

# **Untangling Stories in Earth layers**

Lucie Ponard

# Abstract

In order to reflect on sustainability in design and how an object can go back to the earth, I researched how we can use slags and rocks to reflect on our ways of designing in the context of the Anthropocene. With the case study of Zuiderstrand in the Hague, I studied rocks and what I call industrial rocks: slags and other by-products of the industry, hazardous waste reused as fillers in landscapes, becoming natural rocks in disguise, laying on the beach and on the paths. Rocks question our representation of time: they don't exist in a linear time frame, rather as an ongoing redistribution and transformation of matter, and whereas they are seen as something solid and strong, they are perpetually transforming and moving. That raises the question of why products are designed to remain in a fixed state, since our products are earth matters as well, and are also in a constant state of change. I used the conceptual frame of the technological ideal, developed by land-artist Robert Smithson, that refers to a 'purified' system that has been created for mass produced technological devices to exist in, and that excludes earth processes. The 'human rocks' are discarded by geology and industry, remaining in an in-between state, revealing the failure of the technological ideal, questioning the entanglements and relationships between industrial and earth matters. They shouldn't be ignored but can be analyzed as a medium through which we can reflect on design as well as on relations between humans and non humans.

## Table of contents

Introduction	7
Personal interests and practice as a designer	8
Context of research	9
Existing theory on the topic	10-11
Design context	12
Methods	13
<b>Part one - On rocks, geological gestures</b>	
1- How are rocks created?	16-19
2- Philosophical analysis of the scientific observations	
a- Rocks' ongoing movement	20-21
b- Rock's fragility	22-23
c- Deformation of rocks	24-25
3- From earth's to human matter	
a- Perpetual movement of static things	26-29
b- What inspiration can we draw to design for rocks?	30
c- Product cycles and the cycle of rocks	31-33
<b>Part two - Field studies, analysis of a place: A landscape in process of construction and deconstruction</b>	
1- Introduction: choosing a site to conduct research	36-39
2- The print goes back to the landscape: material experiments on the beach	40-67
3- Which rocks can be found in a place that geologically shouldn't contain any?	
a- Rock's lives	68-71
b- Real or fake? Entanglement of matter and stories	72-88
4- On industrial rocks	
a- Reading stories in rocks	88
b- What slags can tell us about industrial design	89
c- A geology of industrial waste: Relations between rocks, slags and the landscape.	90-91
d- Entanglement of earth and industrial matter	92-99
5- Reflecting on material experiments: designing with impurities	
a- Glazing with slags	100-103
b- Industrial mould	104
c- Smooth roughness	105
6- Conclusion	
a- Using rocks and slags to reflect on industrial design	106-107
b- Design possibilities	108-109

# Acknowledgements to:

Doctor Karl-Heinz Wolf  
Rosa te Velde  
Stefan Lang  
Nico Vischi



## Introduction

Product design is about creating things by shaping, giving a materiality to concepts and ideas. If the term object is understood as 'something material that may be perceived by the senses',<sup>1</sup> earth has been making objects for billions of years. Through this understanding, both earth and product designers are creators of objects. This perception leads to think on what we can learn, as creators, by comparing geological processes to product design processes. The concept of back to earth implies that the object can go back to where it was extracted from. In order to work on this concept, I wanted to understand what earth was actually made of, and how it was formed.

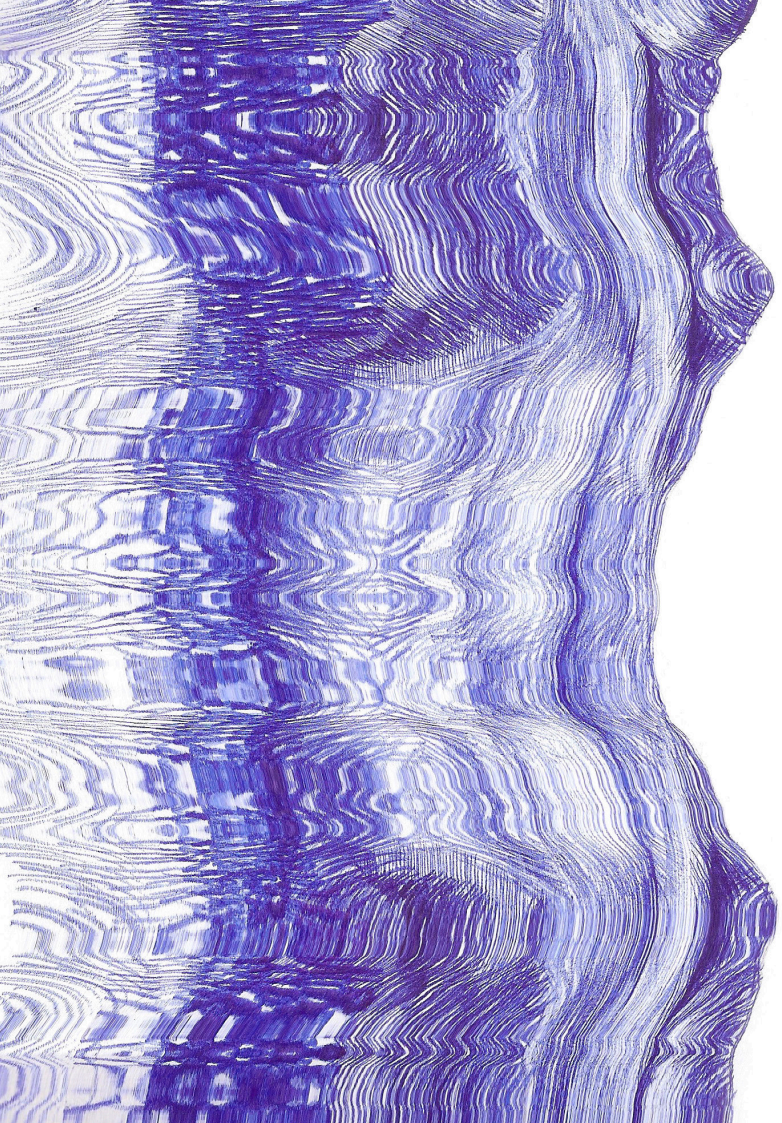
I therefore focused on rocks, the matter that earth mostly consists of. I worked on earth rocks (naturally formed) and what I call 'industrial rocks': formations that seem to be rocks, and that can be found in natural landscapes such as The Hague's beach, but that are actually waste. These various types of by-products from the industry are hard to deal with in recycling, so they are used as fillers, ending up in the landscape. There are different types depending on the industry. Slags, which is what is left after a metal has been separated from its raw ore, coal ash, a left-over from the burning of coal in coal power plants, and incinerator bottom ashes, the impurities from what is burnt in incineration facilities.

Whereas earth makes rocks, product design makes slags, and they all are now part of the same landscape. Reflecting on both earth rocks and industrial rocks is a way to compare industrial and geological systems, find common ground or connections, and think about the human-made system as part of the earth's system.

This leads to the research question 'How can we use rocks and slags in the context of the Anthropocene to reflect on our ways of designing?'

The following research also questions the production of objects with the materials that are around us and its effects when going back to geology. Therefore, a subquestion is 'How can we create objects by using the resources of a specific land so that the object can be in a dialogue with the earth's processes and later becomes part of this landscape?'

Geology, land-art and design were used to find grounding for this research and as starting points for answers to these questions. Furthermore, Westduinpark and Zuiderstrand in The Hague became places for case studies.



<sup>1</sup> Merriam-Webster, s.v. 'app (n)', accessed January 6, 2021 <https://www.merriam-webster.com/dictionary/object>

*Left: drawing in stratum to represent the layers of the landscape shaped by geological processes*

## Personal interests and practice as a designer

The interest I have in the materiality of objects was developed during my bachelor studies in textile design, which helped me to expand a sensitivity to textures, materials and colors. I believe that the surface of an object is very important since it's our first layer of contact with it, and it impacts the way we visually and physically perceive it. My work evolves mostly through experimenting on materials with various supports and techniques.

As a white middle-class person who grew up in a city, I am aware that it's a privilege to enjoy time in nature and have the freedom of mind for these thoughts and reflections, as well as to attend the studies of my choice. For this reason, I position my practice in a view of design that takes into account the current social and ecological problems. I want to design for care, including caring for our eco-system, for human beings and for the non-humans.

I am from Paris, but my mother's family is originally from the Alps. Growing up, I became interested in this idea of roots, romanticizing the mountain hamlet, so unknown but yet familiar. I was fascinated by lives being so anchored in one village, where generations of ancestors lived for hundreds of years, whereas now moving from one city to another is so common. From this probably comes the visual imagery of a dreamt landscape, shaped in imagination by the coarseness of rocks, that I reuse in my work.

## Context of research

On this same notion of origins, this research reflects on how to make objects with the materials that are around us. Working on rocks in the Netherlands, a country known for being very flat, might seem strange. The goal is also to look at things that aren't seen, looking for value in elements considered valueless. On the other hand, industrial rocks can be found everywhere, but they are very likely to be found in the Netherlands since it is an industrial country whose nature has been exploited a lot.

The current covid-19 crisis highlights the necessity to rethink a more local production of our goods, to lower the ecological impact of importation. Moreover, this research also reflects on producing objects in a way that they can go back to where they were extracted from. Martina Taranto is an Italian designer and artist, who researches on topics related to environmental issues. In her project 'Viral Nature,' she states that ruins are our human legacy.<sup>2</sup> Waste is also a human notion.

Studying earth's mechanisms is also a way to question the relation of our objects to time, looking beyond human centered time scales. Indeed, 'Geological processes are events that occur on a geological timescale ranging between millions of centuries, hundreds of meters, and thousands of kilometers.'<sup>3</sup>

The research takes place in the broader context of the Anthropocene. This concept was first described in 2000, in an article by Paul J. Crutzen & Stoermer's, called 'Geology of mankind.'<sup>4</sup> Crutzen states that "For the past

three centuries, the effects of humans on the global environment have escalated. [...]

It seems appropriate to assign the term 'Anthropocene' to the present, in many ways human-dominated, geological epoch, supplementing the Holocene." Ever since, this concept has been used as a framework to debate questions related to environmental issues. The concept of the Anthropocene is interesting to acknowledge the predominance of human activities on the planet and the negative effects that they provoke on the rest of the eco-system. However, the article concludes that this new epoch requires "large-scale geo-engineering projects, for instance to 'optimize' climate." That seems to offer the same type of solution that the problem actually is. In her article 'On the Poverty of Our Nomenclature,' American sociologist Eileen Crist, specialized in ecological issues, states that the Anthropocene became an anthropocentric discourse. She argues that this notion does not confront human dominion, but proposes "technological and managerial approaches that would make human dominion sustainable."<sup>5</sup>

Although I conducted the research from a designer's point of view, therefore from a human perspective, I focused on revealing entanglements between industrial and earth matters, connecting stories. Showing our relationships with the rest of the eco-system and looking for inspiration from that to design is my approach, going beyond the traditional division of nature and culture that led humans to perceive themselves outside of the eco-system, not feeling concerned by the consequences of their actions on it.

<sup>2</sup> Dutch design week online exhibition, Taranto, Martina: 'Viral Nature', <https://ddw.nl/en/programma/3574/viral-nature>, 2020  
<sup>3</sup> Science direct, 'Geological Process,' accessed December 18, 2021 <https://www.sciencedirect.com/topics/earth-and-planetary-sciences/geological-process>  
<sup>4</sup> Crutzen, P. 'Geology of mankind' Nature 415, 23 (2002). <https://doi.org/10.1038/415023a>

<sup>5</sup> Crist, E. 'On the poverty of our nomenclature' Environmental Humanities vol. 3, pp. 129-147 (2013). [www.environmentalhumanities.org](http://www.environmentalhumanities.org)



# Existing theory on the topic

I used theoretical references to reflect on material experiments and geological processes.

## How can we use rocks and slags in the context of the Anthropocene to reflect on our ways of designing?

Analyzing geological processes in the frame of design leads to question what is perceived as pure or impure. American land artist Robert Smithson (1938-1973) is famous for being one of the inventors of land-art, which consists of art works that use the materials of the earth, often on sites distant from population centers. In his essay 'The sedimentation of the mind: earth project',<sup>9</sup> he reflects on notions of purities and impurities. "The smelting process that goes into the making of steel and other alloys separates 'impurities' from an original ore, and extracts metal in order to make a more 'ideal' product."<sup>7</sup> The slags are therefore a symbol of this impurity. Smithson adds, "Yet, the more I think about steel itself, devoid of the technological refinements, the more rust becomes the fundamental property of steel."<sup>8</sup> The truth of a material would therefore not be found in its ideal, refined state but in a worn state, (impure), that comes back when it is exposed to earth processes again. It reflects our fear of erosion, inactivity and the undefined.

Smithson defines this notion of 'ideal system' as opposed to earth system. "Like the refined 'paints' of the studio, the refined 'metals' of the laboratory exist within an

'ideal system'.<sup>9</sup> A 'purified' system has been created for technological devices to exist in but that system can not cohabit with earth processes, such as oxidation or erosion, which leads to create waste because the object can't enter back in the geological stream. Smithson also reflects on the characteristics of earth matter. The land artist opposes 'the breakup or fragmentation of matter' to the overly refined industrial shapes like sheet metals, beams, tubes.<sup>10</sup> He also refers to the artist's works as in a 'state of arrested disruption', concluding that "no materials are solid, they all contain caverns and fissures." As we can understand from Smithson's work, matter is always moving, transforming, evolving.

