to mirror a process over time - a building in decay, moving towards nothingness - tapping into thoughts of impermanence shared by wabi-sabi and Gordon Matta-Clark.



In wabi-sabi philosophy it is said that beauty is a state of consciousness that can occur at any given moment. When working with the glitch material, moments of beautiful awkwardness were found when allowing the unexpected to lead the way in the design process. A smudge in the glitch plan became dramatic pillars providing shade instead of structural support. Re-located lines generated gravity defying water and doors that instruct a playful climbing motion through the opening. Vibrant colorations inspired ways of working with light and material - resulting in neon lights and a staircase draped in a colorful texture. These moments of beauty begin to tell us something about the potential and the possibilities that occur when the glitch meets the architectural drawing.

Awkwardness

The first question of this thesis reads 'What is Awkwardness in Architecture?'. The presence of awkwardness was found in the traditional Japanese crawl door and Michelangelo's odd staircase. It was present in more recent architectural work like the refurbishment of *La Fabrica*, Matta Clark's building dissections and Fujimoto's public toilette. The second question asked was 'What can Awkwardness add to the Architectural Discussion?'. Andrew Zago stated that: 'As an emerging cultural sensibility, the awkward may help define fertile territory for new architecture' (2010, p. 206). The case studies presented in this thesis confirm the awkward's role in architecture as an alternative logic, providing architectural elements that do not fall in line with established expertise. Awkwardness has been shown to enrich these architectural precedences with ambiguity and tension - creating self-awareness in a humbling crawl or, as seen in *Circus,* providing a new sense of architectural space by playing with our sense of orientation. The awkward interferes with our habits and presumptions, expanding our ideas about the world that surrounds us.

Similar awkward situations as seen in the case studies were discovered when reworking the glitch material of the SB-building, which demonstrates the glitching process' potential of generating awkward outcome. That is not to say that awkward aesthetics and situations are always the result of a glitching process. As both the glitching and the interpretation of the glitch has multiple possible outcomes, some might result in more conventional elements and aesthetics. It all comes down to the designer's intention in the reworking stage. The 'climb door', for example, could have been interpreted as a window which purpose is to transmit light and allow sight through the wall - and which does not suggest that you move through the opening. The window-interpretation does not generate the same awkward climbing-situation as the door-interpretation, however both elements derive from the same glitch material.

Process

The third and final thesis question concerns the tradition of instrumental control in architecture and reads 'How can Glitching influence the Architectural Design Process?'. The nature of the glitch is that it cannot be fully controlled. In the same way as intentional awkwardness requires the architect to perform contrary to his or her best judgement (Zago, 2010, p. 209), glitching undermines the architect's expertise by removing spatial clarity from the drawing. The glitching of the SB-building's plan drawing showed that, in order to imagine the vertical shape of the plan representations, reworking techniques had to be invented. The displaced lines were understood according to common expertise, while the smudge effect demanded a more creative interpretation. The glitch makes room for several understandings of a drawing or image, incorporating ambiguity into the design process itself.

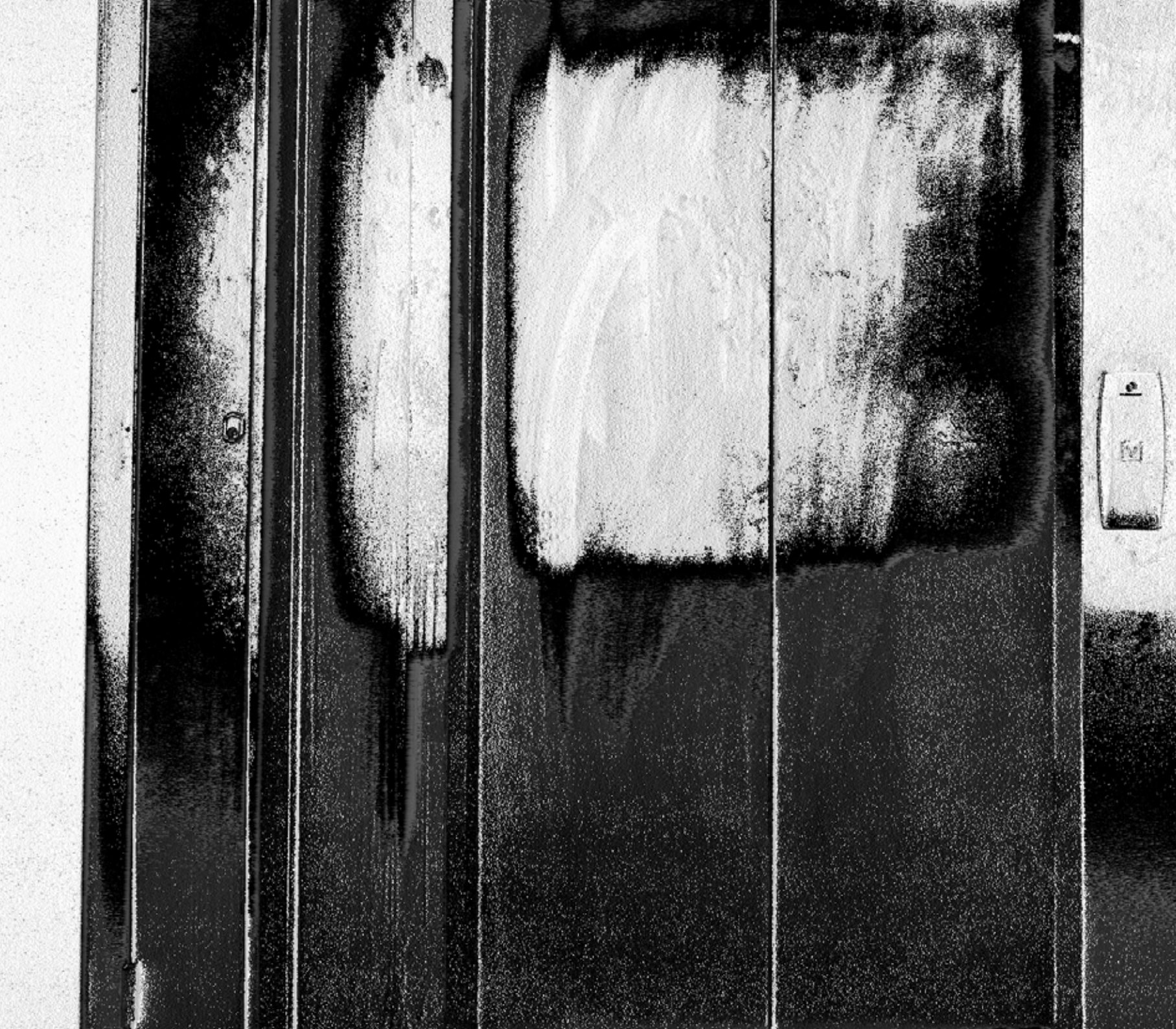
Unpredictability is another defining feature of glitching. When playing a drawing backwards for example, the organization is disrupted in a way that the author of the drawing could not have fully predicted. This provides new insights of spatial relationships that can help spur the author's creativity. Placing a toilette in the middle of a school yard or making a stair inaccessible by turning it upside down would probably not be the results of a traditional design process. These surprises, however, are not necessarily rewarding. The architect is provided with absolute freedom at this stage - a freedom of choosing what to develop and how to develop it.

Another aspect that is significant for the glitching and reworking process is the reversed relation between image and drawing. While a traditional design process goes from drawing to a rendered image or illustration, glitching provides an image of the visual result to begin with. The interpretation of the image is then turned into a design or representational drawings through a creative process. The 'light element' and the 'iridescent element' demonstrate this relationship clearly. They show how a glitch can inspire new ways of using traditional techniques, such as lighting fixtures or an iridescent material, in order to achieve a design similar to the provided glitch image. The 'textured element' demonstrates a somewhat different scenario. The process begins with the glitch image, but instead of mimicking the aesthetics and configuration of the image with subjective interpretation, the glitch image is used to drive three dimensional geometry in a modeling software. The algorithm driven interpretation further distances the architect from the design and allows surprises post the glitching process. The final configuration of the 'textured element' was in this case achieved by the deliberate design choice of applying the 'glitch texture' onto the walls of a staircase shaft.

5

METHOD DEVELOPMENT:
DESIGN INVESTIGATIONS,
GLITCHING TECHNIQUES AND
INTERPRETATION OF GLITCH
MATERIAL

APPENDIX



5.1

THE COPY/PASTE METHOD

DATA BENDING WITH TEXT EDITOR

There are several ways to work with data bending in a text editor. You can replace numbers, use scripts (processing) or in other ways interact with the data. This investigation will use the copy/paste method, a quick and straight forward way to start working with data bending. Any file type that can be opened in a text editor can be used as input, however compressed files have less data information and will not be manipulated as easily. This study uses raw image-file and a couple of object-files (.obj) as input. The data bent material was finally opened in suitable image or modeling software in order to examine possibilities for further reworking of the glitch material.

Conclusions

The copy-paste method had a rather predictable visual output (linear coloration in segments) for all tested raw image-files. In order to get an visible effects, the image also had to be broken quite a lot and the resemblance to the original then became faint. This is a problem regarding the design implementation where achieving awkwardness is a key driver. When the level of confusion becomes too large in relation to familiarity, you might end up in a strange and non relatable result - missing the mark of the more relatable awkwardness. The result of the copy/paste method for object-files was more unpredictable, however difficult to work with. The obj-file showed resistant to manipulation and if edited in the 'wrong' place you end up with invalid geometry. Further development of the data bent material was also found unrewarding. Both the glitch image- and object-files appeared different to what they looked like viewed in Finder. The data bent material also showed tedious to work with.

Input: Image RAW-file (.CR2), 3D object (.obj)
Media: Text editor (Textredigerare on Mac)
Tools: Copy/paste
Output: Image RAW-file (.CR2), 3D object (.obj)

Workflow

1. Open image or object with a text editor.
2. Scroll down to leave head untouched.
3. Rearrange the file's information by selecting sections of text, copy and paste it once or several times somewhere in the document.
5. Save file.
6. Open in suitable software to see result.

Figure 1. Text editor interface. Author's own copyright.

Figure 2. Input image. Author's own copyright.

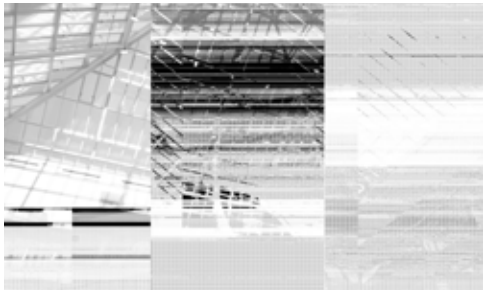
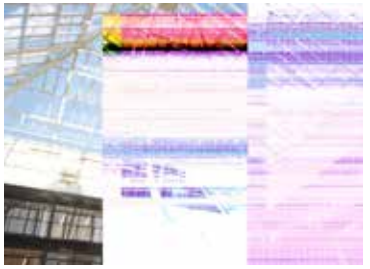
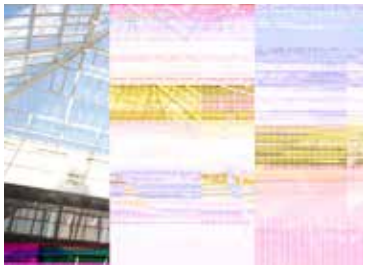
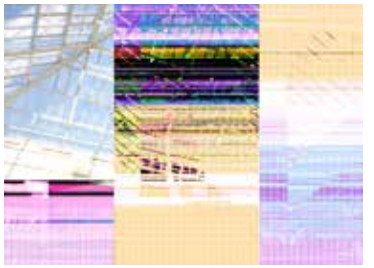
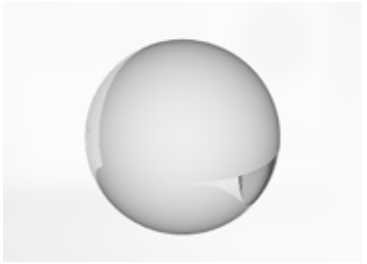
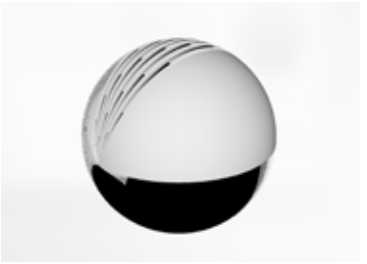
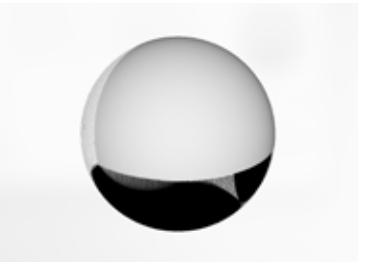
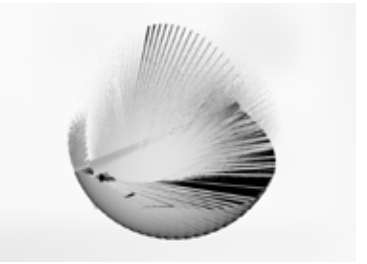


Figure 3. Output image. Author's own copyright.

