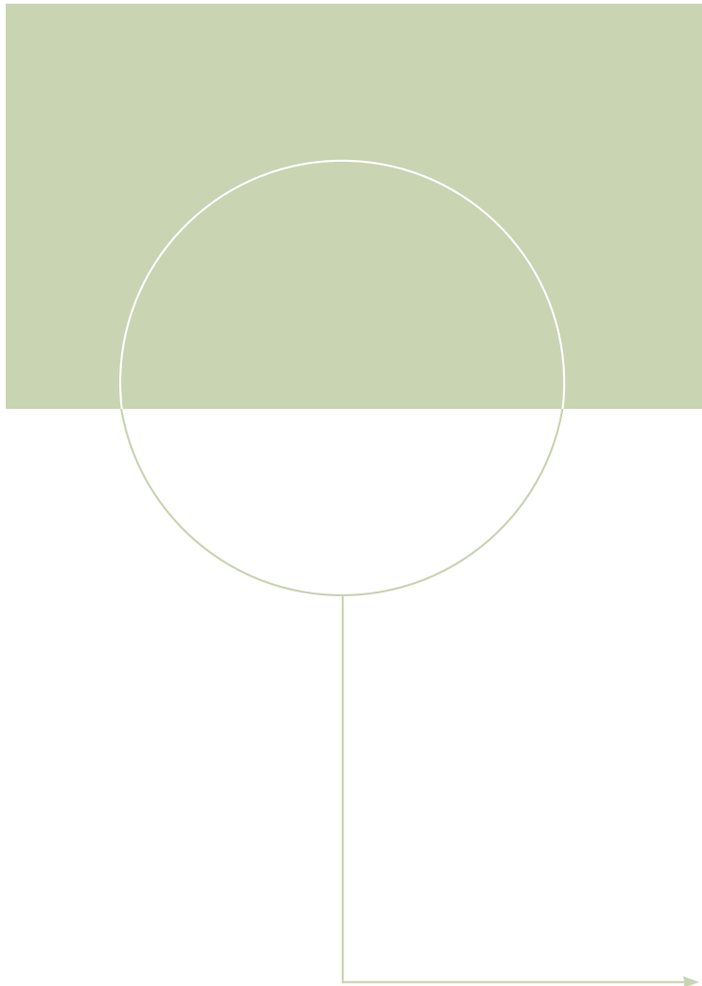

Master's thesis

2019

Torstein Hågård Bakke

NTNU
Norwegian University of
Science and Technology
Faculty of Architecture and Design
Department of Design

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Embodiment in Designing Interactive Aesthetic Experiences

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Industrial Design
Submission date: June 2019
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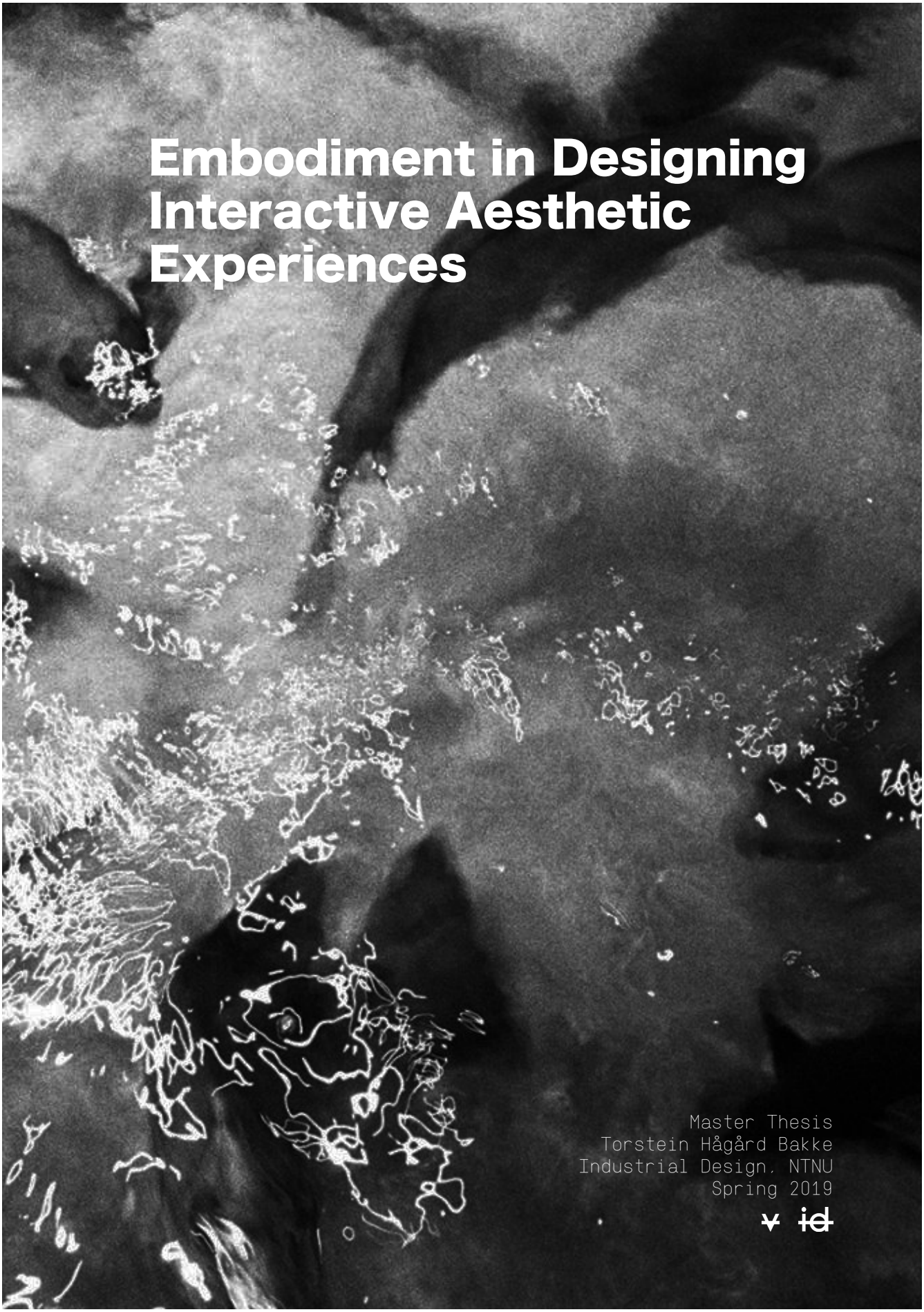


Embodiment in Designing Interactive Aesthetic Experiences

Master Thesis
Torstein Hågård Bakke
Industrial Design, NTNU
Spring 2019

Abstract/Sammendrag

The design of interactive experiences is often discussed in the context of digital apps and their graphical interfaces. The theoretical foundations for these designs often lay in traditional cognitive theory, user research and computational models of the mind. The focus on the interpretation of graphical interfaces often ignores the body, and relies almost exclusively on visual and audial senses. In the realm of mixed media art, installation design and aesthetic experiences, this traditional approach may be inadequate.

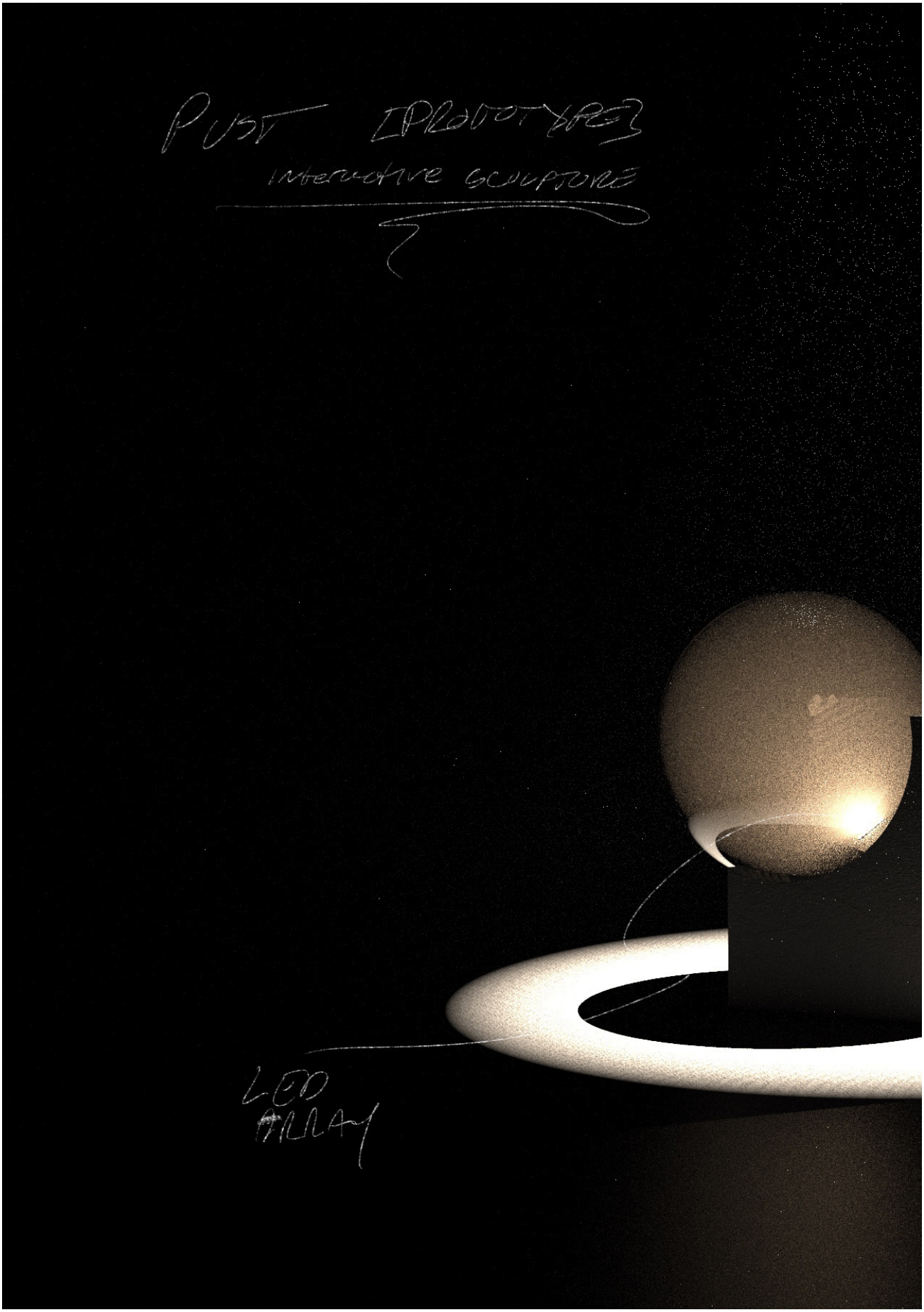
The thesis takes a phenomenological stance to explore designing for interactive experience in three stages, and aims to apply theories of the embodiment of the mind to the development of an interactive sculpture in collaboration with Oslo based design studio Void.

In the first stage, the computational paradigm is countered with theory formulated by philosophers, psychologists and linguists to establish an alternative axiom for interactive aesthetic experience.
The second stage employs a first-person phenomenological framework to gain qualitative insight on embodiment in aesthetics through bodily awareness practices and interviews with creatives.
The final stage sees the development of an interactive sculpture prototype, *Pust*, intended to embody a phenomenological reduction of breathing. The prototype is an initial attempt at applying the theory to an aesthetic experience, and to inform a discussion on alternative ways of looking at the relationship between people, their bodies and technology.

Design av interaktive opplevelser blir ofte diskutert i kontekst av digitale apper og deres grafiske grensesnitt. Det teoretiske grunnlaget for slike design ligger ofte i tradisjonell kognitiv teori, som ser på menneskesinnet som en databehandler. Fokuset på tolkning av grafiske grensesnitt ignorerer ofte kroppen, og benytter seg av primært av syns og -hørselsansene. I moderne mediekunst, installasjonsdesign og estetiske opplevelser kan denne fremgangsmåten være inadekvat.

Denne oppgaven tar et fenomenologisk utgangspunkt i design av interaktive, estetiske opplevelser i tre stadier, og forsøker å bruke kognitiv kroppslighetsteori til å utforme en interaktiv skulptur i samarbeid med designstudioet Void.

*I det første stadiet utfordres det tradisjonelle paradigmet med teorier fra filosofer, psykologer og lingvister for å fremsette et alternativt aksiom for interaktive estetiske opplevelser.
Det andre stadiet bruker et førstepersons fenomenologisk rammeverk for å få kvalitativ innsikt i kroppslighet i estetikk gjennom kroppsbevissthetsøvelser og intervjuer med kunstnere og designere.
Det siste stadiet ser på utformingen av en interaktiv skulptur-prototype, Pust, som forsøker å kroppsliggjøre en fenomenologisk reduksjon av pusting. Prototypen er det første forsøket på å bruke teorien i utformingen av en estetisk opplevelse, og til å informere en diskusjon rundt alternative måter å se på forholdet mellom folk, deres kropper og teknologi.*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INTERACTIVE SCULPTURE
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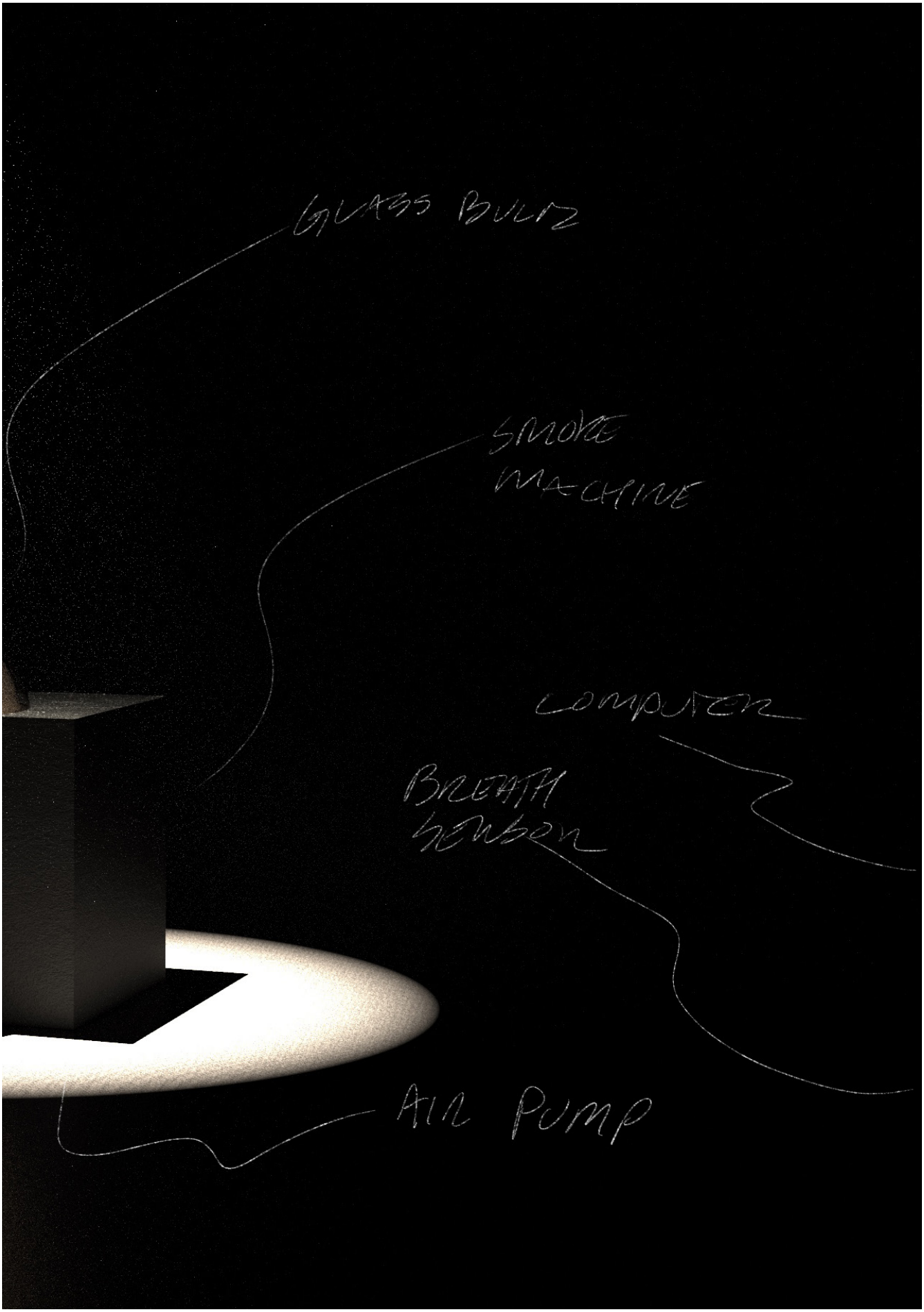
GLASS BULB
SMOKE MACHINE
COMPUTER
BREATH SENSOR
AIR PUMP

Preface

This master thesis was written at the Department of Design at the Norwegian University of Science and Technology in the spring of 2019 in collaboration with design studio Void AS. It documents the development of an interactive installation as well as the theoretical foundation for the thoughts manifested in it.

My sincerest thanks are directed to Ole Andreas Alsos and Dag Svanæs for supervising the project, sharing of their knowledge, network and passions, and for input ranging from the concrete prosaic to the deeply poetic,

to Trond Are Øritsland for putting me on multiple diverging paths to understanding interaction,
to Sue Fairburn for her interstellar support,

to the Void team for office space and gadgets:
Mikkel Lehne for support and engagement,
Joakim Wiig Hoen for attention to detail and craft,
Per Kristian Stoveland for belief and technical know-how,
Nicolay Wesseltoft for support and footage,
Bjørn Gunnar Staal for expanding my mind,

to the Industrial Design Class of 2019,
to Petter Mustvedt, Hanne Sivertsen and Ragnhild Liven in particular,

to all contributors, benefactors, lab rats and interviewees,

to my family and friends, Peder Ebbesen and Ingrid Hågård Bakke in particular, that have inspired and endured me during this project,

to Thale.

Assignment

NTNU
Fakultet for arkitektur og design
Institutt for design

Master Thesis for Torstein Hågård Bakke

Embodiment in Designing Interactive Experiences

Kroppslighet i Design av Interaktive Opplevelser

Void designs bespoke digital and physical experiences across the fields of art, technology, architecture and design. Their work often uses sensors and digital processing to blur the lines between the digital and the physical worlds. The company seeks to explore and innovate, to work independently, intelligently and to challenge paradigms even when working with established clients. Projects include art direction for musical live shows, exhibition design and art installations.

Installations can be made to invoke interest and wonder, it can raise questions as an art piece or enhance a corporate brand, and it can form part of experiment and scientific inquiry. They can confront or immerse an audience, they can be actively interactional or passive, and they can straddle the divide between the subtle and the palpable.

The project departs from the notion of the physical body as locus of experience and perception. Its goal is to create a concept for an installation that consciously engages with the bodies and the senses of the audience on a primarily visceral level, as well as challenging the use of technology in design from a phenomenological standpoint. The project is intended as an in-house endeavour at Void.

The assignment will primarily include:

- A review of theories and findings regarding embodiment in philosophy and psychology
- Qualitative insights gathered from relevant experts: performers, audience, academics etc.
- Aesthetic and interactional explorations for an installation design concept
- Physical and digital prototyping and testing
- Documentation for production, inception and promotion

The thesis is conducted according to "Retningslinjer for masteroppgaver i Industriell design".

Responsible Tutor: Ole Andreas Alsos, NTNU

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Business Contact: Mikkel Lehne, Void

Start date: January 11th, 2019

Due date: June 7th, 2019

Trondheim, NTNU, January 11th 2019

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Prologue: What is The Void?

Interview with Bjørn Gunnar Staal, Designer at void

Conducted at Sørenga Badstuflåte, Oslo, May 28th 2019. Full interview in Appendix I.

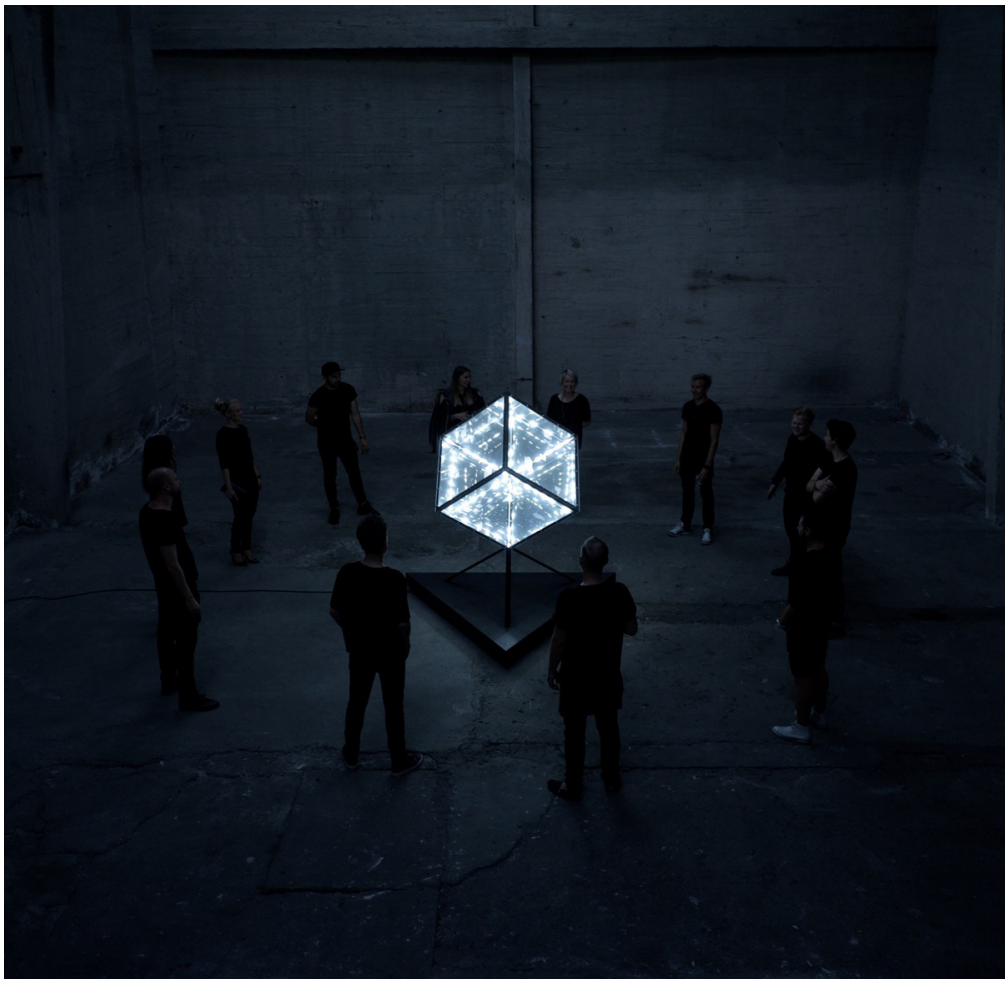
TB: "Constructing bridges across the void that separates our virtual lives from real experiences." That's the tagline from Void's website. What constitutes this void to you?

BGS: That's a hard question. The background for that formulation, when we originally wrote it, was a little more naïve, with regards to how the digital sphere and people working within it were very oriented towards typical digital interfaces. The closest you got to tactility was through a touch screen, they were at best skeumorphic and imitating of analogue interfaces. We wanted to turn that on its head. Technology was to be more of a tool that we combined with more analogue media such as light, smoke, water, motors... Things that have a physical presence. And then we started putting interaction into that. Like with the first big installation I worked on, before Void, Breaking the Surface for Lundin, I experienced that something on a big scale interacting directly with your presence gave me the impression that there is great potential in giving people experiences that blur the lines between what we call digital experience and physical experience. That's what we're after, for technology to take the backseat to the experience. To explore what it means for a human to experience what we've designed.
[...]

There is a lot of focus on what screen time does to how we interact with each other, and we see a backlash in people deleting Facebook and how Apple itself has introduced screen time monitoring to curb this kind of addiction. It's something that takes us out of our environment, out of the moment, and puts us in a more symbol-heavy world, so we live even more in our heads with the screen as an interface to other people.
I really love the movie Her (Spike Jonze, 2013). We really see a cultural shift there - the interior palette includes more wood, it recalls the 70's and a time where craft and a feeling of being in touch with the environment was more important, and technology is more like a person that you talk to through an earpiece, so that your senses are free to interact with the world around you. It's a seamless transition between digital interfaces and reality.

[...]

Aesthetics play a big part, and it's something that can be a challenge to explain and even defend. Norwegian design culture right now focuses a lot on everything having to be able to be explained from a rational point of view. Service design is emerging, and it's informing clients that "what we contribute, will lead directly to profit for your company". That's hard for us to promise, but I adamantly try to



defend that aesthetics is something that has more to do with life quality rather than something you can translate into money. It's like culture, so I'd like what we do to be considered like music, theatre, art, opera. Design can also be culture. We always want the aesthetic experience to be of high quality, and I think we as individuals always try to design things that we experience as pleasing. It's an intuitive process I think.

TB: Would you say that Void has a conscious attitude towards embodiment in your projects?

BGS: No, actually, I wouldn't say that. We might have gotten that effect, surely, but it might not have been conscious from our perspective. I find that interesting with your project [*Pust*] working with us, that it's also made us aware of it. In hindsight I might reflect on the fact that the projects that I've enjoyed the most has been those that involve both music and visuals in a concert context where the combination of 1) immersive audio that correlates directly with what happens visually, and 2) the visuals having spatiality, it gives a very embodied feeling. When you cater to more sense modalities at the same time, and they correlate, it gives a feeling of immersion, being in the experience rather than just observing it. It's something I want to explore going forward, using these multiple sensory modalities. Tactile stuff, which in general is poorly explored. Temperature could be interesting, rapid changes in temperature to supplement the visual. The challenge, that you might have experienced in your project, is the technology not responding quickly enough or with the desired resolution.

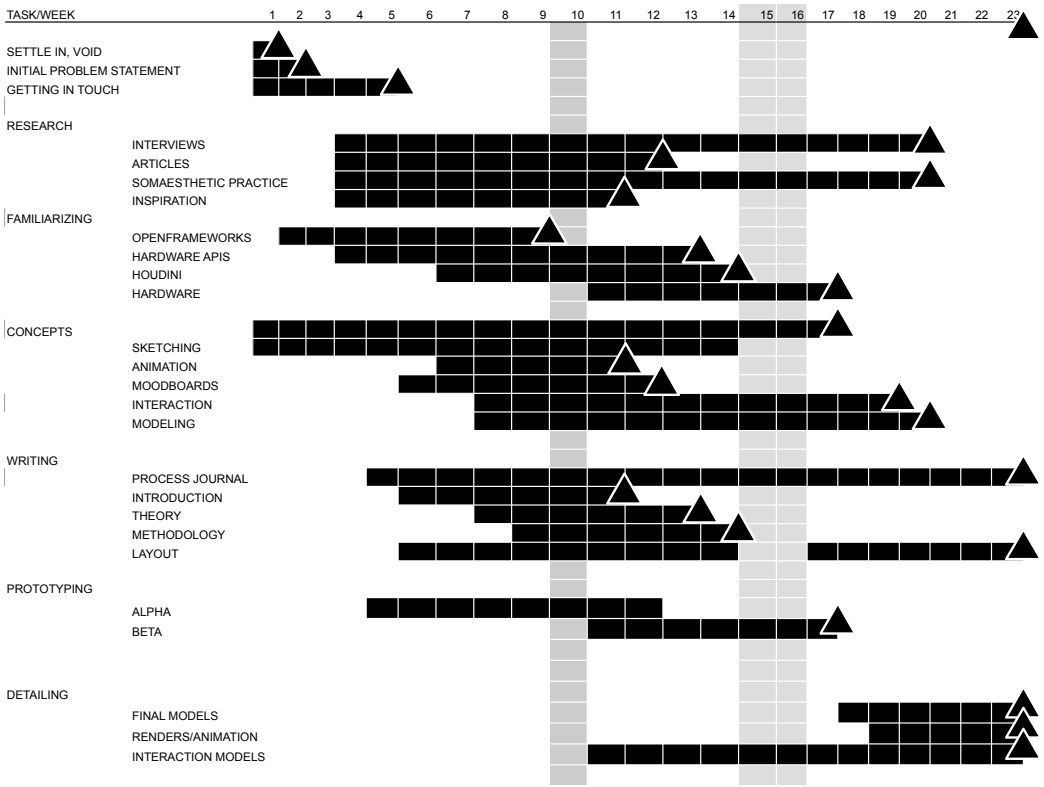
About the Project

This project is about exploring the notion of embodiment in interactive experiences through designing an interactive sculpture or installation. The choice of assignment has its roots in three considerations: a desire to explore approaches to design that differ from the norm, the experience of having worked with the subject matter in earlier projects, and the opportunity to work with Void on the project.

While the subject matter is esoteric and the theoretical foundation dense and decidedly heady, it is hoped that the result of the project will be something that is understood tacitly and in the body, hopefully eliminating the need for the audience to ever read this assignment to get a pleasurable experience. Ironically, what is about be presented in thousands of words is ultimately about those qualities and sensations that can't be. The approach is at once intrinsic yet not entirely traditional in the field of interaction design, which has relied much on a computational model of the human mind rather than embodied. While this philosophical angle is challenging to get a grip on, I find it all the more satisfying when it yields results.

Earlier projects I've undertaken has taken a similar approach, namely the design of a haptic feedback cap for astronauts (Bakke & Fairburn, 2019) and a bike-riding simulator for living on Mars. These projects have employed an embodied cognition model on design, focusing on the lived bodily experience. I've seen how these projects engage on a visceral level, and how the discussions that arise are very interesting and pragmatic in terms of talking about emerging emotions and bodily sensations rather than metrics or efficiency.

Lastly, a desire to apply this approach to the field of aesthetics and experience gave the opportunity to work with Void, whose projects address the real-world aesthetic qualities of digitalism. Their supervision and contextual relevance, I feel, makes it a great environment for exploring and implementing these ideas with constant feedback and a qualified assessment of the effect of my project. Working with Void also gives insight into the marketability of this approach. As a studio that makes a living off of making these kinds of experiences, their sustained existence and subsequent reinforcement of the effects of an embodied approach legitimize it in the design



market, be as it may on the fringes of the mainstream.

The testing of the product has been primarily informal, focusing heavily on the impressions of the experience rather than on the technical or statistical. I've relied on the reflections of those who have tried the experience to refine it, as a way of revealing the phenomenology behind it. This will be embellished in chapter 2 as it relates to methodology.

On that note, the methodology applied in the gathering of insights has relied on qualitative interviews, personal immersion and prototyping. I've tried to couple the thoughts and subjective experiences of performers and creatives with my own experience with bodily awareness practices to inform a prototype. It's important to remember that the prototype is but a step in an iterative process, and would provide insights of its own in encountering an audience.

The idealistic framework for the process is akin to both User Centered and Human Centered design, but is neither - rather, it centres around the body.

Included here is the timeline for the project. Deviations are expected.

Void is, however, also preoccupied with other projects, and I'll admit I was reluctant to undertake the project on my own. In earlier projects I've struggled with keeping my bearings and a tight perspective on the task, and I would have liked to work together with someone if nothing else just to have someone to bounce my thoughts off of and to keep me from straying too far - after all, I've been known to think with my mouth open. For this reason I'm extremely grateful to anyone who has agreed to lend me their ears and their thoughts on everything from abstract metaphysics to correct posture - I hope their pivotal contribution is made abundantly obvious.

Table of Contents

Chapter 1: Paradigms

In this chapter, we will briefly look at the philosophical thought that has shaped the design of interactive experiences. We will then turn towards an alternative school of thought, embodied mind theory, to try and illuminate new axioms for working with aesthetics in interaction.