Certain terms are used all along the research, such as 'technological ideal', the enclosed system that selects and discards certain types of matter. Industry is an 'economic activity concerned with the processing of raw materials and manufacture of goods in factories'.<sup>11</sup> Therefore the 'industrial system' is the process through which earth materials are purified and valued in an economical perspective. Technology refers to the application of scientific knowledge in industry, dealing with engineering or applied sciences.<sup>12</sup> The word technology will then be read as the knowledge and tools that take place in the industrial system.

## How can we consider the time of objects, seeing them not as something static but as something in movement, in a process of change and open to interactions with organic processes?

By analyzing geological processes, I realized that physical matter is in a perpetual state

of transformation, showing therefore that any object is constantly moving. This idea of vulnerability that allows construction and deconstruction is approached by Dutch artist and photographer Bas Princen. Originally trained as a public space designer, he works on the relation between the natural and the artificial, the past and future, and on the idea of construction and deconstruction, raising questions such as: is the landscape a ruin or is it being built?<sup>13</sup> In conversation with researcher and architect Marc Pimlott, he refers to the unclear tension between the object and the landscape, that constitutes a unity, a whole.<sup>14</sup>

The following research draws connection between the industrial system and geology. It aims to reveal the connections of these two worlds that are traditionally perceived in a binary opposition.

The book *The art of living on a damaged planet* cowritten by several professors of anthropology (Anna Lowenhaupt Tsing, Niels Bohr, Heather Swanson and Nils Bubandt) and an art director (Elaine Ganpoints) reveals the entanglement and connection between eco-system's matters.<sup>15</sup> "Against the conceit of the individual, monsters highlight symbiosis, the enfolding of bodies within bodies in evolution and in every ecological niche." In this book, the monsters then have two meanings. On one hand, "they help us pay attention to ancient chimeric entanglements"<sup>16</sup>, on the other hand, they reveal the monstrosities of modern humans. The notion of entanglement is used as a metaphor throughout this text.

The entanglement is also addressed by French sociologist, philosopher and anthropologist Bruno Latour in his text 'Love Your Monsters: why we must care for our technologies as we do for our children.'<sup>17</sup> He argues that humans and earth are inseparable:

"Science, tech and demography make it clear we can never separate ourselves from nonhuman world."<sup>18</sup> In the same text, Latour points at our problem: we abandon our technological creations, whereas we should care for them.

Nature and culture are divided in society, as well as theory and practice. By choosing theoretical actors that are artists, photographers, and who work with materials and images as well as with texts, I would like to blur these divisions. For this research, I reflected on material experiments by writing, and reflected on texts by producing physical work.

6 Robert Smithson, 'The sedimentation of the mind: earth project (Originally published in Artforum, 1968)  
7 Ibid., 87.  
8 Ibid., 86.

9, 9 Smithson, 'The sedimentation of the mind: earth project, 87  
10 Ibid., 97.  
11 Lexico, 'Definition of the word industry', Accessed on December 16, 2020 <https://www.lexico.com/en/definition/industry>  
12 Lexico, 'Definition of the word technology', Accessed on December 16, 2020 <https://www.lexico.com/en/definition/technology>

13 Princen, B., & Pimlott, M. (2008). Utopian Debris. A Conversation between Bas Princen and Marc Pimlott. *Specificity*, 7(6), 3-11. Retrieved from <https://www.oasejournal.nl/en/issues/7/6/>  
14 Ibid., 7.  
15 Tsing Lowenhaupt et al., 'The arts of living on a Damaged Planet: Ghosts and Monsters of the Anthropocene', 2017 Tsing Lowenhaupt, A., Swanson, A., Gan, E., Bubandt, N. Editors  
16 Ibid., 26.

17 Latour, Bruno, 'Love your monsters. Postenvironmentalism and the Anthropocene', 2011 Breakthrough Institute, pp. 17-25.  
18 Ibid., 18.

# Design context

## What is the status quo of industrial design?

Industrial products are mostly designed to remain in a fixed state, not to evolve. The trace of the process is often erased. Moreover, its lifespan is taken into consideration in relation to humans. Textile designers Brecht Duif and Lenneke Langenhuisen, from studio Buro Belén, refer to the status quo of colors used in the industry in their project 'Living colors'.<sup>19</sup> They explain that "paint produces strive to optimize their product to ensure discolouration is avoided, promising that what is seen on a colour chart aligns with reality." Whereas "We often think of colours as something static and fixed" colours are in reality subject to change, since they evolve depending on the environment. The designers then state: "As nature itself, colours are alive [...]". In response to that, the studio developed a line of paint that discolours over time, using the transforming quality of colour as an asset, instead of 'fighting nature.' I believe that this reflection could be applied to other aspects of industrial design, such as the texture, the surface and even the shape.

Several designers have drawn parallels between geological processes and design. Dutch studio Anne Holtrop, in collaboration with Princen, have explored the relation between the material of architecture and the landscape.<sup>20</sup> Their project 'Batara' started with photos of an ancient city in Jordan, where buildings are directly carved out of the desert rocks. The outcome of the project is a pavilion, created by casting material into pits of sands or earth, using the natural

environment as a mold.<sup>21</sup> The use of a single material and the absence of clear outlines gives a feeling of something in a process of creation or deterioration, like the landscape itself. The design embraces the possibilities of interactions with earth process, by being visually already connected to the landscape.

This relation between the materiality of a product and the materiality of earth is also an important aspect of the work of Atelier NL. Dutch designers Nadine Sterk and Lonny van Ryswyck "develop products that showcase the richness of the earth and the value of local raw materials."<sup>22</sup> They design with raw elements such as clay or sand, extracted directly from specific places, revealing the variety in soils, showing outside what is happening in deeper layers.

# Methods

In order to research the question: 'How can we use rocks and slags in the context of the Anthropocene to reflect on our ways of designing?', I worked with several methods. First, I studied some geological processes, like rock cycles, and reflected on them in order to discuss product design sustainability. In addition to reading on these topics, I conducted interviews with scientists, in order to identify rocks I found.

Secondly, I used walking, observing and collecting as research methods, and did field analysis of Zuiderstrand and Westduinpark in The Hague, inspired by designers Krijn Christiaansen and Cathelijne Montens, who use walking as a research method<sup>23</sup> in their design work.

The third method that I used in this research is experimenting with materials. I conducted intuitive material experiments, such as printing and glazing and reflected on them afterwards, analyzing them through theoretical notions.

<sup>19</sup> Website Buro Belén, 'Living colours', Accessed October 23, 2020 <https://www.burobelen.com/projects>  
<sup>20</sup> Another space, 'Batara - Anne Holtrop and Bas Princen', January 1, 2016, <http://another.space.dk/batara-anne-holtrop-bas-princen/>

<sup>21</sup> Ibid  
<sup>22</sup> Website Atelier NL, 'About NL', Accessed October 15, 2020 <https://www.ateliernl.com>

<sup>23</sup> Kabk website, 'Interview from Design Lector Alice Twemlow of designers Krijn Christiaansen and Cathelijne Montens: Walking as a design method in art and design', accessed April 22, 2020, <https://www.kabk.nl/en/tutorials/design/kabknet-walking-as-a-method>

# 1 On rocks

*earth gestures*

# 1– How are rocks created?

How can we reflect on sustainability in design by analyzing rock formation processes?

How can designers draw inspiration from rocks to design objects?

In this chapter, earth and the designers are both approached as objects' creators. I studied the formation of rocks by reading 'Le monde fascinant des roches' (The fascinating world of rocks), an article of science popularization written by Dr. Jacques Deforne and Dr. Nora Engel.<sup>24</sup> I also read parts of the books of geology popularization written by René Dars, a doctor and teacher in geology at the University of Nice-Sophia Antipolis.<sup>25</sup>

Secondly, I reflected on the scientific information with artistic theoretical references, researching how we can get inspired by rocks to design.

Looking at Earth's surface with a human eye, we can see soil, plants, rivers, and oceans. These surface features, however, form only a very thin covering on the planet. Between the crust and the metallic core, Earth is made of solid and molten rock.<sup>26</sup>

There are three main families of rocks, based on three different ways they can be formed.<sup>27</sup>

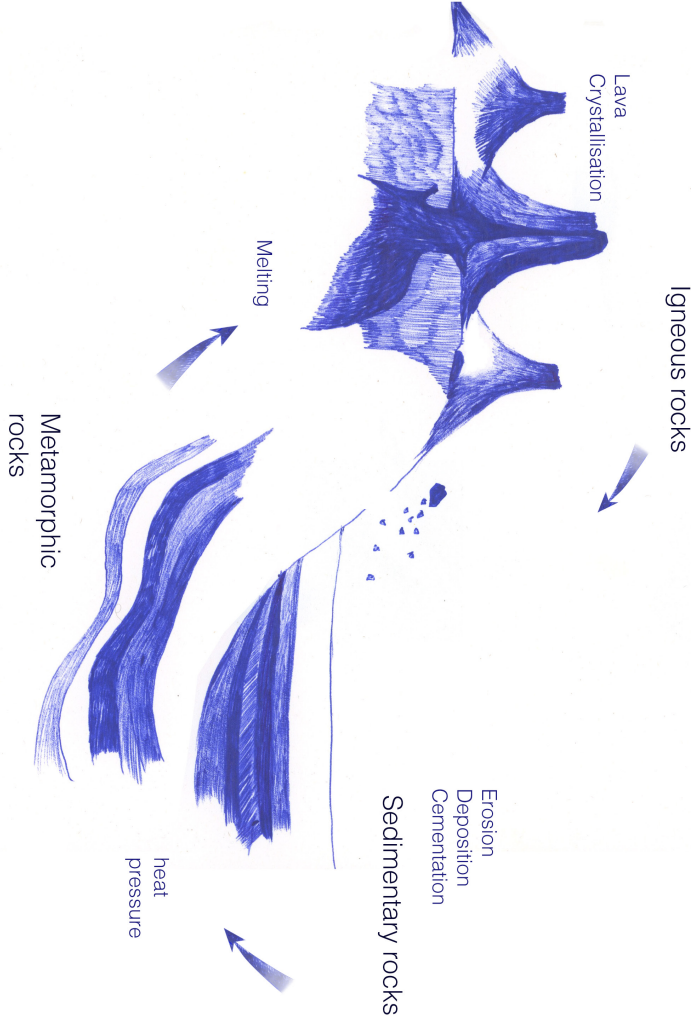
Igneous rocks result from the crystallization of magma (molten rock) after it cooled down. This transformation from liquid to solid can happen on the earth's surface, during volcanic eruptions, with lava solidifying.

Igneous rocks are then eroded with weathering and break down in small pieces. Sediments (pieces of rocks, plants or other loose material) are transported by water or wind and then settle out, forming layers. The different layers then compact and cement into one solid rock, often with heat and pressure, creating the sedimentary rock.<sup>28</sup>

Metamorphic rocks result from the transformation and merging of the two preceding types of rock, because of a modification of their environment, generally in pressure and temperature. With the movement of the different earth surfaces, metamorphic rocks are often buried deep and melt again, becoming magma, and the cycle starts again.<sup>29</sup>

The rock cycle could be described as a set of natural processes that form, change, break down, and re-form earth matter.

During their transformation cycle, the rocks move from one place to another. Professor Dave Bice explains that these 'processes [...] not only transport materials from one reservoir to another, they also transform the rocks, causing them to change their form.'<sup>30</sup>



<sup>24</sup> Deforne, Jacques, Engel, Nora, 'Le monde fascinant des roches', kaachbuch (Swiss website created by Dr. Deforne in order to popularize science) (2016)

<sup>25</sup> Dars, René, 'La géologie', 1992, PUF 'Que sais-je?'

<sup>26</sup> Kraft, M., de Larouzière, F.D., 'Guide des Volcans d'Europe et des canaries, 1999 delachaux et nestlé, pp. 11-13

<sup>27</sup> Deforne and Engel, 'Le monde fascinant des roches', 13.

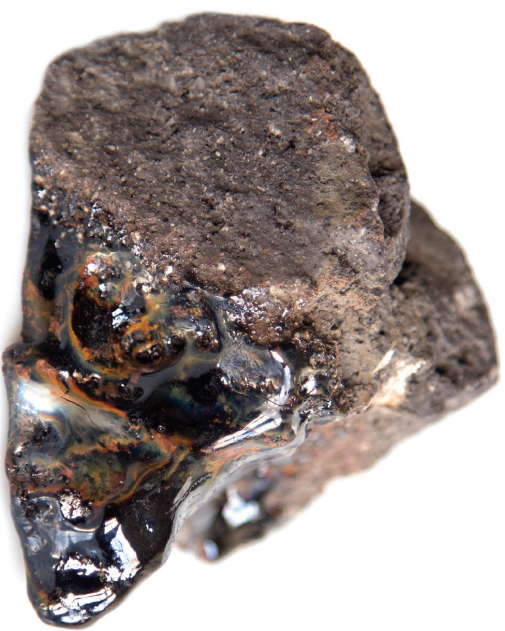
<sup>28</sup> Ibid., 30-35.

<sup>29</sup> Deforne and Engel, 'Le monde fascinant des roches', 37-40.