A

B




C

INPUT (0) *COPY/PASTE (1)* *COPY/PASTE (2)* *COPY/PASTE (3)*

A0 - INPUT
Image RAW-file (.CR2)

A1 - COPY/PASTE
Tools: Copy/paste
Visual output: Horizontal coloration in thin lines (in segments), tactility

A2 - COPY/PASTE
Tools: Copy/paste
Visual output: Horizontal coloration in thin lines (in segments), tactility

A3 - COPY/PASTE
Tools: Copy/paste
Visual output: Horizontal coloration in thin lines (in segments), tactility

B0 - INPUT
3D object (.obj)

B1 - COPY/PASTE
Tools: Copy/paste
Visual output: Structured fragmentation upper half, partial fading (lower half)

B2 - COPY/PASTE
Tools: Copy/paste
Visual output: Partial fading (lower half)

B3 - COPY/PASTE
Tools: Copy/paste
Visual output: Fragmentation upper half

C0 - INPUT
3D object (.obj)

C1 - COPY/PASTE
Tools: Copy/paste
Visual output: Surface fragmentation

C2 - COPY/PASTE
Tools: Copy/paste
Visual output: Surface fragmentation, symmetric fan-like line formation

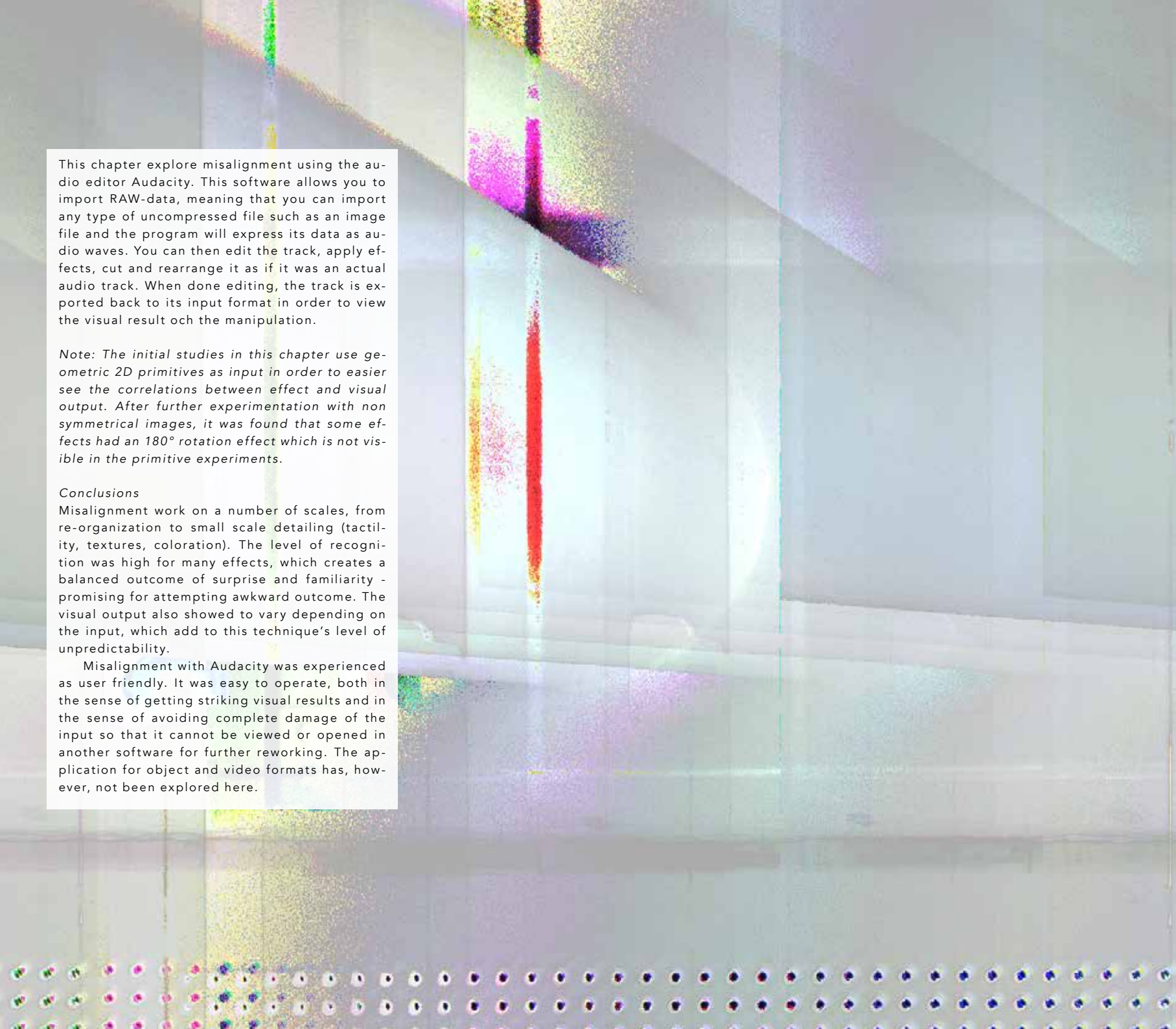
C3 - COPY/PASTE
Tools: Copy/paste
Visual output: Surface fragmentation, symmetric fan-like line formation

The copy/paste was executed randomly for all tests, the visual output of C2 and C3 are still very similar. This shows that the obj-file is rather resistant to manipulation

5.2

TREATING IMAGE FILES IN AN AUDIO EDITOR

MISALIGNMENT WITH AUDACITY



This chapter explore misalignment using the audio editor Audacity. This software allows you to import RAW-data, meaning that you can import any type of uncompressed file such as an image file and the program will express its data as audio waves. You can then edit the track, apply effects, cut and rearrange it as if it was an actual audio track. When done editing, the track is exported back to its input format in order to view the visual result och the manipulation.

Note: The initial studies in this chapter use geometric 2D primitives as input in order to easier see the correlations between effect and visual output. After further experimentation with non symmetrical images, it was found that some effects had an 180° rotation effect which is not visible in the primitive experiments.

Conclusions

Misalignment work on a number of scales, from re-organization to small scale detailing (tactility, textures, coloration). The level of recognition was high for many effects, which creates a balanced outcome of surprise and familiarity - promising for attempting awkward outcome. The visual output also showed to vary depending on the input, which add to this technique's level of unpredictability.

Misalignment with Audacity was experienced as user friendly. It was easy to operate, both in the sense of getting striking visual results and in the sense of avoiding complete damage of the input so that it cannot be viewed or opened in another software for further reworking. The application for object and video formats has, however, not been explored here.

Input: Uncompressed image file (.bmp)
Media: Audacity 2.2.1 (for Mac)
Tools: Effects from the 'Effect'-panel.
Output: Uncompressed file (.bmp)

Workflow
1. Import raw data to Audacity:

For .bmp and .obj choose:
Encoding: U-Law
Bit order: Big endian
Channel: 1

For .avi choose:
Encoding: A-Law
Bit order: Big endian
Channel: 2

2. Mark part of audio to effect (always leave beginning (head) of audio track untouched).
3. Apply effect(s) and/or cut, rearrange the audio track (see following studies for details).
4. Export as uncompressed file, same as input:

Choose:
Head: RAW (header-less)
Encoding: Same as input (U-Law for .bmp and .obj and A-Law for .avi).

5. Open in suitable software to see result.

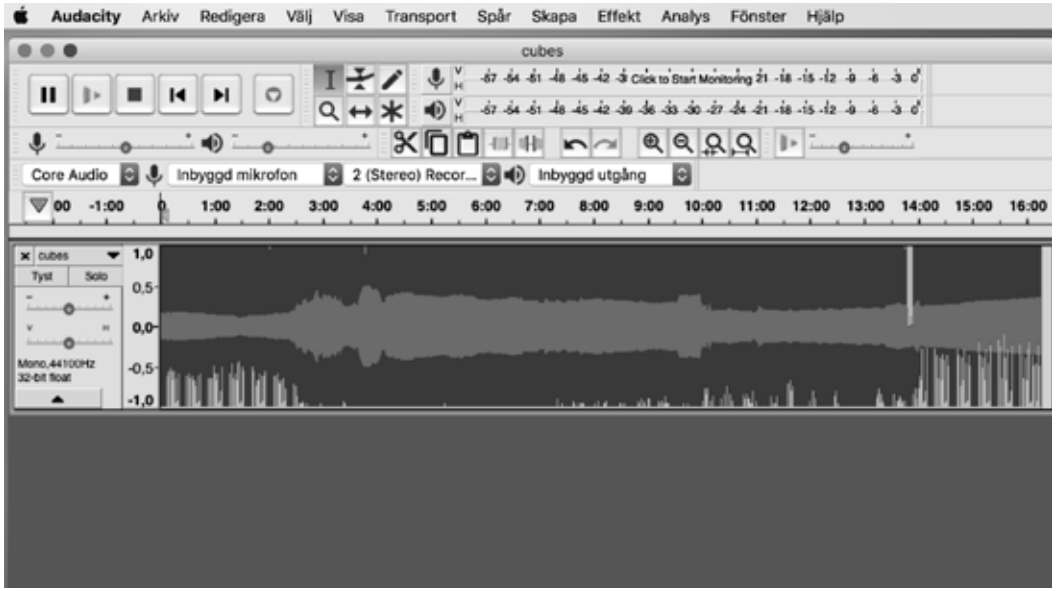


Figure 1. Audacity interface. Author's own copyright.

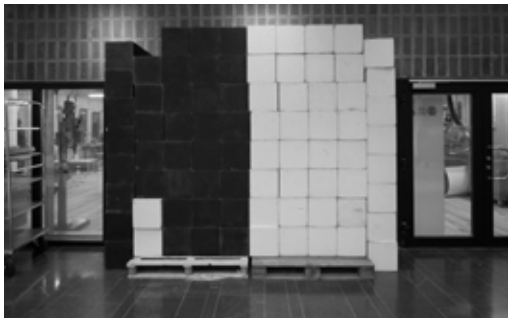


Figure 2. Input image (.bmp). Author's own copyright.

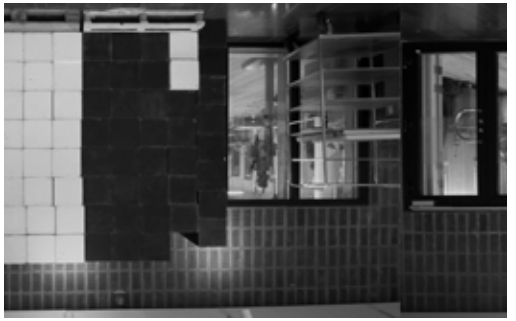
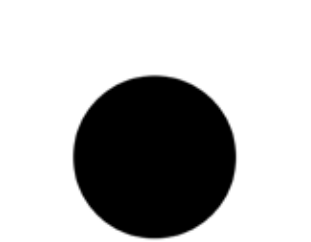
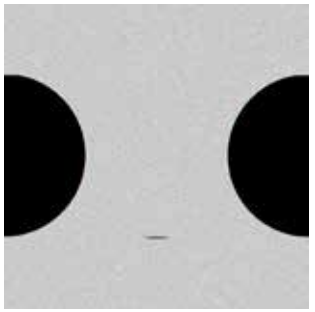
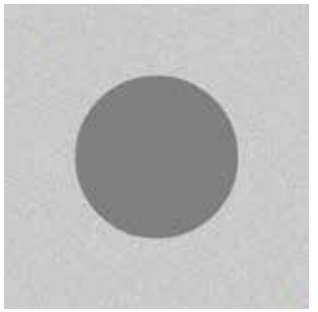
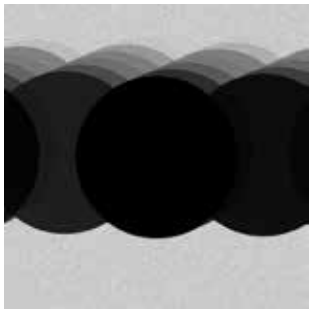
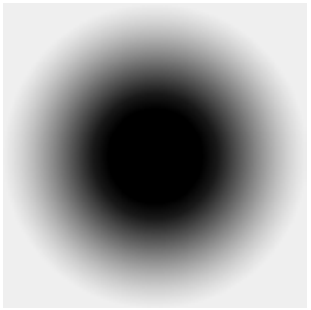
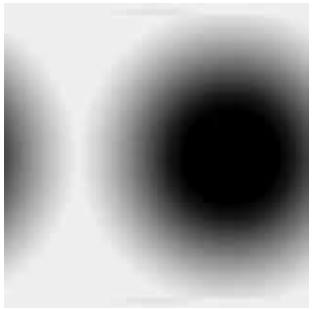
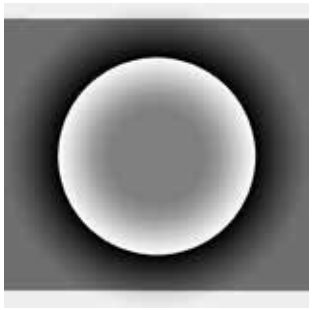
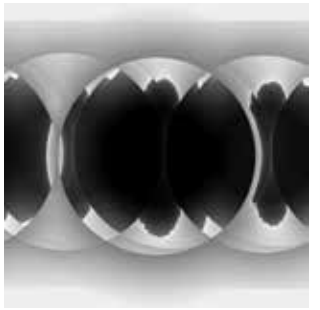