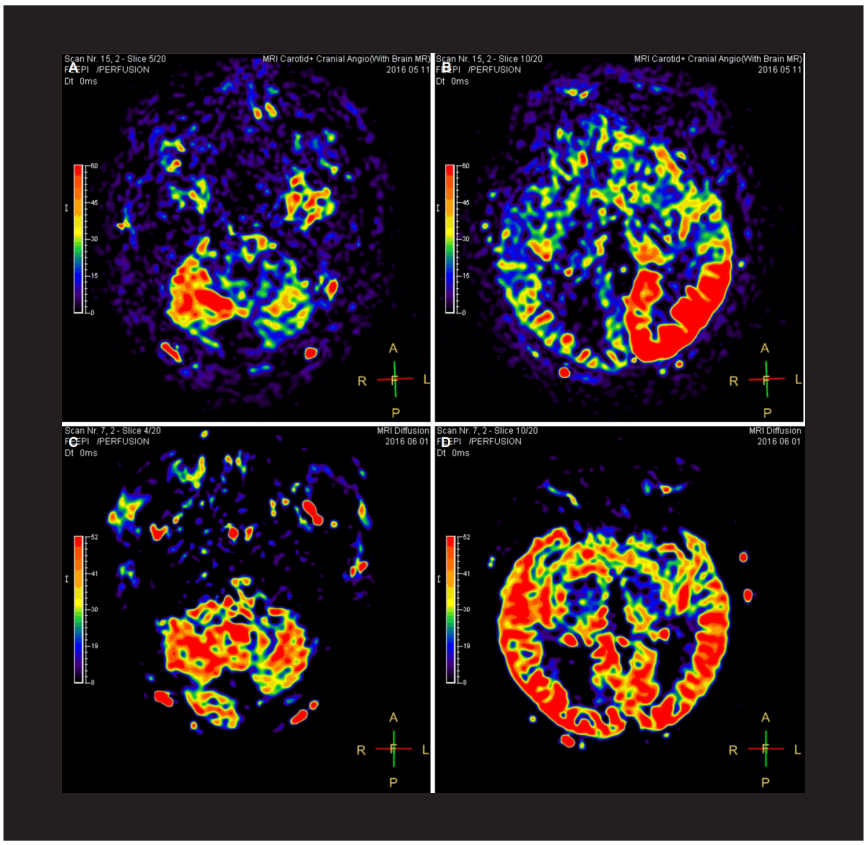
Reigning Paradigms

In classic western philosophical tradition, analysis has been the de facto method for knowledge acquisition. Knowledge has been a term reserved for that which is propositional or conceptual, excluding aesthetics (the study of subjective sensori-emotional values, or more colloquially the study of beauty) from proper meaning-making in human cognition. This kind of analysis has its origin in Descartes. Reasoning, both deductive and inductive, has traditionally been seen as disembodied - something which, while seemingly relying on the biological functioning of our bodies, is something more and on the whole unrelated bar its apparent locality. As in faculty psychology heralding back to the Enlightenment, feeling as bodily occurrence is something apart from and secondary to intellectual cognitive processing (Scarinzi, 2014). This has given rise to a mind-body dichotomy that still stands.

In many branches of cognitive psychology, the science of consciousness, memory and reasoning, this analytical approach coupled with the emergence of computer science, presupposed the computational model of the mind (CTM) in the 1960's. This model holds that the mind behaves much like a computer, and that thoughts and reasoning are representations of symbols in a "language of the mind" that can hold propositional knowledge. CTM handles the mind-body dichotomy by treating the body as sensory inputs and motor outputs (Rescorla, 2017). In this view, bodily perceptions such as visual, audial or haptic stimuli is recorded by the brain and interpreted into symbols that have semantic meaning and that can be held in memory. Intentions, based on the beliefs stored in these symbols, can be enacted onto the environment through instructions sent neurally to the motor system. This is the foundation of most contemporary cognitive architectures.

This attitude of formal analysis towards the mind also informed the first theories of Human-Computer Interaction design (HCI). The Model Human Processor of Card and Moran of the 80's approach makes explicit the idea of reasoning in interaction as symbolic information processing. This has been hugely influential in the design of user interfaces even today (Svanæs, 2000). The field of interactive experience design, while we will acknowledge that there are other approaches that are being put to use with success, is still hugely influenced by a paradigm of symbols and representations. This is perhaps best exemplified by the near-conformity of graphical user interfaces in smartphone apps.

GUIs, even those designed with experience in mind, are often task oriented and focused on jobs to be done, efficiently and pleasingly. Aesthetic experiences such as installations do not have this agenda, and so the underlying paradigms for design are different (Joy & Sherry, Jr., 2003). The first chapter in this thesis presents an alternative view of the mind, in which the mind is embodied and reasoning is inextricably linked to enactment and aesthetic sensing.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Introduction

The first chapter introduces theory from a range of different disciplines to establish what is meant by exploring embodiment in interactive experience design.
Note that while the theory addresses many types of experience, this work and the correlating project is concerned primarily with aesthetic experience. The perspectives that contribute to this are those of modern philosophy (from Husserl and Heidegger through to Graham Harman), cognitive theory and linguistics, and design theory, with philosophical discourse taking precedence.

Thus, we can dismantle the title of this work: *Embodiment in Designing Interactive Aesthetic Experiences*. We will begin at the end, putting experience in the philosophical realm of phenomenology to clarify what is meant with experience. The main representatives of phenomenological method, Husserl, Heidegger and Merleau-Ponty will be presented, and the phenomenological movement as the birthplace of embodied cognition theory.

Later, we'll embellish the notion of experience with *aesthetics*, and explore theories of what constitutes aesthetic experience of objects as seen by the Object-Oriented Ontology movement, and what makes them "successful" through a discussion of metaphor. The discussion of metaphor is introduced as it relates to human understanding through cognitive linguistics and the work of George Lakoff and Mark Johnson. We will also see how this relates back to the embodiment of understanding.

Further, we see how embodiment, embodied cognition theory and its offspring such as extended cognition and ecological psychology has influenced product design, technology and the design of Human-Computer Interfaces, addressing the *Designing Interactive* part of our title.

Moving on, we look at those who focus primarily on the bodies of humans both as site of perception, awareness and reflection through various practices, and as our main resource for designing and making design decisions.
Lastly in this chapter we summarise what these perspectives in aggregate amount to as a paradigm for incorporating embodiment in the design of interactive experience, a lens through which to order the insights discovered in the second chapter.

Phenomenology

At the heart of this assignment (albeit at the end of its title) lies experience. The focus of the project is the aesthetic and bodily experience in the audience as she encounters an interactive installation. We might not usually consider what makes an experience, what differentiates experiences, or break them down to analyze their constituents. The following part will take a look at experience, and make the case that all experience is located in and dependent on the body despite what convention might have us believe.

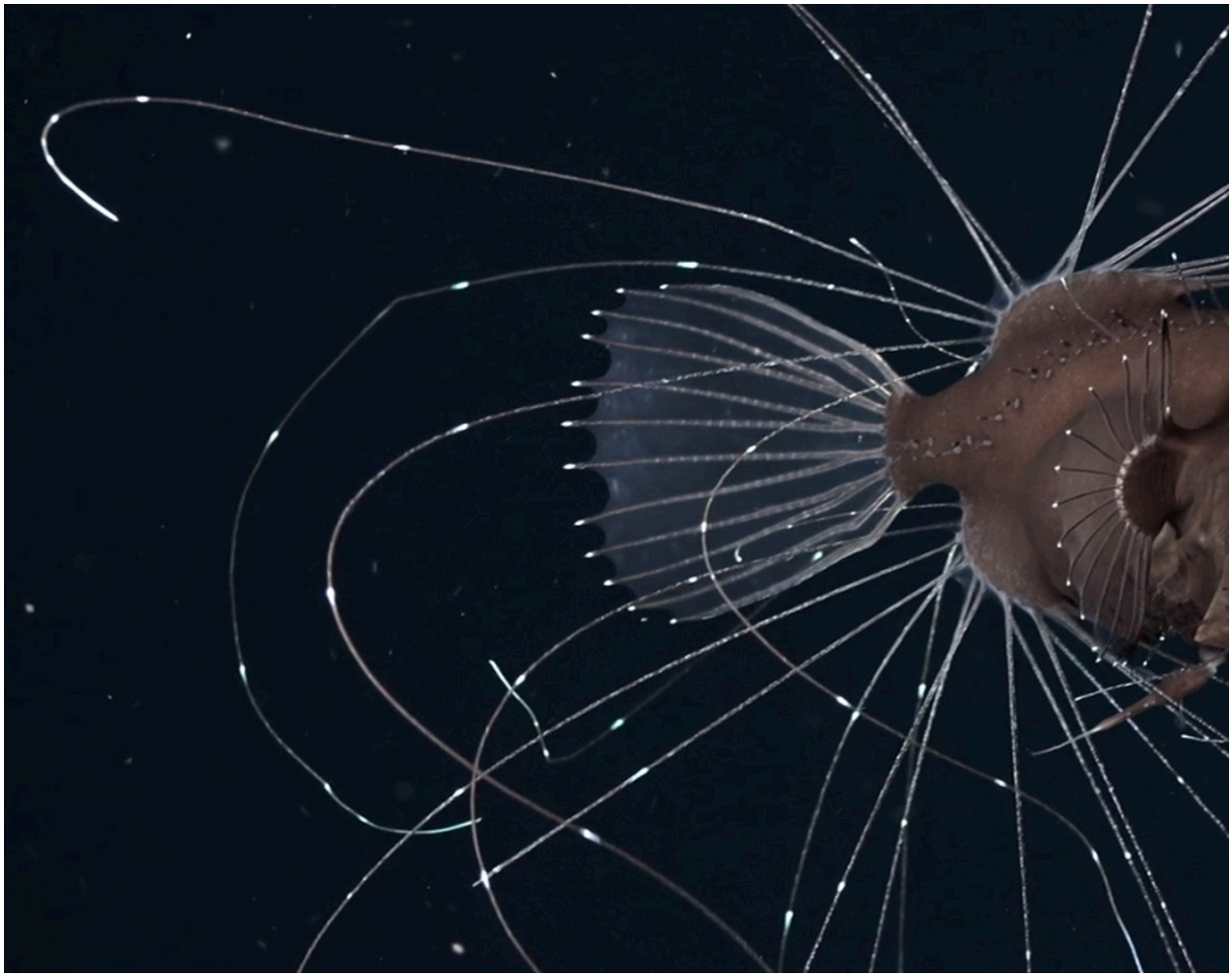
What is experience, and how is it possible? The philosophical style of phenomenology is concerned with the ”objects of direct experience” above all else, and is just as much a methodological angle of approach to studying phenomena. It is usually referred to as a method for objectively studying topics commonly considered subjective - perceptions, emotions, belief. As such, we can also refer to the phenomenology of an object or event, the insight (or ”capta”) gathered from systematic reflection on the experience of it.

Many phenomenological methods employ variations of a process called epoché. A reduction of the facets of the experience, the epoché is a suspension of judgement or assumption to allow reflection without affirmation. This tool is central to this project, and will be explored more closely in chapter 2.

Phenomenology is a modern reaction to rationalist bias or Cartesian analysis. While not necessarily claiming to unveil the entire reality of an object, the strength of the method lies in the way it discloses lived human experience (Gallagher, 2018).

Edmund Husserl is often credited as the father of phenomenology. His work concerns the features of consciousness that shape the way objects appear to us. Intentionality, that consciousness is always, unrelentingly about something, is a central concept in his work. Consciousness has an intentional object, whether it is imagined, remembered or in front of us. In our conscious perception, objects have qualities that also depend on how they are viewed. This he calls the noema - noematic modulations change as the object is viewed for example from different angles, is altered or put in a different surrounding environment, though the object itself does not change (Gallagher, 2018).

Martin Heidegger expands the field of phenomenology, and is perhaps more often referred to in design contexts. He puts the human as action-oriented and pragmatic in the world rather than distanced observer - we perceive things in terms of their potential for use. His work on tool use is central. Tools, as they are used, recede into the involvement in the project they are used for and become experientially transparent. They are “ready-to-hand”, up until the point where they might break or are poorly designed, where they become objects of to be thought about, or “present-at-hand.” His argument is that objects are much too often considered and analyzed as “present-at-hand” rather than “ready-to-hand”. The Dasein, the human being, is always situated in an existence and disposition in the world, and never disassociated from it. It is “ready-to-hand” (Gallagher, 2018). His work implicates the design of objects to be conscious of their qualities as they are used and experienced rather than observed.



Embodiment and Cognition

While having been discussed widely the last century, the term "embodiment" is fairly elusive. What are we talking about when we are talking about embodiment? Colloquially it might refer to someone or something that is a perfect example, or which perfectly encapsulates the essence, of an idea or quality, i.e. *she was the embodiment of neatness.* Other times it refers to a tangible or visible form of anything, i. e. *the chair was post-modernism embodied.* In other examples it more loosely refers to the involvement of the human body.

Maurice Merleau-Ponty puts the body first as the locus of perception, and is greatly influential in the field of embodied cognition theory. He takes Heidegger up on his word, making our relation to the world explicit as a bodily relation where our sensory and motor systems plays a primary role over the intellect. The body expresses its subjectivity in movements, actions and postures (Merleau-Ponty, 1945). Perception is also pragmatically intentional, dependent on the ability, or lack of ability to enact on the world, or what J.J. Gibson called affordance (Gibson, 1986).

Merleau-Ponty's influence sparked theories of embodied as well as extended cognition, and avenues of inquiry in biological psychology. Studies in skill acquisition strengthen his arguments on learning.

He described the experience of skill as the bodily ability to perceive ever finer discriminations of sensation in combination with ever more appropriate or specialized bodily responses. Action, he argues, is therefore not dependent on propositional or semantically interpretable models, but a form of tacit knowledge situated in the body (Dreyfus, 2002, Hoel & Carusi, 2018).

Gibson's work on ecological psychology extends cognition to incorporate the environment in a broad sense, physically as well as culturally (Gibson, 1986). His notion of affordances are appropriated to a design context by Donald Norman (1988) and has been widely adopted.

The concept sees the body and its situation as a unified cognitive system where even inanimate things have cognitive properties and function. Consider the calendar on our smartphones, a calculator or a simple notepad. These objects enhance functions such as memory, calculation or time management, and become incorporated to the point where removing them has an impact on our cognitive functioning (Clark, 2008).

Biological Embodiment

George Lakoff and Mark Johnson (1999) take into account findings in neuroscience to situate the notion of embodied cognition in the realm of science. They argue that the findings in biological psychology support the claim that reason is not at all disembodied but rather shaped by our biological makeup and situation in the world.

Biological psychology is in part the study of sensory perception in a biological sense and how it connects to the central nervous system. It explains for example how touch is perceived, by what cells, and the limits of perception in terms of resolution, range, intensity etc. It also tries to depict in what areas of the brain these signals are processed, and to which areas they in turn connect (Freberg, 2018).

The emergence of this field, coupled with neuroscience, may explain not just that reasoning is in fact embodied, but also how. It is clear that the computational model of the mind is only a metaphor. In meeting with biology, it is unclear to what extent this metaphor is complete. Brooks, 2019, in a talk, discusses whether this metaphor is about to meet a dead end, as it does not immediately account for biological adaptation - biological creatures have been found to be able to adapt to changes for example in their central nervous system that is hard to reconcile with a computational model.

In regards to experience and intersubjectivity (our relations to others), neuroscience has also unveiled the existence of so-called mirror neurons. These neurons fire when we perceive actions in other people apart from ourselves - watching someone lift something heavy, for instance.

What is interesting about mirror neurons is the fact that they fire (albeit with some modulations relating to the interpersonal space) as if we had performed the action ourselves (Caggiano, Fogassi, Rizzolatti, Thier, & Casile, 2009). This to some degree explains how we can learn skills by observing others, not by interpreting the motions and systematizing them but rather by gaining the neural experience of enacting the operation. They form part of a system of empathy, where what is observed to be felt in others is neurally mimicked in the observer, allowing us to "feel" what they are feeling. This is not limited to actual people in front of us but extends to animals and even fictional subjects.

“Reason is not disembodied, as the tradition has largely held, but arises from the nature of our brains, bodies, and bodily experience. This is not just the innocuous and obvious claim that we need a body to reason; rather, it is the striking claim that the very structure of reason itself comes from the details of our embodiment. The same neural and cognitive mechanisms that allow us to perceive and move around also create our conceptual systems and modes of reason.

[…]

From a biological perspective, it is eminently plausible that reason has grown out of the sensory and motor systems and that it still uses those systems or structures developed from them. This explains why we have the kinds of concepts we have and why our concepts have the properties they have. It explains why our spatial-relations concepts should be topological and orientational. And it explains why our system for structuring and reasoning about events of all kinds should have the structure of a motor-control system.”
(Lakoff & Johnson, 1999)

"The embodied-mind hypothesis therefore radically undercuts the perception/conception distinction. In an embodied mind, it is conceivable that the same neural system engaged in perception (or in bodily movement) plays a central role in conception. That is, the very mechanisms responsible for perception, movements, and object manipulation could be responsible for conceptualization and reasoning."
(Lakoff & Johnson, 1999)

Cognitive Linguistics: Metaphors

Embodied mind theory tells us that our reasoning is not merely structurally embodied in the neural networks of the brain and body. This in itself is reconcilable with a traditional view of the mind being located in the brain but ultimately transcending it. But embodied mind theory also goes a long way to explain how the embodiment of the mind gives rise to the abstract and literal expressions we associate with reasoning. The way some theoretics do this is, somewhat surprisingly, through linguistics, or rather, cognitive linguistics.

The question seems to be, how does an embodied mind form disembodied abstract, literally expressed concepts? Lakoff and Johnson reconciles this apparent gap with the notion of the metaphor. Rather than being a primarily poetic or rhetorical device, they argue, metaphor allows us on a general scale to construct a concept through the qualities of another.

Complex, abstract concepts such as MOOD, having no real embodied form, are characterised by physical qualities such as DIRECTIONALITY (*he was feeling DOWN, her mood was going UP*).
In fact, they claim that the qualities we imbue abstract reasoning concepts with are all derived from physical and bodily experience and the emotions they are associated with. HAPPY, STRONG people stand erect UPWARDS. DEPRESSED people lie DOWN, UNMOVING. PROCESSES are conceptualised as PATHS we walk through. RESOURCES are MATTER in CONTAINERS we may deplete. SUPPORTING, FRIENDLY meetings are WARM, confrontational ones HARD and COLD. Basic physical and bodily experiences, they maintain, give us qualities that let us conceptualize even the most complex and abstract of objects using a language provided by our bodies and our senses. Thus, cognitive linguistics, breaking with other linguistic schools such as Chomskyan Universal Grammar theory, which gives no precedence to sensory experience, builds a bridge between the realms of the physical and the literal world. Further, it brings together perception with conception as two sides of the same coin, as opposed to being inherently separated into a perceptive, sensing body and a conceptive, processing mind.

If metaphor is the vehicle of understanding, bringing together perception and conception, what can we say about its role in aesthetic experience? How can this be utilized to create an aesthetic experience? Graham Harman and the Object Oriented Ontology movement incorporates the metaphor intrinsically in its discussion of aesthetics.

Object-Oriented Ontology and Aesthetics

Disillusioned with the natural sciences' quest for a "unified theory of everything", manifested in theories of quantum mechanics and string theory, Graham Harman (2018) founded the philosophical movement of Object-Oriented Ontology. It holds that complete knowledge of any object is impossible, as the complete set of "real" qualities is withdrawn from perception. The movement rejects the position of physicality, literality and propositional statements as the ultimate form of knowledge, as they do not account for the reality of for example non-physical objects (the *esprit de corps* of a winning football team) or fictional objects (such as unicorns). It also challenges the position of the study of human consciousness as separate and opposed to all other objects in the universe.

His position on the unknowableness of the real qualities of objects rely partly on phenomenology. More precisely, the inadequacy of perception to ever hold all possible qualities in its focus: "perception is saturated with accidents, not objects in their own right." It also does not reduce objects ontologically to the sum of its qualities.
OOO places aesthetics at the root of all philosophy, as we encounter objects only through their sensual qualities and never their actual ones. The metaphor, he claims, is at the heart of aesthetics. The metaphor, as in Lakoff and Johnson, is more than just the declaration of resemblance between two things, but a successful metaphor allows us to experience something that combines two entities. Metaphors are unexhaustive, and often asymmetrical in the sense that they do not elicit the same understanding if reversed. The metaphors used in aesthetic objects, whether written as poetry, visual in a painting or interactional in an installation, are what allow us to feel that we are coming in contact with the real, hidden qualities of the object. What happens, according to OOO, is that we assume the position of the object in question, embodying the qualities imposed on it by the metaphor. In the poetic metaphor "a *cypress is like the ghost of a dead flame*", he, through a line of reasoning, poses that the reader, being the only real object available to herself, feels the "dead flame"-like qualities as the cypress itself recedes from direct experience.

The reasoning is complex, but the core concept holds that aesthetic experience of objects through the metaphor is theatrical in nature. The beholder has to embody, like a method actor, the metaphorical object to attain the aesthetic experience. This amounts to a concept of situating ourselves in a work of art (or design) through bodily sensations.

This proposed link between bodily sensation and aesthetic works supports the non-literal, non-symbolic approach to designing interactive aesthetic experiences.

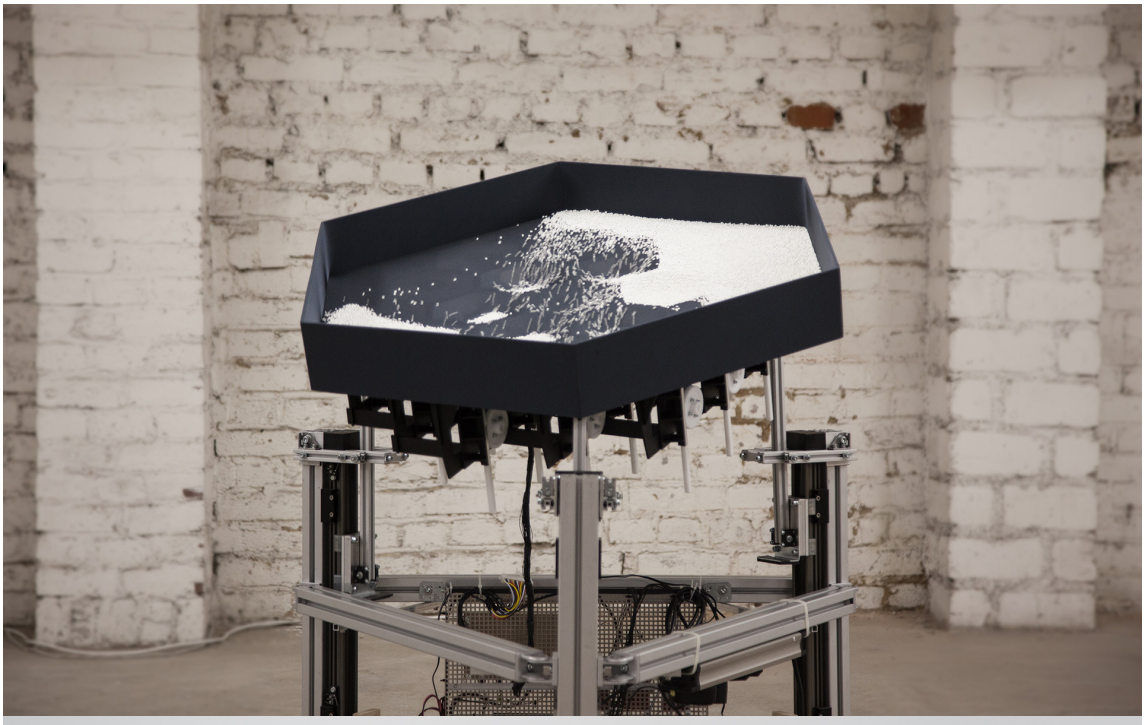
Embodied Cognition in Designing HCI

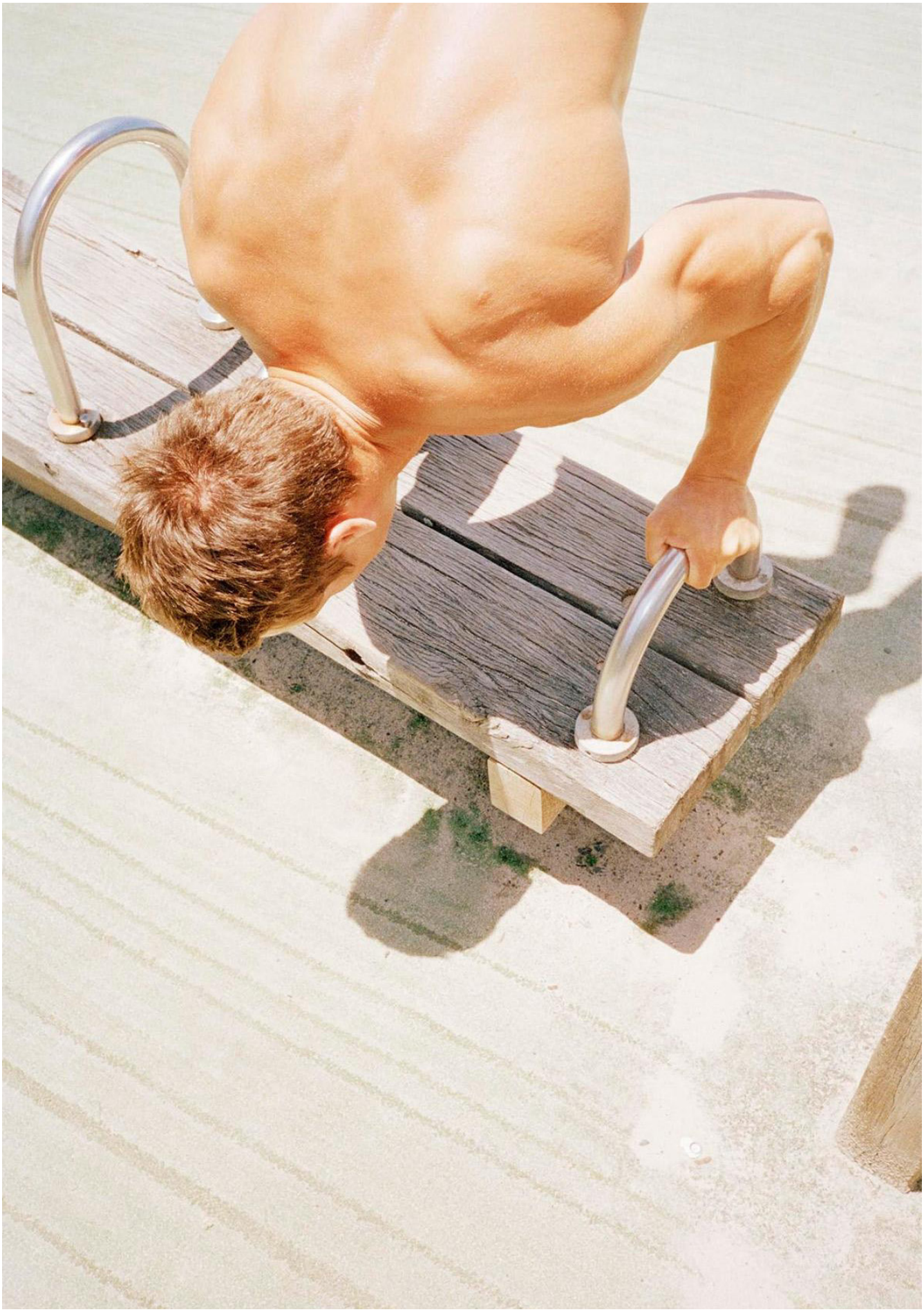
Paul Dourish (2004), in his book *Where the Action Is* on embodied interactional systems, argues that embodiment is a fundamental feature of human-computer interaction. He addresses the discipline of computer science not as engineering, but as philosophical enterprise. His approach to designing interactional systems emphasizes skilled everyday practice in a Merleau-Pontyian sense, rather than disembodied rationality, abstract cognition and symbolic information processing. His analysis looks at both tangible and social interaction examples to inform how future interactive system may be designed.

Dourish refers to his work at Xerox PARC, where the first computer mouse was developed. The mouse becomes an extension of the hand in a Heideggerian sense, and is an example of tangible computing. Other examples of tangible interaction include the work of MIT Media Lab and the Tangible bits project. Novich & Eagleman (2015) demonstrate how encoding of information across an array of vibrational motors embedded in a vest can convey complex information such as words. Designed as aid for people with hearing impairments, this interface towards a translating software speaks directly to bodily haptic sensations.

Dourish' work also includes examples of social interaction through computers, perhaps best illuminated by an example with video conferencing. When conversing with a colleague over video link, he experienced the creation of a shared space that comprised at once his office, his computer, the sound of what was happening in the office of his colleague, and whatever was in the field of view of the camera of his colleague. The space, dubbed a Shared Media Space, allowed him to be a part of the other room in a seemingly embodied way, noticing the sounds, the lighting and whatever would happen in the other room.

As technology becomes ubiquitous, such as everyone having a smartphone, and these devices becoming more perceptive through 3D cameras, microphones etc, the potential for depth of embodiment, in both tangible and social computing, increases.





Somaesthetics in Design

Contemporary philosopher Richard Shusterman (2007) provides a thorough rundown of the thoughts on embodiment of numerous contemporary thinkers, from Merleau-Ponty via Simone de Beauvoir to Michel Foucault. He subscribes to an embodied view of the mind, and expands it with a philosophy of somaesthetics, a field of theory and practice deeply concerned with the body.

A devout practitioner of the Feldenkrais method (akin to but different from Alexander Technique), he argues that understanding of embodied consciousness may be enhanced through what he calls somaesthetic practices - practices that emphasize reflection on somaesthetic awareness. Furthermore, he encourages this kind of practice as a countermeasure to the ailments of contemporary culture: attention, overstimulation, stress, personal and social discontent and deceptive body imagery.

Kristina Höök (2018) takes Shusterman's approach into what she calls soma design, a design methodology that challenges methods dependent on language-drive semantics. Her methods encourages slow, somatic reflection rather than rapid, aggressive development. It is a different set of design paradigms that challenges designers to rethink the field of interaction in an aesthetic context in a world of technology that changes rapidly. It seeks generative paths to new interface through a direct involvement of the body. The method borrows from fields such as art, psychology and ethnography.

Designers are already utilizing the body in designing, such as Schrag (2018) who emphasizes non-visual aesthetics in social design for communities in Britain. Trentini (2015), discusses embodied cognition, spatial situation and implies a somaesthetic approach in designing for immersion in art installations.

Summary: Paradigms

On the background of these theories, we can tentatively formulate simple guidelines for researching and designing for interactive aesthetic experiences.

When designing interactive experiences, being mindful of the bodily dispositions of your audience can be fruitful.
There is tacit knowledge in the body that will not easily lend itself to expression in literal or schematic terms, but can nonetheless be utilized in designing for experience through somatic inquiry.
Even the symbols we interact with in the digital world have their inception in the lived bodily experience.
Aesthetic experiences are successful when the audience assume a position in the metaphor implied by the work.

The next question comes naturally. How do we find a methodology for designing to consciously engage with the body, and how can the body itself be employed in this endeavour?

Chapter 2: Insight

The second chapter outlines the methods employed to gain insight into how we can design with a focus on the lived bodily experience, and what insights were gathered. Starting with a reflection on methodology, it looks briefly at what is meant with choosing a method for design.

It moves on to discuss a framework for exploring phenomena through design. This framework constitutes the basic model which is used in the project, and provides a way to both understand the contexts in which to intervene with design and the impact of the design on it.

A central avenue of inquiry in this assignment is the manifestation of the concepts of embodied cognition in practice. The next part of the chapter looks into some of these practices briefly, as well as the student's subjective experience in actively engaging with them. These include yoga, floating (REST), Alexander technique and Zen meditation practice (Zazen).

What follows are interviews of performers, designers and artists that have met the mind-body problem in aesthetics. Fredrik Høyer is a poet, actor and performer who discusses bodily engagement in performance and reciting. Espen Gangvik, Stahl Stenslie and Zane Cerpina are artists working with mixed media including electronics and sensors.

Methodology: A Point of View

Having established a framework of paradigms through a literature review, we might feel confident that there is merit in applying an embodied mind approach to the design of interactive experiences. How do we move on from this to the actual design of an installation? What tools do we have for the conception of ideas that relate to this, and how do we know when to move on to the next step (or, sometimes more importantly, when to turn back?)

There is a plethora of design methodologies and procedural frameworks to choose from. Some form rigid schemas that allow for rapid iteration. Others ensure rich insights into the users of interactive systems, in terms of demographics, personal story, patterns of consumation, movement etc. Others again are highly vision-centric, making sure you never stray from a predefined goal.