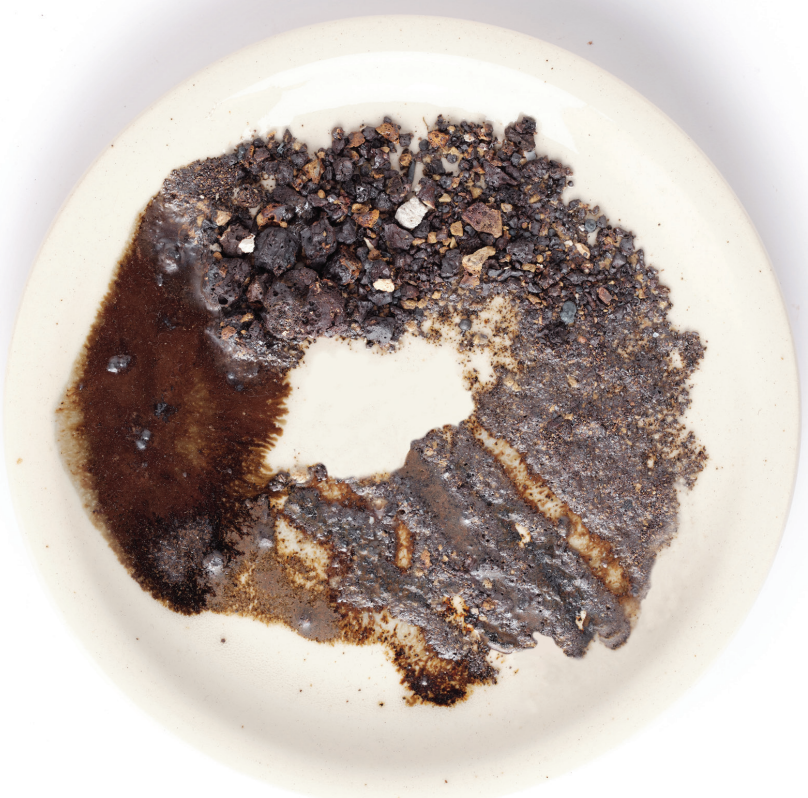
<sup>30</sup> Exploring the Dynamics of Earth Systems: a guide to constructing and experimenting with computer models of Earth systems using STELLA, 'Modeling Earth's rock cycle by Dave Bice', Accessed September 20, 2020, <https://personal.ems.psu.edu/~dmbs3/DaveSTELLAentance.htm>

Illustration of the rocks' cycle





*I melted partially an igneous rock, crystallizing, freezing a formation process that normally happens over billions of years. It reveals the transformation potential of rocks. The movement seems stopped, but the rock is still constantly moving.*



*Tracing the story of rock's formations, using the plate as an object to tell stories. The glazing is made with the rocks themselves.*



## 2– Philosophical analysis of the scientific observations

### a– Rocks' ongoing movement

What we see is that the common image of rocks as solid and static elements is far from reality. Rocks don't really belong to a specific landscape, but are part of a bigger travel, journey.

Moreover, what can be concluded is that the formation of these three rocks form a cycle. Rocks don't exist in a linear time frame and can't be put in the realm of creation and re-cycling, but rather as an ongoing redistribution and transformation of matter. Rocks evolve, slowly change all along their existence, until they are part of a specific time frame to which we can give them a scientific name.

The lifecycle that rock matter goes through can take up to hundreds of millions of years<sup>31</sup> so we perceive the process as static. The temporality of this cycle doesn't include moments of creation and moments of pause, but we can envision rocks as perpetually moving and changing, there is no point at which this process stops.

In the magazine 'Oase 76,' Pimlott comments the following thing about a picture taken by Princen "[...] one is uncertain whether one is looking at constructions or ruins, at a fragment of the future or of history."<sup>32</sup> Looking

at a rock can provide a similar experience, since it is simultaneously constructed and destroyed. Moreover, rocks both belong to past and present since when it transforms and merges with another mineral it both dies and is reborn into a new shape.

Landscapes as well are therefore in a permanent moving state. Since our planet largely is built of rock, one could even say that earth itself is constantly in a state of creation and destruction.

Objects also belong to both past and present, they are as well constantly transformed by their interactions with the users, and with their environments. What makes them old or new is very much subjective. Moreover, when being customized, re-painted, tagged, or if any type of intervention is done on them, they also both die and reborn into a new object.

<sup>31</sup> Exploring the Dynamics of Earth Systems a guide to constructing and experimenting with computer models of Earth systems using STELLA. Modeling Earth's rock cycle by Dave Bicer. Accessed September 20, 2020. <https://personal.ems.psu.edu/~dmb53/DaveStELLA/entrance.htm>  
<sup>32</sup> Princen, B., & Pimlott, M. (2008). Utopian Debts. A Conversation between Bas Princen and Marc Pimlott. Specificity, OASE, (76), 3–11. Retrieved from <https://www.casejournal.nl/en/issues/76/>

Right: Like Princen, looking at this image, I wonder: is this matter in a process of being destroyed or constructed? Rocks are neither one or the other, but a series of elements moving in time and space.





# b– Rocks’ fragility

Rocks are seen as something very solid and strong, mountains looming at us can seem indestructible. In reality, in a time-frame of millions of years, rocks are constantly eroding, cracking, splitting.

Rocks’ fragility allows them to be transformed and to travel, for example to be decomposed into sediments that will be cemented into a new form, further away in a sea basin.

Moreover, rocks also help us question our perception and representation of time. Time in geology is visualized in layering. Smithsonian argues that time does not pass so much as it builds upon itself, what he calls the crystal-line structure of time.<sup>33</sup> Whereas we design our objects with a linear conception of time, the way the time is represented in earth matter is with different layers that stack on top of each-other.

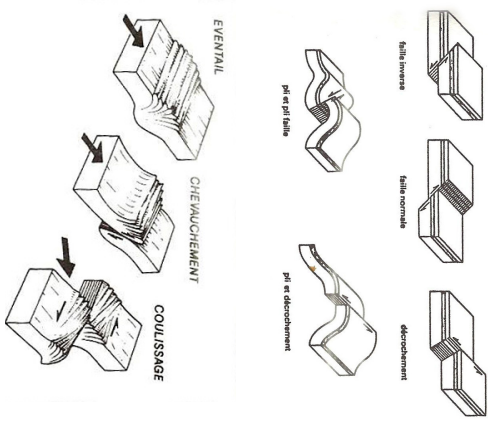
<sup>33</sup> Robert Smithson, *Asphalt Rundown*, 1969, Holt/Smithson Foundation, Licensed by VAGA at ARS, New York

Right: using rocks with other glazes, to tell the story of rock’s formation. The matter transitions from liquid, to solid, to sediments, before agglomerating and then merging with a different matter.



# c– Deformation of rocks

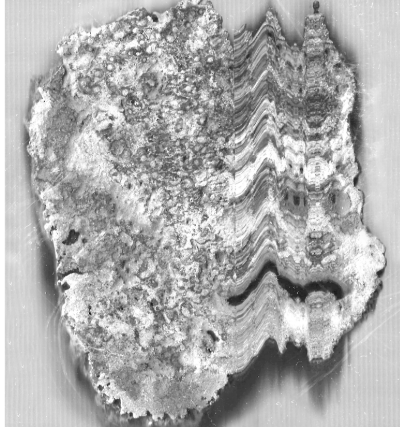
The idea of rocks deforming might seem strange, but it is a common topic in geology, as one can learn from the chapter ‘Formation, deformation, transformation of rocks.’<sup>34</sup> The various geometric ways of arranging matter on earth are called structures. For example, sedimentary rocks form from horizontal layers of materials. This structure can be deformed in time, creating faults, fractures, making the stratum move.<sup>35</sup>



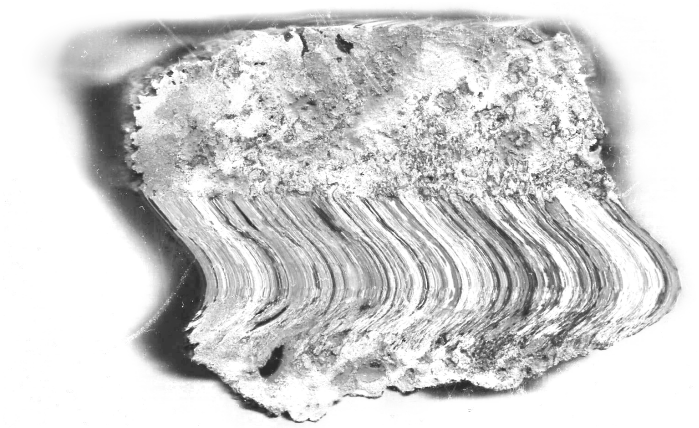
These images are extracted from the book *La géologie*, written by Dars. The top one represents various types of faults, and the second one a fold happening in a mountain's chain. Indeed, rocks can also be distorted in a flexible manner (ductile) when they are still solid. A fold is a result of a flexion or torsion of the rock.<sup>36</sup>

What can now be concluded is that by being distorted, folded, melted, rocks

transform into something else and that is the condition of their existence. The fact that rocks are deformable, almost malleable, can be fascinating. On first thought, we could think that these processes could be copied to create clothes, objects, buildings. But the truth is, we already constantly copy these processes. Shaping, folding, splitting, layering are already actions that human use to create objects and clothes. Our gestures are above all earth gestures. One can ask her- or himself: ‘Am I not earth myself since my gestures as designers are also earth gestures?’



Visual experiments on the topic of folds in geology. Here, a rock is distorted while being scanned. The geological process is re-created digitally. The structure of the immaterial matter is shaped with actions such as thrusts, creating faults, folds.



<sup>34</sup> Dars, ‘formation, déformation et transformation des roches’ in *La géologie*, 54-61 (my translation)  
<sup>35</sup> Ibid.  
<sup>36</sup> Ibid.

### 3- From earth's to human matter

#### a- Perpetual movement of static things

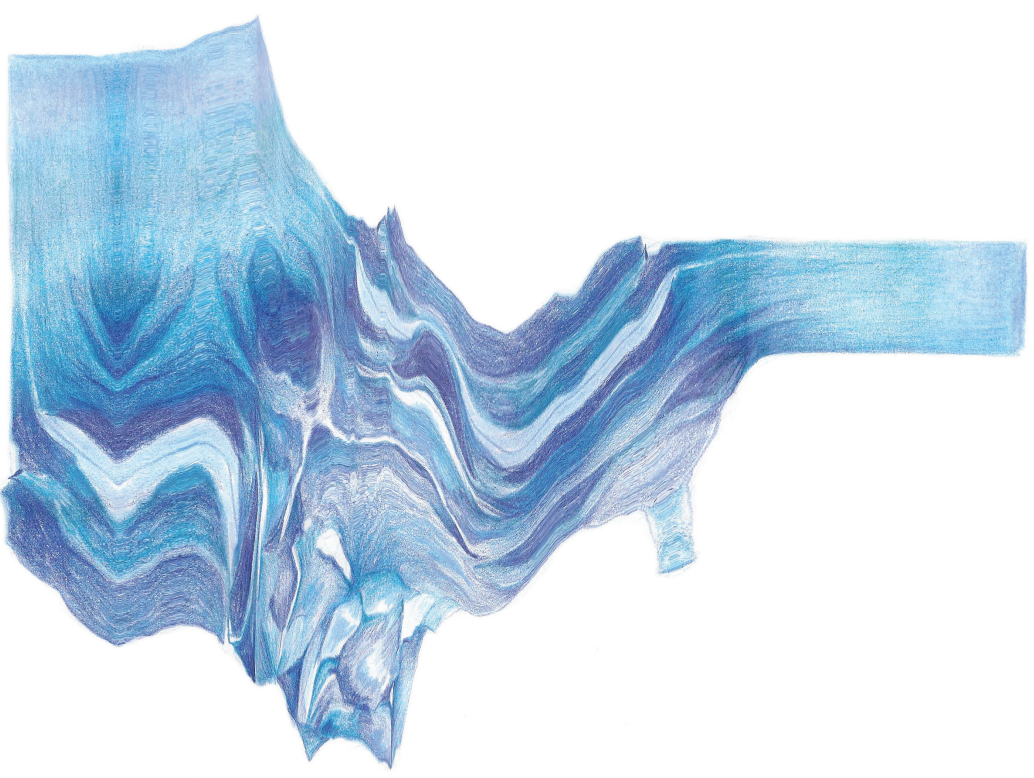
Smithson, when stating that artists works are in a state of arrested disruption and that no materials are truly solid as they contain caverns and fissures,<sup>37</sup> already draws parallels to rocks and objects by extending the properties of earth matter (fragmented, broken up) to things and materials in general. Using rocks as a frame to think in the realms of industrial design leads to the questions of 'Why are products designed to remain in a fixed state? Why is it, that in a world where everything is evolving and transforming permanently the goal of the industry seems to be that the object does not?' As we can understand from Smithson's work, matter is always moving, transforming, evolving so the industry is contradicting the process of nature itself.

24

Homeware, dinnerware, products of daily life are considered in their final and ideal state when they are bought (on the contrary to some consumption goods such as wine). When products decay, change, wear out or just evolve, it often is considered as something bad, within the market and the daily use. For example, the evolution of material being oxidized, therefore changing color, is unwanted. Design studio Buro Belén weaves with a naturally died yarn that will change colors over time in their project 'Another throw' embracing this aspect considered as a flaw.<sup>38</sup>

In many cases of product design, the purpose of the product is for the here and now, hoping that it will remain in this state for the rest of its life and then, if the state changes, will be thrown away or recycled. Smithson refers to the technological ideal, an enclosed and pure system that has been created for technological products to exist in. This system is not conceived to interact with earth processes such as oxidation.<sup>39</sup> Products can therefore not interact neither with earth mechanisms anymore nor with living organisms (if the product rusts it won't be perceived as a useful product anymore). The technological ideal extracts a matter from earth (the ore), purifies it and as a result the new material can't integrate back to where it was extracted. This system shows its limitation in the waste stream. Because objects have nowhere to return to, they create waste.

