PLANT-TECHNOLOGY HYBRIDS

OBSERVING THE HYBRID LANDSCAPE OF THE ANTHROPOCENE

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THE MORE-THAN-HUMAN WORLD

"In 1996 David Abram (philosopher, cultural ecologist, and performance artist) coined the phrase „the more-than-human world" as a way of referring to earthly nature; the term was gradually adopted by other scholars, theorists, and activists, and has become a key phrase within the lingua franca of the broad ecological movement" (Encyclopaedia, 2021).

The term more-than-human challenges the notion that humans are the sole center of importance in the world. The term emphasizes the intentions and value of non-human entities, like animals, ecosystems, and plants (Abram & Rose, 2022). Further, the more-than-human perspective, distinct from the term *nature*, incorporates humans as a part of the concept and imposes responsibility for non-human entities.

PLANT-TECHNOLOGY HYBRIDS

Our world is transforming into a hybrid landscape where technology and its creations merge with everything more-than-human. When we think of technology, we often associate it with complex digital systems. But simpler tools like fire, wheels, or axes are also part of technology.

Not only modern technology but also early tools made by humans were interacting with the more-than-human world. At first, technologies were used to make weapons, sheds, or clothing, employing hands-on technological methods like blacksmithing or spinning. However, as our technology progressed, we began to build on previous creations, layering different technological methods. For example, the use of metal was initially aimed primarily at making simple tools or accessories. Over time, however, metal found new uses, such as building machines which require multiple technological methods combined.

Technologies accumulate over time, leading to changes in their use and application. These cumulative technologies have resulted in complex entities, such as computers, that embody centuries of human ingenuity. As a result, technologies have become more powerful, more complex, and therefore more unpredictable in the way they interact with the rest of the world. From computers to plastic cups to roads, anything that humans build and construct using tools or methods can be considered a technological artifact.

Whether these artifacts are still actively used or not, they eventually begin to merge with the more than human world in unexpected ways. For example, plastic waste that ends up as building material in bird nests, or plants that grow on human structures, creating hybrid entities of plants and technological artifacts. These will be refered to as plant-technology hybrids.

Figure 3: *Captured in Rotterdam, Oude Noorden, 2024: Lichens and moss growing on a bike bag.*