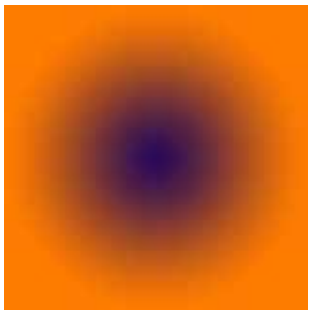
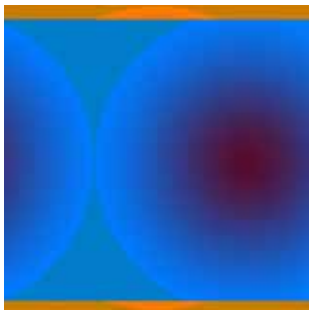
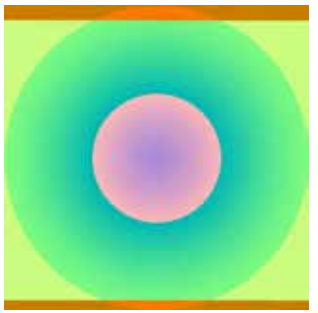
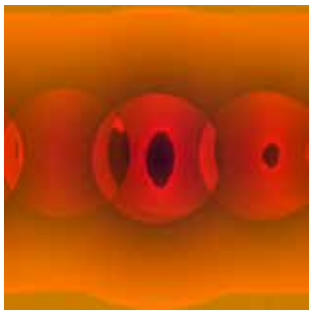
Figure 3. Output image (.bmp). Author's own copyright.

A

B

C

INPUT (0) *BACKWARDS (1)* *INVERT (2)* *ECHO (3)*

A0 - INPUT
Image bmp-file

A1 - BACKWARDS
Tools: Backwards-effect
Visual output: Splitting, horisontal displacement, noise.

A2 - INVERT
Tools: Invert-effect
Visual output: Brightness, noise.

A3 - ECHO
Tools: Echo-effect
Settings: Delay (sec): 0,5; decay value: 0,5
Visual output:. Horisontal and diagonal array with fading.

A0 - INPUT
Image bmp-file

B1 - BACKWARDS
Tools: Backwards-effect
Visual output: Splitting, horisontal displacement.

B2 - INVERT
Tools: Invert-effect
Visual output: Color inversion, distinct color transition.

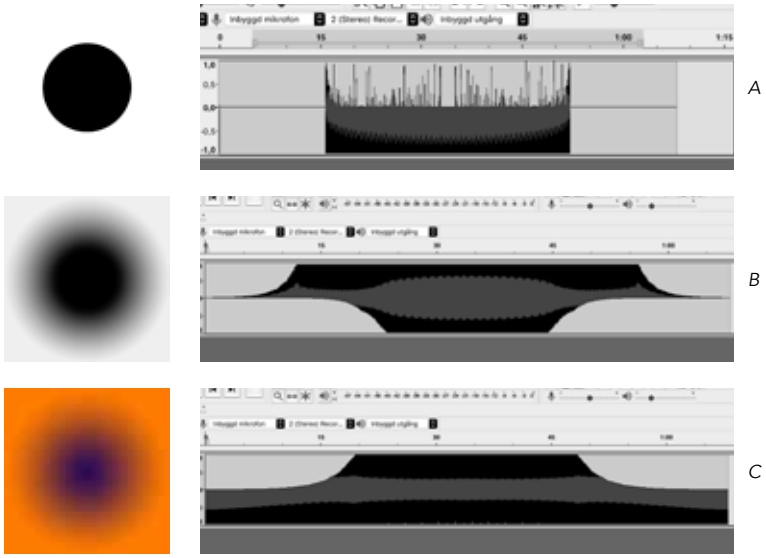
B3 - ECHO
Tools: Echo-effect
Settings: Delay (sec): 0,5; decay value: 0,5
Visual output: Horisontal array, fragmentation.

A0 - INPUT
Image bmp-file

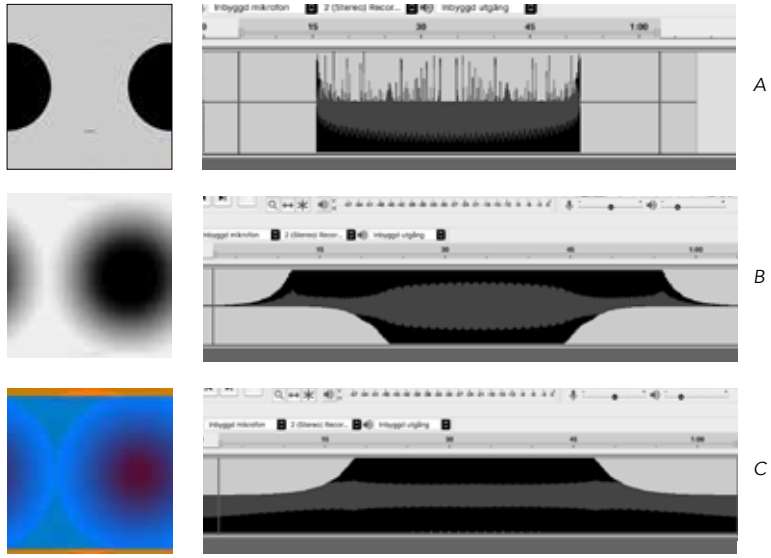
C1 - BACKWARDS
Tools: Backwards-effect
Visual output: Splitting, horisontal displacement, color inversion, noise.

C2 - INVERT
Tools: Invert-effect
Visual output: Color change (brighter), distinct color transition.

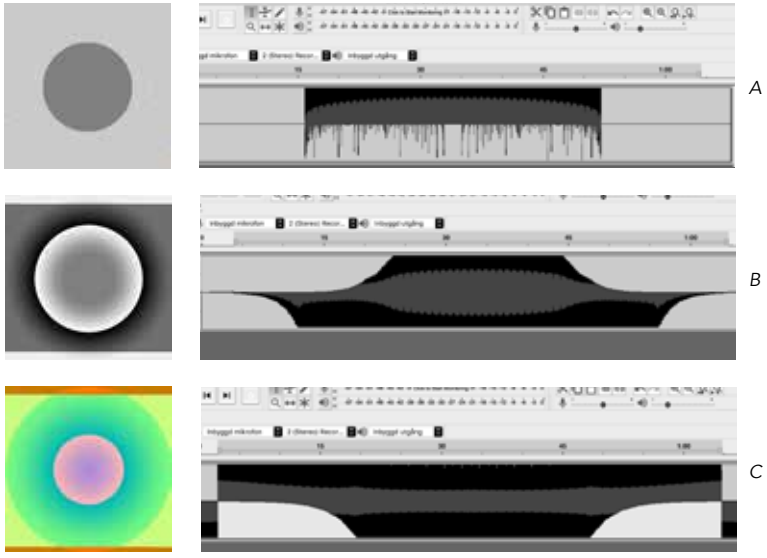
C3 - ECHO
Tools: Echo-effect
Settings: Delay (sec): 0,5; decay value: 0,5
Visual output: Horisontal array, fragmentation.



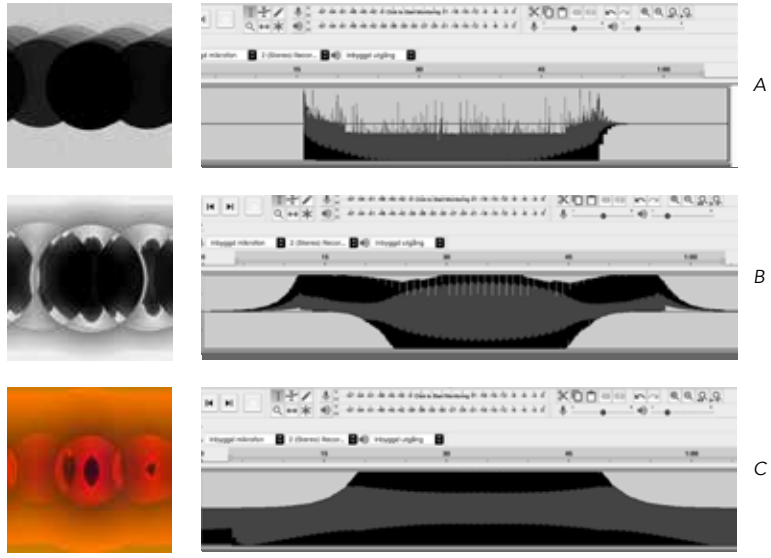
AUDIO TRACK- INPUT (0)



AUDIO TRACK - BACKWARDS (1)



AUDIO TRACK- INVERT (2)



AUDIO TRACK- ECHO (3)

A0 - AUDIO TRACK INPUT (0)
The white area of the image seems to be expressed as silence in the audio track. The black circle is represented by symmetric audio waves.

A1 - AUDIO TRACK BACKWARDS (1)
Changes in the audio track is not very visible for the backwards effect. This might depend on the input's symmetrical layout since the audio waves are simply mirrored in the track. The visual impact in the exported bmp-file shows splitting with horizontal displacement.

A2 - AUDIO TRACK INVERT (2)
Inversion rotates the track 180°, which has a fading effect in the output bmp.

A3 - AUDIO TRACK ECHO (3)
While the echo effect creates a quite litteral visual echo in the output bmp, the echo is not as readable in the audio track. The beginning and end of the dense part of the track (representing the black circle) show changes compared to the input's audio track. The middle section remains the same except that it is less dense.

B0 - AUDIO TRACK INPUT (0)
This example shows more clearly that the dense area in the audio also represents a dense area in the image. The fading edges of the circle are represented in the audio track by waves in the upper section of the track, fading towards the beginning and ending.

B1 - AUDIO TRACK BACKWARDS (1)
See comment for A1.

B2 - AUDIO TRACK INVERT (2)
Inversion rotates the track 180°, making the upper section less dense than the lower part. The output bmp has a dark fading going outward from a white circle, which also fades from a darker center. It seems like the lower part of the track represents the outer part of the image, which is now the more dense area, both in the audio track and the image.