*Right: "The breakup or fragmentation of matter makes one aware of the substrata of the Earth before it is overly refined by industry into sheet metal, extruded beams, aluminum channels, tubes, wire, pipe, cold-rolled steel, iron bars (...)" writes Smithson. The notions are explored by 'scanner sculpting' the drawing of a rock.*



25

<sup>37</sup> Smithson, The sedimentation of the mind: earth project, 97  
<sup>38</sup> Buro Belén website, 'Living colours', Project self initiated in 2015, <https://www.burobelen.com>

<sup>39</sup> Smithson, The sedimentation of the mind: earth project, 86





Translating the tension between the  
image of a static rock and the reality of its  
ongoing movement

*Rock's instability*

*Rock's perpetual movement*

*Perpetually moving rock*

*Rock's ongoing flow*

*Rock's dynamism*

*The fragile dynamism of rocks*

*The constant movements of rocks*

*Perpetual movement of static things*

*The constant moving object*

*Non staticness of things*

## c– What inspiration can we draw to design for rocks?

I would like to design to accept change, connections and merging with the rest of the eco-system. Designing with the ‘impurities’ and ‘imperfections’ of a material allows to go beyond the drive for purification and choosing a ‘poor’ material questions the social values associated to matters and can already be a statement in itself. Rocks and gems have been ranked by their preciousity but in this research I choose to work with the rocks that are around me and that aren’t considered valuable.

Being inspired by rocks to design is also looking at things from a bigger time scale and envisioning the journey of products not in just fifty, but millions of years. Crist questions the human centered perspective of our way of producing.<sup>40</sup> Thinking about sustainable design can also be designing from the point of view of a rock, looking at the impact of production beneath earth’s surface.

Rocks can be used as design materials and their formation processes, such as crystallization, eroding, cementing and metamorphosis, can form them into objects. That way, the object can enter the rock cycle, re-integrating geology, as well as revealing geological processes that are normally invisible for humans. Getting inspired by the mechanisms that formed rocks can allow to discover new ways of processing them into objects, innovative and less effort consuming than traditional uses (like sculpting) such as cementing with pressure, heat or with bacteria like sedimentary rocks do.



<sup>40</sup> Crist, E. On the poverty of our nomenclature. Environmental Humanities vol. 3, pp. 129-147 (2013). [www.environmentalhumanities.org](http://www.environmentalhumanities.org)

## b– Product cycles and the cycle of rocks

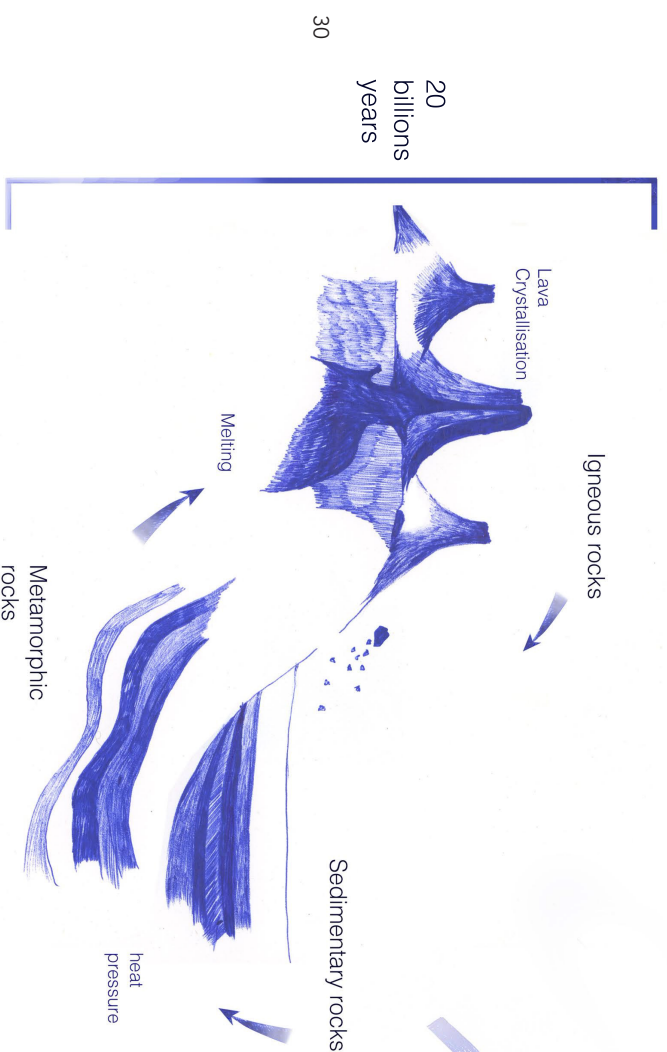
The object I chose is the Teflon pan, that is built with layers, just like earths and rocks. But these different materials can’t be taken apart so it makes them hard to be recycled, creating slags once they are burnt in waste incineration centers.

Industrial processes constantly copy existing earth mechanisms, such as melting, folding and grinding small sediments. But when comparing the cycle of a product to the cycle of a rock, it is striking that rock’s cycle produces no waste, there are no ‘by-products’, starting point or end point. No material is considered more pure or valuable than others. When sedimentary rocks are created, all the loose parts, plants, and dead organisms are formed into one object.

Contrary to this are most of the industrial productions, where matters are classified, selected, and purified, based on values (economical, social), from the technological ideal that form our system of value and production. Flaws and impurities are human notions. The book *The art of living on a damaged planet* shows that the desire of industry to refine and separate different components of the same organism comes from a human centered perspective.

Right: Casting igneous rock in a mold. The rock melted in the ceramic kiln, and the release agent created texture on one side (top picture).

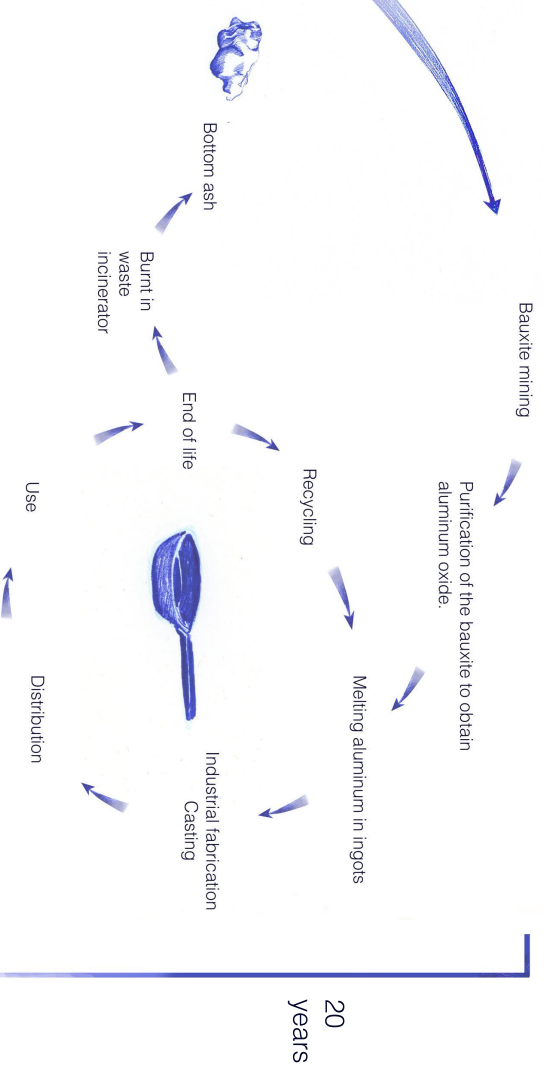
## Life cycle of a rock



20  
billions  
years

30

## Life cycle of a pan



20  
years

31

Comparing the life cycle of a product and the life cycle of a rock. The bauxite is mined, extracted from earth system to be processed by the technological ideal and is purified into aluminum, which creates a slag, that is then sent back to geology.

# 2

## **Field studies: analysis of Westduinpark and Zuiderstrand**

*A landscape in process of  
construction and deconstruction*



# 1- Introduction: choosing a site to conduct research

How can we use the resources of a specific land to create objects that can be in a dialogue with earth's processes and become part of the landscape?

In the second part of the core chapter, I analyzed a specific place, Zusterstrand and Westduinpark in The Hague, inspired by designers Christaansen and Montens.<sup>41</sup> During a lecture of his, Christaansen expanded on their technique: before starting, the borders of the intended area are drawn on a map, therefore setting limits that are then explored in predefined directions and manners. The discoveries are to be documented on the map while investigating the surroundings. For my personal studies in the area, I collected and analyzed a variety of materials. At the beginning of the winter semester, my intention was to base the core of the research on a specific landscape. During the semester, the focus shifted on the rocks that were found there, as I discovered the slags and wanted to spend more time investigating them.

The first visual research was the creation of printing materials from the objects found in the landscape. This part consists of material experiments on which I will reflect. Secondly, the gathered rocks were studied by conducting interviews with geologist Doctor Karl-Heinz Wolff<sup>42</sup> from Delft University, and Harry Huisman from Hunebedcentrum, a Dutch museum<sup>43</sup>.

41 Kak website, "Interview from Design Lector Alice Twinnlow of designers Krijn Christaansen and Cathelijne Montens: Walking as a design method in art and design", accessed April 22, 2020, <https://www.kak.nl/en/lectors/design/krijn-christaansen-walking-as-a-method>

42 In conversation with Doctor Wolff, November 26, 2020

43 In conversation through e-mails with Harry Huisman, November 12, December 3, 2020

Right: Photo of the entrance of the beach access number 10, depicting different layers of space: the small dune of sand with waste in it, behind it shells to build a path, behind it a layer of infrastructure elements, and then the last layer is the vegetation.





For several reasons, I chose to study the southern beach of The Hague, that is connected to Westduinpark, close to Duindrop. It is the place of nature for people living in the Hague. This part of the coast, as opposed Scheveningen and the pier, is considered more calm and authentic by locals as it has protected dunes in the background of the beach.<sup>44</sup> I also chose a space that is close to the city, used by urban dwellers to rest and connect to nature.

Though it is perceived as such, this space is far from being untouched. Firstly, the landscape has been modified with several forms of infrastructure, like paths, poles, benches and signs. Moreover, to work against the perpetual erosion of the coast, sand nourishments are applied by the infrastructure company.<sup>45</sup> For the same goal, in the southern regions of the beach a part is entirely built with a sand engine, a process developed by engineers to bring sand to the beach.<sup>46</sup>

The case of this beach is interesting to show the tension between the natural aspect that it conveys and the reality of its construction. Whereas the landscape deconstructs with erosion, it is artificially rebuilt. The Netherlands is a country that has been made with geo-engineering techniques and therefore is a good example to show the relation between earth processes and industrial processes. What are then the native geological elements and what are not? Moreover, the global corona pandemic is teaching us to produce locally and therefore to look at materials that surround us.

In the following pages, this place will be referred to as a 'natural landscape,' though I don't believe in the idea of 'going in

nature,' as in something that is disconnected from us, pure from human's actions. If human beings are able to go into a natural landscape, it's because of the infrastructure, maps, trails and other investments of fellow humans. In *Landscape memory*, English historian Simon Schama states "it is difficult to think of a single such natural system that has not, for better or worse, been substantially modified by human culture. [...] And it is this irreversibly modified world [...], that is all the nature we have. [...]"<sup>47</sup>

Right: A place in a process of construction and deconstruction, between natural and artificial.

44 Website of the Hague's municipality, 'Zuidstrand', Accessed on October 1, 2020 <https://denhaag.com/nl/zuidstrand>  
45 In conversation through e-mails with Harry Huisman, November 12, December 3, 2020  
46 Wikipedia, 'Sang engine', Accessed on November 12, 2020 [https://en.wikipedia.org/wiki/Sand\\_engine](https://en.wikipedia.org/wiki/Sand_engine)

47 Schama, Simon: *Memory and landscape*, Harper Collins publishers, 1995, p.7



## 2- The print goes back to the landscape: material experiments on the beach

How can the landscape be printed and through which medium? How can this representation go back to the place afterwards?

This research is a first visual approach to get familiar with the space, harvesting possibilities and revealing the beauty of unseen materials. It was an aesthetic and sensitive understanding.

I gathered all the elements that could be used as potential printing materials: looking for pigments, as well as textures that could be added on the printing plate. I accessed the beach through the entrance of Westduinpark and first looked in the areas with forestation - soil, leaves, red berries. I collected soil from the different stratum: first the earth of the woods, secondly the soil on the way to the beach and then rocks and algae found on the beach.

What stroke me the most were the notions of entanglement, layering, metamorphosis: the passage from one state to another. I was fascinated by these different transitions, these layers of space to go through before reaching the sea, then the sky, the end layer. Visually and geologically, the landscape is built with overlaps of stratum.

I first experimented on how to transform the materials into pigments: smashing and mixing them with linseed oil, thinner or thicker, with more or less oil, bringing different textures. Experimenting with different grains and thickness also revealed the constitution (grain) of the soil.



*Right printing with red rocks from the soil of the path*







Printing with coal-ash, that contains a lot of iron, gives a very strong brown colour. Offering a different representation of the space, by showing a detail, or using a material as a color





Working on the notion of layering by representing the outlines of the space. The dunes fade away, and they contain infrastructure elements (a bench on the middle print).