OPENING STATEMENT

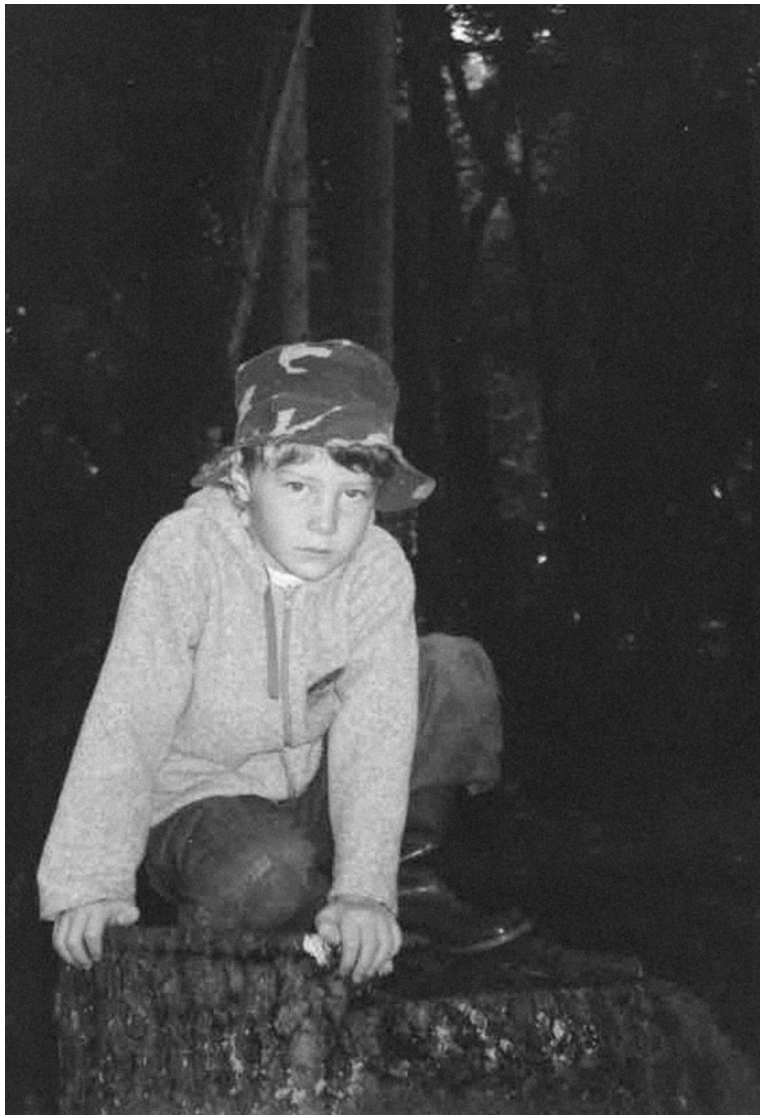


***Figure 4**: Captured in Kleintobel, Germany, 2005: Me as a child outside. Image by Silke Münsch*

***Figure 5**: Captured in Kleintobel, Germany, 2005: Vegetation in forest.*

***Figure 6**: Captured in Kleintobel, Germany, 2005: Me as a child outside. Image by Silke Münsch*

It's not by chance that I'm drawn to a topic that explores the relationship between notions of *nature* and *technology*. Growing up as a child in Germany, my days were filled with explorations in the nearby forest. From the age of 5 to 10, I explored the river valley, the caves, and the waterfalls. I climbed everything, built hideouts, and tried to swing from ivy and lianas over creeks. But I also observed. When in 2005 I got my first camera the film was filled with pictures of plants and animals I found in the forest.

However, remembering my times in the forest also brings up memories of remnants of human presence like old car wheels, metal pieces, and bottles strewn across the riverbed. These artifacts seemed out of place yet part of their surroundings. They were disguised by erosion, dirt and plants partly covering them. At the time they were objects that seemed intimidating; thinking about them now they raise questions about their origin, how they ended up there, and how they interact with the forest landscape.

These objects demonstrated an interaction between technological artifacts and the forest. Simple examples like trash in a forest show that human technology mixes more and more of the world. Even in the most remote places traces of technological artifacts can be found. For example, microplastics have been discovered in the Mariana Trench, on the Galápagos Islands, and even in human blood (Hamzelou, 2023).

Through this, cultural distinctions between the natural world and the realm of human-made technology become more and more flawed. This research delves into the transformation of this dualistic distinction between natural and artificial, into a more differentiated approach discussing the emergence of hybrid entities.

As the distinction between notions of *natural* and *artificial* blurs, it becomes more appropriate to perceive it as a spectrum rather than discrete categories. A spectrum that indicates the extent of human intention applied to, for example, elements, organisms, and ecosystems. For instane, a statue carved out of stone has more human intention applied to it than a big rock on the ocean floor. Both might be the same material but the remote rock has no human intention applied to it and is therefore differently situated on this spectrum than the statue. The technologies, materials, and organisms on this spectrum react and entangle with each other in unexpected ways creating new hybrids that are then added to the equation again. The interactions on this spectrum can be understood as a continuous process of merging and melding, that powers hybridization.

Plants are often used as a symbol of the human notion of the *natural*. They make up 82% of all biomass on the planet (Resnick & Zarracina, 2018). Alone due to their abundance, plants are frequently merged with technological artifacts. From cities and parks to plantations or living rooms, plants can be found in all aspects of human life, often directly or indirectly intertwined with human technology. Analyzing examples of plant-technology hybrids, this research aims to investigate the anthropogenic influence on the more-than-human world. For example, by examining plastic-wood nests built by birds, we gain tangible evidence of the far-reaching and sometimes unexpected ways in which human technology interacts with the world. In the case of a plastic/wood nest, a simple piece of plastic, originally meant to contain yogurt, ends up being used by birds for nest building.

RESEARCH QUESTION

What insights about the anthropogenic impact can be gained from analyzing plant-technology hybrids, and how can the transformative hybridization process, powered by the interaction of human technology with the more-than-human world, be analyzed with an observational approach in urban areas?

Figure 7: *Captured in Rotterdam Noord, 2024: Moss growing on windowsill.*

PLASTIC/WOOD NESTS

Figure 8: *Captured in Rotterdam Noord, 2024: Common coots in plastic/wood nest.*

Not only humans apply their intention to their surroundings. For example, also many birds build structures in the form of nests to brood their eggs. In the book *Next Nature* by Koert van Mensvoort, the Dutch artist, philosopher, and researcher explores the concept of technology and culture interweaving so much that they create a new, Next Nature. In his book, he compares a bird building a nest and a human building a house to question absolute perspectives regarding categories of nature and culture.