In this project we are seeking a methodology that will allow us to make inquiries into and to intervene in a lived bodily experience. We are aiming at imposing an awareness of the lived experience in the audience.
Dag Svanæs (co-supervisor of this thesis), in an as of yet unreleased article (Svanæs, 2019), proposes a framework for categorizing body-centered design practices. These categories relate to point-of-view and tense, known from literature. They provide the designer with a language with which to talk about utilizing the body as a resource, to bring forth individual sensitivities in experience.
In the framework, the 1st person perspective is reflection on one's own experience.
The 2nd person perspective relates to kinaesthetic empathy in participant observation - these perspectives contrast the traditional view in design, the 3rd person view of the body as object of formal analysis.

Tense provides the second dimension for this language. Past, present and future refers to modes of reflection - on what an experience felt like, feels like right now, or might feel like in the future for myself (1st person), a person I'm empathically connected with (2nd person) or a person I'm observing (3rd person).

This project is mainly situated within the 1st person point of view. The student's experiences with somaesthetic practice and the experiences of the interviewees with the body as subject matter in art and design are all recounted from this viewpoint and in the past tense.
In the last chapter, the connection between the prototype and the audience is described as a series of beliefs that occur in the prototype and the user.
In the testing part of the last chapter, participants are asked to comment on their experience with the prototype in the 1st person present tense.

Phenomenology through Design

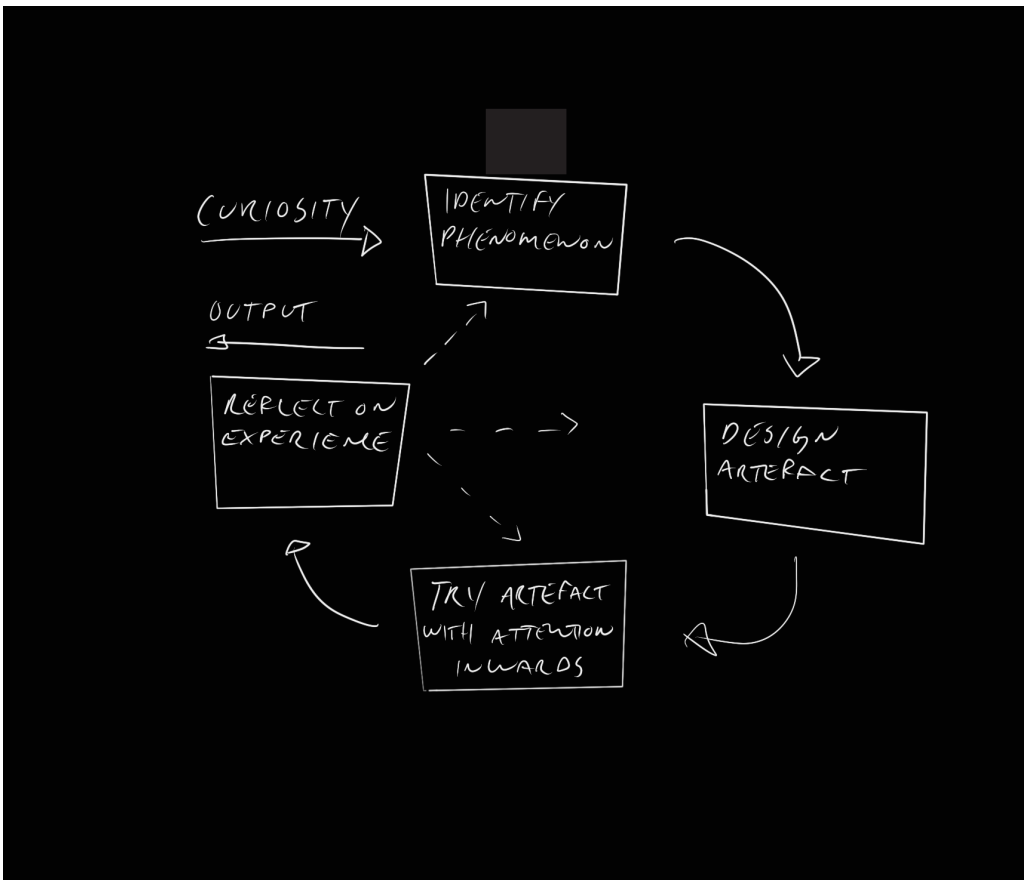
In discussing phenomenology, we came across the term epoché, the bracketing or reduction of experience into bits of knowledge to be reflected on while suspending judgment and assumption. Dag Svanæs (2019) uses the epoché to reflect on the experience of living with a mechatronic "human tail" of his own design. In doing this, he developes a framework for iteratively expanding the phenomenology through design interventions.

The Phenomenology through Design (PtD) framework is a machine for exploring phenomena through custom made epochés and has been used in this project. We will preempt the rest of this thesis by exploring the steps through the lens of the *Pust* interactive sculpture.

The first step requires curiosity as input. In this case, curiosity was spurred by experience in working with embodied interaction. In this step, a phenomenon of interest is identified. We'll see that in this project, the phenomenon (breathing) is chosen for being so fundamental in many somaesthetic practices.
The second step creates the epoché (or "making the familiar strange") through a designed artefact. The Pust interactive sculpture uses light and smoke within a glass bulb in response to the breathing of the audience to expose the experience of breathing consciously.

The third step is the trying out of the artefact while turning the attention inwards. Here, the impressions from trying out Pust is described in the 1st person, past and present tense.

The last step outputs phenomenologically relevant statements of experience based on the previous step that allow for co-reflection with peers. At this point, users of the framework might want to iterate to either of the previous steps; having found a more interesting phenomenon through the inquiry, wanting to replace or improve on the intervention, or further exploring the artefact by trying it out again, perhaps from a different angle.


CURIOSITY
IDENTIFY PHENOMENON
OUTPUT
REFLECT ON EXPERIENCE
DESIGN ARTEFACT
TRY ARTEFACT WITH ATTENTION INWARDS

Somaesthetic Practice

The insights and experiences gathered are presented as narratives in the first-person tense. From the student's experience from trying activities to interviewees discussing their work, these narratives are not stripped of embellishment or metaphor, or reduced to statistics and results, to consciously adhere to the phenomenological frame of mind.

Trying different bodily awareness-practices was crucial to the development of the assignment. What is meant by bodily awareness practices? In theory, there is no practice that could not be imbued with an enhanced bodily awareness, something emphasized in mindfulness practice.

The PtD framework implies an immersion into the phenomenon of enquiry. Aimed at uncovering a bodily phenomenon worth exposing in an epoché, efforts were directed at trying different practices that to a greater extent put emphasis on being mindful of one's body. The activities span a spectrum, from the hyper-awareness of surroundings, high proprioception and conscious positioning of the limbs to near-total sensory depravation. We will see that these practices, while different, have a common element. This element, the awareness and intentionality of breath, justifies its position as focal point in the sculpture described in chapter 3.

Alexander Technique

Alexander Technique, as developed by the actor-turned-theorist F.M. Alexander and wildly praised by philosopher James Dewey (who also explored the mind-body problem), is a somaesthetic practice that emphasizes that our movements and enactments may be more effective by paying extremely close attention to the willed action and the bodily behaviour associated with it (Shusterman, 2014). It is a technique used both as a kind of physical therapy as well as a framework for actors and other performers.
The technique is based on considerations of the human anatomy, and above all else the spine. As the main column of the body, the technique does ask of its practitioners to be very mindful of their spine and connected heads in all action and movement. It also makes use of visualization to access control of muscles that are less used, for example in the shoulders or upper back. While based in physiology, it has, as willed also by its inventor, eluded scientific formalization.

Arriving at the apartment of Elisabeth Dahl, who teaches Alexander Technique from her home in Oslo, she first asked me to stand upright and gaze mindlessly out of the window. While standing there, she thoroughly explained the foundations of the technique - the spine as central column in the body running through the actual centre (as opposed to just along the back), the head balanced neatly on top and supported by tendons and muscles. She explained how being mindful of the connection of head and spine, and the balancing of the head, was very important to maintain good posture as well as proper movement. Next, I was asked to sit down on a chair, which, to my surprise after 25 years of sitting down on chairs, I did very poorly. We worked meticulously through the various movements of the different body parts involved until I was able to sit down, before moving on to applying the same meticulousness to getting up from a lying position and walking around (making sure the head was at all times guiding the movement.)

The experience gave new meaning to the notion of mindfulness of the body. The extreme care taken to self-observation gave access to a tacit knowledge of the body that was fairly surprising (also as this was the first practice I tried.) While lying down in an active resting position (flat on the back with the knees up, arms down along the sides), Dahl assisted in visualizing my "shoulders melting into the mat" - to my satisfaction this bodily visualization helped me to relax the appropriate muscles. As I walked from her apartment I was paying active attention to muscles, tendons and joints that had gone woefully ignored for years despite an active lifestyle. The attention to proprioception, forces, kinaesthetics and breath amounted to a very localized aesthetic experience that in turn inspired the project.

Zen Meditation

Zen has its roots in Buddhism, and may be viewed as a religious movement of sorts as well as a practice. Shusterman (2014) cites both hatha yoga and zen meditation as ancient mindfulness practices in his discussion on somaesthetics.
Alan Watts (1957) provides a detailed account on the roots of Zen and what it is - or rather, what it isn't. Like the Hindu upanishads, Zen often talks about metaphysics in the negative, uncovering what life and the world are through what it is not. It often denies the literality of knowledge, and has a big focus on the power of mundane and quotidian activities. In the words of Watts, it is about "how the centipede can move all hundred of its legs at once", without thinking of them consciously.

Za-Zen is the Zen practice of meditation. I had meditated just a bit on my own, never more than 15 minutes at a time, before joining Bjørn Gunnar from Void for a zazen session at Rinzai Zen Center in Oslo. I was greeted by the teacher, Christian, who gave me a crash course of how the session would be conducted.

The session was structured thusly: first, a session of chanting, enunciating syllables to the beat of a drum from a small pamphlet. Then, 25 minutes of meditation, followed by 10 minutes of walking meditation. Another 25 minute meditation sessions would conclude the ceremony. Christian instructed me in finding a sitting position I could sustain for 25 minutes, mentioning that legs falling asleep was perfectly normal and that enduring the pain was essential to the practice.
The chanting words were mindless in the sense that they had no semantic meaning, focusing on the enunciation of the sounds. It felt liberating yet structured, and activated the throat. The concentration on the pronunciation was deep.

The first meditation session was the hardest. Zen meditation is fairly strict - no movement, scratching, looking around, coughing, or sneezing allowed. Rather, the resisting of the urge to act on stimuli is emphasized. I found myself swallowing compulsively. An itching at the top of the head became the main sensation, propagating through the body. The legs were falling asleep and aching, and the silence, only broken by the sounds of the stomachs of the other participants (we were 6), was complete. I felt bored and annoyed, yet when the gong signalled that the 25 minutes were over I was surprised by how fast they had gone by.

The walking meditation consisted of walking in single file, taking each step extremely slowly as the teacher make a sound on a wooden block. We walked around the room, and as we sat down for the next session I changed my position to one that was more comfortable. I was anxious about the last 25 minutes of meditation, and was afraid I would be restless and uncomfortable. But as we sat down, my eyes at a soft focus on the wooden floor, I was able to open up, take deep, controlled breaths and take in the surroundings and the sensations of the body in full. The breath, and focus on the in and -exhales, became the anchorage for the process. Itches and touches became objects of attention but in a more disassociated way, and I felt I was present in the room. The swallowing did not return, and as my mind began to wander onto practical things, like what I would make for dinner or how I would structure this thesis, I was able to pull it back into the body and focus on the immediate sensations.

The gong rang after what felt like a lot less than 25 minutes, and we gathered by a table to have some tea. The participants, all more experienced than me, discussed what they had undergone, what itches they had felt or what compulsions they had suppressed, and the fact that this seemingly trite focus was exactly the objective for the meditation. To sit still, and do absolutely nothing, and what a challenge that can be.
It spoke to the fact that being in the body and sensing it is not a trivial thing, or simply a pragmatic phenomenon through which we can move our brains about - it's an inevitability.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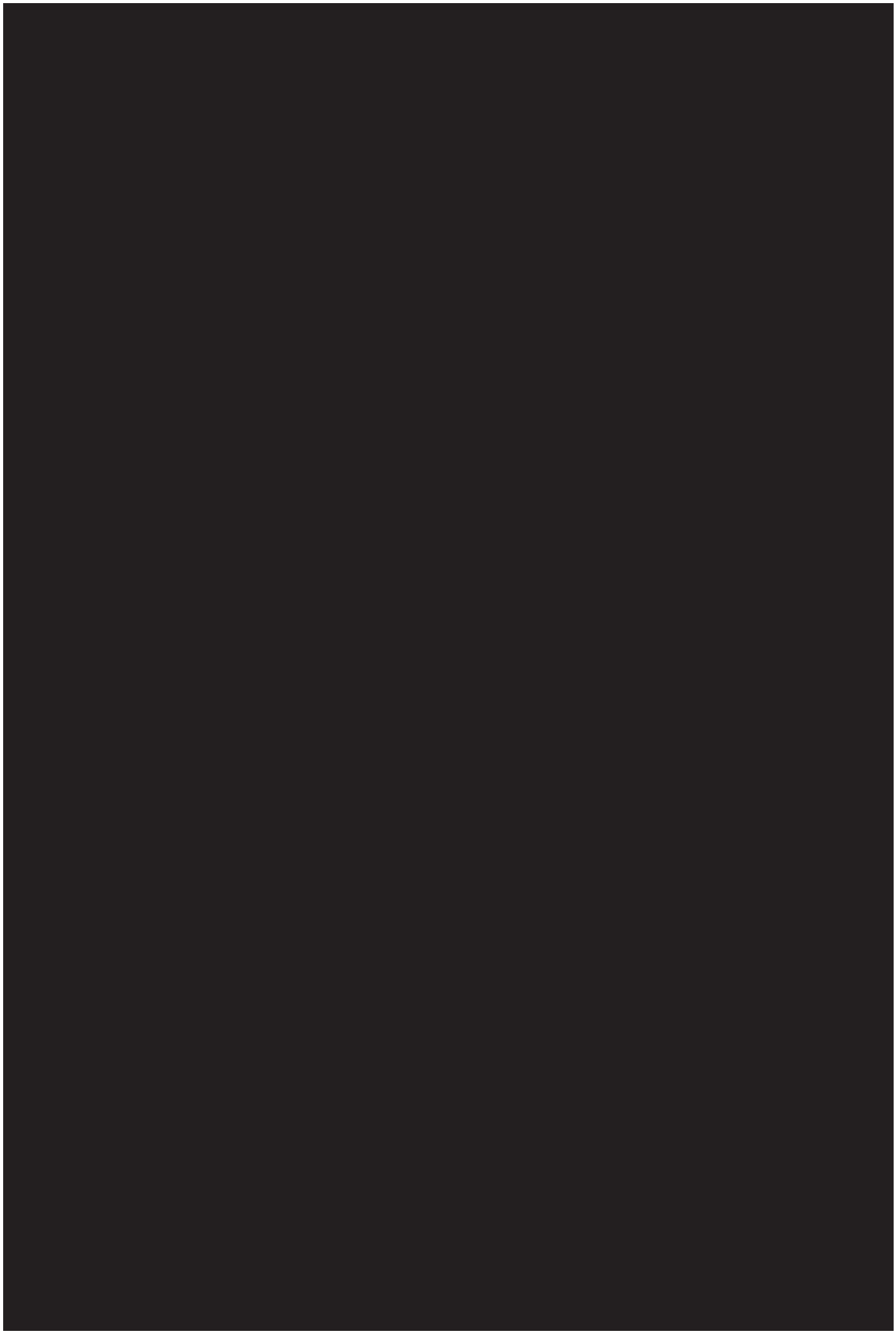


Floatation Chamber (REST)

A floatation chamber, (or Restricted Environmental Stimulation Technique, REST), is a sound and -lightless vat filled with extremely salty water heated to 37.5 degrees Celsius, human body temperature. It is designed to eliminate as much external physical, visual and audial stimuli as possible, to simulate a weightless floating in boundless space.
The technique, usually restricted to between 45 and 90 minutes, has been used in treating reumatism, insomnia, headaches as well as other ailments. It has been widely adopted as a means of treating muscles tensions and stress-related pain (Bood, Kjellgren, & Norlander, 2009). It has also been accepted as an aid for meditation, as its lack of external stimuli encourages a great amount of inward reflection - some users even report hallucinations and feelings of euphoria.

I was welcomed warmly at Oslo Floating's location in Oslo and shown to my chamber, but was not told much in terms of what I would experience. Rather, I was encouraged to try it out for myself. After putting in ear plugs and showering, I got in the vat and closed the lid. A melody informed me that the experience was about to begin. I laid back and floated on my back in the water with minimal effort for the remainder of the 90-minute floating time.

For my initially restless mind, it was inevitable to test the boundaries of the tank, splashing a bit, propelling my body in the salty water until my finger, toe or the top of my head would bounce me in the opposite direction, playing with the forces. After a while, though, as I stayed still, something different happened. An initial overwhelming boredom gave way to great concentration on my breath. Each inhale and exhale was very consciously enacted, paying attention to muscles involved and the movement of the diaphragm, adjusting my body until I was able to get deep breaths using the stomach with very little effort. After some time, as the task of monitoring the breath became trivial, my mind started to wander, bringing the body with it.

The lack of touch, convection, sound or visual stimuli, meant that most imagined sensations were projected from the mind and became embodied. I felt as though I was floating in a void, some times slowly, other times at great speed, feeling the surge in my stomach as though accelerating in a sportscar. Lights and patterns flickered before my eyes, and I forgot I was floating in a vat on the ground floor of some apartment building and not in outer space. Then my finger bounced against the side of the vat and I was brought back.

As the melody informed me that the allotted time was over, the experience made me reflect on how these sensations were imagined not merely as images in the mind but manifested in the body.

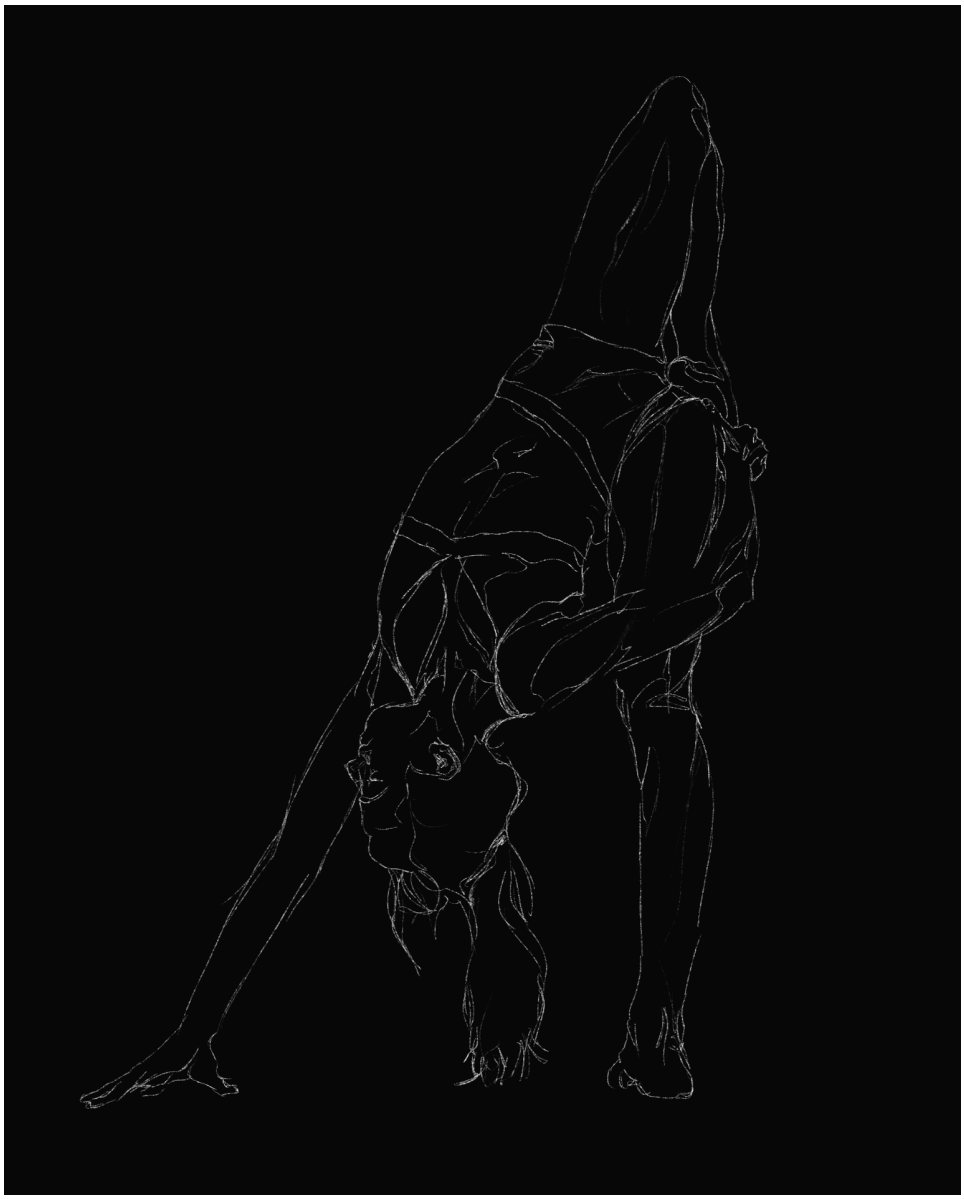
Hatha Yoga

Yoga is hardly a novelty, even in the west. We consider it here as Shusterman (2014) does - a somatic consciousness technique and a form of body-mind attunement. A group of varied practices rather than a single one, they run the gamut from physical to spiritual. It is one of the six orthodox schools of Hindu tradition (Feuerstein, 2012). Yoga as it is referred to colloquially in the west denotes Hatha Yoga, in particular a system of asanas (or postures) that has been adopted as a form of physical exercise, though originally a more holistic system of ethics, meditation, diet, breathing and spiritual development.

I wasn't late, per se, to my first yoga class at Leela Yoga in Oslo. I dropped in to find that a Hatha Yoga class had started just a couple of minutes earlier. My luggage hastily pressed into a locker, I barged into the Shalah with perhaps a little too much vigour, as the group inside was silently laying with their legs up against the wall. The instructor signalled me to get a mat from a cupboard.
I followed the others, laid down and started to breathe. The room was dim, soothing music was playing and an air humidifier was humming along, filling the room with a discrete cinnamon-y smell.

As we began to move between the different postures, or asanas, the instructor would tell us how to in and -exhale accordingly. Synchronising the breath like this was helpful, and allowed me to be mindful of the breath. This focus on breathing also made some of these positions a lot easier - some were stretching my muscles further than they had been in some time. The connection between breath and tension became obvious, as some positions opened the chest for air to flow freely, while some others made me unconsciously hold my breath in straining.
The session ended with lying flat on the back with the legs spread, breathing freely while otherwise unmoving. As we slowly started to move, first just the fingertips and the toes, I became acutely aware of their sensations and state, as I had been of my breath up to that point.

I won't presume to have studied much of the philosophical backdrop for even this very modern form of Hatha Yoga, but as a somaesthetic practice it did, in much the same manner as Alexander Technique, illustrate that the connection between body and mind is non-trivial. It was clear that there was no way I could do it mindlessly, let alone without clear intentionality and particularly in breathing.



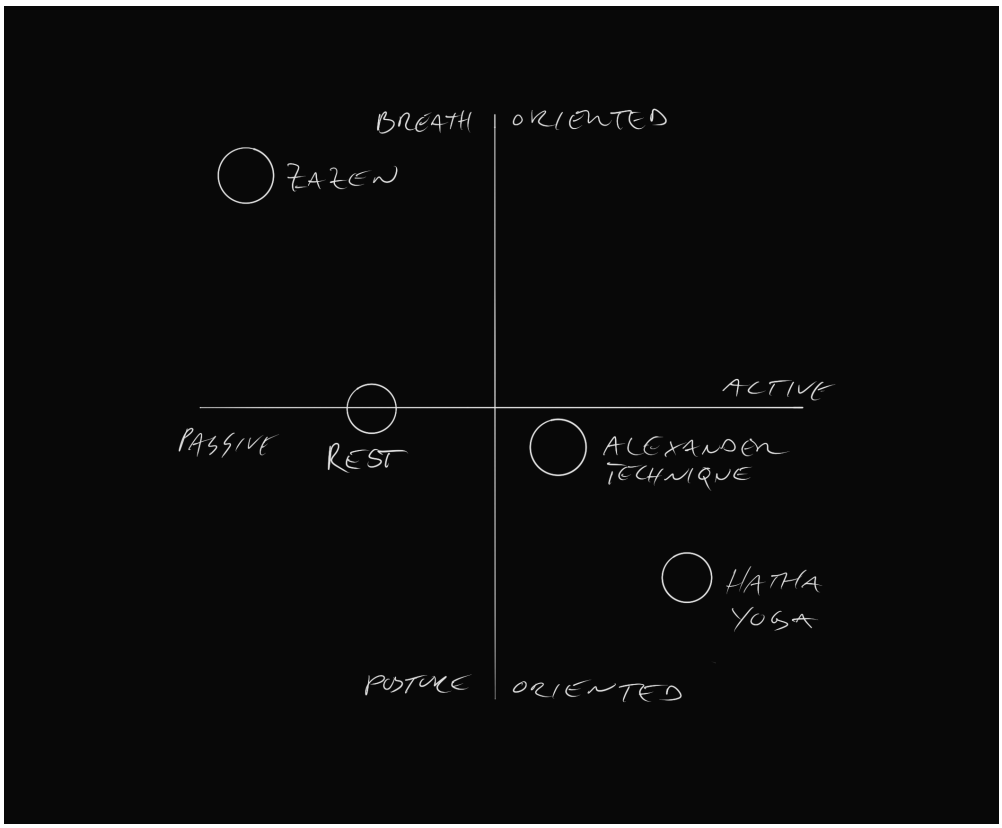
Summary of insights

In this section has been recounted experiences with different somaesthetic, or bodily awareness, practices. While spanning the spectrum from completely passive (Zazen, REST) to mindfully active (Alexander Technique, Hatha Yoga), these practices all require the attention to be directed inwards, not towards the abstractions and imaginings of the mind but towards the body. Many employ the body-scan technique.

While Alexander Technique directs its attention almost wholly towards the spine and movement, it, like the others, is naturally concerned with the breath and proper breathing. In meditative practices, such as floating or zazen, breathing is used as a rhythmical focal point and anchorage for the inward attention should the mind stray.
In Hatha Yoga, the free flow of air is essential to managing the strain of the different postures.

But in even more practices, both of physical exercise, competition, spiritual development, performance, arts and creativity, breathing is introduced on the ground floor. Singing uses the breath in a highly controlled manner, actors must manage it to elicit emotion, painters must keep it even to maintain a steady hand. For most practitioners that involve the body (and we argue that most do anyway), breathing is non-trivial.
This is why the breath will be the focus of the next chapter, which follows the design of an experience, an installation or an interactive sculpture that engages directly with the breath of the audience.

These practices, as mentioned, require inwardly directed attention, and to the breath, but only to be very successful and fruitful for the practitioner. It is perfectly possible to simply try to perform practices such as yoga or floating without ever directing the attention towards the bodily sensations. In this case, you might find them incredibly boring, or yourself distracted by other thoughts. In fact, most people probably go through their day without being mindful of their breath. It is not strange, perhaps, that with so many stimuli begging for attention, from screens to radios to other thoughts, we don't immediately turn inwards. While perhaps not physically fatiguing, these practices are very demanding, and only yield when attention is given. Some people might find breathing very trivial indeed, and as such might find this design proposal equally uninteresting.


BREATH
ORIENTED
ZAZEN
ACTIVE
PASSIVE
REST
ALEXANDER TECHNIQUE
HATHA YOGA
POSTURE
ORIENTED

Interviews

The following are interviews with one performer and three artists/designers. The actor, poet and performer Fredrik Høyer relates how he relies on and incorporates his body both in the shaping of his work and his enactment of it. Espen Gangvik runs Trondheim Center for Electronic Art and curates the Meta.morf festival, and has both made and encountered numerous works of interactive art. Ståle Stenslie is a mixed media artist who has often explored the body in meeting with technology. Zane Cerpina is a design student and artist who works extensively with the speculative.

The interviews are presented as excerpts for brevity - the full interviews can be found in Appendix I.

Interview: Fredrik Høyer, Poet and Performer

Conducted at Postkontoret, Oslo, Feb 10th 2019

FH: It's obvious to anyone who has in the least experimented with meditation, that the mind can be trained. Once you try, you see the connection between mind and body. I've felt it a lot getting massages! I was once in India, in the same place for two weeks, getting the same massage every day. And every time they would hit my right bicep, it released the same emotional response: I got sad. I was never the same emotionally going in, but it would happen every time.

That's my view of the body, outside of using grounding techniques in my performances - you cannot have a Cartesian dualism, because there is not a one-to-one relationship.
The body has grown like a tree throughout life, developing grain, while the mind processes more like a computer. You'll see it in different bodies as well - different postures, being in touch with your muscles, it's something to be used in theatre for example. Standing upright, you seem confident. Our thoughts and minds are reflections of our bodies rather than the other way around.

You'll see it in nervous artists, how they strain their legs like horses, locking their knees. For me in my writing, which is about looking inwards, all my stories and characters are located in the body as I've lived a long life - 31 years times 365 days times 24 hours. It's an infinite process to look inwards towards. It's been very releasing in terms of writing. It's like meditation - listening to what is.

[...]

There are memories in the muscles. It's not a machine driven by a main computer. It's not a mecha, a Zord or a Mega-Zord. It's no mecha-Godzilla.
We live a lot in our heads. We'd live in a better society were we more present in our bodies. We'd be more in touch with our feelings. I experience that in intellectual society today we tend to speak of feelings as secondary to thoughts, and irrational, and that mental clarity is separated from your emotional life, and at best despite of it. I see emotions as a form of knowledge. There is wisdom in feeling - there's been a process of evolution that is not discounted, the instinctual responses are not for nothing and are a source of affirmation.

[...]

Interview: Espen Gangvik,

Director of TEKS and Meta.Morf

Conducted May 19th at TEKS, Trondheim

EG: TEKS [Trondheim Electronic Arts Center] is a child of the nineties, established in 2002 as a kind of a way to provide a vitamin shot to creative fields. People had to learn digital tools rapidly. In encyclopedias you'll see that the digital revolution is mentioned being somewhere in the period from the 60's through to the 90's. What we try to argue in the coming biennale is that we are so immersed in digital practice that it becomes... embodied. It seems like that the real revolution hardly has started, or that it starts now. The foundation is there, the platforms are there in the industrialised world at least, the opportunities are there in terms of the digital cloud, AI and faster communication protocols. I read for instance somewhere that 5G theoretically can be faster than the neurons in our brains transmit information.

[...]

There is a thing to remember, which is that we have a pretty limited way at looking at what a life could be. If we would project humanism on everything, from animals to things, we would always be very surprised, like «what was that?!». Philosophically it's interesting that if we think that what we have is the real deal, then yes, embodiment is definitely basic for what a life may be. But the big question is, what really constitutes this world and what is it? Religious believes gives one kind of answers, metaphysics others, and even recent discoveries in astrophysics is yet another, greatly expanding how we think about us and the universe, really breeding new questions. Higher dimensions, other ways of looking at things outside our little bubble, that's where it has to be, right? A door that we can't close yet. A colleague argued that virtual reality never could substitute the real world due to the lack of touch and tactility, but I see it being developed right now. You see established truth being toppled all the time, in all sciences. We really can't see what's coming, and we might not be able to draw a line in the sand by saying that it all boils down to the body, even if it does so right here and now, in that context. When quantum computing, or other solutions outside the binary emerge, what happens then?

[...]

The body and the environment is something that we try to create together. We're trying to enter digital worlds physically. Social media today is this weakly designed experience on limiting screen technologies, and I see that being translated into immersive landscapes in augmented reality. We also have people trying to boost the speed of evolution by enhancing the body with technology. On one extreme we might end up hooking ourselves up to computers. On the other we might direct all focus on the physical body.

Interview: Ståle Stenslie, Mixed Media Artist

Conducted May 23rd 2019 at Kulturtanken, Oslo

SS: How do you describe phenomenology?
It's wandering through a forest, a pitch black forest with a headlamp. The headlamp is the field of knowledge, the field of perception that we have. You search around, and what you see, is what you know. Once you move your head, you don't know anymore. It's the exploring, the unpredictability of it, which is the exciting thing.
In art, sensing has become an artistic materiality, which it wasn't before. Performance, yes, we did have that, but then you had the performer and the audience separated. Then what happened during the 80's with media art was that suddenly you as a perceiver became part of fulfilling the piece. You become part of it, included in the work as a materiality, constituting the experience.
It's kind of an abuse of the participant, they're becoming part of an act. In any performance, if me as audience enter it, everyone else views me as an actor.