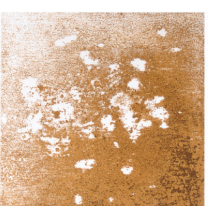


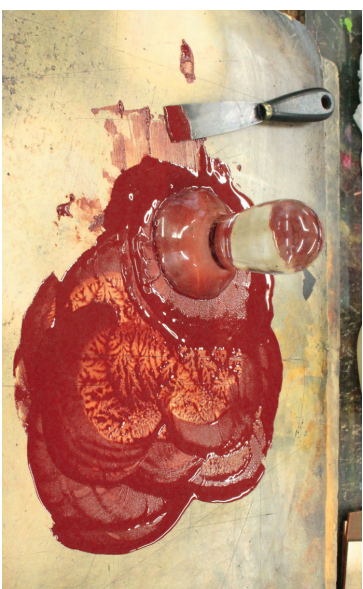
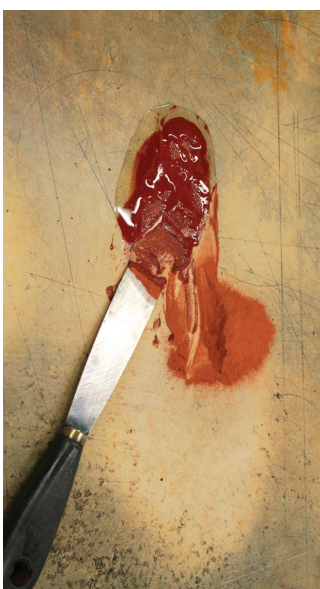
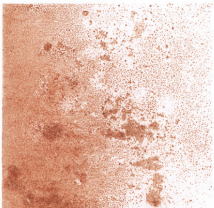
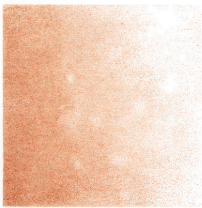


Ink made with soil from  
the wood.









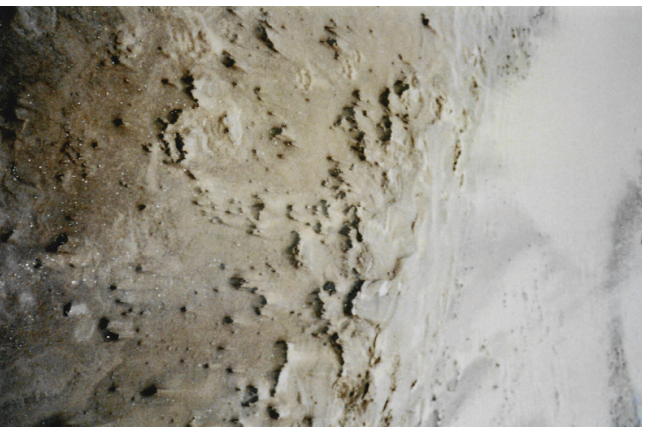
The process of ink making requires many different steps, such as grinding in very thin powder, then filtering with a sieve and grinding with a mortar, before mixing with the right quantity of linseed oil and grinding again.



After I had worked on the pigments, it got more clear that the printing plate should also be extracted from the studied space. In a way, printing tools are directly part of the image and could also go back to earth. I was first seeking materials that could be transformed into sheets. Adding as little outside material as possible would allow the newly formed object to go back to where it was extracted from. I then searched for organic materials that have in themselves the possibility to become a surface, turning algae into plates since its stickiness can be its own naturally glueing binder.

I also collected dead woods from the soil of the forest, interested in the evolution from printing with laser cut wooden sheet bought in school, and using the dead wood that had been engraved by time and organic processes. In a way, this wood is already the printing plate of the park itself. On its surface, elements like the wind and water have been captured and imprinted.

The conceptual reason for wood printing was the idea of imprinting, as time is applied in layers and deposits on the plate. It is an accumulation of time that passes. With wood printing, the memory of the place is kept on the printing plate.



Dead pieces of wood are used as printing plates, the ink comes from the soil.







Algae is used as a printing plate, the ink comes from rocks found on the path.



A rock becomes a printing plate, the ink comes from another rock.



This material experimentation was about exploring the way back to earth, observing how organic systems affect the artifact and how time changes and impact productions. In that sense, the last component of this experiment was the surface which is printed on: the paper. Looking for potential paper material, nettles are ideal since this plant is a weed and grows quickly, covering most of the soil of the place it grows on. Most of the materials used in this research are considered waste or unusable, such as the slags, the rocks imported by the infrastructure company, the nettles, and the dead algae washed up on the beach.

Using the nettle was a way to finalize the circle, that would allow placing back these prints where they were found to give them back to their environment.

Printing with pigments made out of soil, with dead wood, on nettle paper is a way to visualize and translate the spacial relation of these elements, since dead wood lays on nettles in the park.

56

By analyzing Smithson,<sup>48</sup> we can deduct that the original state of an object is when it interacts with organic processes. When its main functions are vanishing, and it's not sellable or usable anymore the object reveals its true nature. Earth processes extract it from its function. What remains of the object is its fragile carcass that shows its vulnerability- outside of its context of creation, outside of the human system in which it was operating. It brings it back to an ecosystem that interacts with other living elements. 'Rust or dust' is also a moving state, because there is not one final way to be rusty but it progressively operates over years.

<sup>48</sup> Smithson, 'The sedimentation of the mind: earth projects', p.86

*Right: The making of paper from nettles. The bottom paper is whitewashed with shells from the beach as well.*

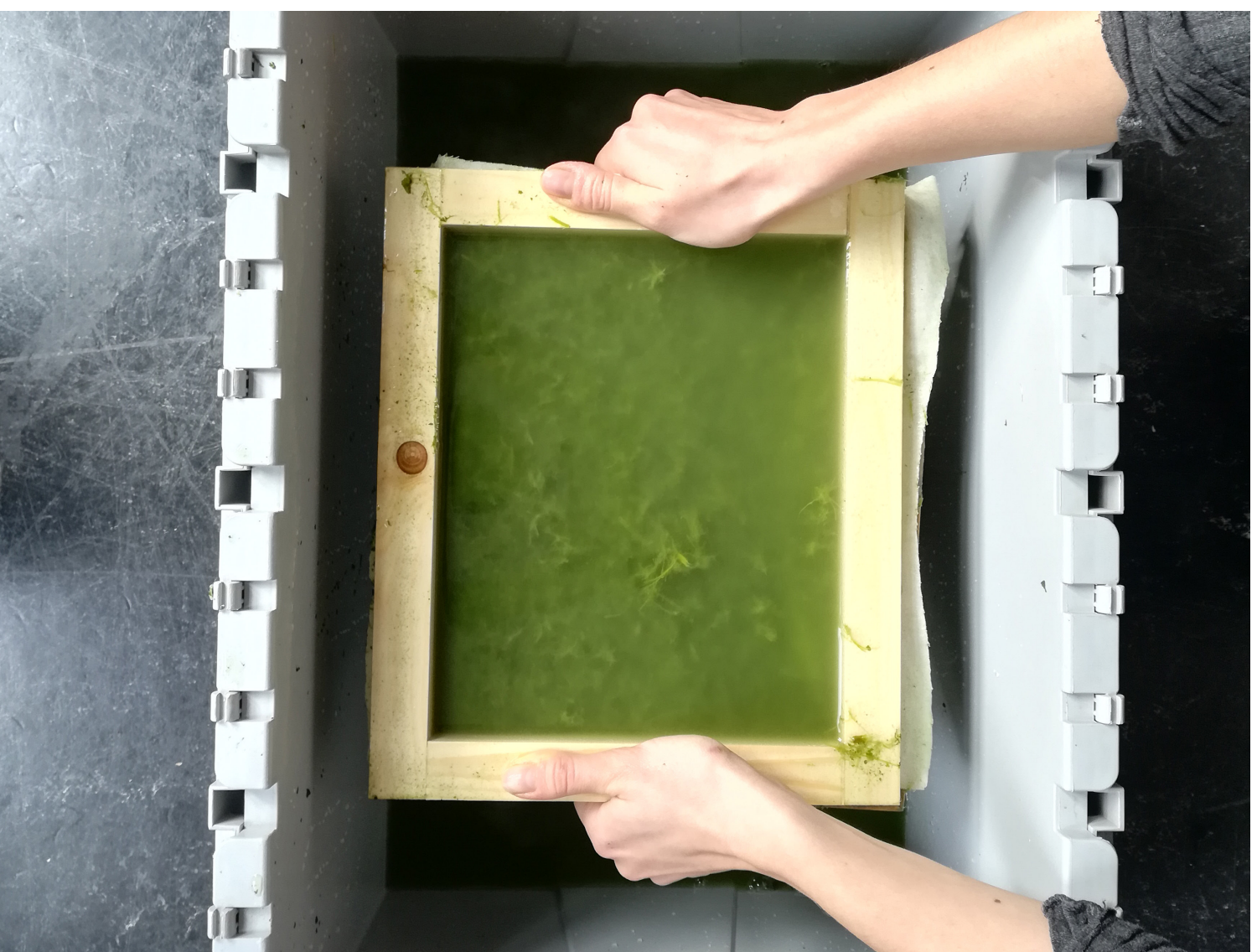




Photo taken by photographer Ronald Smits during the presentation of the research on January 18.







Day one



Day two



Day three



Day eight





Top: Several organisms start merging with the paper, such as leaves, soil and a snail.

Left: Overall setting of the display

Right: Day eight, the paper merges with the living organisms of the space







Day one. The printing is placed next to the rocks that have been used to make the ink.



Day two.



Day eight.



### 3– Which rocks can be found in a place that geologically shouldn't contain any?

#### a– Rock's stories

When going through the area and investigating it, it stood out that there were different types of rocks on the ground, given that geologically, the only materials that should be found there are sand and shells.<sup>49</sup>

Huisman explains that the natural rocks on the beach and in the park have diverse origins. Some come from Scandinavia and were transported to the Netherlands within the shifting masses of ice in the ice age, but most stones are brought along with sand nourishments which are applied by the 'Rijkswaterstaat', an infrastructure company, to beach sections. Additionally, varying amounts of stone comes with the sand brought in by rivers such as the Rhine and Meuse.<sup>50</sup>

<sup>49</sup> In conversation with Doctor Wolf, November 26, 2020  
<sup>50</sup> In conversation through e-mails with Harry Huisman, November 12, December 3, 2020

Right: Photo of a section of Westduinpark, revealing slags as part of the geology, hidden by layers of tars.







When I show my findings, I usually get a disappointed answer: this is not a rock, it's a waste. With this rock, it's the first time that I am congratulated. "Nice finding!" Writes Huisman in his e-mail. It is a quartz porphyry, a volcanic rock, probably from Dalarna in Central Sweden.<sup>51</sup> I found this rock on the path. After I had sent more than fifty photos to all kind of amateurs and specialists, it is the first time that I find a rock considered valuable by others. That value derives from being old and that both its journey and composition haven't been modified by human activities. The fact that some rocks are considered more precious than others from a human's perspective reflects the desire for classifying, ranking and separating things from the eco-system that co-exist.

---

<sup>51</sup> In conversation through e-mails with Harry Huisman, November 12, December 3, 2020



The rock shown in this picture is a natural formation. "It arises in the soil off the coast through the action of bacteria, the sand and shells are bond together", Huisman writes<sup>52</sup>. This is the first product found in the research formed only with the materials that geologically belong to the beach. This would then be the best example for a 'native' rock. It also reflects the interaction of various living organisms, since it's through the work of bacteria that it has been created.

---

<sup>52</sup> In conversation through e-mails with Harry Huisman, November 12, December 3, 2020



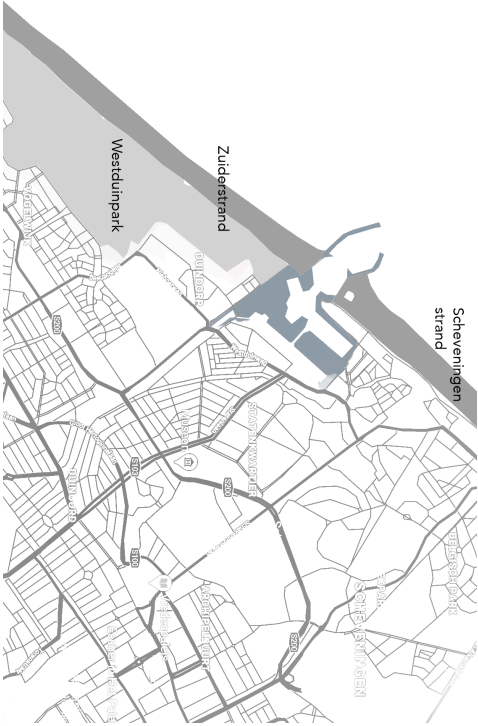
# b– Real or fake? Human-made rocks, entanglements of matters and stories

Whereas the initial intention was to work on rocks in a classical sense, the research led to a discovery of several elements that aren't rocks but seem to be such. They are what will be referred to as 'industrial rocks' in the following. They are made of parts of the infrastructure (the path) that got loose with time, and by-products of the industry like slags and coal ash.<sup>53</sup> In nature, metals are found in impure states called ores. To extract the desired metal, the ore is exposed to high temperatures and the impurities are separated from the molten metal and can be removed under the shape of an agglomerated of compounds that is the slag. Identifying the origins of these objects was a long process since slags aren't considered important by many geologists.