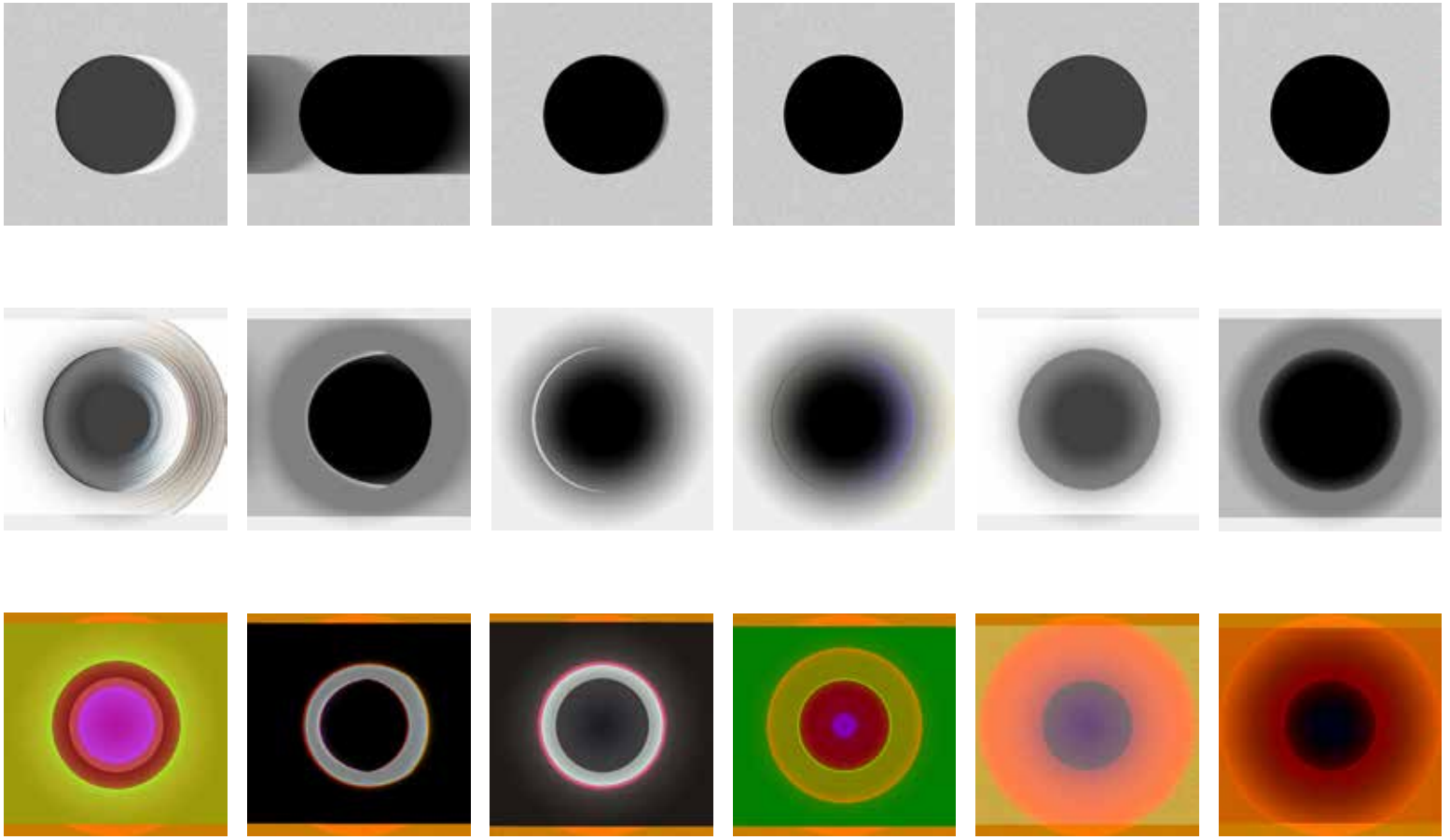
B3 - AUDIO TRACK ECHO (3)
This image has a symmetrical representation of the echo effect in contrary to the previous example. Reasons for this are unknown. The center of the audio track is dense just like the vertical center of the image bmp.

C0 - AUDIO TRACK INPUT (0)
The orange part of the image seems to be represented in the lower part of the audio track (at the beginning and ending) while the blue correspond with the dense middle section of the track.

C1 - AUDIO TRACK BACKWARDS (1)
See comment for A1.

C2 - AUDIO TRACK INVERT (2)
As for previous examples, inversion rotates the track 180°. Like in primitive A2, it is difficult to draw any conclusions on the correspondence of output bmp and audio track.

C3 - AUDIO TRACK ECHO (3)
The echo effect does not show much impact on the audio track for this example. There is a vague asymmetrical change in the darker areas of the audio track.



A

B

C

BASS -25 (4.1) *BASS 25 (4.2)* *DESCANT -25 (5.1)* *DESCANT 25 (5.2)* *VOLUME -25 (6.1)* *VOLUME 25 (6.2)*

A4.1 - BASS: -25
Tools: Bass and descant effect
Settings: Bass -25, descant: 0, volume: 0
Visual output: Fading, inverted horizontal smudge, noise

A4.2 - BASS: 25
Tools: Bass and descant effect
Settings: Bass 25, descant: 0, volume: 0
Visual output: Horizontal smudge, noise

A5.1 - DESCANT: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: -25, volume: 0
Visual output: Vague horizontal smudge, noise

A5.2 - DESCANT: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 25, volume: 0
Visual output: Noise

A6.1 - VOLUME: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: -25
Visual output: Brightness, noise

A6.2 - VOLUME: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: 25
Visual output: Darkness, noise

B4.1 - BASS: -25
Tools: Bass and descant effect
Settings: Bass -25, descant: 0, volume: 0
Visual output: Asymmetry: right side: linear color noise

B4.2 - BASS: 25
Tools: Bass and descant effect
Settings: Bass 25, descant: 0, volume: 0
Visual output: Darkness, distinct color transition (less fading), asymmetry

B5.1 - DESCANT: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: -25, volume: 0
Visual output: Asymmetry: left side: thin, white half halo

B5.2 - DESCANT: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 25, volume: 0
Visual output: Asymmetry: left side: thin, dark half halo; right side: thin blue and yellow lines (color inversion)

B6.1 - VOLUME: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: -25
Visual output: Brightness, noise

B6.2 - VOLUME: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: 25
Visual output: Darkness, noise

C4.1 - BASS: -25
Tools: Bass and descant effect
Settings: Bass -25, descant: 0, volume: 0
Visual output: Color change, distinct color transition (less fading)

C4.2 - BASS: 25
Tools: Bass and descant effect
Settings: Bass 25, descant: 0, volume: 0
Visual output: Darkness, distinct color transition, asymmetry

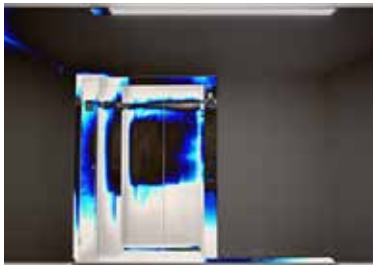
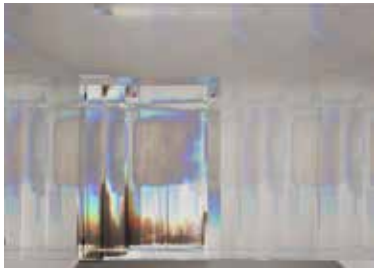
C5.1 - DESCANT: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: -25, volume: 0
Visual output: Darkness, color change, distinct color transition (less fading)

C5.2 - DESCANT: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 25, volume: 0
Visual output: Color change, distinct color transition (less fading)

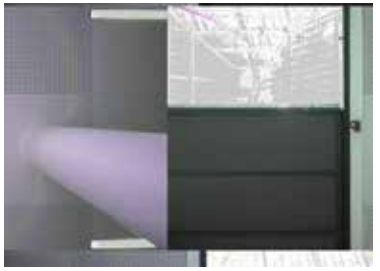
C6.1 - VOLUME: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: -25
Visual output: Brightness, noise

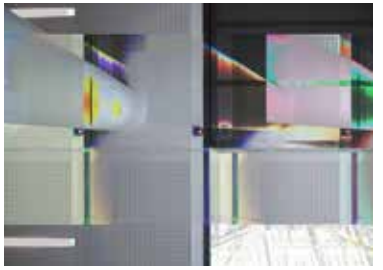
C6.2 - VOLUME: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: 25
Visual output: Darkness, noise



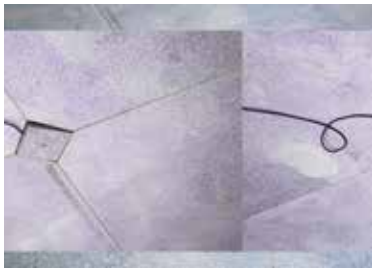



D



E

F

INPUT (0) *BACKWARDS (1)* *INVERT (2)* *ECHO (3)*

D0 - INPUT
Image bmp-file

D1 - BACKWARDS
Tools: Backwards effect
Visual output: Split with 180° rotation, tint change

The input has a red/yellow tone which transforms into a green tint with the backwards-effect. The effect also splits the image in two, non equal, pieces and rotates them 180°.

D2 - INVERT
Tools: Invert effect
Visual output: Inverted colors and brightness value

The input image has a red/yellow tone while the visual output shows blue tones (the colors have been inverted). The effect also makes bright parts of the input image darker while dark spots are turned brighter.

D3 - ECHO
Tools: Echo effect
Settings: Delay (sec): 0,5; decay value: 0,5
Visual output: Horisontal array with fading, coloration

The echo effect creates a visual echo, repeating distinct shapes in the image multiple times. This image also experience a blue toned color change.

E0 - INPUT
Image bmp-file

E1 - BACKWARDS
Tools: Backwards effect
Visual output: Split with 180° rotation, tint change

The left side of the input has a vague blue tone which outputs as a lilac tint with the backwards-effect. The right side of the input seems to have a vague red/yellow tone and outputs as a green tint. Splitting and 180° rotation also occur.

E2 - INVERT
Tools: Invert effect
Visual output: Diagonal displacement, low saturation

The diagonal displacement shown in this image will not count as a general visual output for the invert effect due to the differentiation of visual output compared to other studies of this effect. A re-run of this test would be suitable for higher accuracy.

E3 - ECHO
Tools: Echo effect
Settings: Delay (sec): 0,5; decay value: 0,5
Visual output: Horisontal array with fading, coloration

Besides the visual echo, this image has a lot of color changes with a wide spectrum of colors emerging.

F0 - INPUT
Image bmp-file

F1 - BACKWARDS
Tools: Backwards effect
Visual output: Split with 180° rotation, tint change

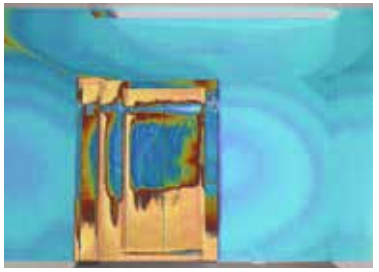
The input image has a blue tone which outputs as a lilac tint with the backwards-effect. Splitting and 180° rotation also occur.

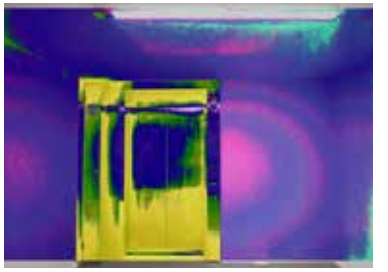
F2 - INVERT
Tools: Invert effect
Visual output: Darkness, inverted coloration

The input image has a blue tone which outputs as orange/yellow color spots. The effect also makes the image darker.

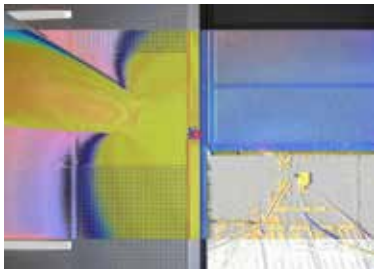
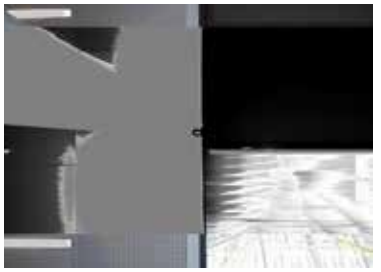
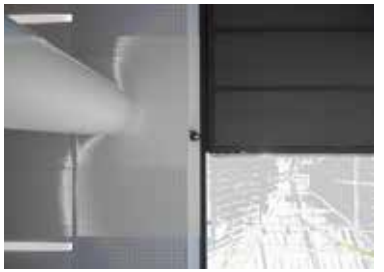
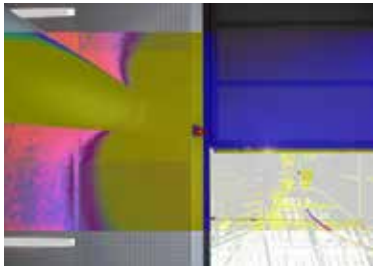
F3 - ECHO
Tools: Echo effect
Settings: Delay (sec): 0,5; decay value: 0,5
Visual output: Horisontal array with fading, faint coloration

This image has a less colorful visual output compared to the others. The array effect is also more subtle.