"The dividing line between nature and culture is difficult to draw. When a bird builds a nest, we call it nature, but when a human puts up an apartment building, suddenly it's culture. Some try to sidestep the problem by claiming that everything is nature, while others claim that nature is only a cultural construction. It's tempting just to lump the two together and give up thinking about it." (Mensvoort et al. Next nature 2015).

But what if a bird builds a nest partly using synthetic materials? Mensvoort might put this phenomenon into the category of *Next Nature*. Through my lens, it demonstrates the mixture and interaction of technological artefacts with an entity more-than-human.

I conducted a survey where I asked people to categorize images into three categories: natural, kind of natural, and unnatural (Survey, 2024). One image I showed depicted a plastic/wood nest. Surprisingly, the results were quite divided, with 42% of respondents considering it natural, another 50% describing it as kind of natural, and 8% perceiving it as unnatural. I conducted this survey digitally and shared it with classmates, friends, and family (twelve participants). My goal was to understand how people use categories like *natural* and *unnatural*, and to identify which entities are difficult to fit into these categories. The plastic wood nest divided the respondents the most, suggesting its hybrid nature *(see Image 12)*.

Further results:

Image 1: natural 83%, kind of natural 17%, unnatural 0%
Image 2: natural 8%, kind of natural 75%, unnatural 17%
Image 3: natural 100%, kind of natural 0%, unnatural 0%
Image 4: natural 45%, kind of natural 55%, unnatural 0%
Image 5: natural 42%, kind of natural 58%, unnatural 0%
Image 6: natural 0%, kind of natural 8%, unnatural 75%
Image 7: natural 91%, kind of natural 9%, unnatural 0%
Image 8: natural 75%, kind of natural 25%, unnatural 0%
Image 9: natural 33%, kind of natural 67%, unnatural 0%
Image 10: natural 0%, kind of natural 18%, unnatural 82%
Image 11: natural 92%, kind of natural 8%, unnatural 0%
Image 12: natural 42%, kind of natural 50%, unnatural 8%
Image 13: natural 0%, kind of natural 8%, unnatural 92%
Image 14: natural 8%, kind of natural 75%, unnatural 17%
Image 15: natural 33%, kind of natural 67%, unnatural 0%
Image 16: natural 100%, kind of natural 0%, unnatural 0%
Image 17: natural 100%, kind of natural 0%, unnatural 0%
Image 18: natural 0%, kind of natural 0%, unnatural 100%
Image 19: natural 100%, kind of natural 0%, unnatural 0%
Image 20: natural 17%, kind of natural 83%, unnatural 0%
Image 21: natural 83%, kind of natural 17%, unnatural 0%
Image 22: natural %, kind of natural 17%, unnatural 83%
Image 23: natural 0%, kind of natural 8%, unnatural 92%