[...]

I've worked with Wagnerian gesamtkunstwerk - Wagner's big, wet dream, creating a total experience. All is art! The embodied, aesthetic orgasm! As a metaphor, naturally. How do we create these kind of works? You could do that with sense-manipulating pieces. The first one I did, doing a classical education, was building giga-structures in concrete. I built weird, almost religious structures where you walked around in temple-like structures. I used to dive a lot in my youth - you would lose the experience of senses, it's sensory deprivation. If you dive to 15 metres, the light starts coming from everywhere. If there are particles in the water, you won't be able to discern any contrast. And like with a floatation chamber, your mind will start to produce sensory stimuli. You'll see lights, patterns, shapes, like an acid trip. If you have no contrast surfaces, your eyes will create them.
It's a physiological mechanism. If there is no stimuli, we will create it. It's a neural mechanism, like with learning. Where there is nothing, we will produce it. We are always phenomenologically directed towards something - we are always sensing. We can't turn it off! We can't relax away from it, it's part of being a life-being, it's survival.

[...]

Why embodiment though? The thought is that you and I, and an African woman, and the people of Patagonia, all have access to the space of experience. It's a universal language of senses. That's the hypothesis. And it has to be proven, which is why we need experiments such as yours.

Interview: Zane Cerpina, Artist, Designer and Researcher

Conducted May 24th, Cafe Laundromat, Oslo

ZC: My own work has different directions. One is more anthropocene eco-critique, and the other is more bodily exploration, more transgressive, technological work with the body. In both of these areas I've done performances. For example, I've done dance performances with a drone, where the drone tracks me autonomously.
That's a somaesthetic exploration of this unique relationship with a technological entity. With these movements I've travelled around the world making performative videos. The drone sort of becomes more human through these performances. That project is in the early stages though.

Then I have more body-based work.
I'm working on a project now that is a somaesthetic exploration of another person's body. Somaesthetics is often very inwardly focused, so I'd love to have this other perspective. I think the field is kind of unexplored. I really like the philosophical aspects of it and the work of Richard Shusterman, and I think it could be taken a lot further. And not only through Yoga, or these typical things, but in all fields. There are many areas that have been explored, art especially, but there are many other fields to include, and I hope my project will expand on this and start a discussion.

[...]

Embodiment has a place in this. The most interesting works in Europe right now are produced in bio-art, with very somaesthetic, personal touches to it. A gallery in Ljubljana is one of the most daring galleries, with the most daring curator in Europe. If you look at their history, they started with bodily performances, transgressive works, shootings and whatnot.

Lately they have taken two directions, at the core. One is exploring technological black boxes, but I really think their strongest focus is bio-art and bio-tech, but in a very human manner. They are in the grey zone of what's legal. One of the projects was about coupling a human and a wolf, genetically. Aspects like that may be important in the future, and is very much an exploration of the body.

Chapter 3: Implications

Aesthetics has seemed to be secondary to literal and propositional knowledge in traditional formal analytics. We have seen how some thinkers, performers and creatives position themselves in relation to the mind-body problem, and place the body as the locus of perception, metaphor as intrinsic to aesthetics and feeling as a source of affirmation. Design practitioners have demonstrated how an embodied approach to interaction design can be successful, while design researchers explore ways of incorporating somaesthetic practice and phenomenology into design methodology.

The last section of this thesis concerns the development of the Pust sculpture, framed as an interactive aesthetic experience.
This intervention, introduced as the "artefact" in step two of the phenomenology-through-design methodological framework, is made primarily to engage with the bodies of the audience through an epoché constructed within the confines of a design object, an implication of the preceding work. We will look at some reference projects and trends in the field, and follow the conceptualization, sketching, modeling, simulation, programming, interaction development, technology and construction involved in the proposed prototype.
Lastly, people who have tested the prototype relate their impressions in the 1st person.

Scope

Starting out, the goal of the prototype project was more blurred - to make something that would consciously address the bodies of the audience, and challenge the use of technology in design. As the project grew, the literature review unveiled several perspectives on embodiment, and personal immersion in practice gave personal experience, these goals would coalesce into something more concrete.

Firstly, the concept should not only involve the bodies of the audience, but encourage, explicitly or more subtly, inwards bodily reflection, in this case towards breathing. This constitutes the second step of the PtD framework, or the epoché.
Secondly, the prototype should add to the discussion of how we design technology, and how we use technology in design. What are the cognitive properties of the technology, and what kind of interactions does it afford? What paradigms does it adhere to, and is it successful in involving the body?
Thirdly, it should yield insight on whether the aesthetic experience is enhanced by reflecting inwards on the body and the conscious use of metaphor.

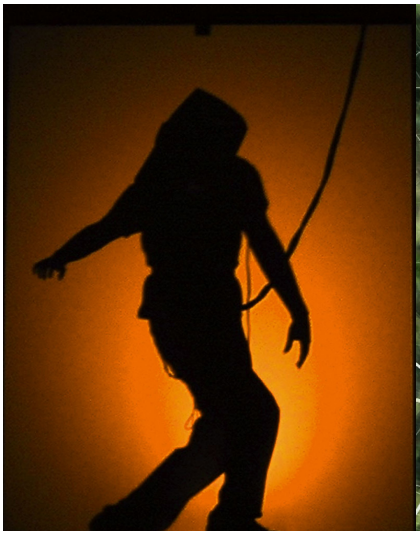
In terms of scope, the first prototype is intended to be just that, the first step in an iterative process. However, it is deemed important that the prototype be sufficiently elaborate in terms of finish, resolution and interactional function. As an aesthetic object, it is feared that much of the effect is gone if the aesthetic or functional quality is severely lacking. It should be able to be exhibited and tried by an audience to make evaluations on its effect along the guidelines of the PtD framework.

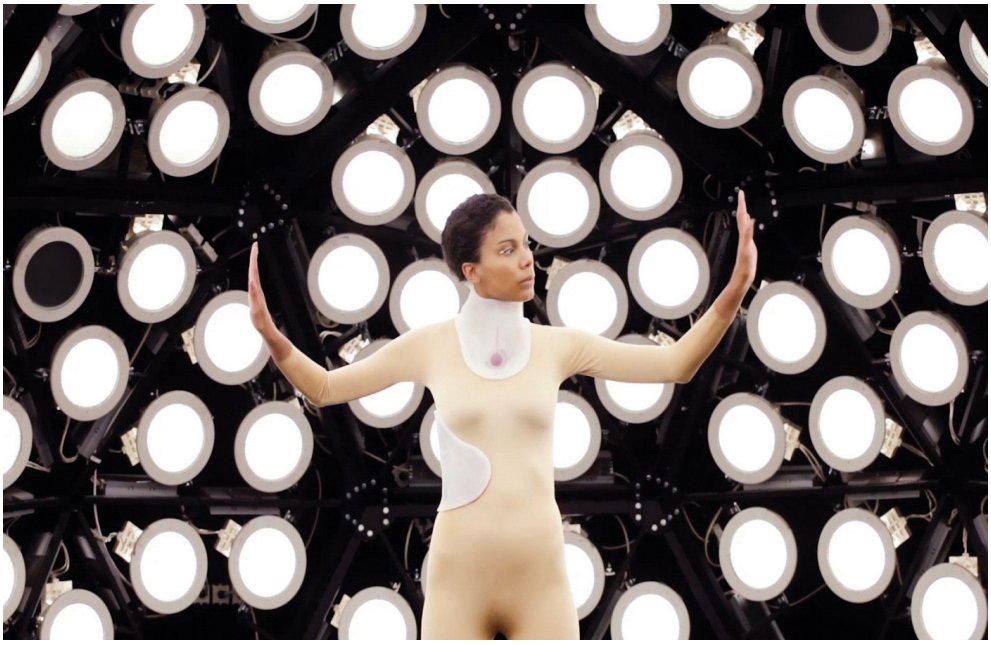
Inspiration

There is a plethora of projects in this realm to inspire projects in embodied interaction. This is a small selection.

Hugo was developed by the student in collaboration with other students at the Department of Design, NTNU, as part of a mechatronics design class. This robotic hugging machine was intended as an emotional aid for people in distress, and had a very simple yet embodied interface. It would sense the user's presence through a proximity sensor, and invite it in for a hug, activated by a squeeze. It was intentionally un-human in its morphology to avoid the "uncanny valley". It was a stimulating project, and introduced to me embodiment and emotional potential in technology.

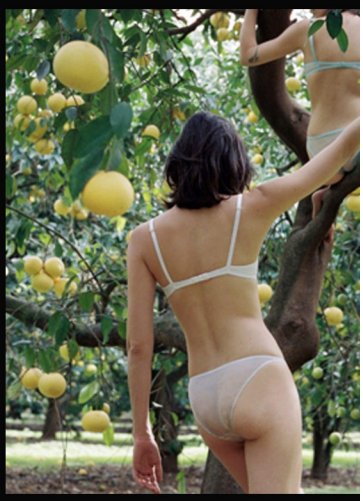
Char Davies' Osmose (1995) is a virtual reality experience from the very early days of VR. Focusing primarily on immersion/gesamtheit, the user would be situated in a virtual, organic environment. They would use their balance and breath to navigate this space, much as a diver would use air volume to control elevation. This is an exploration on the interplay between subject and world.

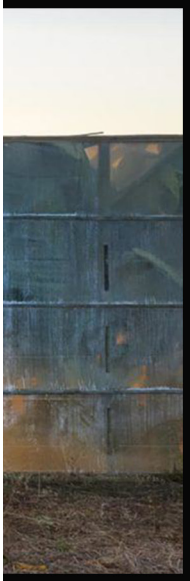


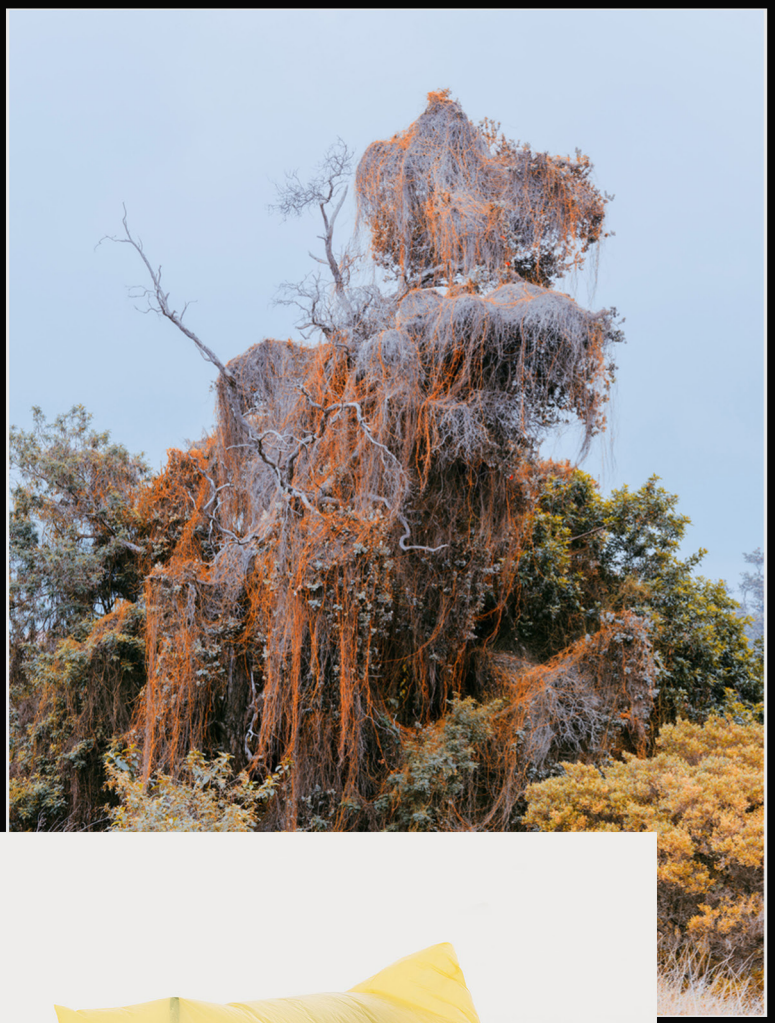


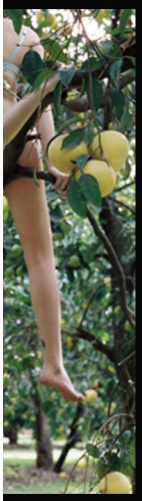
The Pulse Room by Rafael Lozano-Hemmer (2006) is an interactive installation in which participants would have their pulse measured with a machine. The recorded pulse would then be sent to illuminate a lightbulb, situated in an array of hundreds of other lightbulbs, all pulsating with the rhythm of another person. It explores both biometrics and intersubjectionality in installations.

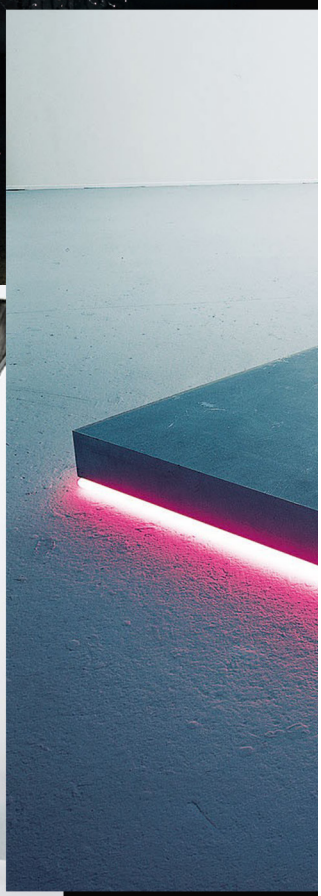
Lastly, Paneta & Aghakouchak's Sarotis (2016), designed at the Interactive Architecture Lab at UCL's Bartlett School of Architecture, is a study of soft prosthesis and wearables. The soft wearables inflate and deflate in relation to the space perceived by 3D cameras embedded in mobile devices. The project explores spatial and embodied cognition in relation to emerging technologies to enhance awareness of space.











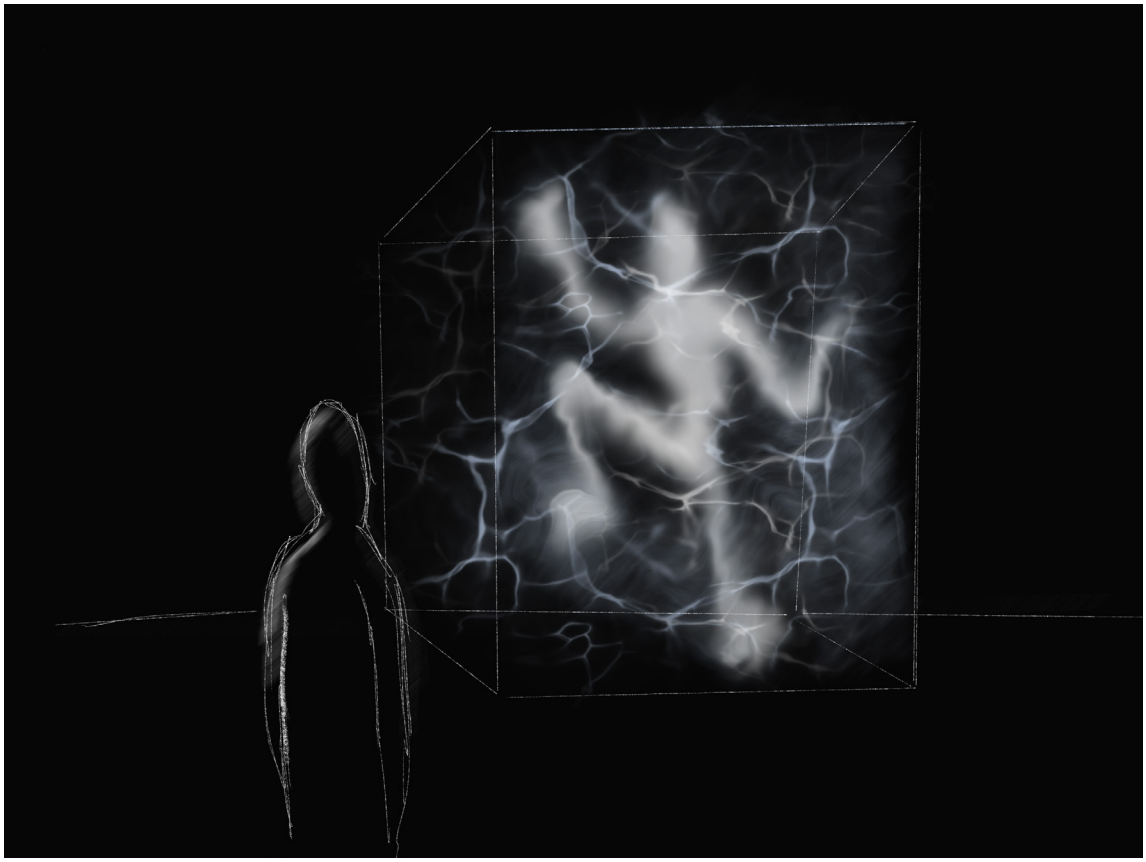
Concepts

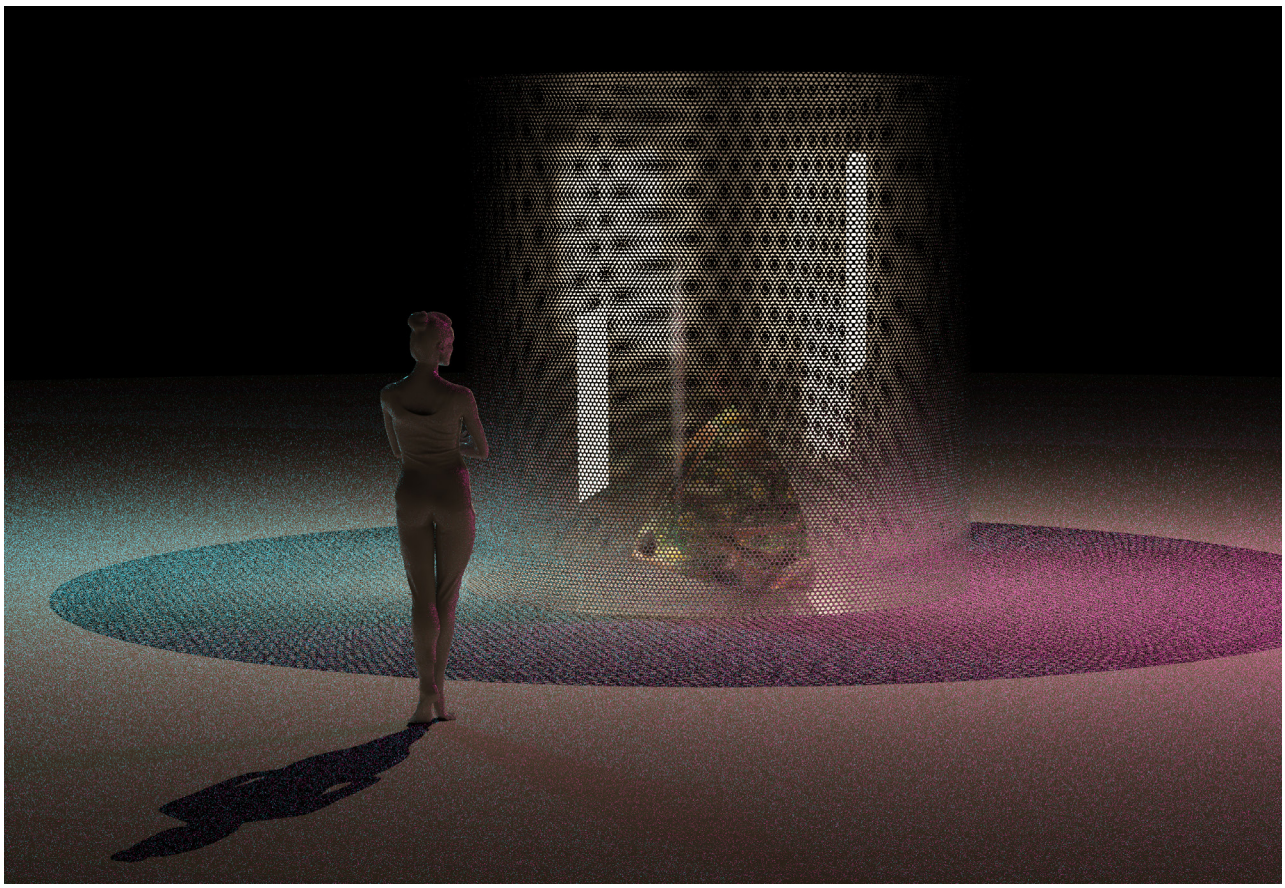
An initial conceptual direction focused on kinaesthetics. A prototype would explore the feeling of having limbs, exposing the balance and positioning of them. It would sense the audience through cameras and tracking, to give feedback in several sense modalities such as vibration and temperature. This feedback would push the audience into strange postures, to "make strange" the body and encourage reflection on muscles and joints that often go unnoticed.

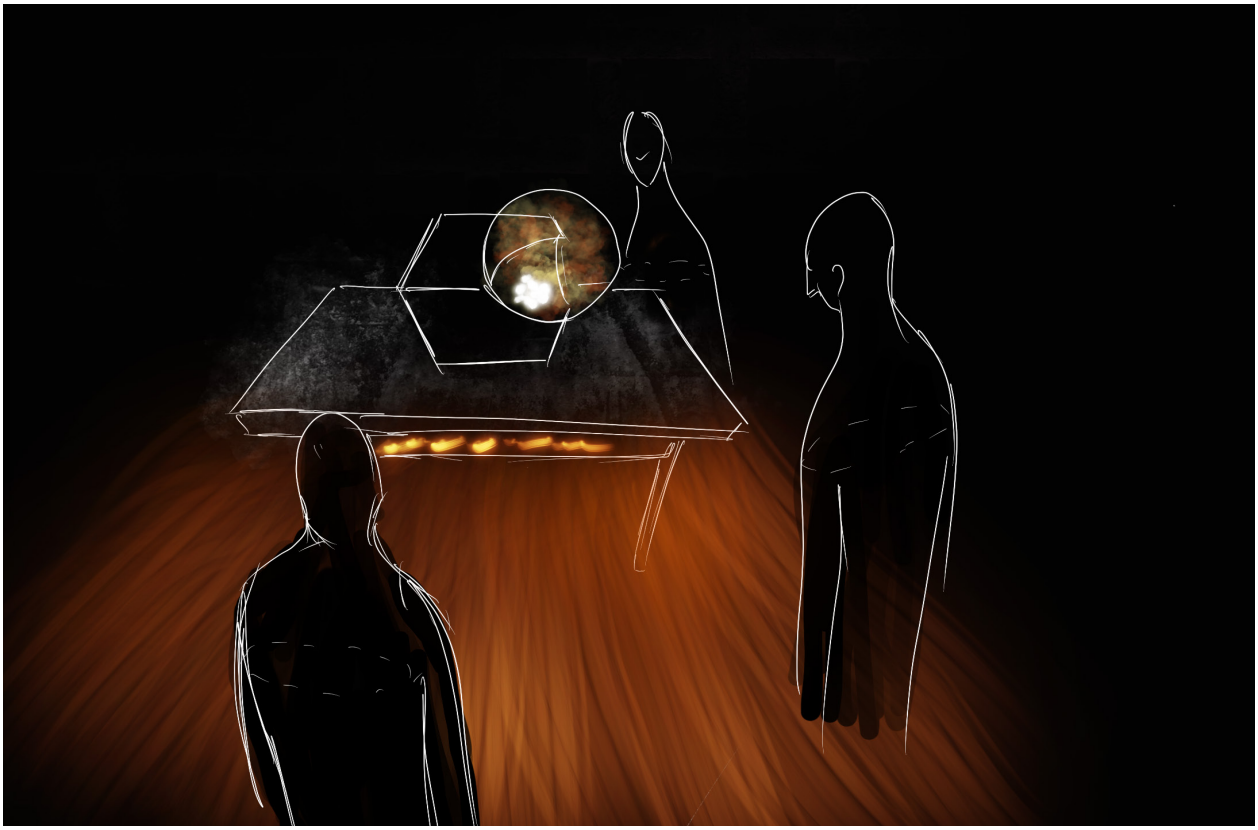
A second direction focused on micromovements. Using movement trackers and cameras, the installation would, in graphics and audio, translate small movements such as those of the lips or the fingers into exaggerated patterns. This very sensitive interactional system would encourage high awareness and control of small movements. It would explore high inwards concentration, and "reward" mentally detached somaesthetic skill.

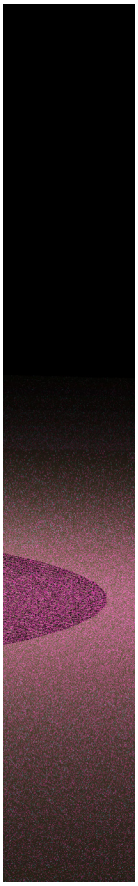
A lot of thought was directed towards the physical presence of the sculpture as well, particularly in terms of volumes, composition and lights.

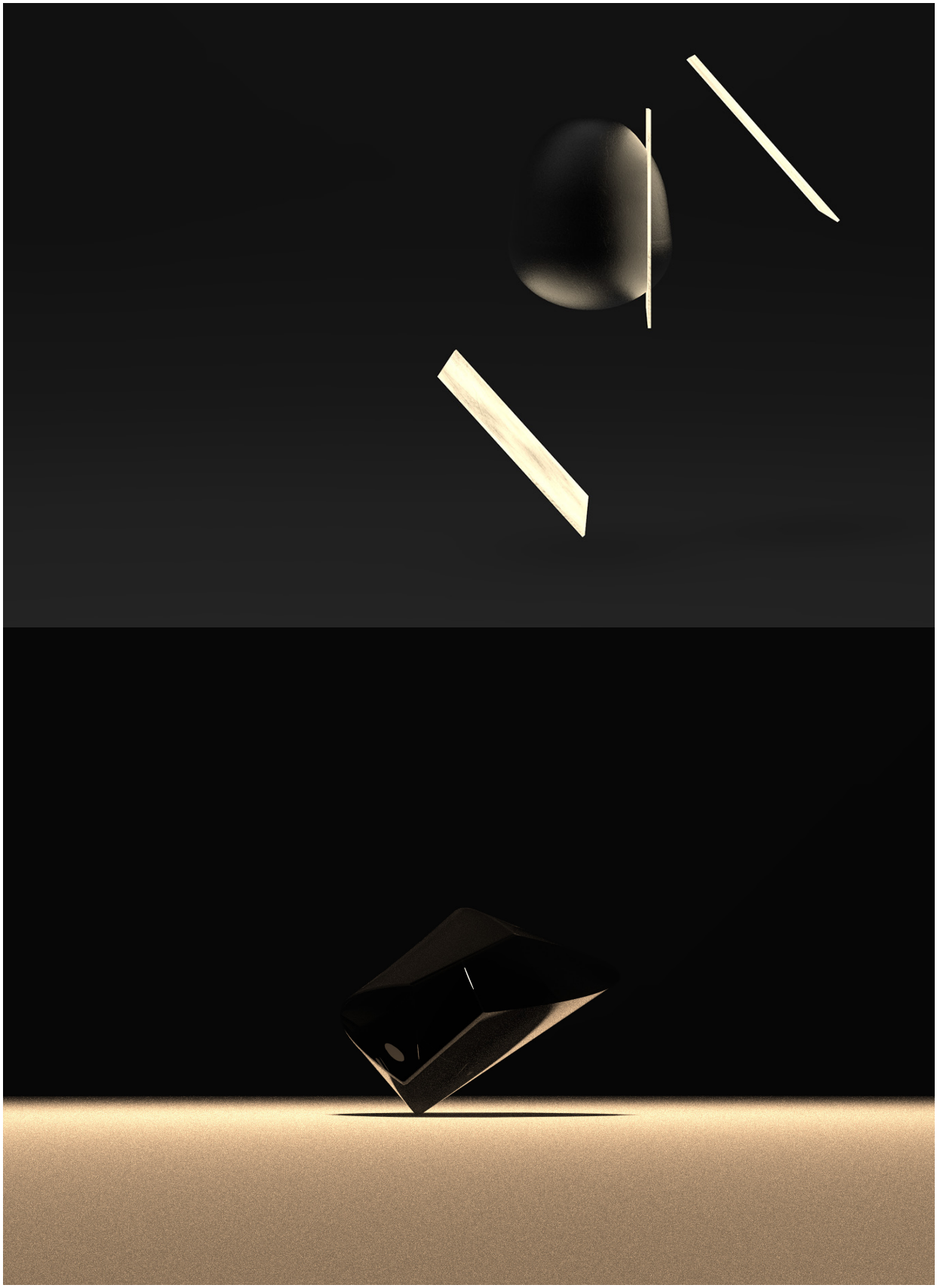
Further, as the research uncovered breathing as a central component in a lot of somaesthetic practices, a concept emerged for the use of breath as interactional axis. A thought was to include heating lamps that would pulsate with heat in rhythm with the breathing, to create a fluctuating temperature field for the user. Experiments with heat lamps showed that they would not react fast enough to follow this rhythm.