Slags can be found on the beach as well as the paths throughout the area. The slags that are on this beach have been brought there by the waves and tides.

They can have various origins since they could have been dumped into the sea in Germany, France, Belgium or in Rotterdam. They were slowly washed and separated from the heavier kinds, the process of which is called separated sedimentation.<sup>54</sup> Determining the age of these formations is unclear as the production, movement and formation can have happened at some point over the past two hundred years.

The slags from the paths are fly ash from a power plant, used as a filler for the tar, in order to make it stronger, so we can walk and drive on it. To build the path, asphalt and tars are combined with ash and shells.<sup>55</sup>



<sup>53</sup> In conversation with Doctor Wolf, November 26, 2020

<sup>54</sup> In conversation with Doctor Wolf, November 26, 2020

<sup>55</sup> Ibid.





## Conversation with Dr. Karl-Heinz Wolf

L.P.: I found this slag on paths a lot, what do you think it is?

K.W.: From its yellowish color, we can deduct that this slag contains a lot of iron, which means that it probably comes from the steel work. Steel slag is a by-product of steel making, produced during the separation of the molten steel from impurities. When being heated, the iron melts over disintegrated limestone. This type of slag is composed of reminiscence of limestone (mostly calcium), dirt and the coal itself.

L.P.: Do you have an idea where this steel slag could come from?

K.W.: There are several steel industries along the coast. Every city had one to make molds to cast iron, bronze or copper to make statues. This slag could also come from the Maasvlakte, the new industrial area recently built in Rotterdam, that has been created by pumping sand from the sea.

L.P.: How did these slags end up on the beach?

K.W.: They dumped everything over the past hundred years. It's only in the last thirty years that we got more aware.

L.P.: And do you have any idea why this particular slag was brought by the waves on the beach?

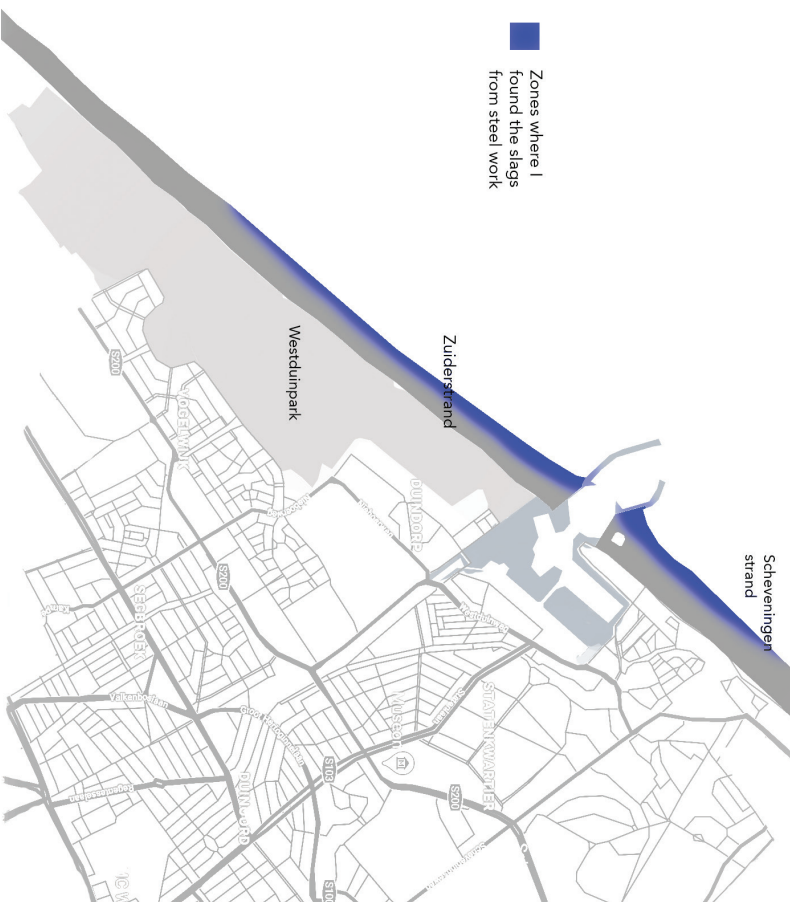
K.W.: That is a difficult question. There are many possible ways. Maybe this was a piece of a weight that they had on a boat to keep the balance. What can we do? This area has suffered from two thousand years of intensive human history.

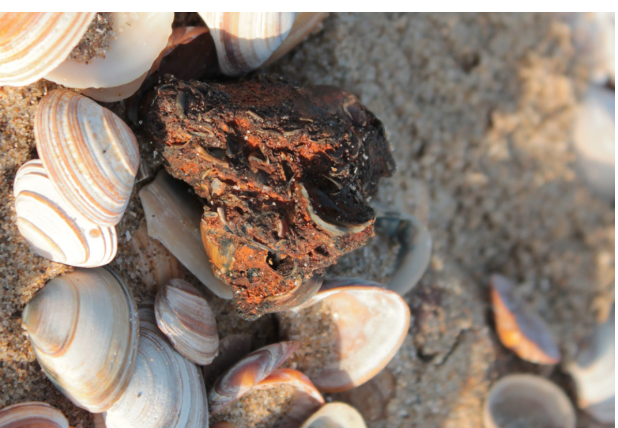






Where did I find these types of industrial rocks?





L.P.: I found several 'objects' of this type on the beach. They seem to be merged

with shells. Are these slags?

K.W.: This is a mix of tar and shells, agglomerated with slags and little pieces of rocks and sand. It is probably a broken-off piece from the paths, so this is not a slag from the industry.

L.P.: But how do these materials get merged?

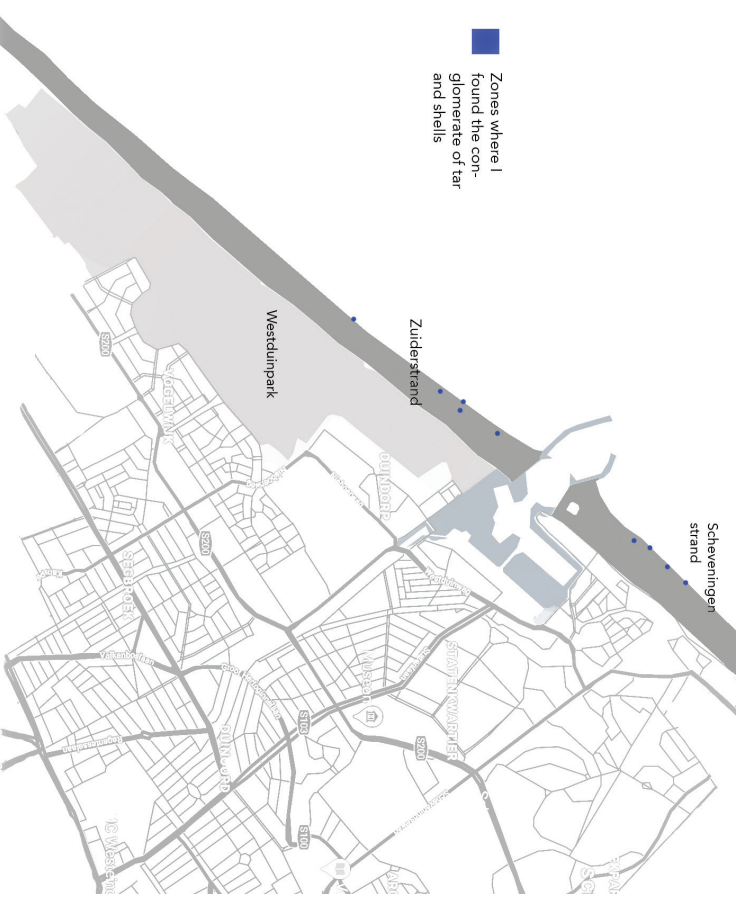
K.W.: It was probably originally a shell path, and later they put tar on top of it, that's how they got merged. When I was a kid, we had shells paths, and when they needed a new path they were just dumping the shells. That's why there are not that many shells on the beach anymore, compared to half a century ago. There are less animals. We are just using everything that the nature produces. We are cannibalizing nature.







Where did I find these types of industrial rocks?





L.P.: I found many objects of this type both on the beach and on the paths.

K.W.: That is a slag, what they call clinker, and that is as strong as porcelain. I see pieces of clay that have been heated to high temperature, pure kaolin, a very special clay-type, which means white earth. This is what they call an agglomerate, of little pieces of burnt and fused rocks. These are little pieces of art themselves.

L.P.: Where do these come from?

K.W.: It's just from burning coal. When I was a child, most households were burning their own coal, and the ashes were thrown in the house's path. This slag could come as well from the path behind my parents'. But it most likely comes from coal fire power plants. The air is separated through a fly ash filter, and the ashes are fused and melted and fall at the bottom. And this could be just from the Maasvlakte.

L.P.: And how did it get agglomerated with clay?

K.W.: They add particles of various elements when burning coal, to improve the heat capacity, and use the heat much longer. What they do for example is that they take leftovers from concrete, grind it, and throw it with the coal in the mix. That is what they call 'reuse of materials'. The only thing you need is fine particles. It can be sand, it can be clay, it can be reused buildings.

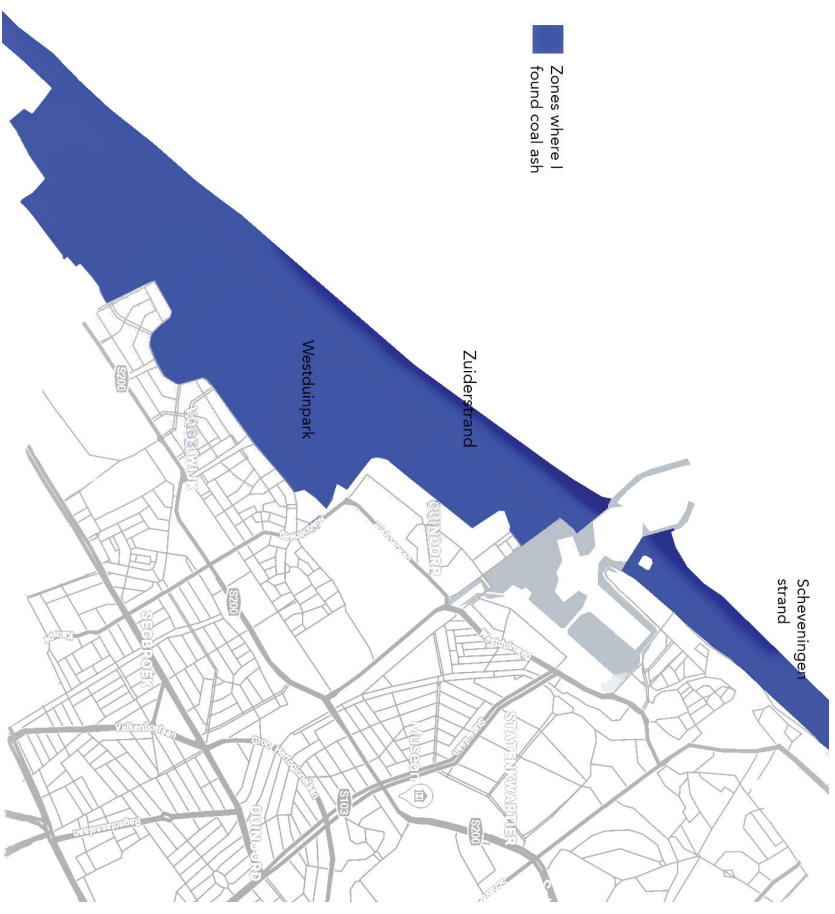
L.P.: How are the clinkers reused?

K.W.: These are the fillers. They fill dykes with it. They fill pavements with it. We had fly ash mountains in the Netherlands, until the 80s or the 90s, and then we started re-using it, as filler for roads, for concrete, for whatever.





Where did I find these types of industrial rocks?







A new geological entity? The slag is an entanglement of various materials at the end of their life, merged together.





**Do these slags actually represent the landscape that I worked on, Westdunpark and Zuiderstrand?**

I originally wanted to depict the landscape. Focusing on elements that are hidden in it might seem contradictory. But what can be concluded is that these slags are specific to this landscape, because they make up the foundation, they make it more solid in order for us to have access to it. They tell the history of the area and how the landscape was transformed, and co-created with humans.

I would like to present this rock study as a museum of natural history would present a collection of the finest minerals. By doing so I aim to highlight the rocks and human rocks that are around us.

## 4– On industrial rocks

### a– Reading stories in rocks

In the following chapter, I reflect on the information from the previous chapter within the theoretical context.

**In what ways can slags and human-made rocks participate in the discourse of the anthropocene? What can slags reveal about industrial design and our ways of producing?**

**What do these slags reveal about the dutch history and culture?**

Rocks tell the history of the earth, slags tell the history of the industry. Each slag tells in its way a story about human relations with the rest of the eco system. The conglomerates of tar and shells reveal the decreasing number of animals on the beach. Slags from

coal power plants show the over-use of fossil energies in the Netherlands. Whereas currently, most of the Netherlands electricity is generated in coal-fired power plants,<sup>56</sup> 90% of mined coal being used as fuel. The dutch government wants to ban the use of coal in electricity generation by the end of 2029.<sup>57</sup> Will these human-made rocks be seen as fossils in less than ten years, a vestige of a past time, with an archeological value?