D

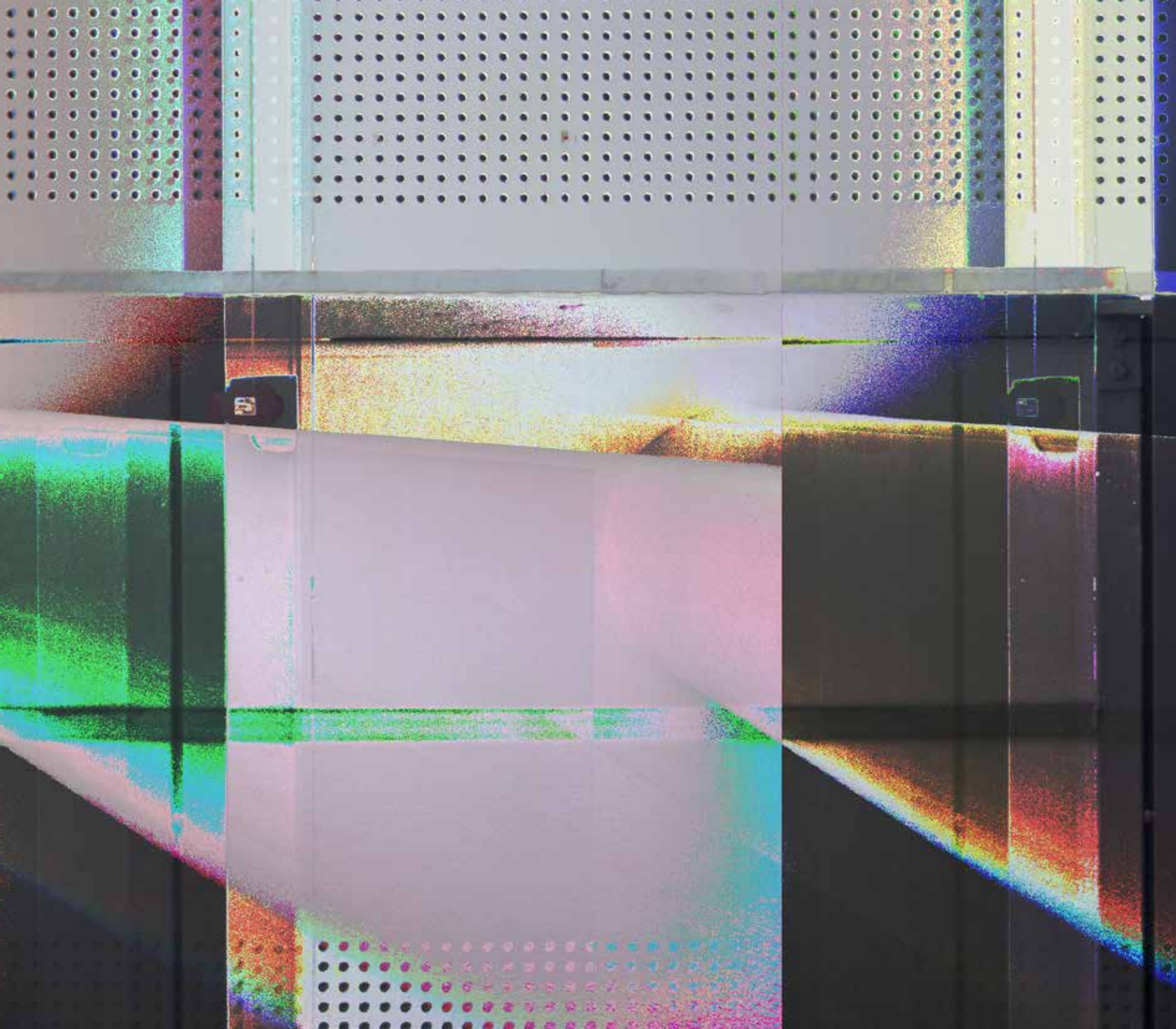





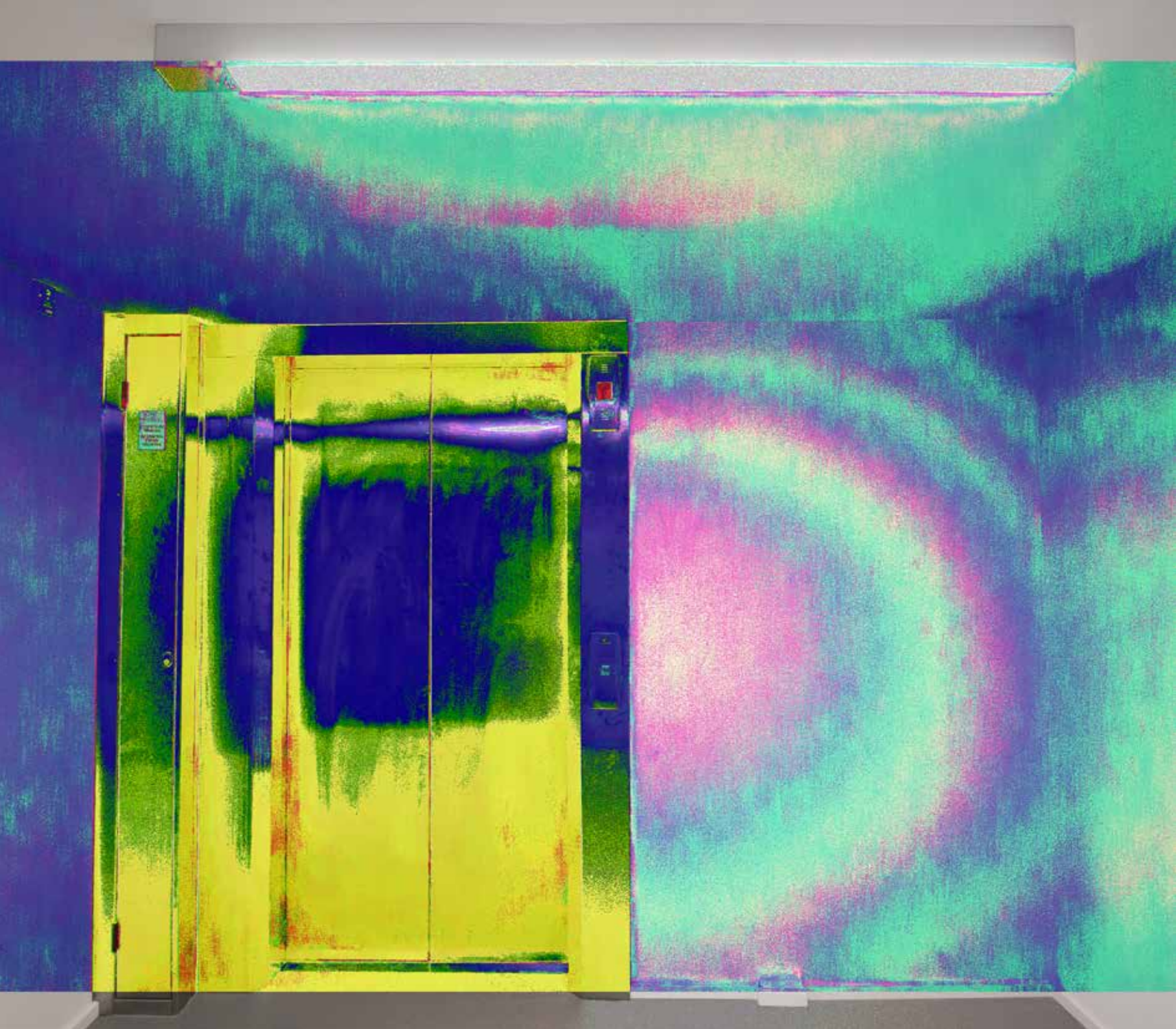
E




F

BASS -25 (4.1) *BASS 25 (4.2)* *DESCANT -25 (5.1)* *DESCANT 25 (5.2)*





D4.1 - BASS: -25
Tools: Bass and descant effect
Settings: Bass -25, descant: 0, volume: 0
Visual output: Coloration, high saturation

Decreasing the bass value has an intense, saturated visual output dominated by blue tones for this image. The blue coloration generate a feeling of being submerged in water.

D4.2 - BASS: 25
Tools: Bass and descant effect
Settings: Bass 25, descant: 0, volume: 0
Visual output: Low saturation, smudge, fragmentation, darkness

Increasing the bass value desaturates and fragments the input image in a smeary manner. The visual output creates a feeling of decay.

D5.1 - DESCANT: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: -25, volume: 0
Visual output: Skew, low saturation

The skew-effect seen in this image was only retrieved for this input, not for any of the other examples. A re-run of this test would be suitable in order to draw general conclusions.

D5.2 - DESCANT: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 25, volume: 0
Visual output: Coloration, darkness

Increasing the descant value has an intense coloration effect and a slightly darker visual output compared to the brightness value of the input image.

E4.1 - BASS: -25
Tools: Bass and descant effect
Settings: Bass -25, descant: 0, volume: 0
Visual output: Coloration with smudge, high saturation, tactility

This image is similar to image D4.1, however a slight smudge effect is also visible in this example and the coloration is more varied. The graininess in the image creates a feeling of tactility.

E4.2 - BASS: 25
Tools: Bass and descant effect
Settings: Bass 25, descant: 0, volume: 0
Visual output: Low saturation, smudge, fragmentation, darkness

See example D4.2.

E5.1 - DESCANT: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: -25, volume: 0
Visual output: Low saturation

Decreasing the descant has a desaturating effect for this image, which was also found in example D5.1.

E5.2 - DESCANT: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 25, volume: 0
Visual output: Coloration, darkness

See example D5.2.

F4.1 - BASS: -25
Tools: Bass and descant effect
Settings: Bass -25, descant: 0, volume: 0
Visual output: Coloration, high saturation, tactility

F4.1 shows a coloration dominated by yellow tones. The grainy surface has tactile, sand-like qualities.

F4.2 - BASS: 25
Tools: Bass and descant effect
Settings: Bass 25, descant: 0, volume: 0
Visual output: Low saturation, smudge, fragmentation, darkness

See example D4.2.

F5.1 - DESCANT: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: -25, volume: 0
Visual output: No visible effect

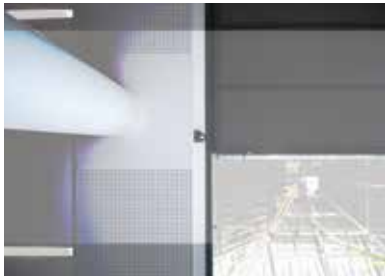
This test shows no or little change in the visual output. This could be due to the appearance of the input image or a faulty execution of the misalignment. A re-run of this test would be suitable in order to draw general conclusions.

F5.2 - DESCANT: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 25, volume: 0
Visual output: Coloration, darkness

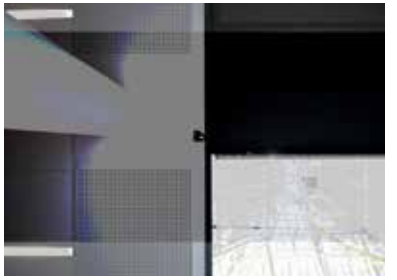
See example D5.2.

D6.1 - VOLUME: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: -25
Visual output: Brightness

D6.2 - VOLUME: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: 25
Visual output: Darkness



E6.1 - VOLUME: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: -25
Visual output: Brightness



E6.2 - VOLUME: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: 25
Visual output: Darkness

F6.1 - VOLUME: -25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: -25
Visual output: Brightness

F6.2 - VOLUME: 25
Tools: Bass and descant effect
Settings: Bass 0, descant: 0, volume: 25
Visual output: Darkness