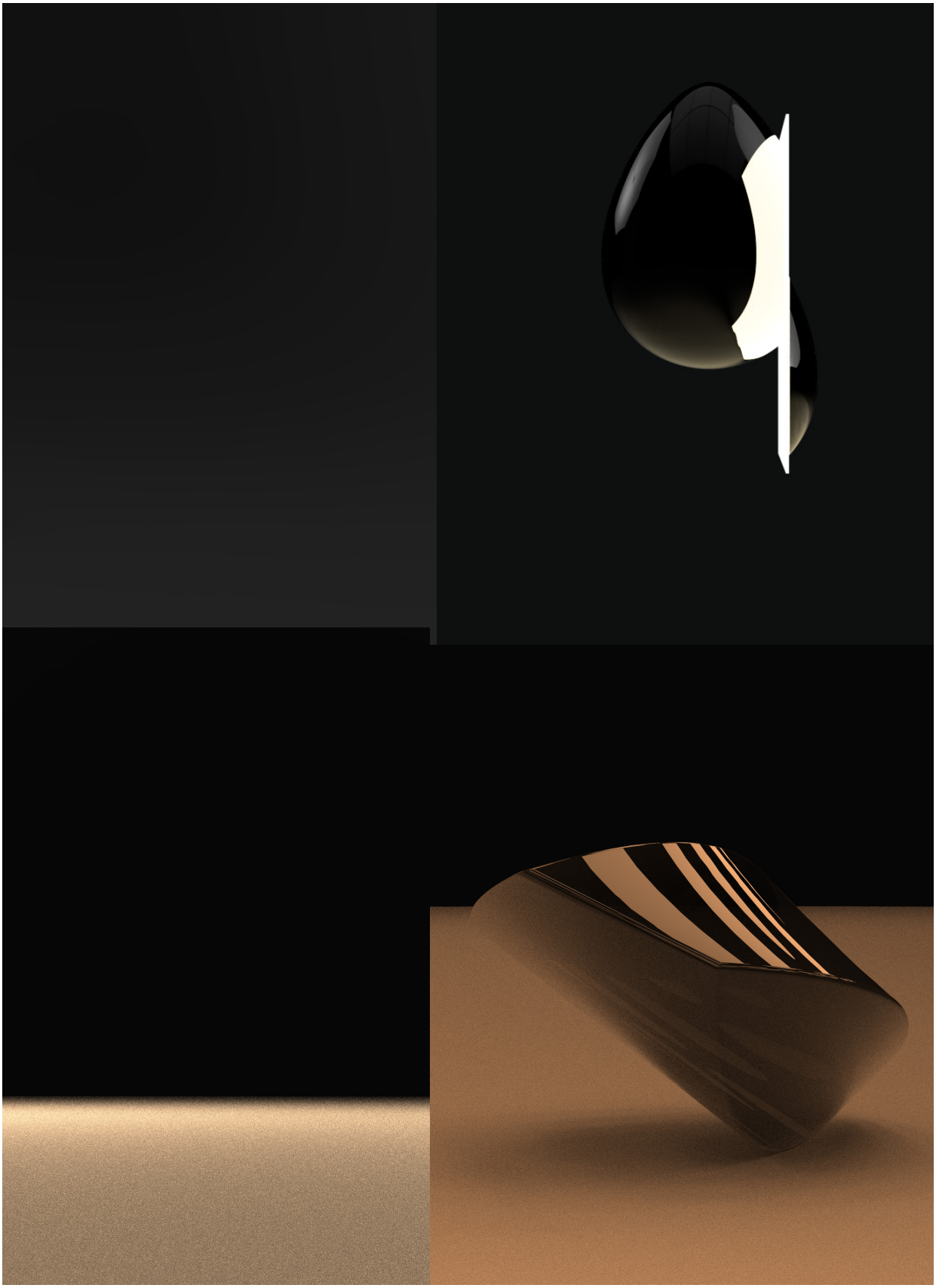












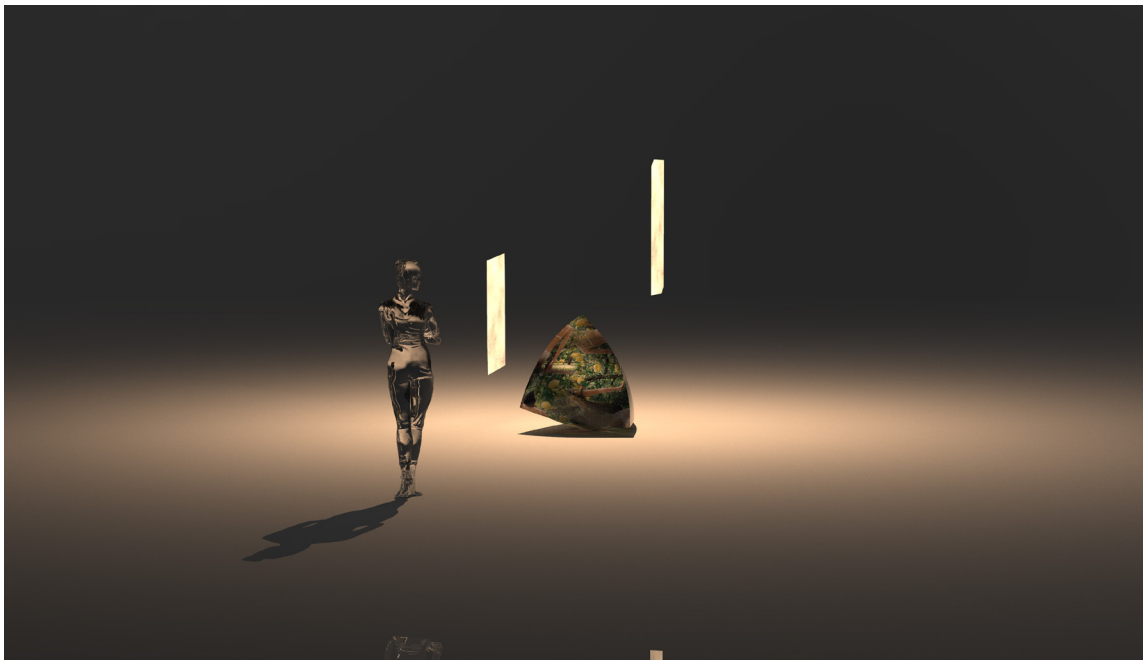
Sketching and Modeling, Simulation, Prototyping

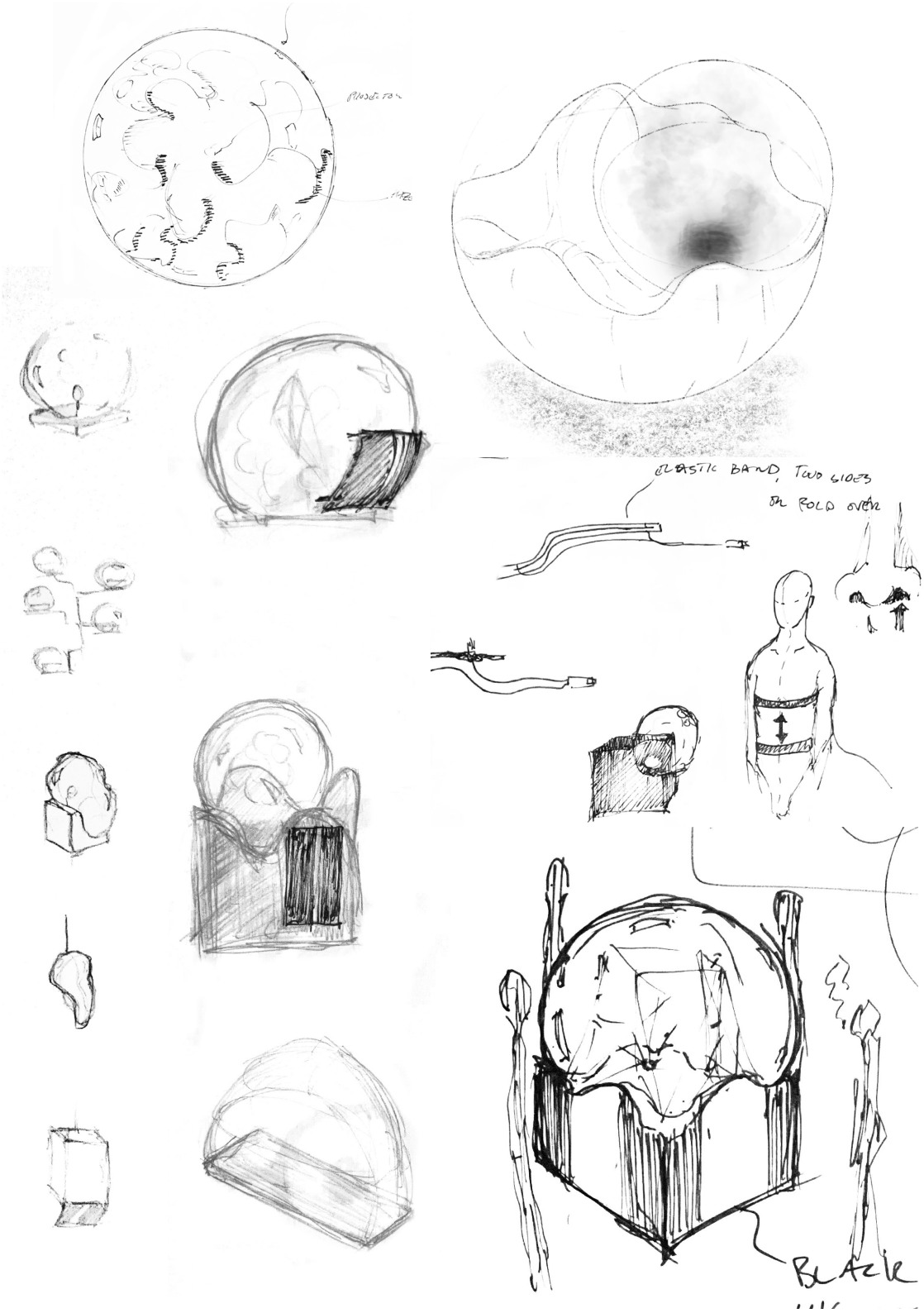
Traditional sketching was employed to explore different shapes, compositions and modes, as well as sketching in 3D modelling software for volume explorations and generative, random shapes such as landscapes.

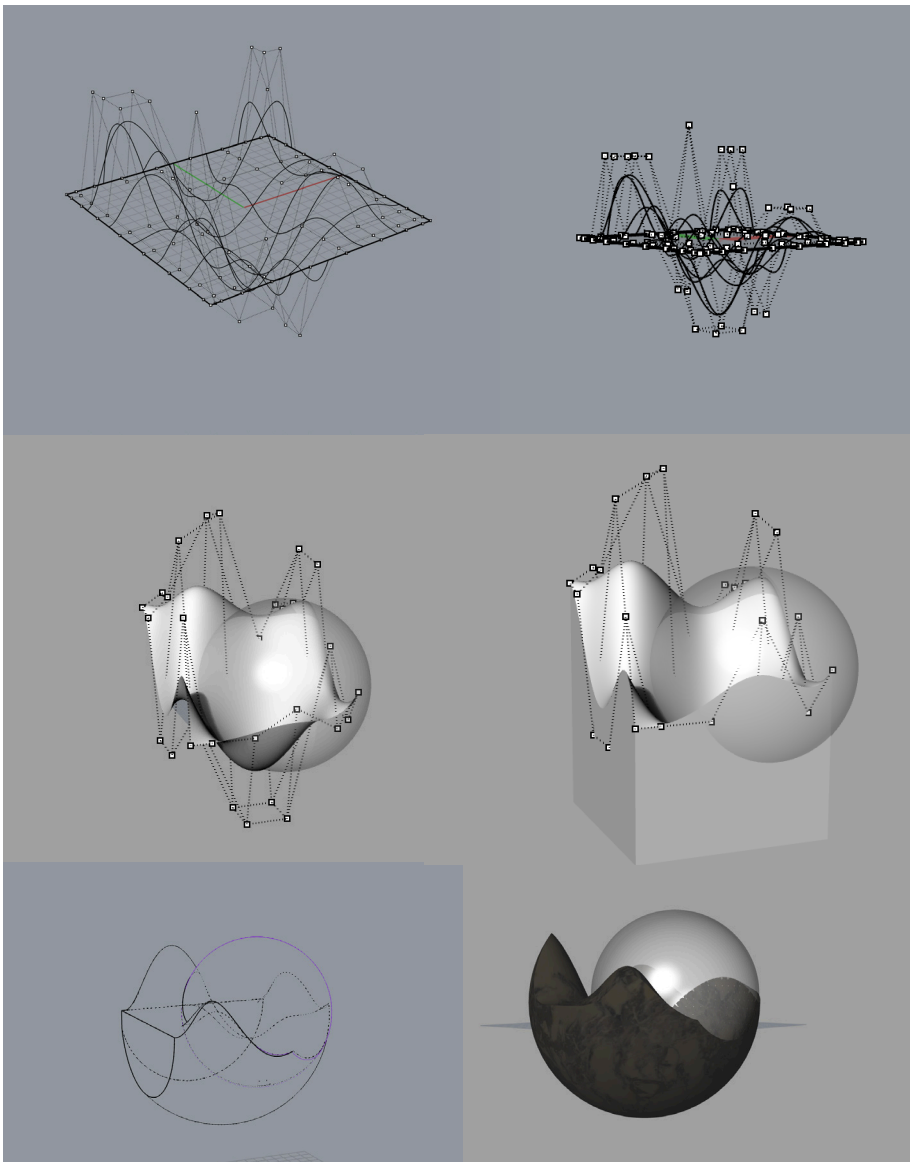
The process saw a lot of experimentation with projection. Filling a glass bulb with smoke and projecting the computer screen from the back produced shapes that would extrude with a taper through the smoke to form three-dimensional volumes. Simple shapes with coloured outlines on black backgrounds produced the most vivid effects. Initial prototypes looked into using 3D-cameras to translate movement into these shapes, as well as having the graphics react to the breath of the user.

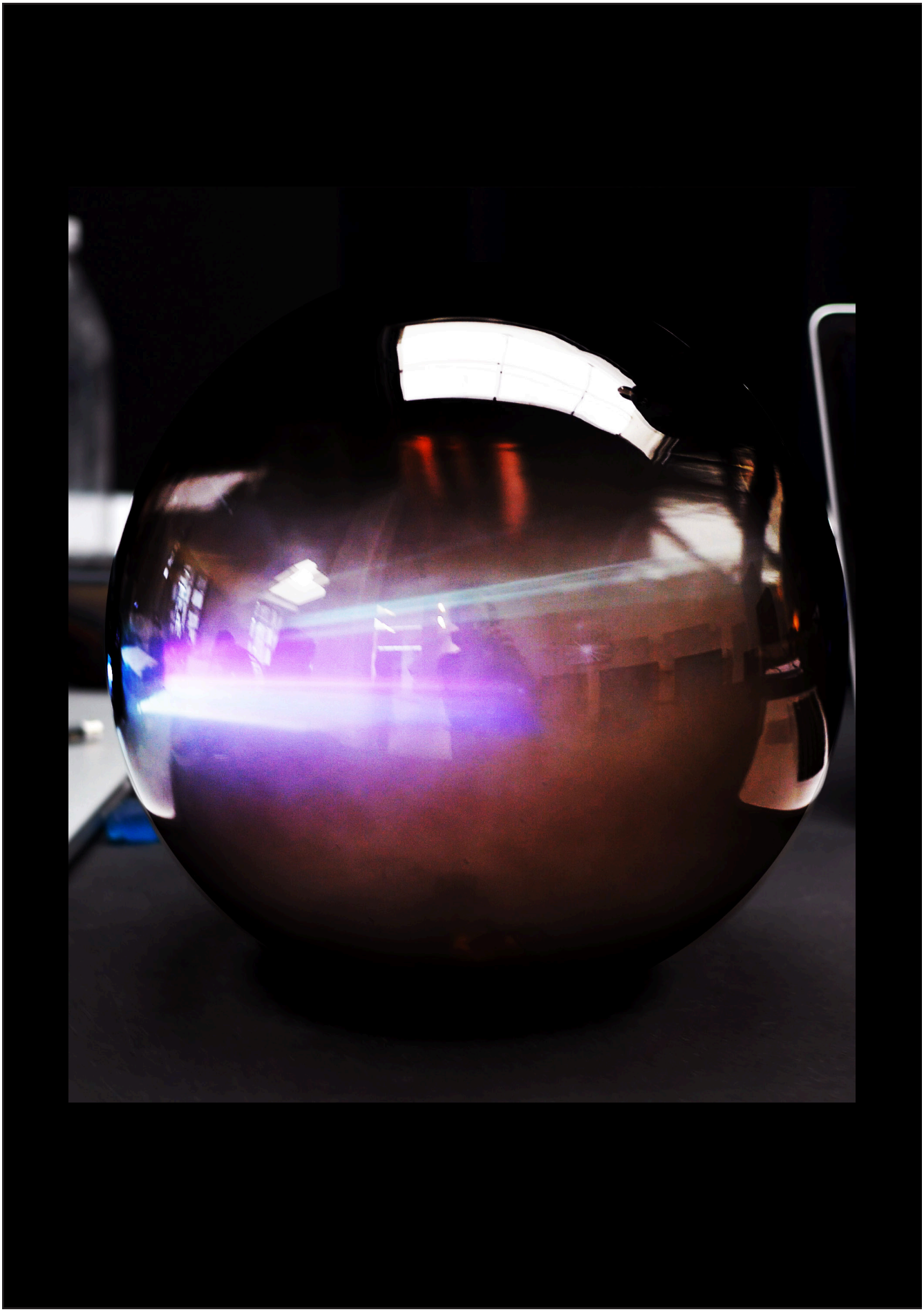
The project moved on, and it was decided that the focus would be solely on creating a connection with the breathing of the audience through smoke and light. While interesting as a visual effect, the projection bit was dropped in favour of a simpler LED-array to provide dynamic lighting. Different ways of implementing temperature as a sense modality were explored, even the thought of just having the field in front of the prototype get hotter as the interaction went along, but it was eventually dropped to focus on the breath relation.

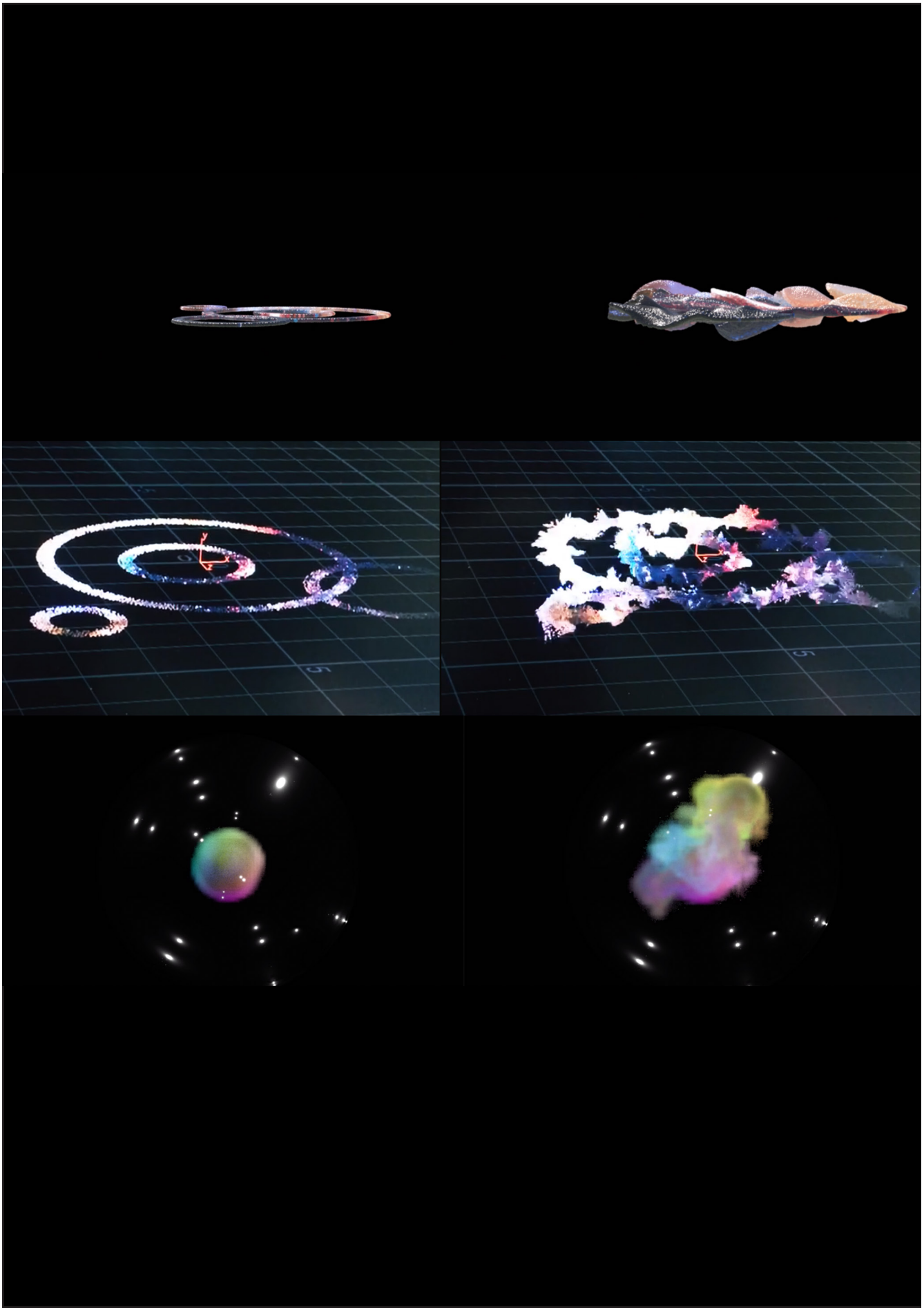
See Appendix III, Videos, for footage of the prototyping process.

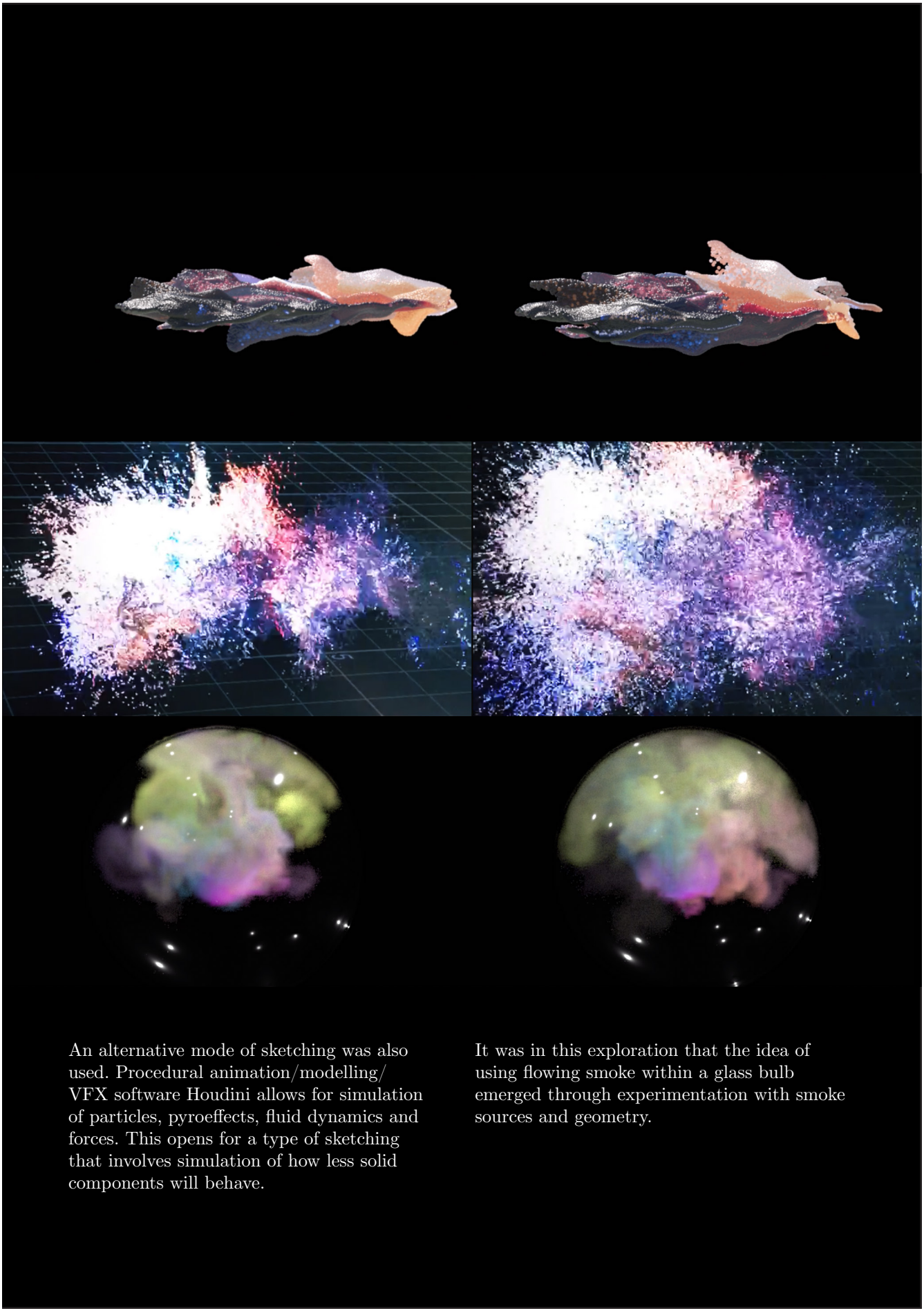



ELASTIC BAND, TWO SIDES
OR FOLD OVER
BLACK



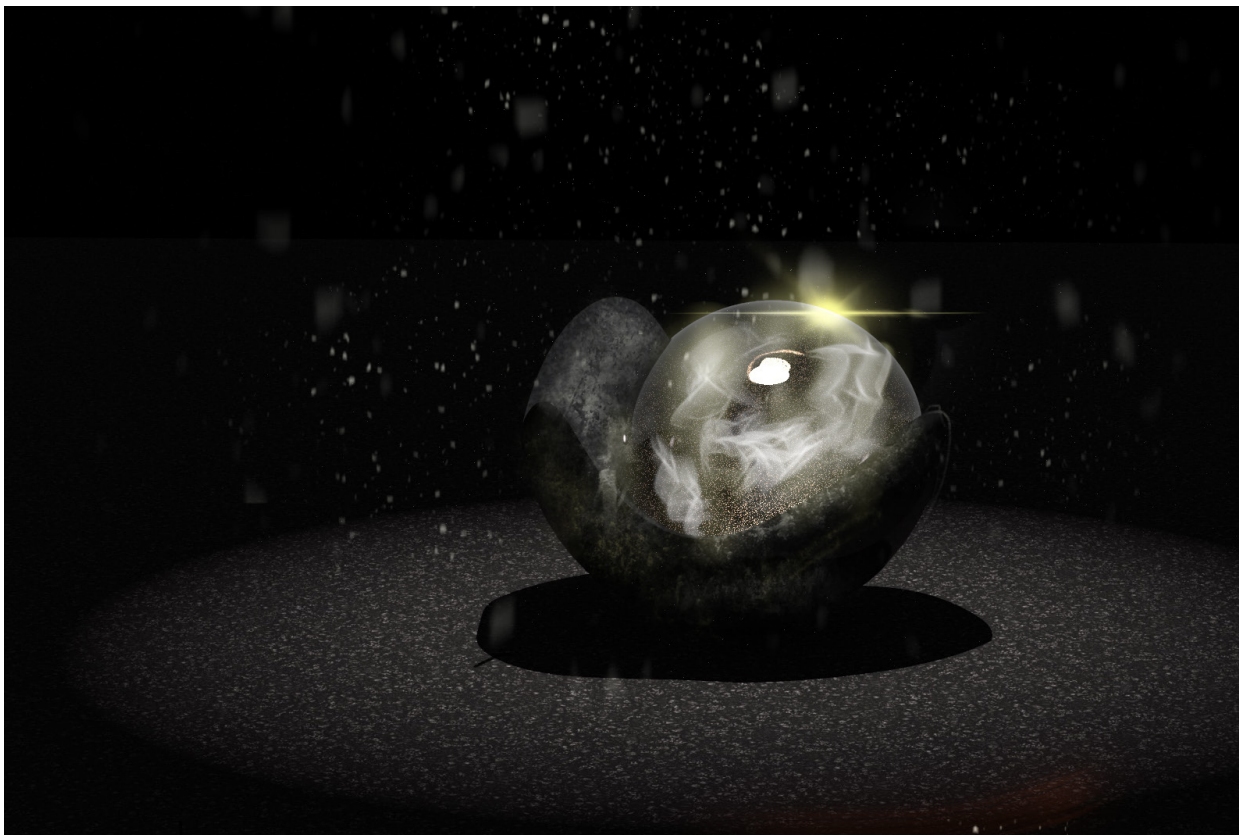


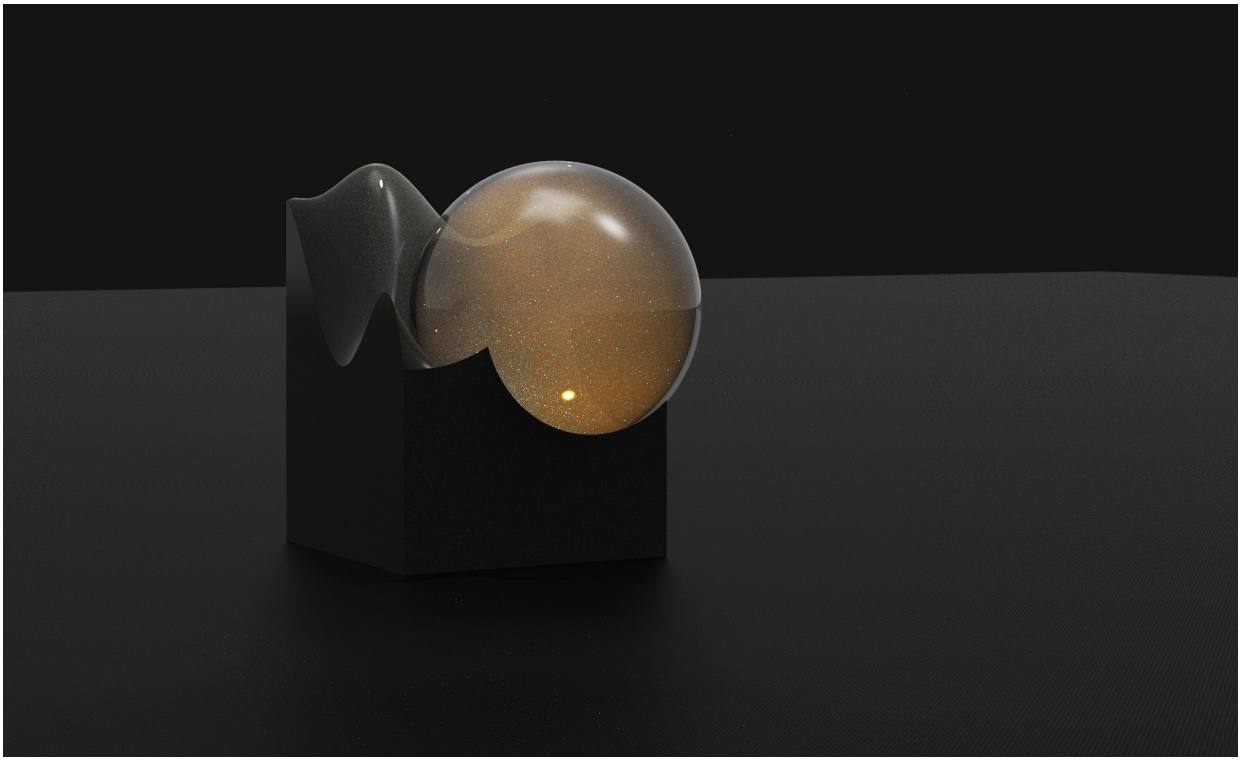


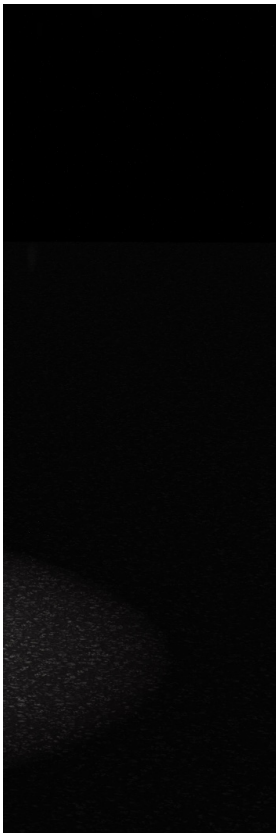


An alternative mode of sketching was also used. Procedural animation/modelling/ VFX software Houdini allows for simulation of particles, pyroeffects, fluid dynamics and forces. This opens for a type of sketching that involves simulation of how less solid components will behave.

It was in this exploration that the idea of using flowing smoke within a glass bulb emerged through experimentation with smoke sources and geometry.







Pust

Pust is the concept that was decided on. This sculpture has a base that contains the components, and a glass bulb.

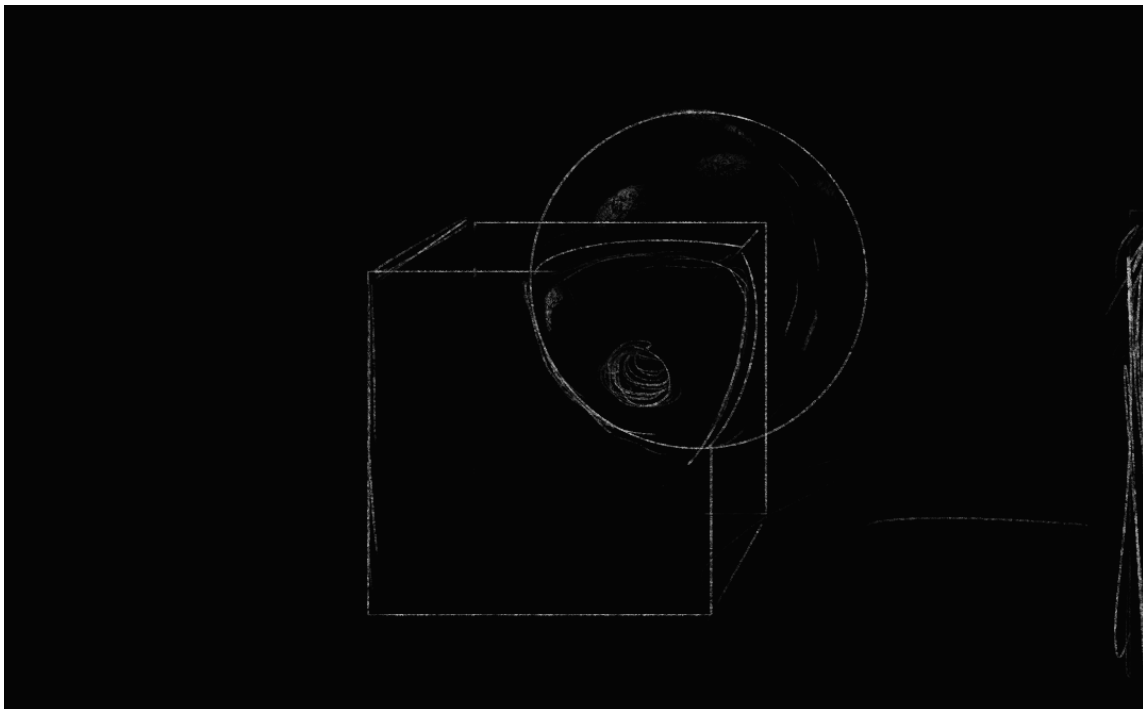
The audience interacts with the sculpture through their breath. As they breathe, the lights reflect the breathing and the bulb fills with smoke - if they stop, the bulb empties. It encourages inwards attention towards the breath.