**To which extend do the slags evolve?**

To the question of ‘How long will these rocks stay on the beach?’ Dr. Wolf responded with another question. ‘How old is Iceland?’ He asked. 33 billion years old. Iceland is made from the same process. The only thing that can destroy slag is erosion and they will be polished until they turn into little beads. “Technological ideology has no sense of time other than its immediate supply and demand [...]”<sup>58</sup>, writes Smithson. It takes a few hours to create a slag but it will take billion years for it to disappear. Rocks, on the opposite, are never created nor recycled.

By observing that the man-made rocks agglomerated with various earth materials (pebbles, shells, clay), I thought that a merging was occurring over the years with the natural debris that were around it and that technological waste would transform once placed back in a natural landscape, going back into a ‘wild’ state, re-entering the rock cycle.

But Dr. Wolf explained that the merging process happened already in the factory. Gravel is placed at the bottom of the incinerator so that the ash melts on top of it so that it’s easier to remove.

<sup>56</sup> Dutch government website, ‘The future of fossil fuels’, accessed on October 20/2020  
<sup>57</sup> Bart H. Meijer (18 May 2018), ‘Netherlands to ban coal-fired power plants in blow to RWE’, *reuters.com*. Reuters. Retrieved 14 October 2019.

After their fabrication, the life and destiny of the slags does resemble the rock’s life. Sedimentation brings the lighter slags onto the beach and they get eroded after millions of years. The only difference is that the slags don’t complete the cycle by melting and turning into a new rock. They can not re-enter the cycle, even if they evolve, travel, change, they will remain as waste.

It’s interesting to notice that neither the product nor the by-product can return to the cycle, if we see the object and its residue as an entity. Slags and metal products could be perceived as two faces of the same industry, as a whole. Slags would be a way to visualize the ‘ecological impact’ of the creation of a product or a service. If we refer to these attributes as immaterial, they actually have a physicality.

### b– What slags can tell us about industrial design

**Reminders, memento mori of the industry.**

Human-made rocks are, in a way, acting like reminders that our actions have consequences, memories of an intensive industrial work. They are mostly used as fillers, hidden under layers of sand, spread around the country. We don’t want to see them.

The slags also tell us about industrial design. This is what it becomes. It’s through the creation of an overly refined product (metal extraction) and through its destruction (incineration centers where products that can’t be recycled are burnt) that slags are generated. They could be seen as a materialization of the technological ideal’s failures. Indeed, Smithson explains that the refined ‘metals’ exist within an ‘ideal sys-

tem’<sup>59</sup> that can’t cohabit with earth processes. As a consequence of this invented system, slags are the evidences proving the impossibility to create a human organization that denies earth processes. They are glitches, term from computing industries that refer to a fault in the system, which suggests something more mysterious and unknowable than a bug.

**Same ore: two different products. Contrast in matter.**

As Smithson explains, there is a contrast between the shape and texture of technological products and by-products.<sup>59</sup> The slag’s surface is swollen, cracked, broken up, very agitated and opposed to the intense smoothness and geometry of the industrial products. The controlled repertoire of shapes that the technological products are mold into reflects our fear of erosion and the undefined. It also shows our fear of time passing. Reading Smithson, one can understand that the honesty of a material comes back when it is exposed to earth’s processes again because it’s alive, moving and transforming. Change and evolution show us that time passes and that we are not eternal beings. Being confronted with time scales way bigger than we can grasp is unsettling and it confronts us with the fact that humans aren’t the center of the system. This could be the reason of why humans create their own industrial system at a human time scale.

Investigating this place, I picked rocks that were 300,000 years old, walked on a sand that was 10,000 years old, carried slags that were 100 years old while I was 23 years old.

<sup>58</sup> Smithson, ‘The sedimentation of mind: earth project.’ 86  
<sup>59</sup> Smithson, ‘The sedimentation of mind: earth project.’ 89

## c– A geology of industrial waste: relations between rocks, slags and the landscape.

### Faking naturality

If slags look so much like rocks it's because their formation process is quite similar. A liquid crystallizes, like in igneous rocks. They are both entanglements of several identities. While scrolling on geological forums, I discovered that it frequently happens that a searcher would mistake a slag for a rock. Slags are in a way natural rocks in disguise. They could be seen as tricks. Finding a by-product reveals the industrial trace that we want to escape from when going into nature. In a sense, they betray the idea of the landscape being a place far from human activities.

Princen explains his fascination for the 'making of the landscape.' He refers to the Dutch landscape as 'a designed object,' built with several layers of geo-textiles, polystyrene blocks, and then covered by a layer of grass. "I am impressed by this effort, by this idea of construction, and ultimately by hiding all these 'technologies' underneath the grass."<sup>60</sup> The slags are part of the same landscape construction process, hidden under a layer of sand.

Instead of denying and hiding human interventions in places, I believe that we should try to develop new connections, while acknowledging the history of dominion, that aren't based on exploitation, but rather on getting inspired by the possibilities that a place offers. I want to be aware that this notion of going into the wilderness, into a nature that would be disconnected from us, is a fantasy. The natural landscapes we

are able to walk in are already co-created. Simon Schama, in *Memory and landscape*, states "[...] It seems right to acknowledge that it is our shaping perception that makes the difference between raw matter and landscape."<sup>61</sup> The landscape is part of us and we are part of it.

### Landscapes form in various parts of the world: different origins converge in one place

Studying the different elements found on the beach led me to question what is a native, autochthonous element of this beach and what isn't. Are the rocks that have been imported from the Meuse and Rhine more native than the slags coming from the Maasvlakte area in Rotterdam? Are these industrial rocks the beach's new geology? Amongst all the elements that I analyzed, only one is solely made with the geological elements of the beach. All the rocks and slags are entanglements of various compounds that have a different origin and journey. The coal ash is agglomerated with pieces of clay, limestone and shells, originally from old buildings, concrete, that come from somewhere different.<sup>62</sup> The oil that was used to build the tar, the pebbles that are agglomerated to the slags also travelled.<sup>63</sup> It's an entanglement and cross-road of various stories and lives that end in this final absolute residue that is the slag.

Therefore, this also shows that we see the landscape as something static and grounded yet it's perpetually evolving. It is in this disrupted phase, mentioned by Smithson. Landscapes themselves are not 'unities,' but things in a state of arrested disruption.<sup>64</sup>



A steel tube and a steel slag are brought together in a common object. Two states of the same ore are reunited, after it has been separated by the industrial ideal.



## d-Entanglement of earth and industrial matter

When their toxicity is too high, slags are buried deep underground, forced into earth's deeper layers. Whereas the technological ideal's motor is making things cleaner, humans are the ones creating actual dirt, harming other species. The effects of by-products on the environment are still partly unknown. Pincen refers to "a world in which man is slowly but surely losing his grip on the very matter that he has created."<sup>65</sup> The accumulation of slags and their over-presence makes it impossible to perceive where they are from and how to deal with them which, in a way, refers to that idea of losing the grip on human-made matter. The human rocks are conglomerates of elements from the industrial system and the earth's system, in which "the artificial and the natural take each other's forms."<sup>66</sup>

The book *The art of living on a damaged planet* reflects on the notion of entanglement. In order to live on a 'human damaged planet,' our survival "demands that we learn something about how best to live and die within the entanglements we have."<sup>67</sup> The word 'monster' is used to describe the ambiguity between how natural elements in their complexity can be perceived as monstrous by a human view that aims to separate and purify. On the other hand, the industry created monsters that can't integrate with the rest of the eco-system. Indeed, the drive for purification ignores the connections and interdependencies between all species. Classifying, organizing, purifying, brings new species that can not interconnect with one-another. "Ironically, the denial of the monstrosity of entanglement has turned this life-making trait against us."<sup>68</sup> The

slag is created with the desire to purify the metal but the left-over of the process is a toxic element that can't interact with the rest. Industrial rocks are themselves monsters in that sense, the result of "industrial campaigns exterminat[ing] impurities [...]."<sup>69</sup> They now consist of entanglements of different things that can no longer be separated. The entanglement can also refer to layering materials that normally don't go together. For example, teflon pans are layered with various materials that can not be separated and recycled after the products life-cycle. The pans, therefore, need to be burned, creating an entangled slag.

Latour argues that humans and earth are inseparable. Like the slag, "We, our technologies, and nature can not be disentangled."<sup>70</sup> He also states that we failed caring for our technologies, and that problems arose from that, using the metaphor of Dr. Frankenstein who created a dangerous creature (technology) that he then abandoned.<sup>71</sup> The lesson that Latour gives the reader is that we should be aware of the responsibility we have for our technological creations, stating that we should love our monsters. Stein is the German word for stone. It is common to refer to the monster as Frankenstein, therefore our slags could be called our Frankenstones.

Here it is about taking care of a matter even more discarded than technological creations: technological undesired creation. In 'Utopian debris,' Bas Pincen states "To see the beauty [...] you need to exclude the actual context; you need to give it an aura of it being an unreal place."<sup>72</sup> I extracted the slags from their actual context to be able to look at them. Whereas human rocks are normally buried and hidden in a group, I decided to focus on each individual entity.

On the following pages, photographing was a way to reveal these monsters, chimera, half-organic and half-industrial, that don't belong in any system. By changing the perspective (from small to very large) I aim to confuse and explore a new representation of this matter, revealing the entanglement from very close, inventing new landscapes and exploring the complex texture.

The entanglement of so many elements brings forth this rough and coarse beauty of a surface with the complex organisms sealed in its materiality. This work was made in collaboration with photographer Michal Kucharski.

<sup>65</sup> Pincen and Piniot, *Utopian debris*  
<sup>66</sup> Ibid.  
<sup>67</sup> Tsing, Lowenhaupt et al.; *The arts of Living on a Damaged Planet: Ghosts and Monsters of the Anthropocene*  
<sup>68</sup> Ibid

<sup>69</sup> Ibid  
<sup>70</sup> Latour, Bruno; *Love your monsters. Postenvironmentalism and the Anthropocene*, 2011 Breakthrough Institute, pp. 17-25.  
<sup>71</sup> Ibid  
<sup>72</sup> Ibid











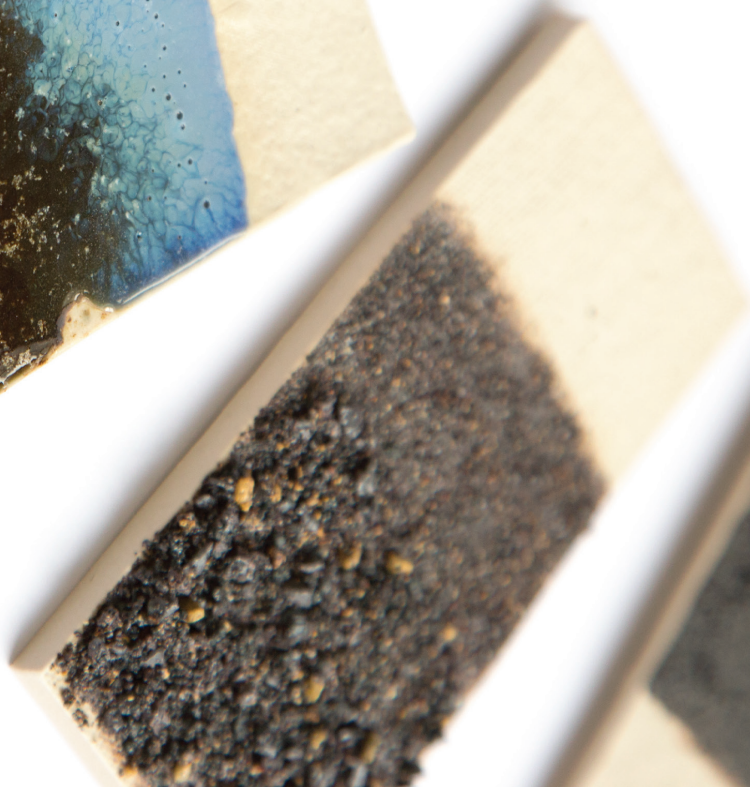
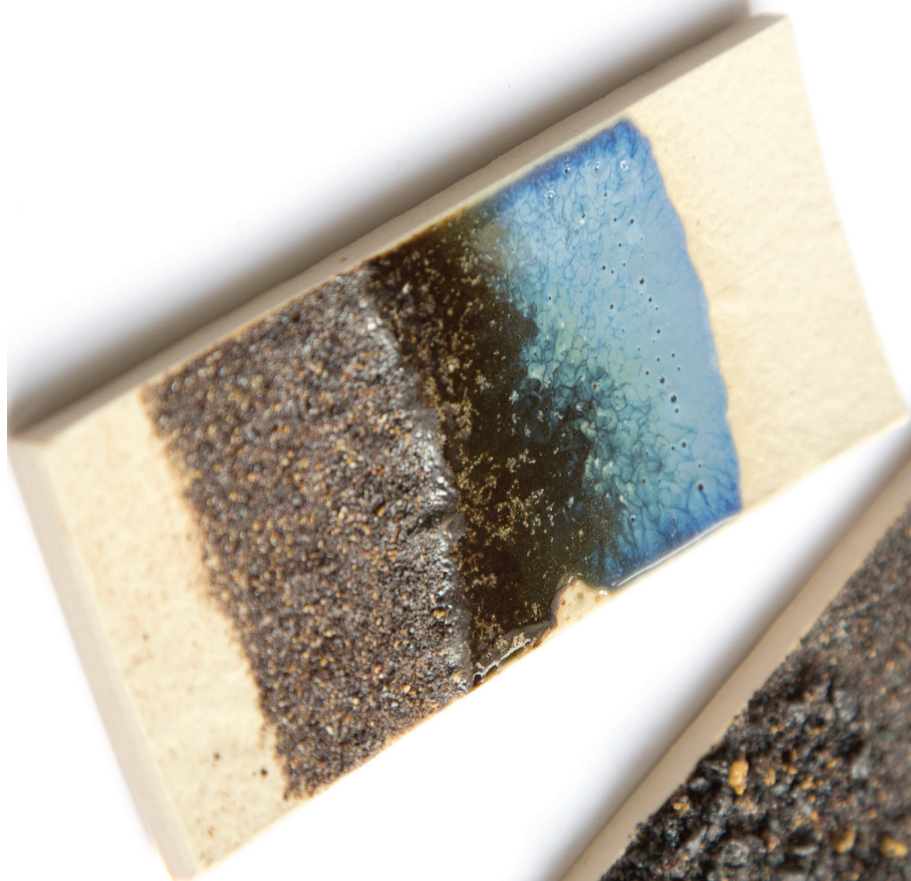
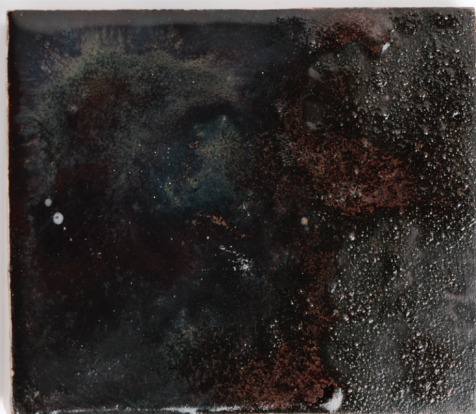