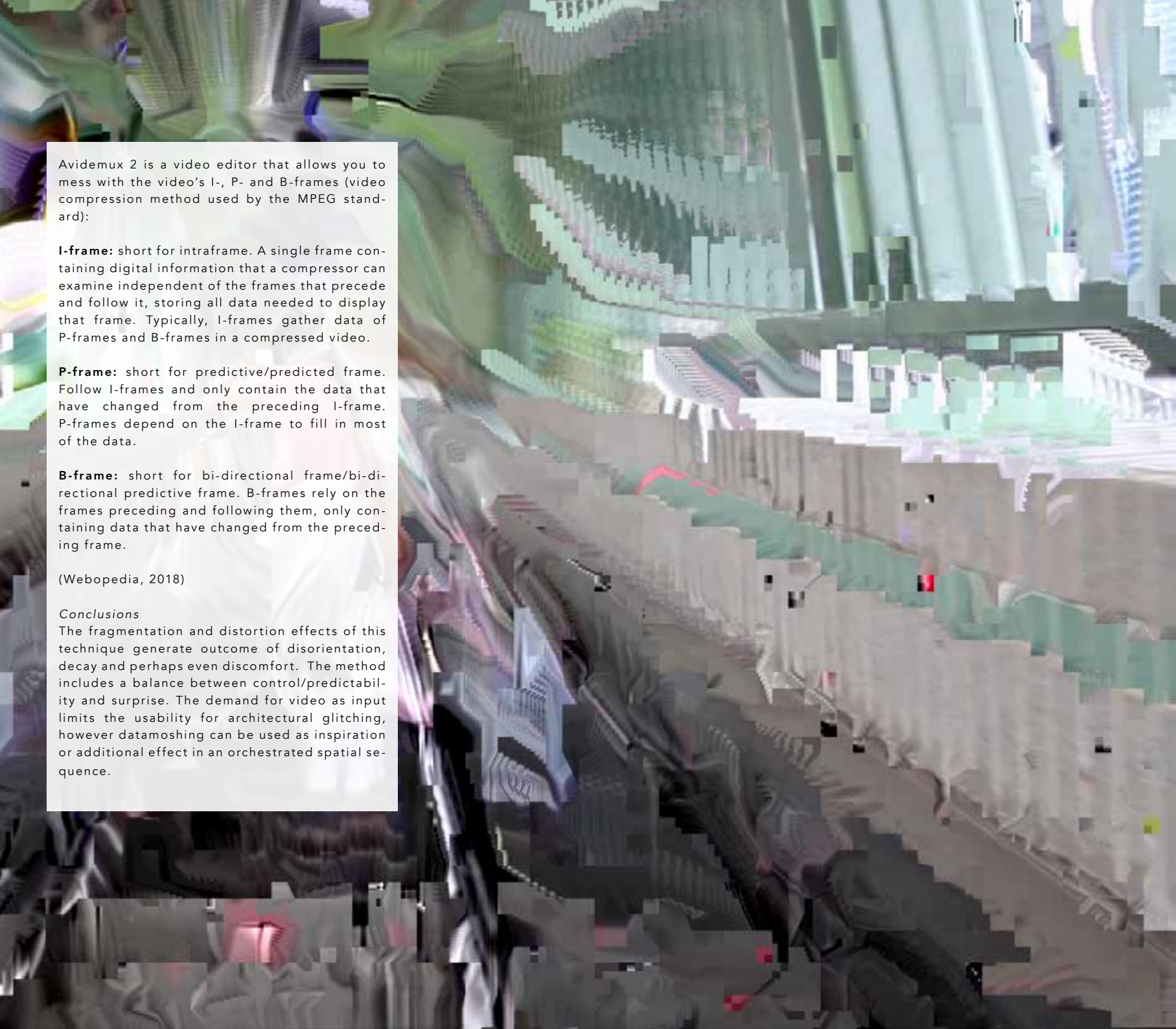
VOLUME -25 (6.1)

VOLUME 25 (6.2)

5·3

I-FRAME DELETION AND P-FRAME EDITING

DATAMOSHING WITH AVIDEMUX



Avidemux 2 is a video editor that allows you to mess with the video's I-, P- and B-frames (video compression method used by the MPEG standard):

I-frame: short for intraframe. A single frame containing digital information that a compressor can examine independent of the frames that precede and follow it, storing all data needed to display that frame. Typically, I-frames gather data of P-frames and B-frames in a compressed video.

P-frame: short for predictive/predicted frame. Follow I-frames and only contain the data that have changed from the preceding I-frame. P-frames depend on the I-frame to fill in most of the data.

B-frame: short for bi-directional frame/bi-directional predictive frame. B-frames rely on the frames preceding and following them, only containing data that have changed from the preceding frame.

(Webopedia, 2018)

Conclusions

The fragmentation and distortion effects of this technique generate outcome of disorientation, decay and perhaps even discomfort. The method includes a balance between control/predictability and surprise. The demand for video as input limits the usability for architectural glitching, however datamoshing can be used as inspiration or additional effect in an orchestrated spatial sequence.

Input: Video (.mp4) composition
Media: Avidemux 2 (for Mac. No later version than 2.5.4). VLC-player to play defected video
Tools: I- and P-frame editing (deletion, copy, paste)
Output: Video (.avi)

Workflow
1. Open video (.mp4) in Avidemux. Choose 'No' for any popups.
2. Go to 'Video': Click on 'Copy' and choose 'MPEG-4 ASP (Xvid)' from drop list. Click on 'Configure' and go to 'Frame' in popup window. For 'Maximum I-frame Interval' type in 9999999 (as many as possible). Click 'Ok'.
3. Save as AVI: Format: AVI (default). Go to 'Save video' and save it.
4. Close project.
5. Open saved avi-file in Avidemux.
6. Edit I- and/or P-frames (see following studies; 'I-frame deletion' and 'P-frame edit' for details).
7. Go to 'Video': Click on 'MPEG-4 ASP (Xvid)' and switch back to 'Copy' from drop list.
8. Save as AVI: Repeat step 3.
9. Open in VLC-player to see result.

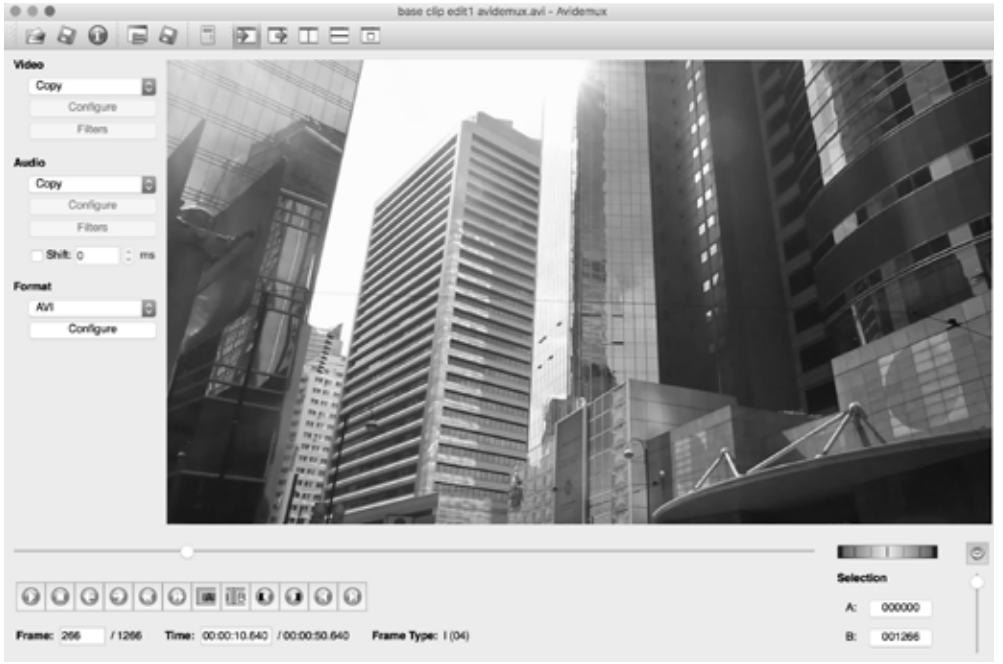


Figure 1. Avidemux interface. Author's own copyright.

Figure 2. Input (still from video). Author's own copyright.

Figure 3. Output (still from video). Author's own copyright.

<<<
Scan for demonstration sample of data-moshing with I-frame deletion or visit:
https://vimeo.com/275278916

Tools: I-frame deletion
Visual output: Fragmentation with mixing
Possible outcome: Disorientation

Follow step 1-5 for 'Datamoshing with Avidemux/Work-flow'

DELETE I-FRAMES
1. Go to first I-frame (first frame in video) then skip to next I-frame with the 'up' arrow key. Always keep the first I-frame intact or the video will not play in any program.
2. Click A-button in Avidemux then move over one frame with 'right' arrow key.
3. Click B-button in Avidemux. This will select the I-frame.
4. Delete I-frame: Click 'delete' or 'backspace'.
5. Click 'up' arrow key to move to the next I-frame and repeat step 3-4.
6. Repeat step 5 until all I-frames are removed (except the first one).

Follow step 7-9 for 'Datamoshing with Avidemux/Work-flow'

Figure 4. Input at 0.01. Author's own copyright.

Figure 5. Output at 0.01. Author's own copyright.

Figure 6. Input at 0.11. Author's own copyright.

Figure 7. Output at 0.11. Author's own copyright.

Figure 8. Input at 0.38. Author's own copyright.

Figure 9. Output at 0.38. Author's own copyright.

>>>
Scan for demonstration sample of datamoshing with P-frame editing or visit:
https://vimeo.com/275273918

Tools: P-frame editing
Visual output: Distortion
Possible outcome: Disorientation, discomfort

Follow step 1-5 for 'Datamoshing with Avidemux/Workflow'

EDIT P-FRAMES

1. Use arrows to go to a P-frame that you want to copy.
2. Click A-button in Avidemux, then move over one frame with 'right' arrow key.
3. Click B-button in Avidemux to select the P-frame.
4. Copy P-frame: Copy selection (Command+C).
5. Paste P-frame over following B-frame: move over one step to the right with 'right' arrow key then paste (Command+V).
6. Repeat step 5 several times until you get a series of P-frames.

Follow step 7-9 for 'Datamoshing with Avidemux/Workflow'

Figure 10. Input at 0.18. Author's own copyright.

Figure 11. Output at 0.18. Author's own copyright.

Figure 12. Input at 0.19. Author's own copyright.

Figure 13. Output at 0.19. Author's own copyright.

I*Figure 14.* nput at 0.20. Author's own copyright.

Figure 15. Output at 0.20. Author's own copyright.

5·4

INTUITIVE FRAGMENTATION AND
RECOMPOSITION

COLLAGING
WITH PHOTOSHOP

This investigation was inspired by Gordon Matta-Clark and his way of deconstructing architectural elements. The study was done with digital collaging, an intuitive method not derived from the glitch art movement. Collaging excludes the self-generating element of surprise that the glitch art studies demonstrate. Collaging is a deliberate act, where the placing of the cut resembles the way Matta-Clark executed his precise, and yet messy building dissections. The purpose of this investigation was to deepen the understanding of fragmentation and its effect on architectural space.

Conclusions

A sense of disorientation was a common outcome for all three collages in this study. Different levels of disorientation was found in many of the case studies. This suggests that fragmentation is a useful tool for deconstructing space in search of awkwardness. The studies also show that the relation between familiarity and uncertainty has to be carefully balanced in order to achieve an awkward outcome and not end up in a chaotic configuration that is difficult to relate to.

Input: Digital imagery (.CR2)
Media: Photoshop
Tools: Cut and paste, re-organization
Output: Digital image composition
Visual output: Fragmentation

Workflow
1. Open chosen imagery in Photoshop.
2. Cut and rearrange fragments intuitively.

Figure 1. Input 1. Author's own copyright.

Figure 2. Input 2. Author's own copyright.

Figure 3. Output - Collage. Author's own copyright.

Figure 4. Collage A. Author's own copyright.

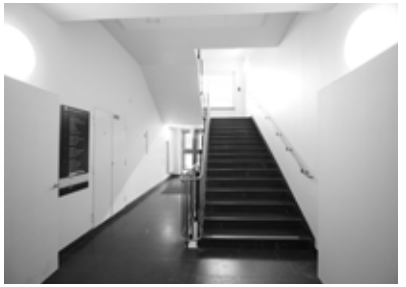


Figure 5. Input A1. Author's own copyright.

Figure 6. Input A2. Author's own copyright.

Figure 7. Input A3. Author's own copyright.

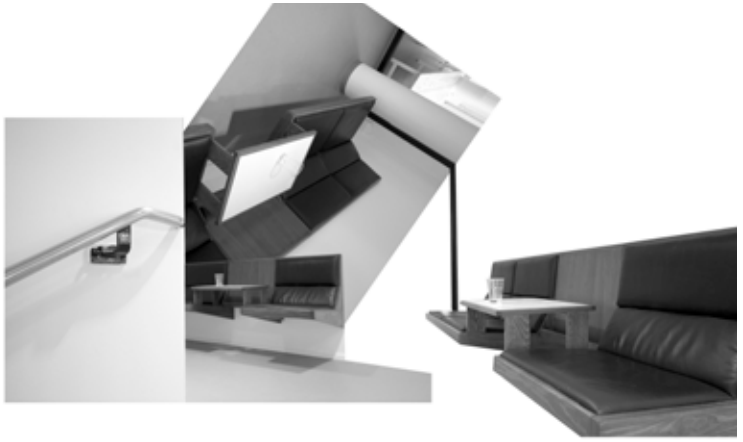


Figure 8. Collage B. Author's own copyright.

Figure 9. Input B1.
Author's own copyright.

Figure 10. Input B2.
Author's own copyright.

Figure 11. Input B3.
Author's own copyright.

Figure 12. Collage C. Author's own copyright.

Figure 13. Input C1.
Author's own copyright.

Figure 14. Input C2.
Author's own copyright.

COLLAGE A

The combination of fragments from three images with different perspectives causes a disorienting composition that is difficult to make sense of spaciously. The initial reading of the composition is that it is 'right', however after looking more closely, the spaces do not add up. Opposite to the stair in the Laurentian library, this image fools you to believe it at first glance, but after a closer reading it no longer make sense.