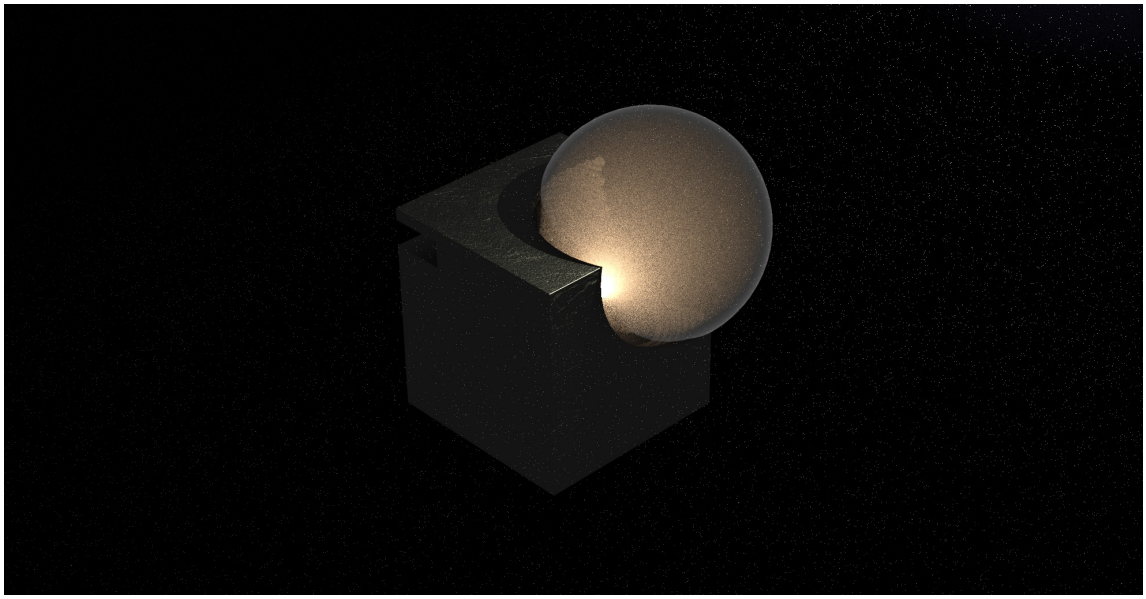
This concept addresses the theoretical background through incorporating breath as the only axis of interaction. The output of the sculpture is purely phenomenological, and tries to put biological embodiment in a technological context. It uses metaphor through physical phenomena (i.e light and smoke) and uses no literal semiotics to convey its message.

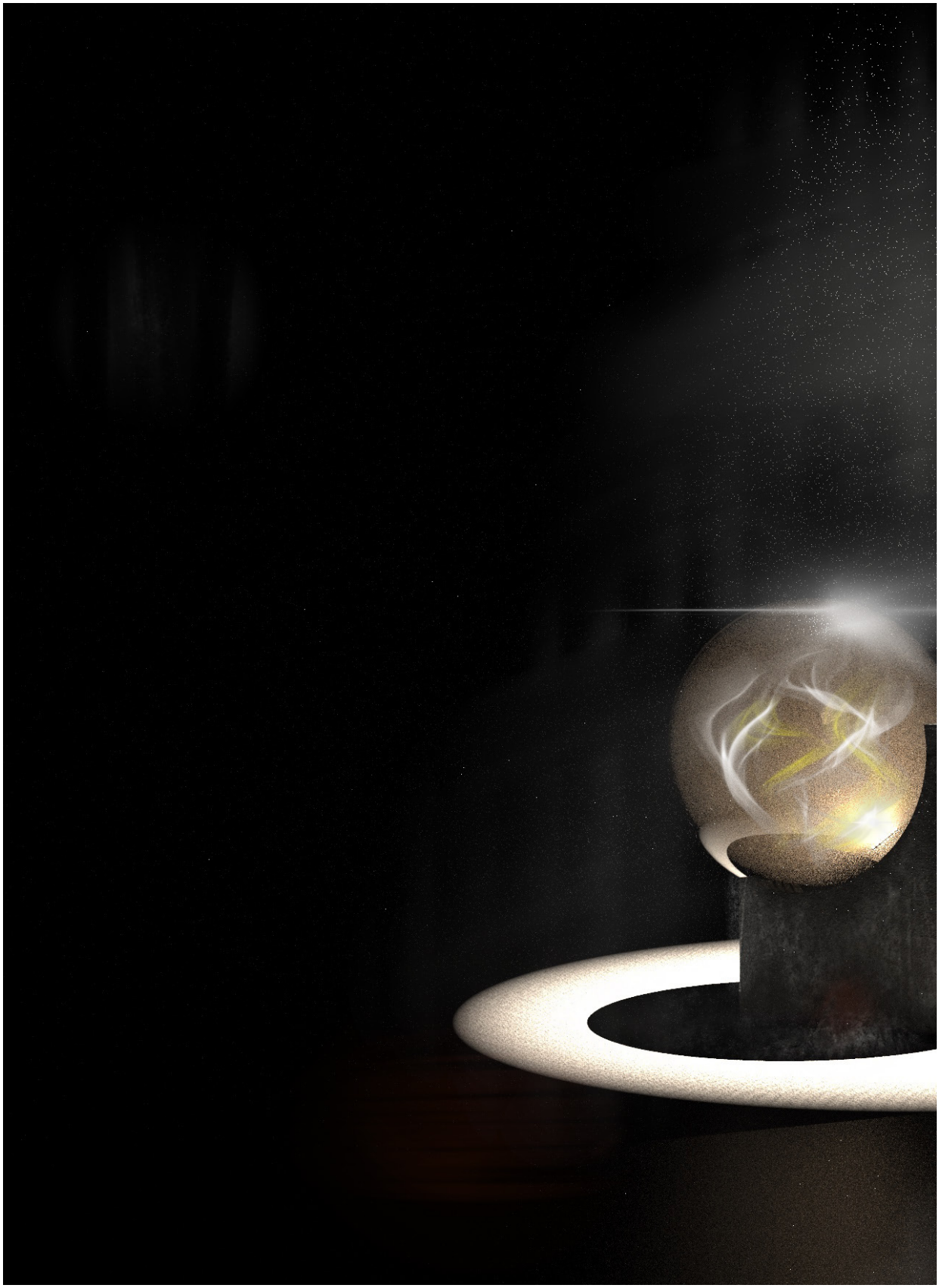
Aesthetically the sculpture mirrors the user, and attempts to make explicit the substitution of oneself into the piece. Using the sensory and motor systems to interact with it could encourage reflection on the ontology of the sculpture as well. What, in essence, is it really?

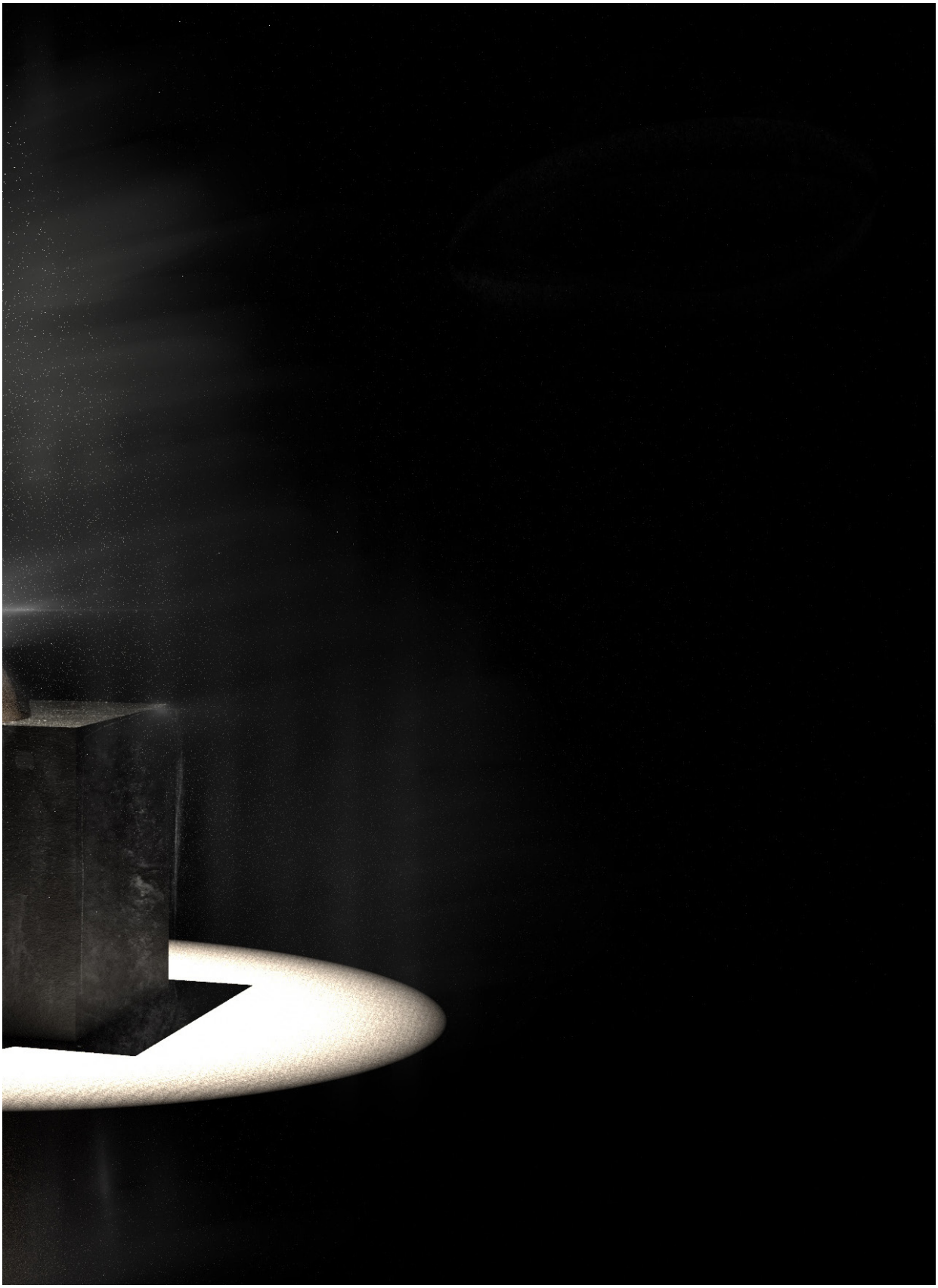
More pragmatically, the concept also tries to address the possibilities of incorporating biometrics such as breath in making HCI systems that can cater to more than just semiotic understanding. What could breath tell a system about the user's emotional state, and why don't we consider emotional states more when we design the things that surround us?

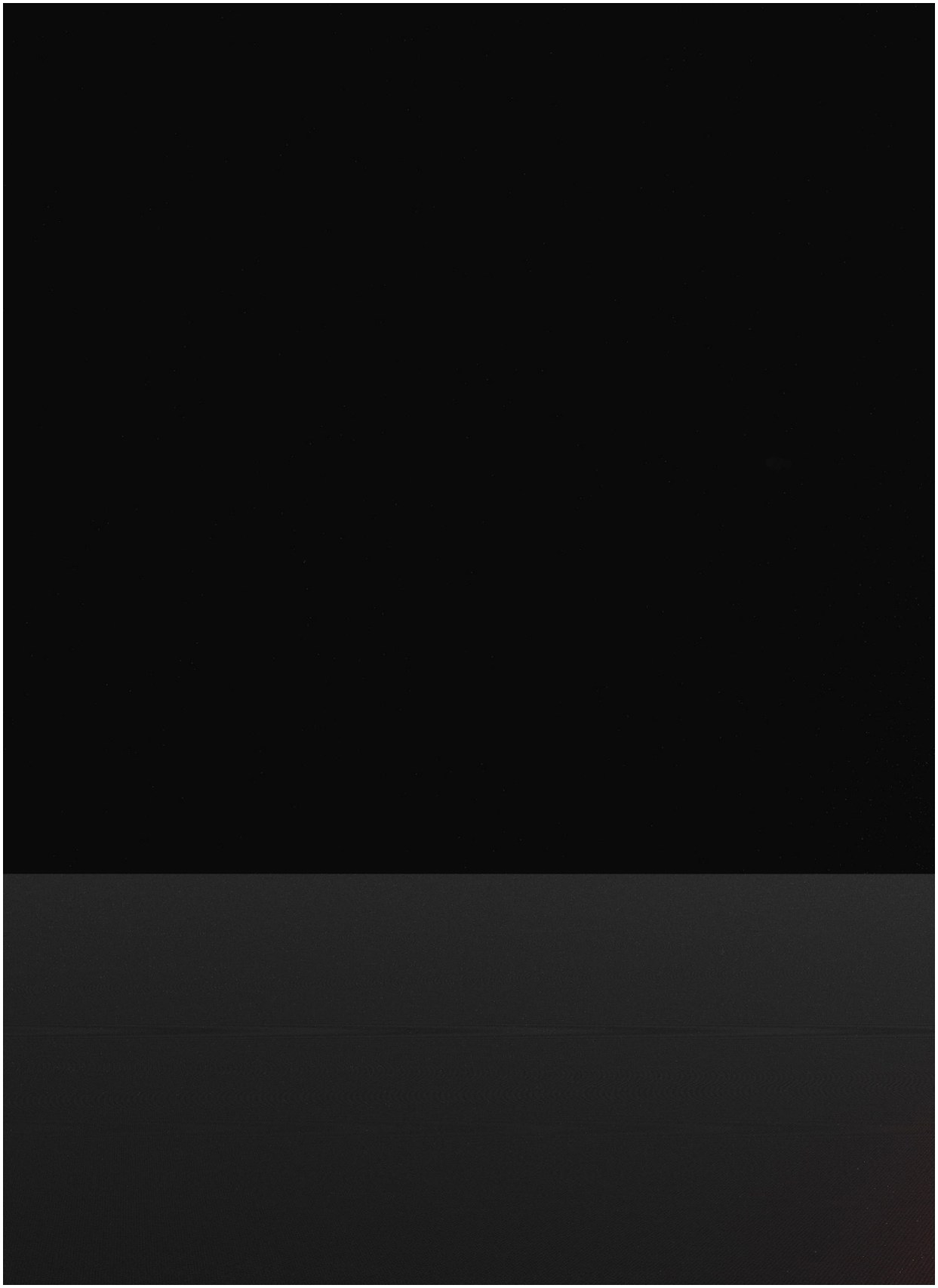
See Appendix 3, Videos, for a short film presenting the final outcome.

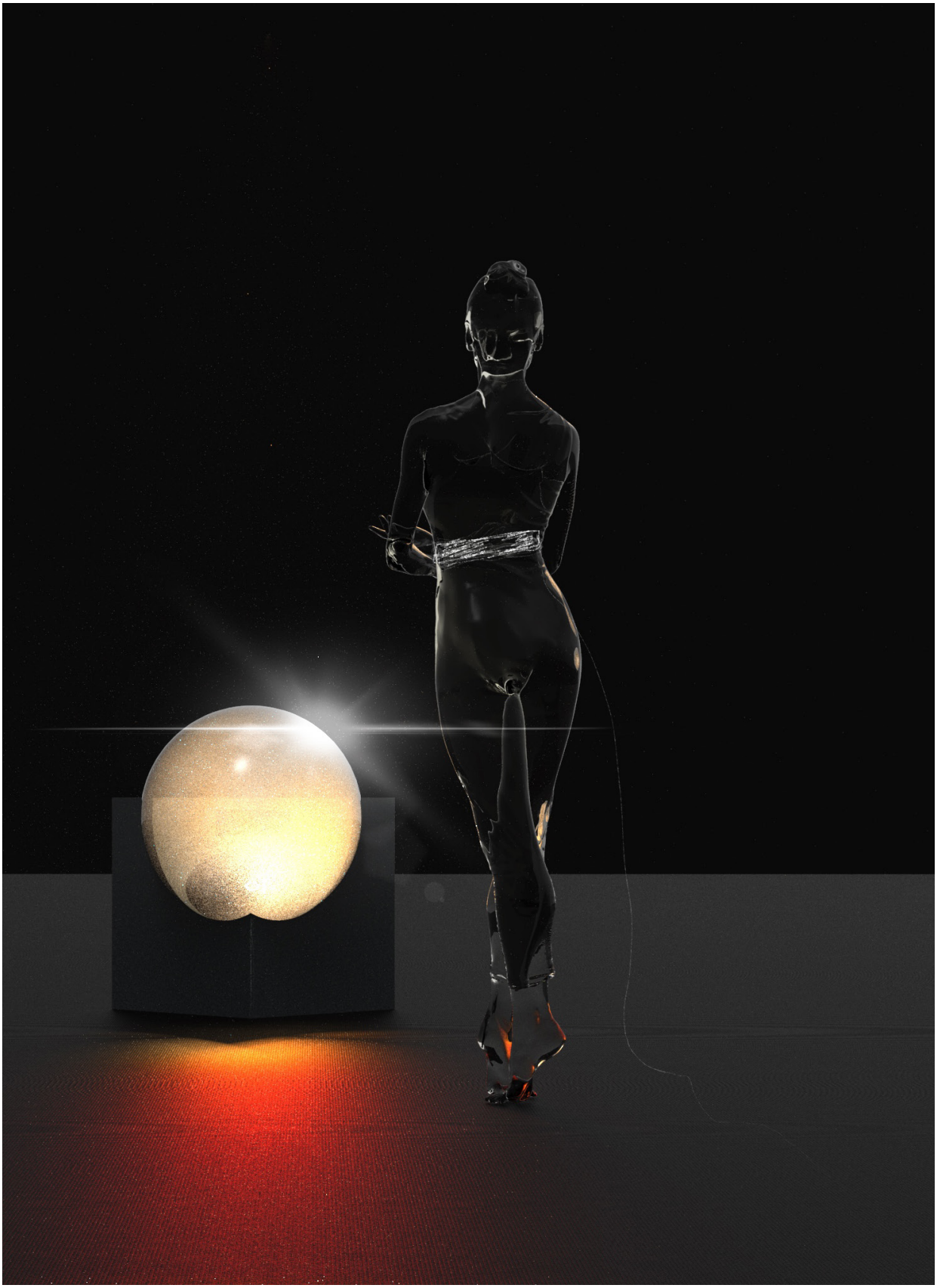












Smoke/Breath

In deciding to focus on the aesthetics of breath, and to encourage inward reflection towards it, the sculpture would embody a metaphor. The sculpture is an abstraction of the body, with the glass bulb a metaphor for the lung.

There was an intention for the audience to connect to the sculpture in a way that was intercorporal (a term borrowed from Merleau-Ponty) in the sense that it would not only remind people of their breaths, but have them experience the breathing of the sculpture as their own. This was a way of having the audience insert themselves metaphorically into the aesthetic object.

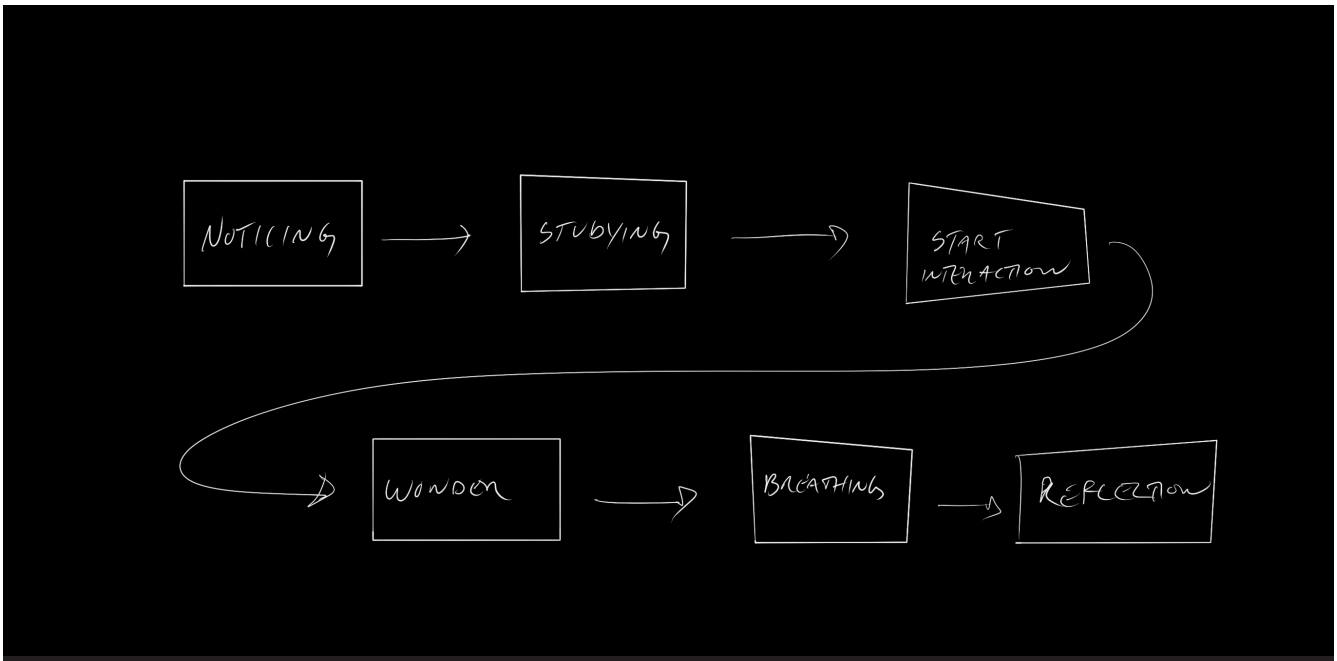
As a result of having played with smoke simulations in Houdini, smoke was chosen as the best metaphor for air. A highly visual representation of suspended particles, smoke also reacts fluidly to forces, makes interesting shapes, and scatters light. This made it perfect as an aesthetic representation not only for the air going into the body, but also for the energy it disperses within it. The smoke as breath metaphor is vastly interpretable not only mentally but also relating to its movement throughout its container.

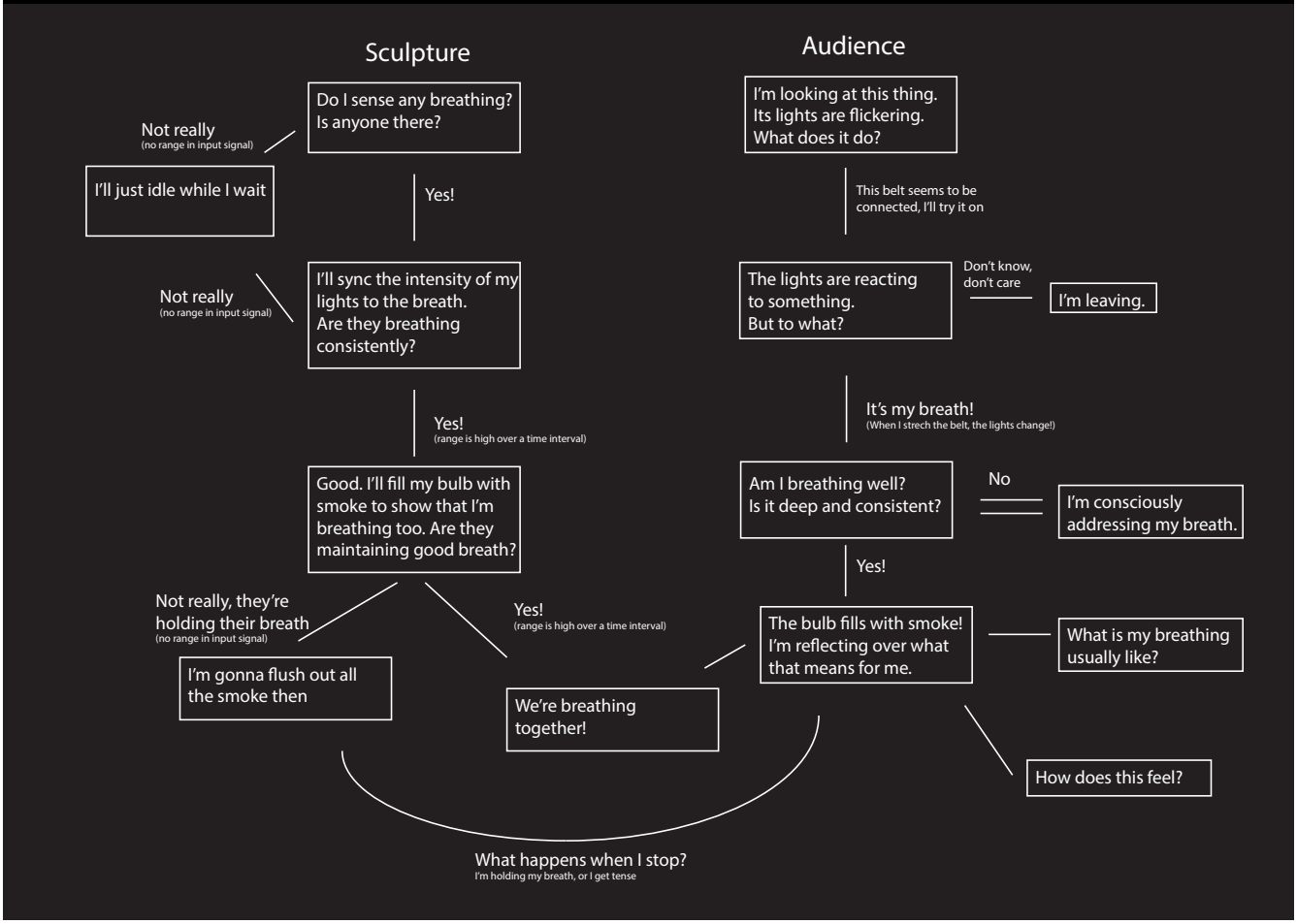
Thus, the smoke, or air given an almost solid form, would allow for inward reflection on the life-sustaining substance constantly entering, permeating, and then leaving our bodies several times a minute.

Interaction

Initially, it was hoped that the smoke could enter and exit the bulb in rhythm with the user's breath through a breath sensor. The response times of the smoke machine and pump embedded in the prototype did not allow for this. Hence, the lights dim and glow in rhythm with the breathing, while the smoke emerges as the sculpture senses that the user is breathing deeply and consistently, as a way of validating the connection. If the user tenses up and holds their breath, the pump empties the bulb of smoke.

Throughout the process, multiple angles were considered in terms of interaction. An initial desire to saturate the sculpture with features meant including different parameters to be encoded in different outputs - posture to light, rate of breath to smoke density, movement to sound etc. In the end, and through the input of Void and supervisors, it was considered wiser to focus on honing one interactional arc rather than several at once - to strip it down to just breath.


NOTICING
STUDYING
START INTERACTION
WONDER
BREATHING
REFLECTION


Sculpture
Audience
Do I sense any breathing? Is anyone there?
Not really
(no range in input signal)
I'll just idle while I wait
Yes!
I'm looking at this thing. Its lights are flickering. What does it do?
This belt seems to be connected, I'll try it on
I'll sync the intensity of my lights to the breath. Are they breathing consistently?
Not really
(no range in input signal)
The lights are reacting to something. But to what?
Don't know, don't care
I'm leaving.
Yes!
(range is high over a time interval)
It's my breath!
(When I strech the belt, the lights change!)
Good. I'll fill my bulb with smoke to show that I'm breathing too. Are they maintaining good breath?
Am I breathing well? Is it deep and consistent?
No
I'm consciously addressing my breath.
Yes!
Not really, they're holding their breath
(no range in input signal)
Yes!
(range is high over a time interval)
The bulb fills with smoke! I'm reflecting over what that means for me.
What is my breathing usually like?
I'm gonna flush out all the smoke then
We're breathing together!
How does this feel?
What happens when I stop?
I'm holding my breath, or I get tense

Construction and Composition of *Pust*

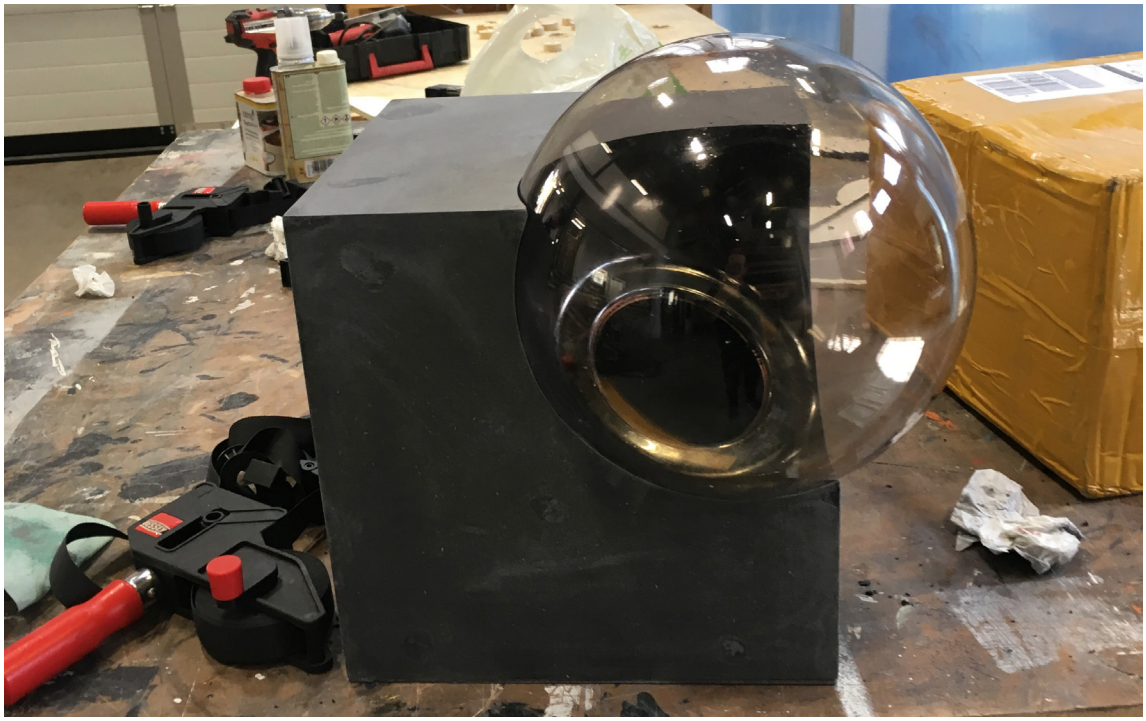
The final piece is built up out of parts that each serve a distinct purpose. Structurally, a box supports a spherical bulb in a subtracted cradle on its corner. The box is constructed out of Valchromat, a high density wood fibre material which was constructed out of plate material at Fellesverkstedet in Oslo. A 3D model informed the construction, and the sides were milled manually. After assembly, the box was oiled to darken the colour and bring out the texture. The texture is similar to black granite or concrete (a great material but ultimately dropped as an alternative due to weight and difficulty in manufacturing), and grounds the composition.