Image 1

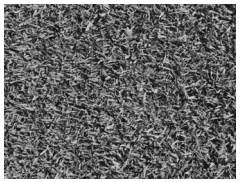


Image 2

Image 3

Image 4

Image 5

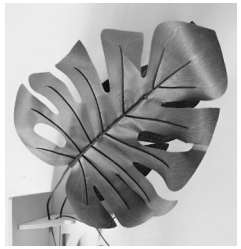


Image 6

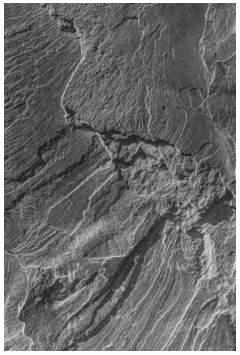


Image 8

Image 7

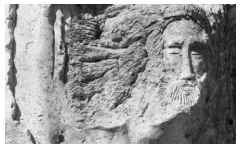


Image 9

Image 10

Image 11

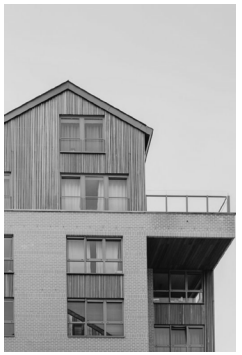


Image 13

Image 12

Image 14

Image 15

Image 16

Image 17

Image 18

Image 19

Image 20

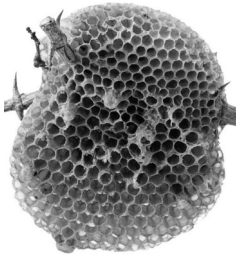


Image 21

Image 23

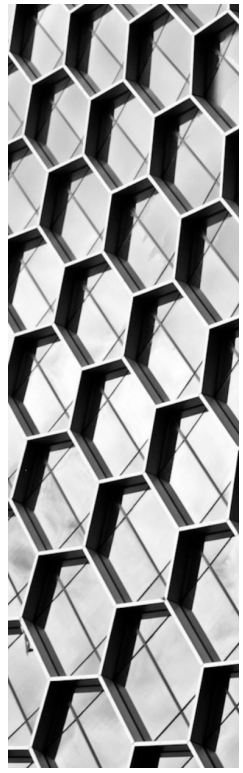


Image 22

I also discovered plastic wood nests in the channels of Rotterdam North, made by Eurasian coots (Fulica atra), which contained plastic waste such as bags and food packaging alongside natural materials like sticks, leaves, and grass. It wasn't a coincidence that I found nests of this species as the Netherlands has one of the highest populations of common coots in Europe with an estimated breeding population of 120.000-150.000 (Sovon Vogelonderzoek, 2021).

Some nests I found had more trash than others, and it seemed to correlate with the availability of natural materials like reeds, trees, and grass, in close range of the breeding spot. It seems plausible that the common coot uses synthetic building materials to compensate for the lack of natural construction supplies.

In 2019, a study examined synthetic materials discovered within the nests of the common coot in the canals of Leiden, Netherlands. They dissected 12 nests categorising the found materials into *natural* and *artificial*. They found that the nests consisted *"(…) on average of 29.3% artificial material. Some nests were even constructed with more plastic than natural items"* (Hiemstra, Gravendeel & Schilthuizen, 2021).

Further, their outcome aligns with my observations making food packaging the most common type of plastic in coot nests. Second came cigarette pack foil, and straws. But another waste stood out: *"Among the plastic material were several artificial plants"* (Hiemstra, Gravendeel, Schilthuizen, 2021), *(see figure 10)*.

These plastic plants can be considered a prime example of a technical artefact whose purpose unintentionally exceeded its human intention. Fake plants are designed to trick humans into believing they are real for mainly decorative purposes. However, these fake plants eventually also interact with the more-than-human world where they might trick animals into believing they are real plants. This results in artificial plants being used as nest material or in more extreme cases being mistaken as food mainly by reptiles in terrariums with artificial plants as decoration (Healey, 2020).

In all 12 nests dissected during the study in Leiden, artificial material was found. In all eight nests I found in Rotterdam, some plastic waste could be seen just from outer observation. Have a close look at what waste can be seen in the shown nests *(see figure 9,11,12,13,14, 16, 17, 18, 19)*.

Figure 9: *Captured in Rotterdam Noord, 2024: Two common coots in plastic/wood nest with younglings.*