COLLAGE B

Collage B is even more disorienting and difficult to make sense of than collage A. The composition is perhaps too chaotic in order for you to imagine the image as an architectural precedence. The collage becomes more of a decorative image than a representation of three dimensional space.

COLLAGE C

This composition is easier to imagine as an architectural precedence compared to the previous examples. However, the initial reading is more disorienting than the initial reading of collage A.

COMMENTS

5·5

SUBJECTIVE AND ALGORITHM
DRIVEN INTERPRETATION OF GLITCH
MATERIAL

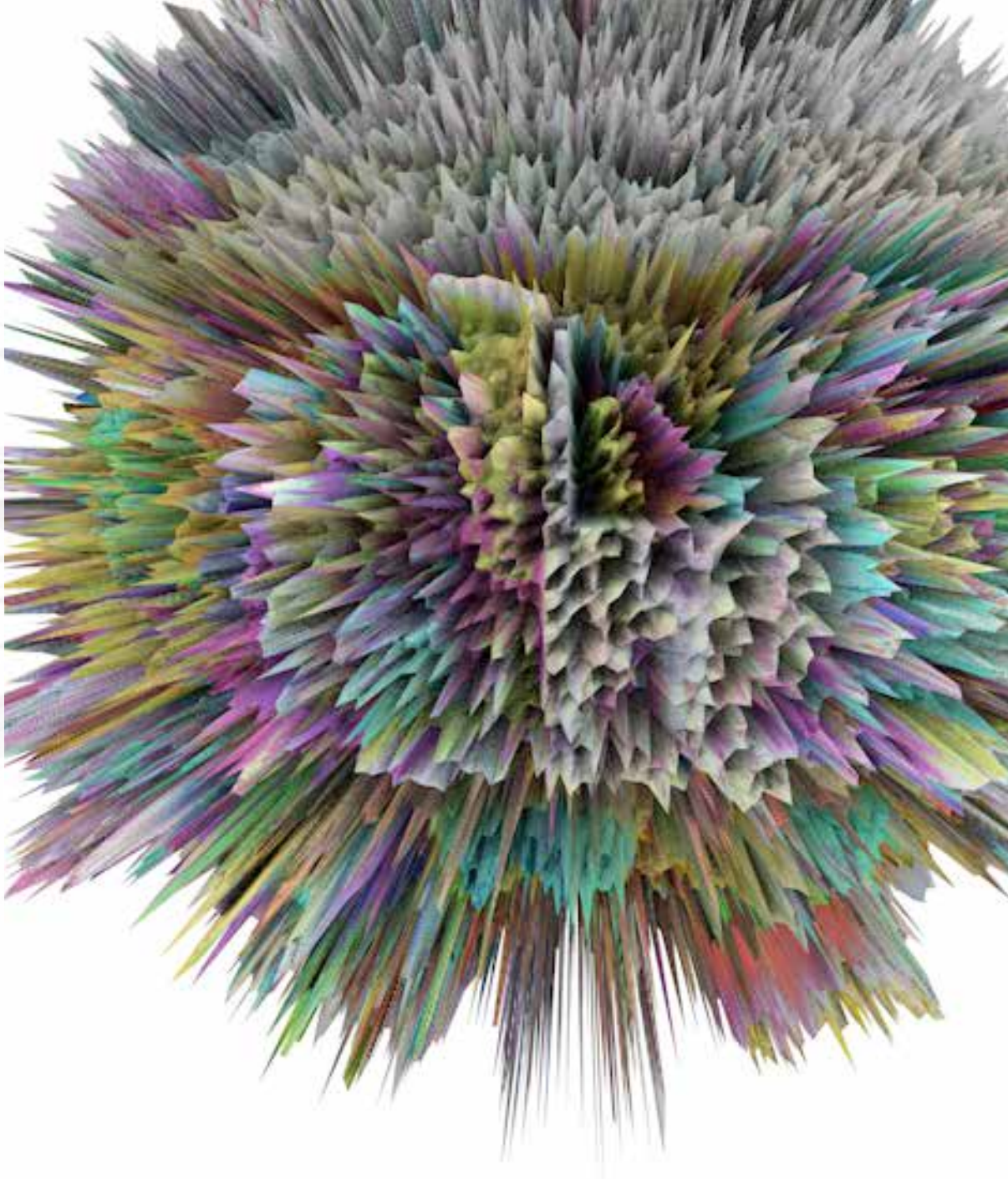
GLITCH TO 3D

As the aim of this thesis is to explore the use of glitching within an architectural discourse, methods for reworking of glitch material are necessary in order to transform two dimensional representations into three dimensional form. Like discussed about architectural glitching in chapter 3 - *Breeding error*, this reworking could take on various shapes. Following investigations explore techniques and methods of transforming two dimensional glitches into 3D, testing both subjective interpretation and ways of letting a 3D modeling software rework the glitch material.

The initial study is a subjective interpretation where a glitch image from the misalignment study is interpreted in three dimensions. A suggestion of how to imagine the three dimensional shape was constructed in order to set a guideline for the subjective reworking. Darker areas of the image was interpreted as positioned further away and brighter areas as closer to the viewer (figure 1). The second and third studies use available tools in Rhino and Cinema 4D to drive three dimensional geometry from two dimensional glitch material.

Conclusions

The subjective interpretation study demonstrates a promising method for realizing the glitch into architectural space. The spectrum of possible interpretations makes this method flexible and rich in outcomes. Letting a modeling software interpret the glitch is also an interesting path to take. Using Heightfield in Rhino showed to be a bit clumsy to work with, while material treatment in Cinema 4D presented better flexibility and allowed interpretation opportunities for the designer.



FIRST STUDY
Input: Glitch image
Media: Rhino
Tools: Horizontal extrusion based on perceived depth in the image
Output: Digital 3D model

Workflow
1. Place the glitch image on a vertical plane in Rhino.
2. Place a camera to create a perspective view facing the input image. This will act as your lead perspective, meaning that whatever happens in the model it has to follow the glitch image from this perspective.
3. Extrude surfaces on the horizontal axis to follow perceived depth in the glitch image. (Fragments of the glitch image was also mapped onto the extruded surfaces).

SECOND STUDY
Input: Glitch image
Media: Rhino
Tools: Heightfield
Output: Digital 3D model

Workflow
1. Create a depth map and a color map from a glitch image (or part of image).
2. Use the depth map to drive a Heightfield in Rhino.
3. Map the color map to the surface.

THIRD STUDY
Input: Glitch image
Media: Cinema 4D
Tools: Material displacement
Output: Digital 3D model

Workflow
1. Create a material and load the glitch image as a displacement map and play around with different settings to get desired texture.

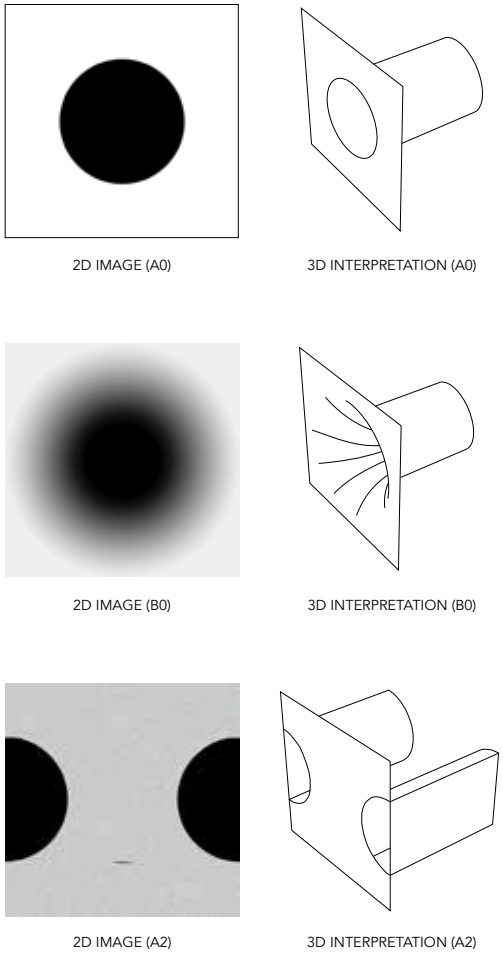


Figure 1. Guide for horizontal extrusion. Author's own copyright.

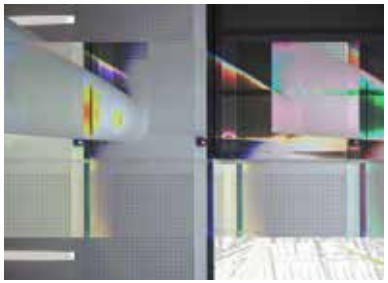


Figure 2. Glitch image E3 - input for reworking. Author's own copyright

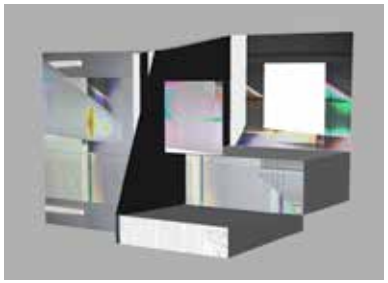


Figure 3. Reworked glitch image E3. Author's own copyright.

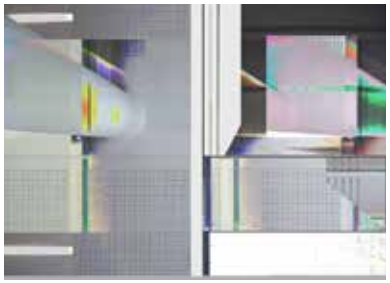


Figure 4. Reworked glitch image E3 - lead perspective, no shadows. Author's own copyright.

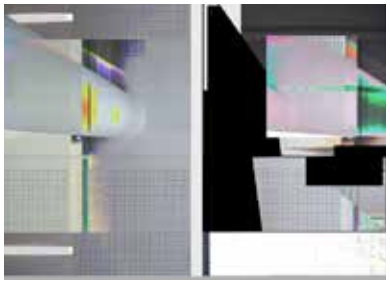


Figure 5. Reworked glitch image E3 - lead perspective, shadows. Author's own copyright.

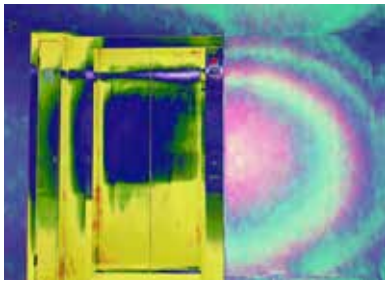


Figure 6. Color map made from glitch image. Author's own copyright.

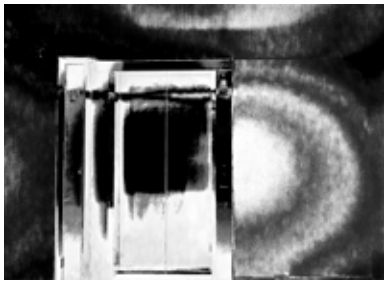


Figure 7. Depth map made from glitch image. Author's own copyright.

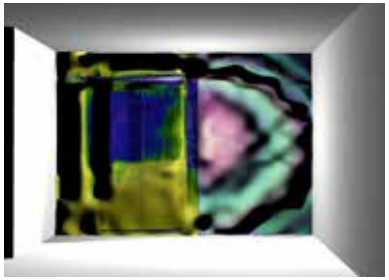


Figure 8. Heightfield. Author's own copyright.

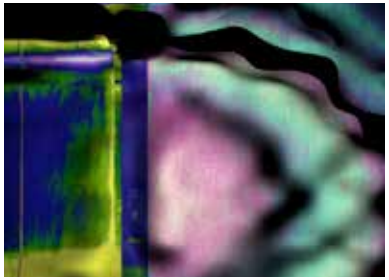


Figure 9. Heightfield - close up. Author's own copyright.

Figure 10. Glitch image - Input for displacement.

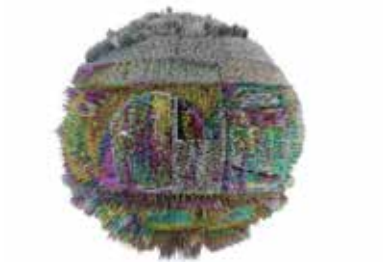


Figure 11. Displacement 1. Author's own copyright.

Figure 12. Displacement 2. Author's own copyright.

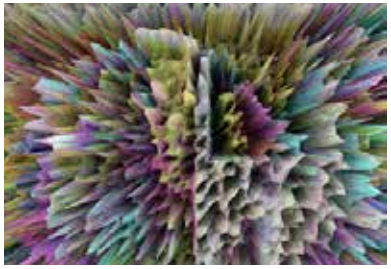


Figure 13. Displacement 2 - close up. Author's own copyright.