## 5- Reflecting on material experiments: designing with impurities

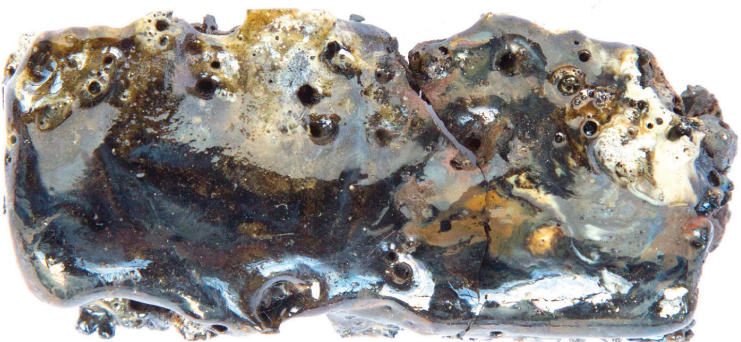
### a- Glazing with slags

Whereas by-products are used underground, below another surface, I decided to return that process and put them on top. Using them as an outside decorative layer is the opposite of using them for their solidity. I chose a ceramic plate as a surface to glaze because it's an object that, at the end of its life, can become part of the slag. Indeed, pieces of clay are used in coal power plants to improve the heat capacity. Moreover, another way for ceramics to be recycled is by being smashed in small pieces and used as fillers, together with the slags. I was also interested in translating geological processes because we find rocks on top of clay. Using every part of it as a glass also reveals the different impurities that it contains and it's a conscious choice to use all of it and not to select and purify it.



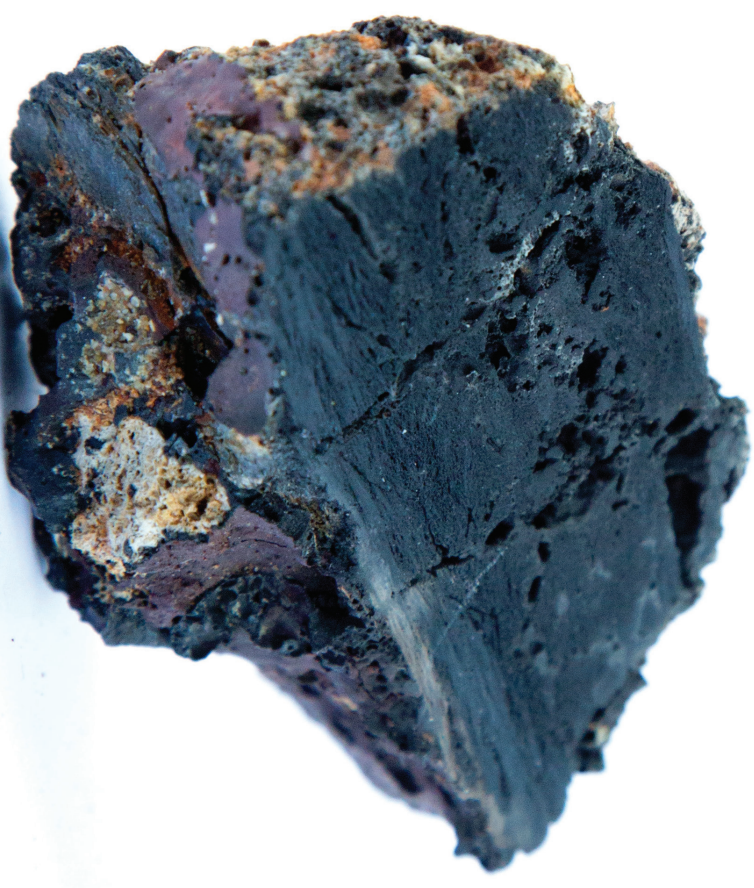






## b– In an industrial mould

Industrial rocks are melted in a mould, transformed into glass. It was a way to play with this contrast of systems as understood by Smithson. The slags are formed by being melted, therefore I am recreating their initial formation process. But they are now casted into a mould whose shape comes from the technological ideal. Making a material out of all the impurities goes against the desire for selecting and purifying.



## c– Soft roughness

Slags sliced and polished. The tools of the industry are reused to work on what the industry has discarded. The glitch, the undesirable element, is now the main beneficiary of the technological process. Moreover, actions like sanding and polishing, that refer to the desire for purification, are now confronted with the symbol of impurities, the slag.

## 6– Conclusion

### a– Using rocks and slags to reflect on industrial design

I started out this research with an interest in producing with materials from a specific landscape that would be processed in order that it could go back to the land it was harvested from. At first I wanted to work on an area known for its variety of rocks, but I then decided to focus on a landscape around me, The Hague's beach, which led me to work on, not only rocks, but also 'industrial rocks.' Therefore, my research question was 'How can we use slags and rocks to reflect on design in the context of the Anthropocene?'. These two matters were the ground for reflections comparing geological and industrial systems with the theoretical frame-work of Robert Smithson. The 'technological ideal' rejects or ignores the inevitable consequences of earth's system and aims to create products that would exist outside of the earth-system. I learnt that the relationship between objects and geology is complex and entangled. The technological ideal is a sub-system part of the eco-system, therefore our objects are earth's matters, just as much as a rock. But this matter has been extracted, purified and transformed.

I connected various approaches and mediums to conduct this research- intuitive curiosities (my interest in a rock found on the beach), 'real science' legitimized by an academic context (TU/e Delft and Doctor Wolf), personal stories (of Dr. Wolf), emotions, and art (Robert Smithson, Bas Prinzen as well as the guidance of my teachers). It taught me that a 'designer' can also be a 'connector', linking different actors, from the organic and inorganic worlds. It also made me reflect on the

different ways of doing research and I realized that there is one side the science, the truth, the real knowledge, which is considered more valuable to approach and 'know' the world and on the other side the intuition, the stories, the personal that are kept separated whereas it could work together.

Interviewing Doctor Wolf about slags thought me a lot. By studying the materials considered unvaluable around me, I felt that I was 'listening to the unheard'. I learnt about dutch history, the history of earth and the relation between humans and non-humans. I believe that this approach of giving a voice to the 'dead matters' that we are surrounded with, can be tackled by design. By revealing the stories of things that are around us, we can learn from them, creating a dialog with earth, the industry.

In this research, I learnt that the condition of existence of rocks is that they move, transform, merge with other organisms. Since our products, such as the pan that is produced in factories and can't be recycled, but as well as a jar made by a craftsman in ceramic, are earth matters as well, they are also in a constant state of change, they crack, distort, rust, flake. Design can take into account and even reveal the evolving interactions of a product with the rest of the eco-system, the connections it has with living organisms (lichens, moss), merging and blurring the divisions between the industrial and earth systems. After all, everything is before all earth matter, from the soil, to us, to our products, and if we dump toxic waste on the landscape we are intoxicating ourselves. Designing with rocks places the objects in a different time frame, envisioning their future in millions of years, using materials and processes that would allow the object to become a fossil itself, and reintegrate the cycle.

Researching on rocks also questions what is considered valuable or not. Stones and

minerals, more than anything, have been ranked and marketed by their preciousity. Humans look at materials that cohabit in nature, separating them, giving them a value, a price, a name. Based on their rarity and their potential of transformation, they are linked to an economical system. The raw minerals are processed to be transformed in what we call precious stones, gems and lead to certain areas being exploited. Why and how some materials are given value is also a question design can approach. The choice of a design material, and of its pretended preciousity is already a statement in itself. In this research, I didn't study the most precious rocks but chose to focus on the matter that I could find around me.

What I also found out during my research is that not all matter on the ground is natural and presumably 'good', as opposed to an industrial system that would be 'bad'. Indeed, beyond the beach that seems peaceful, in a nature that is presumably 'healthy', hazardous waste is hidden under a layer of sand. Unwanted byproducts of industrial design and capitalism, these matters are the result of the drive for purification, classification and selection, revealing the entanglements between industrial and earth matters. Whereas it would be unthinkable to throw pans on the beach, the slag, melted residue of that same pan but disguised as a rock, lay amongst sea-shells.

These human rocks are a good example of elements of the Anthropocene, becoming The Hague's new geology, questioning what is native, and what is natural. These industrial relics are made from natural elements, but they have been processed in a way that they shouldn't belong anywhere- neither in the landscape, nor in the industry, nor in the product market, yet they are there now. Discarded by geology and industry, they remain in an inbetween state. They, in a way, shouldn't exist, failures of the industrial systems, muffled stories buried in the

crust's layers. As a designer, I believe that it's important to think about the 'material' ecological consequences of the products we create and to avoid designing with materials that will create slags. Now that they are there, it is valuable to embrace the complex and dirty byproducts of industries; to use them as raw material or to raise awareness to them? Can they become considered precious? Can they be reinserted into a cycle? Can they be used as a matter on which to reflect upon?



## b- Design possibilities

1) Creating objects inspired by the three formation processes of rocks: igneous (lava melting), sedimentary (different particles cementing together), and metamorphic (two rocks merge together with heat and pressure).

Rocks would be the design material and their formation mechanisms would be reused to shape them. Ideally, each of these objects would be associated to a specific place that has in its landscape these different types of rocks. For the object's overall shape, the geological processes that formed the overall landscape could be inspiring.

To design the object, I could also reuse some of the aspects that I experimented with: rocks as glazing, rocks as pigments...

I could work on an area that has an interesting geological formation and that has a wide variety of rocks. For example the area of volcanos in Auvergne, France.

Creating an object entirely with rocks allows it to become a fossil and re-enter the rock cycle. In the same idea that atelier NL created objects made with clay extracted from different parts of the land, I could make objects with rocks coming from various locations, revealing the differences between these rocks, also telling about the history of the geology of the space.

2) This proposal is about specifically designing an outside object with these rocks. My area of study was a place intervened by humans (with benches, path, trash-cans...), that pretends to be natural. I am interested in how public objects reveal that the nature is actually intervened by humans. When industrial objects re-

main outside, their materiality is being exposed to the same organic processes that lead them to eventually merge with their environment. They suffer from erosion, organic lives starting to nest inside them. The separation between the industrial processes starts to lose its efficiency. Slowly, organic processes destroy it into something else. This process is beautiful, like surrendering to the organic, an acceptance of the ongoing decay.

How can a public object from a 'natural space' integrate itself in the landscape? It would be designed by using the material of the soil and the formation processes that formed this material. It would reveal the geological formation of the place, showing outside what happened inside. The object would later be affected by the same geological processes as the rocks from the ground, return to where it's from, becoming a part itself of the geological landscape.

3) This proposal is about using specifically the process of diagenesis, when the different sediments compact into one solid rock, creating a kind of a natural cement. A frame could be used the rocks sediments placed inside and with the heat and pressure, it would cement into an object.

The diagenesis happens outside, it would then be very interesting to try to trigger this process outside, growing rocks. Sometimes, natural reactions with bacterias happen outside, maybe that could also be used, and I would need to do more research on that specifically.

4) This proposal is about continue working with the slags by highlighting them and revealing them as entities made of various entities and translating what it can say about the industry. They could be used as glass to create objects, or by

being sanded and used as themselves, or the research with the glazing could be thoroughly extended.

5) This proposal is inspired by Robert Smithson, designing objects that would allow a dialogue between industrial and organic processes, open to interventions with earth processes, evolving depending on their environment. The aging of the object and its interactions with the outside would be visible. For example, metal rusting only on some parts, creates being formed with time... To reflect more on the theory of Robert Smithson, these objects could translate this notion of the perpetual movement of things, and they wouldn't be designed in a fixed state. They could also be designed for a specific outside context and change aspect with more or less humidity, etc.

Thesis text and images by  
Lucie Ponard

Design by  
Lucie Ponard  
Ian Scheufler  
Stefan Lang  
Royal Academy of Arts, The Hague 2021 ©