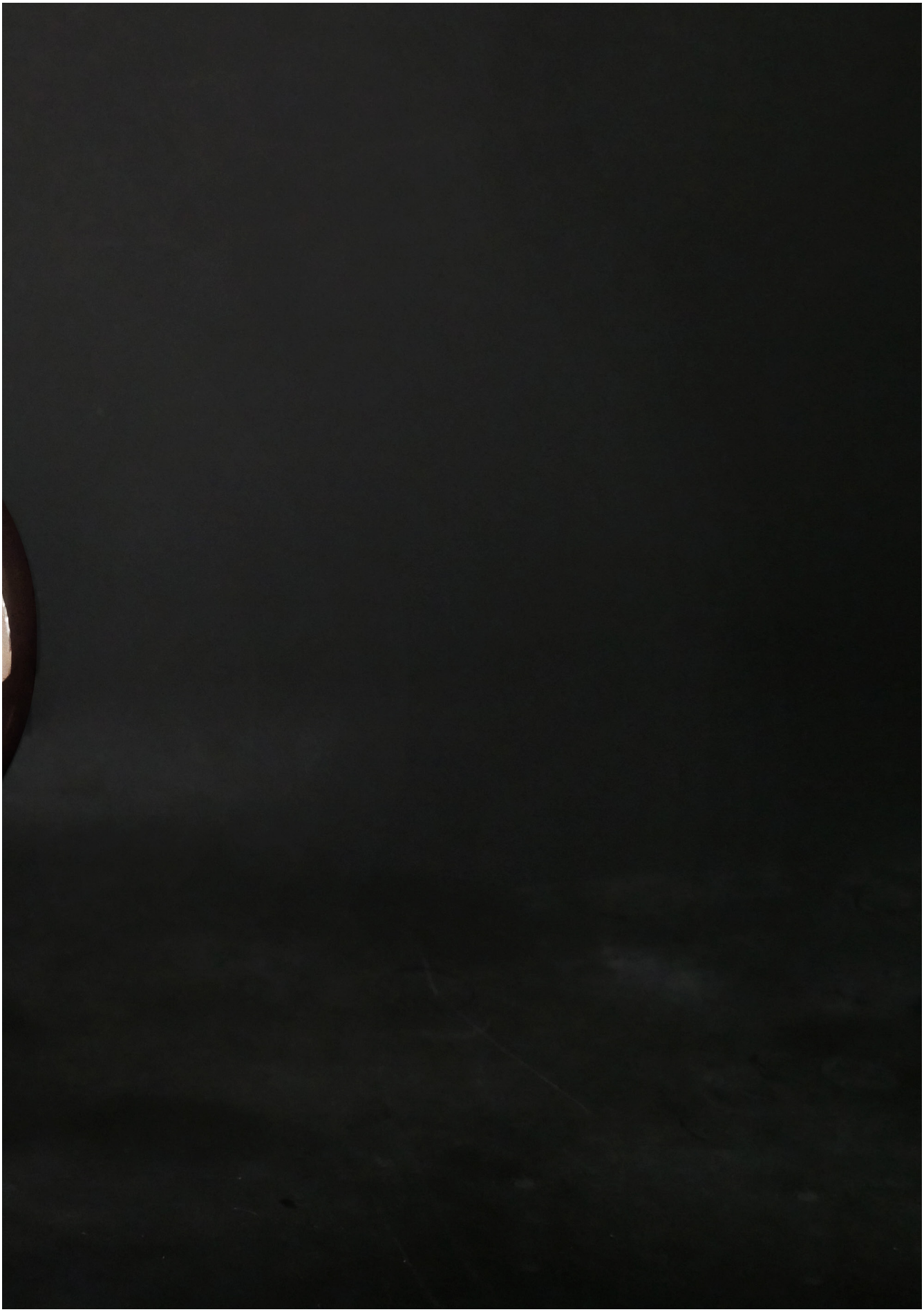
The glass bulb, harvested from a lamp, is spherical and rests in the cradle. At the base of the bulb is mounted the 3D-printed fixture for the lights, as well as hole for the tubes which deliver smoke and air respectively.
The lights are made out of three concentric Adafruit Neopixel LED Rings, covered with diffusing white acrylic. The LEDs are all programmable, and are connected to an Arduino microcontroller mounted on the backside of the fixture. Inside of the box, a 5V power supply delivers electricity to the LEDs, while a USB cable runs out through the backside from the Arduino to connect it to the central computer.

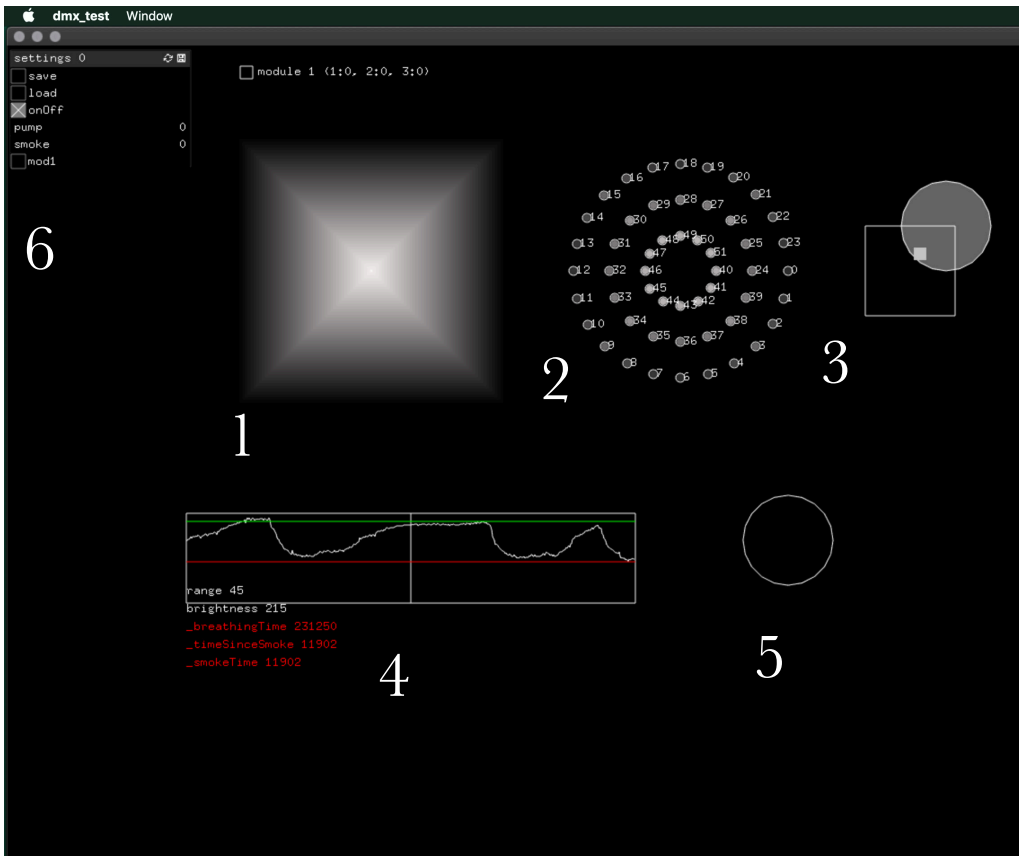
Inside of the box we find electrical outlets, whose cable runs out through the back. There is also a one-channel DMX dimmer - the DMX signal runs from the outside, and to it is connected the pump which is also mounted within the box. Built for inflating mattresses, the pump is controlled by the dimmer and delivers air through a tube to the fixture of the bulb for flushing out the smoke.
Outside of the box is the smoke machine. Initially intended to also be mounted within, it would not fit. Also controlled by DMX, it is daisy-chained with the DMX dimmer within the box. The smoke output tube runs through a hole to within the box and connects to the fixture. The input signal runs from a DMX USB interface connected to the central computer.

The computer is external and houses the software developed to run the installation. It connects the DMX USB interface, the microcontroller to control the LEDs, and the breath sensor through USB.

The breath sensor was at first intended to be the XeThru Remote Respiration sensor, made by Norwegian company Novelda. When one was tried out, it turned out to be too sensitive to movement, as it was designed for sleep monitoring. The breath sensor is therefore constructed by a stretch sensor, sewn into a belt for the user to wear. The sensor changes its electrical resistance as it expands, which is read by a microcontroller and relayed to the central computer.






dmx_test Window
settings 0
save
load
onOff
pump 0
smoke 0
mod1
module 1 (1:0, 2:0, 3:0)
6
1
2
3
4
5
range 45
brightness 215
_breathingTime 231250
_timeSinceSmoke 11902
_smokeTime 11902

Software

The software to control the sculpture was developed in openFrameworks, a visual programming suite for the C++ programming language. It's designed to perform all operations and calculations to make the sculpture possible, managing input and outputs, while also providing a control and monitoring interface for an operator.

The animation (1) is created within the software, reacting to input from the breath sensor, and mapped to the LED (2) array in the sculpture. A representation of the sculpture (3) indicates which parts are operative at any given time, and whether there is smoke present in the bulb. The graph (4) shows the curve registered by the breath sensor, as well as the dynamically calibrated maximum and minimum values. An expanding and contracting circle (5) represents the breathing in realtime. To the left of the window are controls (6) for operating the smoke machine and pump manually.

The entire code for the project can be found in Appendix II.

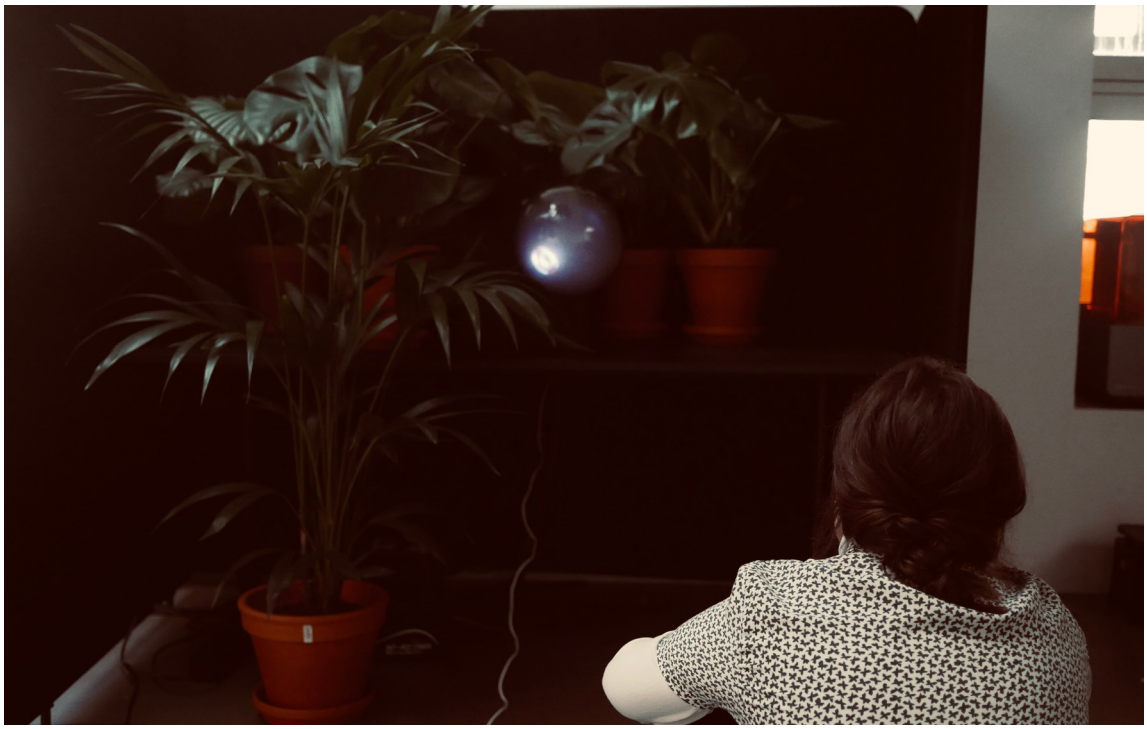
Impressions

Participants were invited to try out the prototype. They had to some degree been informed of its function, but none has properly tested it before. They were asked to relay their immediate sensations and reflections in the first person.

These impressions form part of the output of the project, in the form of experiential reflection.

“I was worried I wasn’t getting it right. It was stressing. But mostly because of my breath - It’s hard to breathe with the stomach. I’m used to testing my lungs, at the doctor’s, and I only use my chest. I felt like I had to perform. But it did make me reflect on my breath - a lot. I’ve not done that outside of worries about asthma, and I think it was because I could see it. That was neat. It was evidence that I was in fact breathing, and I might have needed that. The smoke was oxygen, the air I was breathing. Even if I was stressed, it was comforting. My breath was doing something.
The sculpture feels alive. The lights are very organic. I was shocked to find out how shallow my breath was though. I was thinking of only breathing, and nothing else, like work or anything. It was nice.”

Female, 24, Digital Marketer



"It was pretty hard in the beginning. I find it hard to… breathe. When my head is spinning as much as it has been, lately, I literally don't breathe. I couldn't get it to work at first! I had to disconnect the head to start breathing. Sitting, and sitting uncomfortably, helped, because then my head could focus on the pain. What was left was breath. I could relax, and air got to my head. It's something tangible when my mind is racing. It was nice to have something to focus on, that was "itself", and not me.
I started to think about… do you know in Harry Potter, when he has to cast the Patronus spell, and he has to channel something outside of himself? It kind of felt like that. There was less control, but more a part of me externalized. It gave kind of an emotional connection to the sculpture. When it breathes calmly, it's OK, and that's what I want for me. It's a very embodied way of embracing yourself.
I like that the smoke dissipated when I held my breath, that's when I could kind of start over, reset, and empty my head. I had that control. I'm less stressed."

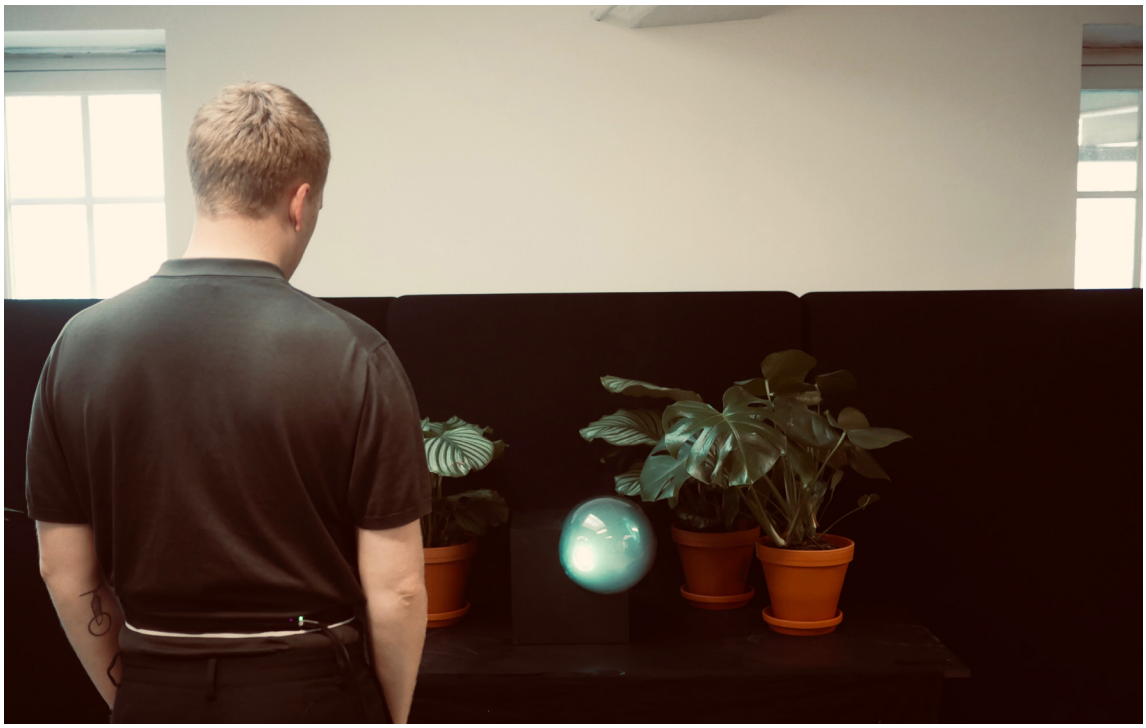
Female, 26, Radio Journalist

“I’m trying to hack it, to understand when things happen. I don’t think I’ve learned it yet. The connection is pretty direct. I’m getting a little dizzy, breathing like this. But I get dizzy from meditating as well. I’m concentrated on my breath, using the stomach, it’s not something I’m used to. I breathe with my chest when I work, and the stomach does nothing. This is the opposite.
It makes me reflect on the breath, but kind of knowing how it works makes me want to “solve” it, or break it. And I’m using the body to do that, flexing the abdominals. It’s exciting to incorporate this in an installation, but perhaps it’s too direct? In a bigger installation I guess you’d have more data points - posture, pulse, movement. I’d love for it not to be tethered, just remote sensoring.
The smoke is the most fun part - I’d love to understand it better.”

Male, 32, Architect

"You get very conscious of your breath. It's weird... it's so direct, it's breathing with me. Nice. I've never felt so... electronic. When you told me to take the belt off, for a minute I though "But I'd die!". I felt like I was getting something out of it. Yes, I was providing the stimuli for the sensor but it felt the other way around. A very strange experience, I didn't know what it would be like. It flickers a bit, like a flame, but when you're breathing evenly it evens out as well.
At one point, the smoke did something... It behaved weirdly, in a good way, but I don't know how. I like the smoke, and the way it comes and goes, but I have no conscious association with it.
I felt like I connected very fast through this mirroring of my body. Breathing like that, when you find each other's rhythm, it's an emotional connection."

Male, 34, Actor



“Fascinating. Could you scale it up, tether it to an artist onstage? It’s pretty. Who’d have thought this thing would make me think about whether I was breathing wrong. It’s neat how it feels like a strange body, because of the combination of the organic smoke and the artificial. I like the flickering of the lights. I get ideas on applicability right away.. on stage, performance, or even as breathing therapy? For singers, for instance.
I might not exhale properly, I think. I don’t have any physical ailments, so I’ve never thought about that. I just breathe. It’s not until asked to breathe properly that I reflect on that, so I guess that could be therapeutic, meditative angle to it. The focus on the breath could definitely put you in that state.
The smoke became like an externalized breath. It didn’t follow my breath, but I felt like I was filling the bulb. It was like an essence that leaked into the bulb, and if I held my breath it emptied. It was kind of my task to make sure it was filled. I felt my body influenced something outside of it.”

Male, 24, Journalist

Discussion

It seems as though the prototype is successful in its base function, which is creating an epoché to aid reflection. There are certainly things that may be improved upon, such as creating a more "believable" link of higher fidelity between Pust and the audience, removing the need for a belt sensor and not having it "punish" shallow breathing. Despite this, users report that the sculpture, if nothing else, has them breathing consciously, and when asked for impressions about their bodily feelings they've been facilitated.

The sculpture, however, does not do "more" outside of creating this epoché in terms of a classical value-proposition. It does not comment on the quality of breathing, nor does it propose a breathing-exercise regiment for the audience. That is deliberate, as the experiment was never designed to be normative.

Furthermore, the success of the sculpture in putting a bodily phenomenon like breath in this juxtaposition brings to the discussion of embodiment in interaction an example of an interactive axis that holds aesthetic value. By connecting the bodies of the audience with the aesthetic outcome, they have an emotional investment in the sculpture. The enactment of their intent as they explore the limits of this connection has to be embodied, and the controls are simple enough that they are able to do so.

This project built on a consideration of the body as locus of perception and conception. What we'll argue next is that many highly successful products already do this, consciously or not. Consider the extreme attention to balance of weight and materiality in the design of Apple products. These are not considerations of literal, abstract judgment of quality but rather of the "feel" of the product as it is handled. It is what separates great gardening tools from bad ones, and what might make "ergonomically" designed products fail miserably.

Donald Norman (2007) explores this in his work on emotional design, which has been very well received even in traditional UI/UX fields. What we have been exploring in this thesis is emotional design on a visceral level, and it has shown that, if not enhancing the felt aesthetic experience, the direct engagement with the breath of the user certainly influences it. That does not exclude the possibility that the sculpture may elicit emotional responses on the behavioural or even reflective level.

If we did manage to facilitate a higher bodily awareness, Shusterman (2007) argues the health benefits of this. He even proposes somaesthetic practice as a remedy against a number of modern ailments, particularly in mental health. Numerous studies seem to confirm this, and even more connect physical health intrinsically with mental health. More to the point, conscious and willful breathing in particular has also been connected to a number of health benefits, physical and mental as summarized by Owen in an essay called Do Hold Your Breath (2019).

From the purely physiological to the spiritual, breath seems to be nothing but trivial, something which has been pointed out by spirituals from every corner of the world throughout time. As mentioned in the essay, conscious breath may be a trend, and its effects or significance can be exaggerated and misunderstood, but it is after all what gives us and sustains life.

Lastly, while barely scratching the surface of the possibilities of incorporating the body in digitalism, this examples falls in line with recent projects that do this. This is challenging some of the traditional paradigms in HCI, and also in cognitive theory and neuroscience, and this development can change how we shape digital systems and artificial intelligence. The article The Cul-de-Sac of The Computational Metaphor (2019) discusses the limits of considering the mind as a computer, comparing it to findings in biology and neuroscience. Embellishing cognitive theory with alternative considerations of the body and how it adapts to the environment in how we design future digital systems can push the development in unexpected, more natural directions.

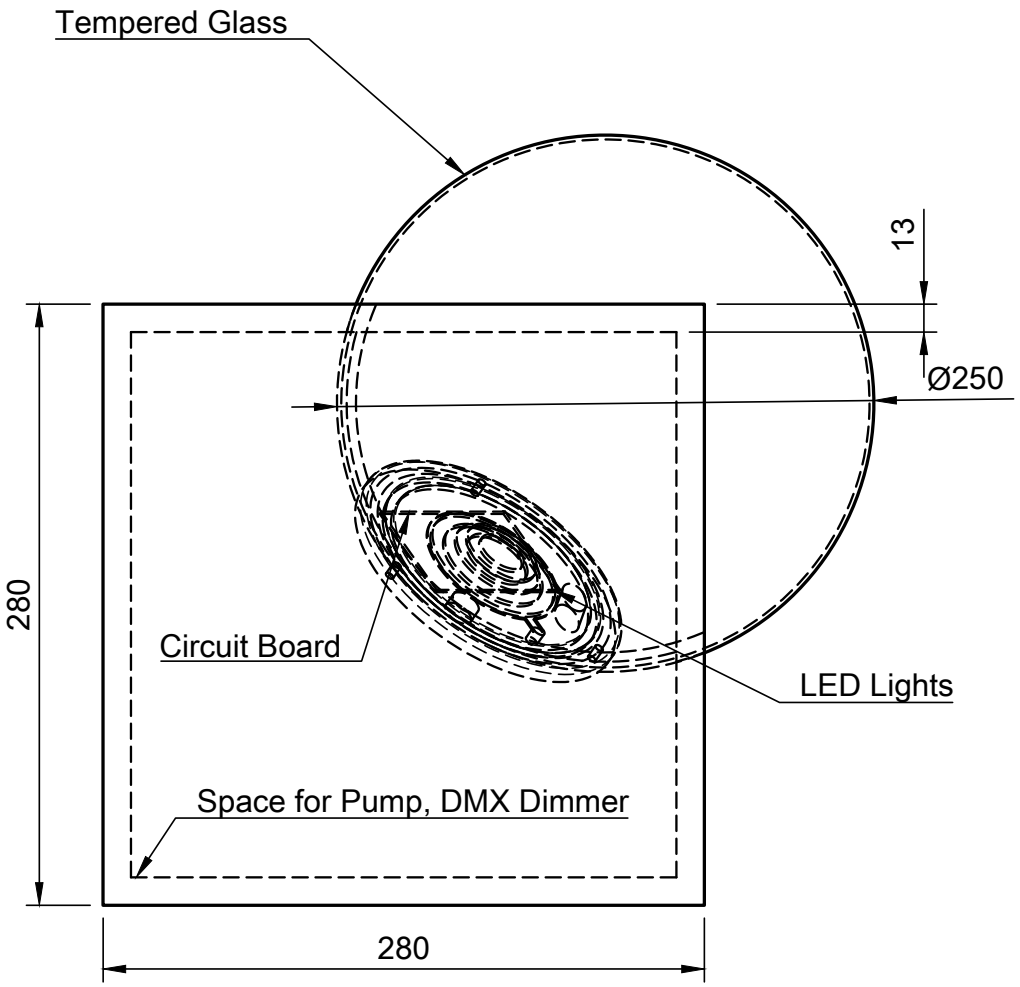
The real world has a much more analog aspect and is also much less tractable [than the digital]. So, taking information from the real world and putting it into a machine through learning may lead to structures that are much more complex and intractable than things that are programmed.
(Wilzchek in Brooks, 2019)

Conclusion

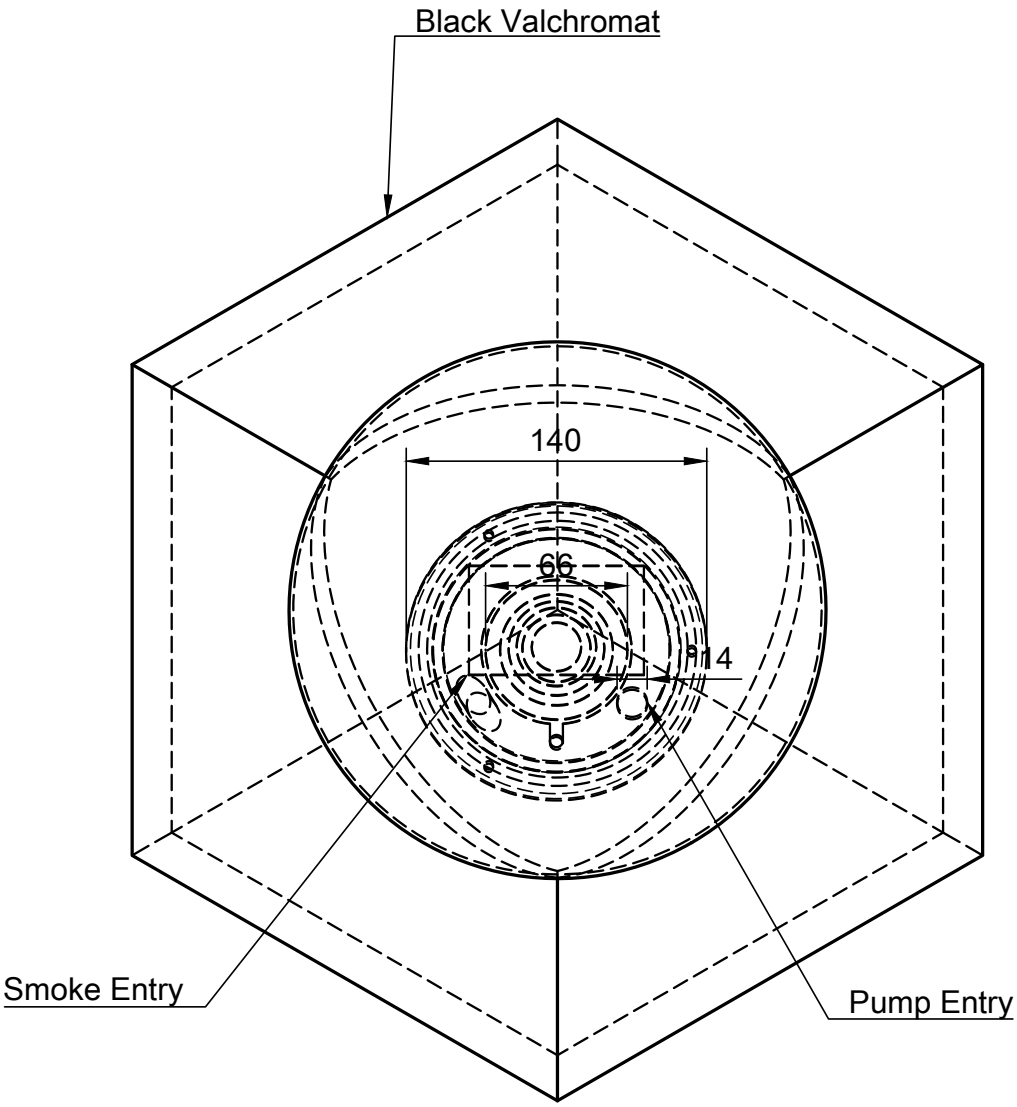
In the realm of designing for interactive aesthetic experience, the traditional approach of using a computational model of the mind in interaction design is thought to be lacking in eliciting successful effects. The theories of several thinkers, from philosophers to linguists, were consulted to established different paradigms for design that consciously considered both reasoning and aesthetics as embodied phenomenons.

A phenomenological framework was proposed for designing artefacts that would explore this approach in a new way. Creative professionals and performers were interviewed to get an impression on how the body can be used in creative work. Following a model of soma, or body, design, the student approached several bodily awareness practices to use the experience in the design of an interactive sculpture.

This informed the design of *Pust*, an interactive sculpture that encourages bodily awareness of the breath using smoke as a metaphor. Testing the intervention revealed that the sculpture created a distinct aesthetic experience through the sensation of this explicit interconnection with the bodies of its audience.



Pust Prototype
All measurements in mm


Black Valchromat
140
66
ø14
Smoke Entry
Pump Entry

Epilogue: Design, Art, Philosophy

Let's acknowledge right away that there was no time left for developing and documenting proper industrial production of the sculpture or promotion in this thesis as stated in the assignment. But we might take the time at the end to briefly consider how the design work has been conducted in this project with regards to two other fields that have been very impactful on the process - art and philosophy.

How is "designing interactive aesthetic experiences" different from making art installations? We know that design research is very indebted to scientific research and methodologies from the social and humane sciences, but what can it learn from the field of art? As to the difference, between art and design, a lot of thinkers, artists and designers have voiced their opinion. Some cite art's role as provocateur, and design's role as problem-solver. Ståle Stenslie, in the aforementioned interview, maintains that design is reusable while art is more localized in space and time. The work of the designer is also not bound by the art world's constant demand for originality and innovation. That is not to say that design cannot be art or the other way around.

Koskinen (2008) explores design research through its practice and categorizes it in three realms according to the methodology it utilizes. In Lab, research follows the guidelines of experimental science. In Field, research uses the methodology of social sciences and ethnography. In the last realm, Gallery, design is put in gallery spaces to elicit responses much as art is.

The mode of evaluation in this project is certainly closer to the Gallery approach that the other two, and deliberately so. Embodied, aesthetically oriented design projects may blur the lines between design and art partly because of its measure of success lying in the experience. This project, even after the delivery of this report, will have its continued evaluation when (and if) exhibited and tried by future audiences the student has no control over. Koskinen argues that this is a valid form of design research.

Considered as a format for knowledge dissemination (in a wide sense of the word), curated exhibitions in particular fill a function rather similar to that of a research paper, since the work has to be invited and accepted. However, this format typically encourages a high-quality finish of the objects and exhibition rather than the theoretical thinking, which is the central function of most written reports. However, the primary purpose of an exhibition is to enable experience, not only reflection. There is a profound difference between going through a result in an exhibition and reading an art historian's or an art critic's analytic interpretation of what was going on in the exhibition.

[...]

For design research, Gallery is an important approach in that it puts design into the middle of design research, not Lab's theory or Field's community. [...] Gallery is not after scientific legitimacy, but its development primarily owes to a willingness to situate design research into new institutions. For us, the most important thing in Gallery is that designers increasingly get into domains and issues previously explored by research-based design research programs." (Koskinen, 2008)

Lastly, this thesis is very indebted to the thoughts of philosophers who started to think differently about the mind, the body and objects. What place does philosophy hold in design? How does it shape it, and do designers have to be mindful of that?

Luckily there is a field devoted to these questions. Philosophy of Design, according to Per Galle (2007), is "whatever philosophers of design do, or could reasonably do". This, we might assume, is thinking about design, what separates design from other fields, what is the ontological connection between design and artefact etc. They are both philosophers and designers, and many philosophers have discussed issues of design at length, like Heidegger or Baudrillard.

The field poses that there are insights about design that may be obtained through reasoning and reflection rather than empirical observation. In this case, it's argued, with the help of a few philosophers, that insight about design may be obtained through embodied reflection.

Philosophy of Design is useful inasmuch as designers desire to know more about their profession and its consequences. It reaches for an understanding of design, not just knowledge on how to perform it. There is no direct evidence of a correlation between this understanding and the quality of the designs produced by those who claim to understand, but it does provide a toolkit for discussing it. The world is so reliant on technology, and very much feeling the ramifications of how it is designed, from social media, to social structures, food production, transportation and waste management. A philosophical mindset can aid responsible designers in taking a critical stance to the designs they unleash upon the world, the people and their bodies.

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p. 133: Smooch Baby Face, 1987, by Harold Feinstein. Courtesy of Harold Feinstein Trust and Carrie Scott

All other images and graphics by the student.

Appendix I: Interviews

Interview with Bjørn Gunnar Staal, Designer at Void

Conducted May 28th 2019 at Sørenga Badstuflåte, Oslo,

TB: "Constructing bridges across the void that separates our virtual lives from real experiences." That's the tagline from Void's website. What constitutes this void to you?

BGS: That's a hard question. The background for that formulation, when we originally wrote it, was a little more naïve, with regards to how the digital sphere and people working within it were very oriented towards typical digital interfaces. The closest you got to tactility was through a touch screen, they were at best skeumorphic and imitating of analogue interfaces. We wanted to turn that on its head. Technology was to be more of a tool that we combined with more analogue media such as light, smoke, water, motors... Things that have a physical presence. And then we started putting interaction into that. Like with the first big installation I worked on, before Void, Breaking the Surface for Lundin, I experienced that something on a big scale interacting directly with your presence gave me the impression that there is great potential in giving people experiences that blur the lines between what we call digital experience and physical experience. That's what we're after, for technology to take the backseat to the experience. To explore what it means for a human to experience what we've designed.