FIRST STUDY (figures 2-5)
The angle of perception is important in this study and interesting in relation to the both-and phenomenon mentioned in chapter 2 - *Awkward*. All lines and angles appear orthogonal and two dimensional when perceived from the position of the lead perspective. Moving from that point the structure is revealed as a three dimensional, skewed figure. This method is promising for the design implementation.

SECOND STUDY (figures 6-9)
A color map and a depth map (monochrome, high contrast image) was made from a glitch image. The depth map was used as driver in the heightfiled functionality in Rhino, creating a three dimensional surface. The color map was then mapped onto the surface. Using a monochrome, high contrast version of the glitch as driver created more depth in the 3D surface compared to only using the original glitch image as heightfield driver. The flexibility and control of the output is low for this method, which makes it less awarding to work with in the design implementation.

THIRD STUDY (figures 10-13)
The spheres are carrying a material that uses a glitch image (figure 10) as source for surface displacement. The expression of the material can be adjusted in various settings which makes this method quite flexible. Displacement 1 (figure11) shows a fussy expression with almost hair like properties, while displacement 2 (figure 12 and 13) has a more spiky and "explosive" character. This method is promising for application in the design phase since it can translate textural qualities found in the glitch material into actual 3D textures.

5.6

MATERIALIZING THE GLITCH WITH
SHRINK PLASTIC

GLITCH TO MATTER

Phillip Stearns' *Glitch textiles* inspired this investigation of attempting to materialize the digital glitch. Instead of letting a textile loom weave the glitch pattern, this study translates glitch imagery onto plastic.

Conclusions

The print did not translate 'accurately' onto the plastic, the imagery shows a diffused, hazy character instead of the vibrant and more distinct visual output of the input glitch material. The curved edges of the plastic and the sloppiness of the hot glue add an element of 'ugliness', or 'awkwardness'. The semi-translucency creates an opportunity for light transmission and a luminous effect.

This method will not be suitable to continue with in the design implementation due to its limited plasticity. However, the visual output is interesting, showcasing the vibrant glitch as a more muted version transitioning towards wabi-sabi aesthetics.

Input: Glitch imagery
Material: Shrinking plastic
Tools: Printer, scissors, glue gun
Output: Physical model
Visual output: Diffused haziness, semi-translucency

Workflow
1. Print glitch images onto shrinking plastic.
2. Cut and separate pieces.
3. Heat in oven for 3-4 min.
4. Assemble plastic pieces with hot glue.

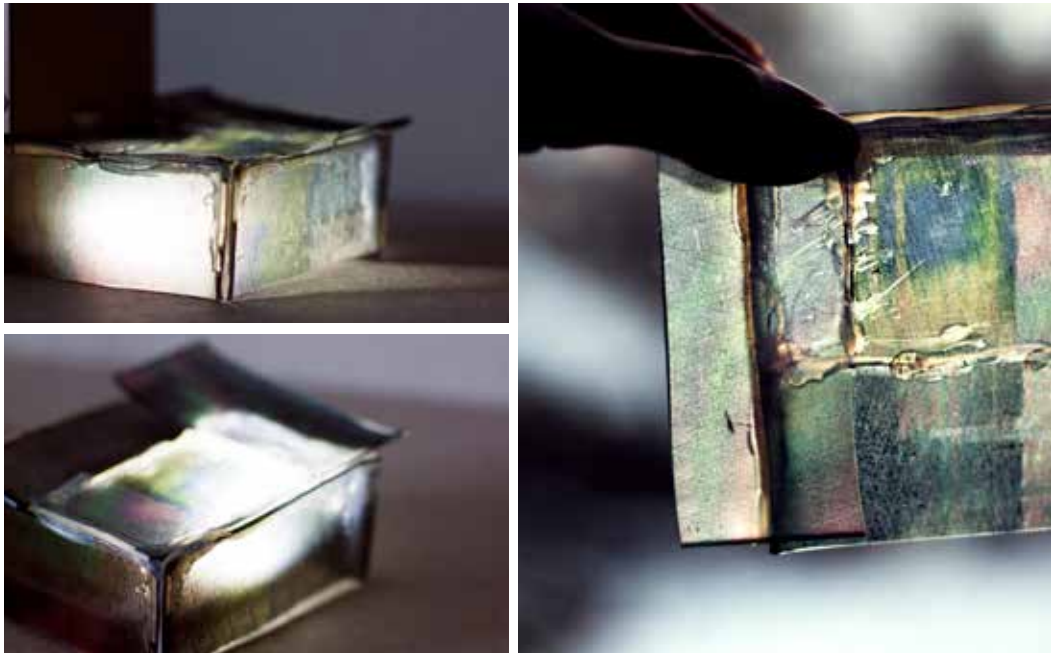


Figure 1. Output - Shrink plastic model. Author's own copyright.

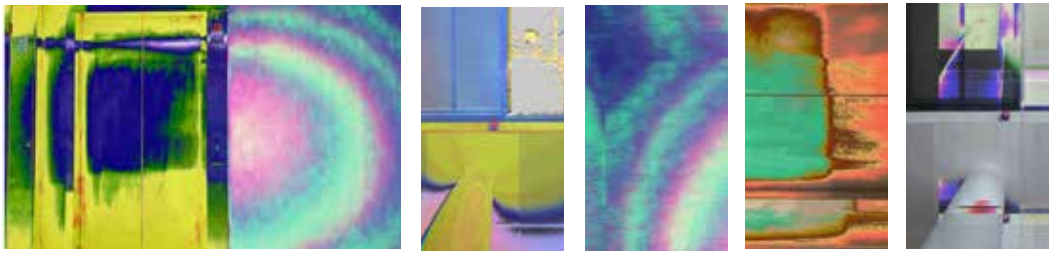


Figure 2. Input - Glitch imagery. Author's own copyright.

Austin, Matthew & Perin, Gavin. 2016. Drawing the Glitch. In Laura Allen & Luke Caspar Pearson (red.). *Drawing Futures: Contemporary Drawing for Art and Architecture*. London: The Bartlett School of Architecture University College London, 14-19.

Brown, William & Kutty, Meetali. 2012. *Datamoshing and the emergence of digital complexity from digital chaos*. Sage Journals. The international Journal of Research into New Media Technologies.

Gross, Matthias. 2010. Introduction: Brave the Unknown. In *Ignorance and Surprise: Science, Society, and Ecological Design*, 1-10.Cambridge: The MIT Press.

Koren, Leonard. 2008 (first published 1994). *Wabi-Sabi for Artists, Designers, Poets & Philosophers*. Point Reyes, CA: Imperfect Publishing.

Menkman, Rosa. 2011. *The Glitch Moment(um)*. Amsterdam: Institute of Network Cultures,

Vavarella, Emilio. 2015. *Art, Error and the Interstices of Power*. Journal of Science and Technology of the Arts.

Venturi, Robert. 1966. *Complexity and Contradiction in Architecture*. New York: The Museum of Modern Art

Walker, Stephen. 2009. *Gordon Matta-Clark; Art, Architecture and the Attack on Modernism*. I.B.Tauris & Co Ltd.

Zago, Andrew. 2010. *Awkward Position. Perspecta*, Vol. 42, THE REAL PERSPECTA (2010), pp. 205-218. The MIT Press on behalf of Perspecta.

ONLINE SOURCES

Altice, Nathan. 2012. *Aperture Science and the Caribbean Orange*. Kotaku. Retrieved from https://kotaku.com/5869208/aperture-science-and-the-caribbean-orange

Bofill, Ricardo. 2015. *La Fábrica – Read*. Retrieved from http://www.ricardobofill.com/la-fabrica/read/

MoMA. 2012. Gordon Matta-Clark - Splitting - 1974 in *The Shaping of New Visions: Photography, Film, Photobook*. Retrieved from https://www.moma.org/collection/works/50871

Roy, Mallika. 2014. *Glitch it good: Understanding the Glitch Art Movement*. The Periphery. Retrieved from http://www.theperipherymag.com/on-the-arts-glitch-it-good/

Voon, Clair. 2014. *Translating Computer Algorithms into Tangible Fabrics*. Article in Hyperallergic. Retrieved from https://hyperallergic.com/390652/translating-computer-algorithms-into-tangible-fabrics/

Zurko, Nick. 2016. *Glitches Get Stitches: An Interview with Artist Phillip Stearns*. Post in Zurkonic. Retrieved from http://www.zurkonic.com/blog/2017/4/27/glitches-glitches-an-interview-with-artist-phillip-stearns

ONLINE ENCYCLOPEDIA

B-frame. (2018). In Webopedia. Retrieved from https://www.webopedia.com/TERM/B/B_frame.html

I-frame. (2018). In Webopedia. Retrieved from https://www.webopedia.com/TERM/I/I_frame.html

Kintsugi. (2018). In Wikipedia. Retrieved from https://en.wikipedia.org/wiki/Kintsugi

P-frame. (2018). In Webopedia. Retrieved from https://www.webopedia.com/TERM/P/P_frame.html

_AWKWARD (2)

Bofill, Ricardo. 1971-. *La Fabrica*. Barcelona, Spain.

Fujimoto, Sou. 2012. *Public Toilette*. Ichihara, Japan.

Matta-Clark, Gordon. 1978. *Circus*. Chicago, USA.

Michelangelo. 1525-71. *Laurentian library*. Florence, Italy.

Yee Sookyung. 2015. *Translated vase*. Korea.

Yugao Tei Teahouse. 1774. Kenrokuen, Japan.

_BREEDING ERROR (3)

ASAP Mob. 2016. *Yamborghini-high*. USA.

Menkman, Rosa. 2010. *TIFF compression Gif*. Netherlands.

Mies van der Rohe, Ludwig. 1929. *Barcelona Pavilion*. Barcelona, Spain.

Stearns, Phillip David. 2015. *Cosmic Winds - IC 2944 The Running Chicken Nebula*. USA.

Stearns, Phillip David. 2016. *Glitch textiles*. USA.

_AWKWARD (2)
Dalbéra, J-P. (2015). *Translated vase, Oeuvre de Yee Sookyung.* [Online Image]. Retrieved from https://www.flickr.com/photos/dalbera/26836292545

Forgemind ArchiMedia. (2014) *Interior work space, La Fabrica, Barcelona.* [Online Image]. Retrieved from https://www.flickr.com/photos/eager/14216415047/in/photostream/

Forgemind ArchiMedia. (2014) *Process, La Fabrica, Barcelona.* [Online Image]. Retrieved from https://www.flickr.com/photos/eager/14402836915/in/photostream/

Gaynor, I. (2012). *Dissected building 1, Gordon Matta-Clark.* [Online Image]. Retrieved from https://www.flickr.com/photos/gaynoir/8618186488/in/photostream/

Hamilton, N. H. (1984). *The triple staircase of the vestibule of the Laurentian Library, one of the unusual features of Michelangelo's design for this building.* [Online Image]. Retrieved from https://www.flickr.com/photos/nat507/11227808416

Michelangelo. *Plan of the vestibule of the Laurentian Library.* [Online Image]. Retrieved from https://commons.wikimedia.org/wiki/File:Laurentian_library_plan.jpg

Spackman, C. (2002). *Yugao Tei Teahouse at Kenrokuen.* [Online Image]. Retrieved from https://commons.wikimedia.org/wiki/File:2002_kenrokuen_hanami_0123.jpg

_BREEDING ERROR (3)
Austin, M. & Perin, G. (2016) *A redrawing of the Barcelona Pavilion by Kieran Patrick.* Drawing the Glitch. In Laura Allen & Luke Caspar Pearson (red.). Drawing Futures: Contemporary Drawing for Art and Architecture (p. 17)

Austin, M. & Perin, G. (2016) *A study matrix of how the same figure of the plan reconfigures itself depending upon binary-numeric transformations of the plan.* Drawing the Glitch. In Laura Allen & Luke Caspar Pearson (red.). Drawing Futures: Contemporary Drawing for Art and Architecture (p. 17)

Austin, M. & Perin, G. (2016) *Three-dimensional reworking of a valid interpretation of the data-bent image of the plan of the Barcelona Pavilion.* Drawing the Glitch. In Laura Allen & Luke Caspar Pearson (red.). Drawing Futures: Contemporary Drawing for Art and Architecture (p. 17)

Menkman, R. (2010). *TIFF compression glitch.* [Online Image]. Retrieved from https://www.flickr.com/photos/r00s/4771351166

Stearns, P. (2015). *Cosmic Winds - IC 2944 The Running Chicken Nebula.* [Online Image]. Retrieved from https://vimeo.com/128757751

Stearns, P. (2016). *The Making of Glitch Textiles at Pure Country Weavers* [Online Image]. Retrieved from https://vimeo.com/147530589