TB: What place do you think this has in the digital future of people?

BGS: I think it'll matter more and more, not as much perhaps in the arts-oriented cultural sphere, but even more in how technology to a greater and greater extent permeates life in a non-intrusive way. There is a lot of focus on what screen time does to how we interact with each other, and we see a backlash in people deleting Facebook and how Apple itself has introduced screen time monitoring to curb this kind of addiction. It's something that takes us out of our environment, out of the moment, and puts us in a more symbol-heavy world, so we live even more in our heads with the screen as an interface to other people.
I really love the movie Her (Spike Jonze, 2013). We really see a cultural shift there - the interior palette includes more wood, it recalls the 70's and a time where craft and a feeling of being in touch with the environment was more important, and technology is more like a person that you talk to through an earpiece, so that your senses are free to interact with the world around you. It's a seamless transition between digital interfaces and reality.

I'd say Void has an intuitive way of approaching these issues rather than a systematic one. It's more of a process where we try, within the frame given by a client, to make something that touches other people on one level or another. I think we're blindly feeling our way forward, and that's the joy of running your own thing. We started Void to avoid being too rigid, both in turns of

what we would do at any given time and the media we turn to to achieve something. It's a liquid, organic process where it's driven by the interests of the people working there.

It started with a thought, about 10 years ago, between me and Per Kristian (Stoveland) when we were working together. We worked with digital magazines, and were interested in exploring interactive media. We saw the silhouette of a community growing around openFrameworks. We saw artists, designers, programmers coming together to make things that broke out of the screen to make interactive experiences, lights reacting to movement. I remember a piece with a pair of glasses, on which was mounted a Playstation Eye-camera, that tracked the eye movements of a graffiti artist who had Lou Gherig's Disease. His buddies made a device that enabled him to make graffiti, walking around the city with a projector so he could graffiti onto the buildings from where he was laying. I felt that there was this great potential for making an impact on people's lives. I noticed how the internet at that point was more oriented towards more conformative interactive stuff, and I felt that the proper arena for exploration would be installations. So me and Per Kristian talked about doing that at one point.
So when I'd finished the installation for Lundin, I'd quit my job, and Per Kristian was ready to do the same. I'd also met Joakim, who was introduced to me by a robotics engineer. He had a wish from an architectural standpoint to work with this subject matter. It started with the thought of being a collective of freelancers, but in the process of finding solutions we took a chance at establishing a company.

TB: What is your philosophy when it comes to aesthetics?

BGS: Aesthetic plays a big part, and it's something that can be challenge to explain and even defend. Norwegian design culture right now focuses a lot on everything having to be able to be explained from a rational point of view. Service design is emerging, and it's informing clients that "what we contribute, will lead directly to profit for your company". That's hard for us to promise, but I adamantly try to defend that aesthetics is something that has more to do with life quality rather than something you can translate into money. It's like culture, so I'd like what we do to be considered like music, theatre, art, opera. Design can also be culture. We always want the aesthetic experience to be of high quality, and I think we as individuals always try to design things that we experience as pleasing. It's an intuitive process I think.

TB: Would you say that Void has a conscious attitude towards embodiment in your projects?

BGS: No, actually, I wouldn't say that. We might have gotten that effect, surely, but it might not have been conscious from our perspective. I find that interesting with your project [Pust] working with us, that it's also made us aware of it. In hindsight I might reflect on the fact that the projects that I've enjoyed the most has been those that involve both music and visuals in a concert context where the combination of 1) immersive audio that correlates directly with what happens visually, and 2) the visuals having spatiality, it gives a very embodied feeling. When you cater to more sense modalities at the same time, and they correlate, it gives a feeling of immersion, being in the experience rather than just observing it. It's something I want to explore going forward, using these multiple sensory modalities. Tactile stuff, which in general is poorly explored. Temperature could be interesting, rapid changes in temperature to supplement the visual. The challenge, that you might have experienced in your project, is the technology not responding quickly enough or with the desired resolution.

TB: Do think that it is just now, or not yet, that technology is getting "good enough" to

enter the real world?

BGS: Yes, and I actually feel there is a lot of innovation to be done and that there is a lot of focus on the screens. VR and AR are the next frontier, but it's very oriented towards the graphic. The gaming industry drives a lot of that technology, pushing graphic cards ever further. In terms of VR, minimizing latency is essential as high latency really distorts the immersion.
In other arenas, such as industrial automation, there is development that might be harder for us to follow. That's where the potential is for picking up new pieces of technology that we can use to make new types of installations.
I was at the Hannover Convention, and the amount of stuff was staggering and of really high quality as it was for industrial use. But people don't necessarily have access to that. Robotics, for instance.

TB: What are the biggest challenges in making installations of this kind?

BGS: What I experience is that you have to be very explicit. It has to be like theatre make-up, it has to be exaggerated, so that you experience that your actions or presence has an actual effect. I think a lot of people might on paper design a lot of reactive elements, and you end up working along different axes at the same time, and in the end just confuse your audience. Being simple and explicit, and use more tools to achieve just one effect might be what is the most interesting. Simple principles that facilitate exploration is a nice effect, you get people behaving like children, walking around, shouting, testing different stuff, exploring everything your design does.
If you have designed the whole experience as a narrative, people might experience going through just that narrative and then they walk away.

TB: They've "solved" it?

BGS: Exactly. That's what's nice with prototyping, and testing along the way on different types of people, you'll find that the most interesting thing about your design might not be what you intended, and you can use that information to highlight what in the end gives the best effect.

TB: What is the market like for this kind of business?

BGS: I'd say response has been surprisingly good, I wouldn't have known that there would be this kind of interest. But it's been hard, it's a market that hardly existed before we entered it. It's been a challenge convincing people that this is in fact interesting, and it's precisely the cost-value perspective that is hard to argue. We try to avoid it, because if the project is driven by trying to up the bottom line of the client, I think you end up making stuff that doesn't have the desired effect. The type of client we work best with are emotionally engaged, a little childish, and just want to make something fantastic.
In a commercial context, there is a potential for strengthening brands with these installations. A good brand, I think, is like a good person. It has to do with giving back and being generous. Some of the big brands, like Nike and Adidas, have always played with their brands like this. Obviously they've tried to make money, but the culture you feel has always played with the expression, making stuff for fun. It becomes a cultural phenomenon and not just a product that you make. I think Norwegian brands have a lot to learn from this.

[...]

Interview with Fredrik Høyer, Poet, Actor and Performer

conducted February 10th 2019 at Postkontoret, Oslo.

FH: [New Age thinkers,] I experience them as a periphery, outside the paradigm. And if you look back through history, development rarely, if ever, happens within the reigning paradigm. I experience that those who have thoughts about auras, bioenergetic, dreams... I find it exciting, not because it's verifiable, but because there is a friction between what is and what might be.

TB: That's what inspired part of this as well, how the established scientific rationalist paradigm might fail to explain the bodily sensations apart from their physical constituents.

FH: It's obvious to anyone who has in the least experimented with meditation, that the mind can be trained. Once you try, you see the connection between mind and body. I've felt it a lot getting massages! I was once in India, in the same place for two weeks, getting the same massage every day. And every time they would hit my right bicep, it released the same emotional response: I got sad. I was never the same emotionally going in, but it would happen every time.
That's my view of the body, outside of using grounding techniques in my performances - You cannot have a cartesian dualism, because there is not a one-to-one relationship. The body has grown like a tree throughout life, developing grain, while the mind processes more like a computer. You'll see it in different bodies as well - different postures, being in touch with your muscles, it's something to be used in theatre for example. Standing upright you seem confident. Our thoughts and minds are reflections of our bodies rather than the other way around.
You'll see it in nervous artists, how they strain their legs like horses, locking their knees. For me in my writing, which is about looking inwards, all my stories and characters are located in the body as I've lived a long life - 31 years times 365 days times 24 hours. It's an

infinite process to look inwards towards. It's been very releasing in terms of writing. It's like meditation - listening to what is.

TB: And is it like mental visual or literal images or about the bodily dispositions and sensations?

FH: There are memories in the muscles. It's not a machine driven by a main computer. It's not a mecha, a Zord or a Mega-Zord. It's no mecha-Godzilla.
We live a lot in our heads. We'd live in a better society were we more present in our bodies. We'd be more in touch with our feelings. I experience that in intellectual society today we tend to speak of feelings as secondary to thoughts, and irrational, and that mental clarity is separated from your emotional life, and at best despite of it. I see emotions as a form of knowledge. There is wisdom in feeling - there's been a process of evolution that is not discounted, the instinctual responses are not for nothing and are a source of affirmation.

TB: That might be just as wrong, though, as normal thought?

FH: If thought is not just a refinement of the feeling. A review, for instance, is just putting words to a bodily feeling. For me, it's about unifying these two through language to make art. I try to understand this, to use it.
Technology is more of a creative thing for me, coding language through neural networks. I find that extremely interesting.
I do have a lot of thoughts about language that I've built my artistic career on. Most importantly, I find that language is a strong, inadequate invention to express a subjective reality. It is our way of understanding reality, and in many ways the spectacles we use to see the world - they are not necessarily good enough. There is something wordless, outside of language, that I want to capture. Sounds ambitious, and I might add to my writing something that is isn't yet, but it's how I view especially the verbal language. I'm more interested in how a Tinder date unfolds, talking about their refrigerators. It's not interesting in terms of the literal information relayed, but information outside the language is transferred, and that's what I love in literature and theatre. We use words to understand and communicate the world, but the big drama is - it will not work. I can never fully relay anything to you, there are too many parameters. Time is one, the power of language is another. How I treat language. A word might be included in a data set of connotations in you that is vastly different from mine.

TB: It's in a sense even semantically inadequate?

FH: I'd say so.

TB: Is there anything in the embodied world that might fill in the gaps?
FH: There is an emotional sphere that does not come across. Western cultural sphere does not take emotions seriously. Literature, movies or music are ways of relaying emotion - on a macro level all art might be humanities great project to create a language of emotion.
There is a cultural dimension as well. I only have to go as far as Bergen before some of the power of my work, Grønlandssutraen in particular, is lost. A lot of what I joke about when it comes to smalltalk will be lost in the countryside, where it is vastly different.
Synesthesia is very interesting to me. I'm not synesthetic, but I feel like I understand it.
Looking for a title, I often start a project by finding a title. The colour and the tone of the emotion will be very clear from the start that way.

TB: You're using words from the sensual world though, not the literal? Tone, color, pitch, timbre, frequency, texture..

FH: They are also bodily experiences. It's relating to our sensory perception.
I'm thinking of other levels. In my life, because

it is important, I try to remove myself from my own conceptions of the world. It has to do with the wordless, how children view the world before language develops. These things are common in terms of conceptions - we still have a common understanding of these concepts. It's sensual experience, and I try to use it in my language as much as I can. Still we live in a world full of preconceptions, and it's very important for me as an actor to be mindful of the fact that adhering to these preconceptions I remove myself from sensual experience and jt will come across as bad to an audience. They instinctively know if you are doing something that's learned rather than experienced.

TB: Do you feel like there is also a measure of bureaucracy in how are taught to use language? Like for example how we talk about request and consent in sexuality, while very important and safe, is a pretty formal way to talk about something so sensual.
FH: Yes, and I feel it is very removed from the instinctual of mating. It's how the animal in us are. It exists, and we're repressing it. The west is very removed from the instinctual in that sense. We have an instinctual level, and a lot of learned levels on top of that.

In terms of language, it's something that as much as we want it to communicate the sensual world, removes us from it. But language is something learned, above the bodily level.

My first real confrontation with this was working as a teacher while writing my first novel, and I did P.E. with these two boys. 6th grade. They were best friends, and they started fighting. I told them to stop, and that I would call their parents if they didn't. In the end they made up, and one of them, once the fighting was over, asked me if I would still call his mom. And suddenly I was the one feeling scared! Even though I was the object of fright in this situation, his fear manifested in me, and I realized that emotion is something we share, and that I could use that on stage. If I want to give an audience a feeling, I have to feel it myself. The best actors really feel it - it's not acting, they're really feeling it. If I want to make you feel it, rather than just taking a reflective interest, I have to harvest from within the body on stage.

As for an artistic project, it's very interesting not just to convince the audience about what a thing is our how it works, but rather showing what it is not. Like the Hindu upanishades, or Jewish agnostics, that were more concerned with what God and the world is not rather than what it is. Dissonances. Challenging visual or literal conceptual models - you might think that something works in a particular way, but you can subvert that and challnge the audience on their conceptions.

[...]

Interview with Espen Gangvik, Director of TEKS and Meta.Morf

Conductec May 19th at TEKS in Trondheim

TB: I have a few questions relating to TEKS and what you are up to. What is behind the notion of 'electronic art'?

EG: It's a name we've kept intentionally from a time when we talked about working with helping creative souls with employing electronics and digital tools in their practice. Today it's kind of an anachronism. It's about art and technology, in all fields and all kinds of art. There is no point in changing the name, because it's still valid. Basically, electronic art is art that runs on electricity and uses energy. But it's about interactivity, projects that are made through programming and different types of hardware, and the digital part of the field. But analogue stuff as well, we've done analogue synths... analogue is very healthy! It gives some perspective. Today you have biotech, nanotech, neurotech, and new types of computational tech. In short TEKS is about the increasing intertwine between technology development and the development of our society in general, expressed through artistic practices.

We're planning next year's biennale for art and technology, Meta.Morf, right now, and it'll be titled 'the Digital Wild'. It's about digital practice, the wilderness and underbrush of the digital landscape of today.
TEKS is a child of the nineties, established in 2002 as a competence platform and media lab for creative fields. People had to learn digital tools rapidly. In encyclopaedias we'll see that the digital revolution is mentioned being somewhere in the period from the 60's through to the 90's. What we try to argue in the coming biennale is that we are so immersed in digital practice that it becomes... embodied. It seems like that the real revolution hardly has started, or that it starts now. The foundation is there, the platforms are there, in the industrialised world at least, the opportunities are there in terms of the digital cloud, AI and faster communication protocols. I read

for instance somewhere that 5G theoretically can be faster than the neurons in our brains transmit information.

TB: So it's a matter of resolution and speed that constitutes the real digital revolution, because it starts to behave as fast as us?

EG: Well, digital is certainly becoming part of the real, not just the virtual. We're striving to find ways to implement us into a virtual world, like AR and VR that are emerging rapidly, and autonomous vehicles and a humongous amount of other technologies, substituting us as physical creatures. We can start imagining mankind as a tool for an evolutionary process or idea that we don't recognise us being a part of. When the cloud eventually can document everything we do, as the boundaries of privacy shift, everything gets more transparent. Maybe the digital cloud will develop to be the common and collective memory that I, as a teenager, thought of as a form of metaphysical idea of a universal consciousness. It's the chicken and the egg - what we're programming and developing today may be new realities, virtual worlds to explore. Tactility in augmented reality is being developed, you will feel things that are not there. It's like we're reinventing ourselves and our world, which I find very interesting.

To take a step back, no one knows what it's about being human, why we exist or why the universe exists. I recently read the heading of an article about George Hotz, a self-driving car developer and famous hacker, that suggest that our universe may be a simulation, a hologram, a pre-programmed situation. How do you define programming? God creating something? Anyways, his argument is that we are programmed, and he like to start this religion whose purpose is to break free from the hologram.

TB: A classic Matrix-type thing?

EG: Exactly. Many astrophysicists today, as well as entrepreneurs like Elon Musk are talking about the universe being a hologram. So talking about the digital, for a while we might have thought the digital had seen its peak. But look for instance at biotech and neurotech research over like the last ten years. I recently spoke with a biotechnology researcher who said that he had projects in which just a few years back would have taken him 10 years of analog research to complete. Now digital tools are so efficient and versatile that he could do the same research as a computer simulation in like 6 months. The digital really is in everything right now! It seeps into every area of research, and into literally all aspects of our lives. The digital is really taking off. Looking at the timeline from the dawn of man until now, you'd think a technological revolution already had taken off, but then looking at the very few last years, the technology development, and for certain the digital development, looks like that of the Richter scale, it really grows exponentially, and we might just be at where that curve really starts to get dramatic, and I find that hysterically exciting.

TB: So the embodiment of technology, is that an intrinsic part of this revolution or a consequence of it or something in between?

EG: Well I'd say «yes and no». There is a thing to remember, which is that we have a pretty limited way of looking at what a life could be. If we would project humanism on everything, from animals to things, we would always be very surprised, like «what was that?!». Philosophically it's interesting that if we think that what we have, is the real deal, then yes, embodiment is definitely basic for what a life may be. But the big question is, what really constitutes this world and what is it? Religious believes gives one kind of answers, metaphysics others, and recent discoveries in astrophysics yet another, greatly expanding how we think about us and the

universe, constantly breeding new questions. "Higher" dimensions, other ways of looking at things outside our little bubble, that's where it has to be, right? A door that we can't close yet. A colleague argued that virtual reality never could substitute the real world due to the lack of touch and tactility, but I see it being developed right now. You see established truths being toppled all the time, in all sciences. We really can't see what's coming, and we might not be able to draw a line in the sand by saying that it all boils down to the body, even if it does so right here and now, in that contexts. When quantum computing, or other solutions outside the binary emerge, what happens then?
If programming is a kind of creation, it's neat to imagine that we're in a kind 'Matrix', or a process we know nothing about. Mankind's practice may well be a form of programming. When there is a consensus about something we wish to achieve, it seems like we are able to do it, whatever it is! Could this be a form of programming that we do, that again simultaneously creates the laws of physics, ad hoc? We are now approaching black holes as never before. First they were purely theoretical, then we found them, then we learned that they are impenetrable, and now just recently I read that actually they might not be, theoretically, and I don't see us not pursuing that.

But getting back to TEKS. Art and technology. What is interesting, is that creative practices that use, or discuss, new technologies makes a contribution to research and is pushing boundaries. And around the world, universities are creating departments that merge art and technology. For instance in Perth, Symbiotica is a department for art and bio-technology at the University of Western Australia that has run since 2000, and they were in fact the first ones to synthesise meat in a lab. Big companies, like Ericsson in Sweden or Telenor here, are also establishing these kind of sandboxes for exploration. Meta.Morf is a part of this as well, and is trying to address how we look at society and social issues, discussing the possibilities and pitfalls of technology in society. Technological development is becoming synonymous with social development.

The body and the environment is something that we try to create together. We're trying to enter digital worlds physically. Social media today is this weakly designed experience on limiting screen technologies, and I see that being translated into immersive landscapes in augmented reality. We also have people trying to boost the speed of evolution by enhancing the body with technology. On one extreme we might end up hooking ourselves up to computers. On the other we might direct all focus on the physical body.

TB: I think we see it in the case of Snapchat. A pretty unlikely success in terms of classical interaction design, but it might have done something very right in terms of bringing ourselves and our immediate surroundings through taking photos into the digital interaction in real time, using technology while not being too removed from the real world.

EG: Snapchat also broke through with enhancing images, even if it was just putting bunny ears on the users. It's interesting with all the possibilities we have for touching up photos and how we use this kind of technology to present ourselves, how we use the possibility to physically enhance our bodies. We can already almost choose what kind of physical representation we like to be perceived as. Will we end up preferring virtual bodies? «Body Image», I feel, is something fairly new. It may have something to do with the notion that our bodies, as they are presented to others, are not «given» anymore, but rather an object to

be optimised, something that we can enhance digitally, while we in the same instance seem to be sitting around more and more, not taking care of our physical vessels.

TB: You've encountered lots of artworks that address the body. What is the biggest challenge in making this kind of art? When does it work?

EG: From an audience perspective I first of all think participation needs to be voluntary. People need to feel safe. It's something that you'll have to want to explore. It needs to inspire curiosity. It's a difficult question, also because people have different attitudes about trying new things.
What I really liked about your project was, that first of all in terms of design it appears interesting and inviting, and then it turns out that the installation has possibilities beyond the visual aspects that points to bodily and cognitive processes. It goes straight to meditation and spiritual practice, a truly embodied experience.

[...]

Interview with Ståle Stenslie, Mixed Media Artist

May 23rd 2019, at Kulturtanken in Oslo

TB: I'd like to hear about your experience with working with art. What is the core inquiry of your work?

SS: That's the main question, right? What is at the core of it all? What are we exploring? It's part of the nature of art, what we don't know and haven't sensed. And that brings it back to the phenomenological. How do you describe phenomenology?
It's wandering through a forest, a pitch black forest with a headlamp. The headlamp is the field of knowledge, the field of perception that we have. You search around, and what you see, is what you know. Once you move your head, you don't know anymore. It's the exploring, the unpredictability of it, which is the exciting thing.
In art, sensing has become an artistic materiality, which it wasn't before. Performance, yes, we did have that, but then you had the performer and the audience separated. Then what happened during the 80's with media art was that suddenly you as a perceiver became part of fulfilling the piece. You become part of it, included in the work as a materiality, constituting the experience.
It's kind of an abuse of the participant, they're becoming part of an act. In any performance, if me as audience enter it, everyone else views me as an actor.
And that's the third level, you have the piece, the experience of the piece, and those looking at others experiencing it. That's also very interesting in terms of user interfaces - you have the user experiencing something, but what does that look like to others? It's an extra performative layer. For me it's about engaging in a contract with everything the world could give you. That's what's great about art, there is no limit to what you can do and wonder about. That's a driving force for what I'm doing right now [working with art and kids in school].

TB: You've incorporated the body in a lot of your work. What kind of priority do you give to the bodily sensation of a piece?

SS: That's interesting in terms of how you use the body and what parts of the sensory system. I've worked with Wagnerian gesamtkunstwerk - Wagner's big, wet dream, creating a total experiencing. All is art! The embodied, aesthetic orgasm! As a metaphor. How do we create these kind of works? You could do that with sense-manipulating pieces. The first one I did, doing a classical education, was building giga-structures in concrete. I built weird, almost religious structures where you walked around in temple-like structures. I used to dive a lot in my youth - you would lose the experience of senses, it's sensory deprivation. If you dive to 15 metres, the light starts coming from everywhere. If there are particles in the water, you won't be able to discern any contrast. And like with a floatation chamber, your mind will start to produce sensory stimuli. You'll see lights, patterns, shapes, like an acid trip. If you have no contrast surfaces, your eyes will create them.
It's a physiological mechanism. If there is no stimuli, we will create it. It's a neural mechanism, like with learning. Where there is nothing, we will produce it. We are always phenomenologically directed towards something - we are always sensing. We can't turn it off! We can't relax away from it, it's part of being a life-being, it's survival.
We can produce really weird, exciting phenomena through stimuli, and that's something I'm curious about. We are hunting for fascination, something cultural and embodied.

TB: That's manifested in the body as well?

SS: Take learning. I've worked with vibrotactile stimuli. That works only a short while before it dissipates. The body thresholds it, outsmarting it. What is the greatest bodily art experience you could have?
I had an art project called Artgasm. And the goal was to reduce the experience to an orgasm. And that's kind of the most extreme, most elevated bodily experience, having an orgasm. The french author Stendahl describes this, from his travels to Florence in the 1800's, how he loses himself and is overpowered by the aesthetics and the art, sweating profusely and having this orgasmic experience.
That is the hunt for the ultimate art experience. That's exciting, but will also always move in terms of learning, or where your headlamp is directed, in a phenomenological sense. Where is the focus, coupled with biological dispositions. It's an exciting field where everything is new.
I reserve the right to be completely open and unrestrained in terms of the next exploration. But I do have cultural, artistic preference, where I should be immersed in the experience, and that takes different shapes. I've worked a lot with immersive sound the last years. I've built 3D sound rooms, where you produce the sounds through a special interface, and you control the audio like a physical object. It's manipulated through concrete movements in space. That's exciting, also because sound is physical.

Everything starts with oneself. What is a good work of art? How innovative is for example your bulb? Has it been done? One thing is what the sensory system may produce, another thing is in relation to the field of art. It's always in a context, which is merciless! If you do something that has been done, you know, you can't do that. You can respond, or do variations, but you have to bring something new. There is forced innovation in art - there might be less of it in design. Art is about concepts. That's what stimulates, but can also be a hindrance. In design the fall might be more shallow.

The discussion of embodied cognition goes back to, you know, precognitive forms of knowledge. Can you understand anything

if you don't have a concept? It's the big metaphysical question, can we know anything without developing literacy? Good question. Probably not? It's an hypothesis. Children develop literacy from day one. They are directed towards thing, they're very sharp. They develop something, and absorb stuff, and put them into a system. Is this precognitive literacy, if they're hearing stuff from within their mother's belly?
What are you learning about things, is the main question. When I did the Artgasm project, which was kind of ironic but seriously put to fruition, participants were given different experiences, that were on the whole asexual. It was not about giving an orgasm in an erotic context, it was a reduction of the experience. And we discovered these things about the body that we didn't know were there. Do you know where the G-point is on your penis?

TB: Let's assume I don't.

SS: There is a point in our nervous system, that, when stimulated, can give men a neurally realized ejaculation, like the push of a button. (We haven't found this point in women.) In practice you could bring a man to ejaculation within 2 minutes. What we discovered in doing that was that it induced very different feelings from joy. It becomes forced, painful, and a feeling akin to rape. It's involuntary. Eroticism and sexuality is a holistic state. Once you reduce it to a biologically induced feeling it feels wrong, and when doctors do this medically the patient is usually given betablockers, to disassociate the brain from the orgasm, or you might get cardiac arrest - the bodily conflict is that great.
I had to try it. And the apparatur used, called Ferticare, I mean, it's just so evil. I feel bad thinking about it. You expose a darkness and a depth you didn't know was there. It's very brutal. This is where the art object, or the design object, may unveil or distort things you didn't think about initially.

TB: What are the biggest challenge in making pieces of art or design that try to attain a bodily effect, in one way or another? When does it succeed?

SS: Art is socially constituted, and there is no art outside of a human society. My projects have been bodily experimentation - I do them once, then I'm done. It's been explored. The question is what is difference between art and design? Well, design can be reused. Superficially. Design is art in the everyday. I've worked at AHO, and I've experienced that they sometimes do more art there than at the art academy. As an artist, it's more about breaking boundaries than it is about making the experience practical. That's a debate in its own right.
Back to trying, trying to find something interesting. The challenge is trying. You can't know what you're making, and certainly not the response. That's what is socially constructed. You can make the best bulb in the world, but if no one experiences it, it's lost. Art and design are both anthropological phenomena.
Why embodiment though? The thought is that you and I, and an African woman, and the people of Patagonia, all have access to the space of experience. It's a universal language of senses. That's the hypothesis. And it has to be proven, which is why we need experiments such as yours. And through my work with tactility, this hypothesis has seemed to hold up.

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Interview with Zane Cerpina, MA in Design at AHO, Artist, Researcher and Designer

at Café Laundromat, Oslo, May 24th 2019

TB: I've been trying these somaesthetic practices for this project.

ZC: Oh yes, I was part of the Journal of Somaesthetics that came to life, so I was on that team and worked with Richard Shusterman on that. I put together the design for his book The Man in Gold. Funnily enough, the book has Richard's text and Yann Toma's photographs, so he was performing, Yann was taking photos, and I was the third person photographing Yann. So I have lots of footage that I'd love to turn into a book, a second perspective on somaesthetics. I came into the field through the univeristy in Aalborg. I started working with somaesthetics then, and since then I've incorporated it in pretty much all of my practice.

My own work has different directions. One is more anthropocene eco-critique, and the other is more bodily exploration and more transgressive, technological work with the body. In both of these areas I've done performances. For example, I've done dance performances with a drone, where the drone tracks me autonomously. That's a somaesthetic exploration of this unique relationship with a technological entity. With these movements I've travelled around the world making performative videos. The drone sort of becomes more human through these performances. That project is in the early stages though.

Then I have more body-based work. I'm working on a project now that is a somaesthetic exploration of another person's body. Somaesthetics is often very inwardly focused, so I'd love to have this other perspective.
I think the field is kind of unexplored. I really like the philosophical aspects of it and the work of Richard Shusterman, and I think it

could be taken a lot further. And not only through Yoga, or these typical things, but in all fields. There are many areas that have been explored, art especially, but there are many other fields to include, and I hope my project will expand on this and start a discussion.

TB: What is your philosophy in incorporating the body in your works?

ZC: If I think about somaesthetics, I think somehow for me the practical work and the concept goes hand in hand, so it evolves as it goes along. I have another project that is very somaesthetic as well, it's called Body Fluids, and it's actually several project. The only one I've made is Body Liquids, jewellery made of menstruation blood, which is kind of inverting the body inside out.
It's about practice-based explorations of body. Same as with my new project - it's been going on for a while, and now I'm taking it apart philosophically and psychologically and giving it a more academic twist. It's very phenomenologically guided, it's about experience.

In terms of my education, you know, the projects closest to my heart always gets the most attention. I'd say in Norway, design and art are very separated. Art is rather conservative, still. There are things going on, the PNEK (Production Network for Electronic Art) network, different installations, TEKS has been around for 20 years soon, and the Meta.morf for 10 years, but still, in general, the electronic media art field is kind of an outsider. It has some problems in terms of selling the works. Why is it like that? My hope would be for it to go more towards what it is like in the Netherlands, where design is much more explorative and brave. Speculative design is a lot more accepted, and the lines between art and design are more blurred. I like that interconnectedness.

TB: What are we missing in Norway in terms of this interconnectedness?

ZC: I think it has to do with education. There's a lot of it in the Netherlands. Norway, I think, fine arts is still on top, and music is very developed, but in other art forms, media arts, bio-art, hybrid art forms, there might not be an immediate institution to study that right now. It slows things down not to have something that introduces students to this kind of knowledge.
PNEK is around, and all its nodes around the country, but it's not enough. You'd need more education, or more production spaces that focused on talent development, like V2 in the Netherlands. There are lots of ways to go, and that's also how FAEN (Female Artists Experiments Norway) came to be. That's kind of my comment.

TB: And what is that comment?

ZC: That we need to think of the next generation artists, in this specific case young female artists, to introduce them to media art even if they're not studying it. We do have good expertise and places for production in Norway, but it's important to make the connections.
We had an open call, and picked out 8 female artists. The interest was massive, we got 80 applicants. It's very exciting. The comparison in interest with respect to other endeavours with PNEK really speaks to the fact that we need something local. Production has to happen locally. They are going to develop works for an exhibition in October, but the exhibition is only part. It's about talking about this need for places of production, and how we can get young artists to connect to these forms of art.

TB: Where do you see the field going over the next years? Where would, or wouldn't you like to see it go?

ZC: I wouldn't want it to stay where it is. I

love the field, and the way it is and it's history, and I think we can really push things further. We need to get young people in the field. There is a generation gap right now, where there is more stuff going on with established artists.
I think bio-art is a thing Norway has to pick up on. We've had Biolab in Stavanger, but it's been mainly been just a festival, and I think we need a more permanent institution for bio-art. There is a new institution in Ås, a new lab for doing this, so they're trying to figure out what bio-art is about in Norway and how we can put up production spaces. I also think art science could go further in Norway, and I'd like to see more funding for that.

TB: And how do you see for example bio-art making a contribution to society as a whole?

ZC: That's very important. I think that's why hybrid arts are important, because of the complex contemporary problems we have and I don't think they can be fully discussed through fine arts, painting or drawing. I think these hybrid art form offer so much for public discussion, kind of like speculative design. Showing scenarios that we might want to see, or not want to see. They encourage reflection on complex issues. Bio-art can make a contribution here.

Embodiment has a place in this. The most interesting works in Europe right now are produced in bio-art, with very somaesthetic, personal touches to it. A gallery in Ljubljana is one of the most daring galleries, with the most daring curator in Europe. If you look at their history, they started with bodily performances, transgressive works, shootings and whatnot. Lately they have taken two direction, at the core. One is exploring technological black boxes, but I think their strongest focus is bio-art and bio-tech but in a very human manner, in they grey zone of what's legal. One of the projects was about coupling a human and a wolf, genetically. Aspects like that may be important in the future, and is very much an exploration of the body.

TB: Where do you see the role of the body going in a more general discussion of technology?

ZC: Well that's at the core of the next Meta. Morf as well, the Digital Wild. It's about how bodies couple with technology.

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