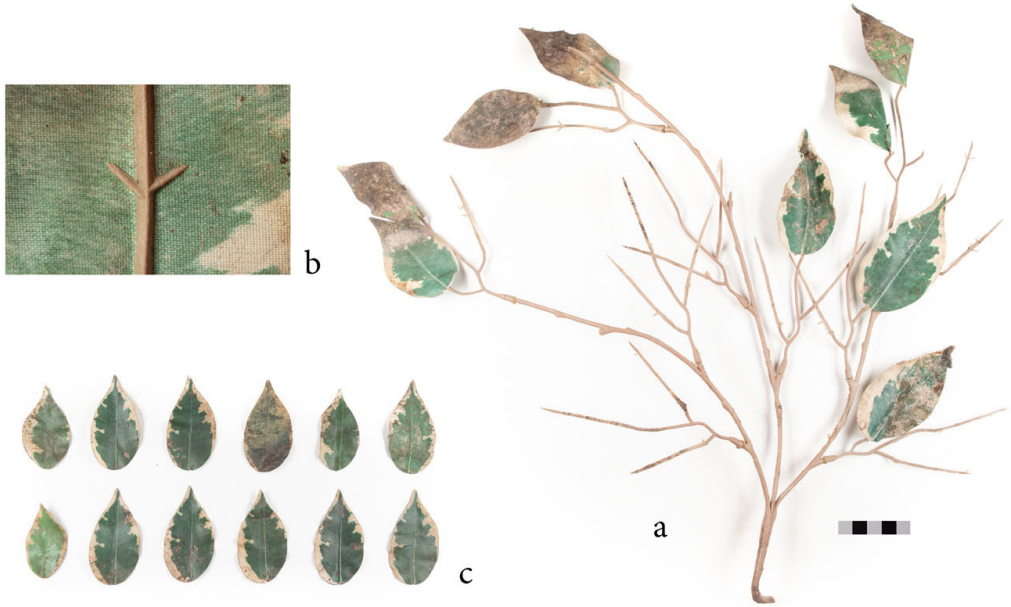


Figure 10. *(a) Weeping fig (Ficus benjamina) imitation by Mica Decorations, found in a common coot nest in the city centre of Leiden, The Netherlands in August 2019. (b) Closeup of artificial secondary veins. (c) Close-up of loose leaves (Hiemstra 1, L3991784). Scale bar = 5 cm. Photo by A.-F. Hiemstra et al. / Behaviour 159 (2022) 193–205*

Figure 11: *Captured in Rotterdam Noord, 2024: Common coots in cardboard/plastic/wood nest.*

Figure 12: *Captured in Rotterdam Noord, 2024: Common coots in plastic/wood nest.*

Figure 13: *Captured in Rotterdam Noord, 2024: Common coots in nest with little plastic.*

Figure 14: *Captured in Rotterdam Noord, 2024: Common coots in plastic/wood nest.*

Figure 15: *Captured in Rotterdam Noord, 2024: Common coots nest with plastic.*

Figure 16: *Captured in Rotterdam Noord, 2024: Common coots plastic/wood nest.*

Figure 17, 18, 19: *Captured in Rotterdam Noord, 2024: The same common coot's plastic/ wood nest over 30 days in March, every 10 days.*

These results lead to the question of whether or not there are any consequences for the bird, its eggs, or its young hatchlings. In the case of the common coot, there is little to no data if the plastic litter poses a threat to the bird. The *Naturalis Biodiversity Center* in Leiden is currently researching this subject. I contributed to this research by sending them pictures and the location of the nests I found. To the question, if you should remove plastic from bird nests they state: *"No. We may prefer to see nests without plastic, but once it's part of the nest, you can't remove it. Bird nests are protected by law."* Further, they mention: *"It may look sad, because we see plastic as waste. But some waterfowl see it as a useful material and build their nests with it"* (Naturalis & Hiemstra, A.F., 2024), (translated from dutch to english).

A potential concern is that freshly hatched coots may become entangled in plastic waste, but there is no data on whether or how often this occurs. Surprisingly, research suggests that there are even benefits for the common coot and other bird species, which could help explain its use of plastic as a material, beyond the previously mentioned reason of lacking organic alternatives. Plastic not only provides durability, enhancing the nest's strength, but its vibrant colors also facilitate easy detection by birds, minimizing search efforts and expediting construction (Antczak, 2010). In addition, used cigarette butts which are also made of plastic might help keep parasites away from the nest (Suárez-Rodríguez, 2013).

However, when considering seabirds in particular, the negative impacts of plastic as a construction material stands out. Especially the Gannets, large white seabirds, are affected. A study conducted on Alderney, an island owned by the British crown, found that 100% of Gannets incorporated plastic into their nests (BBC, 2019). A rock at the coast of Alderney called *Les Etacs* is a major nesting spot of Gannets *(see figure 20)*. Between 2019 and 2022 ecologists tracked a total of 88 deaths due to entanglement in fishing nets used as nesting material (Purdie, 2022).

Using waste materials for nesting can harm certain bird species in additional ways. For example, using plastic can raise the temperature of eggs, potentially harming embryo development, and using conspicuous materials can make the nest more visible to predators that rely on sight (Nova, 2023).

Figure 20: *Captured in Les Etacs Alderney, 2019. Gannets on their nests clearly with a dead bird who's legs have been trapped in the middle of shot, Photo by State of Jersey*

The adaptation and behavior of birds can tell us a lot about anthropogenic influence. The reasons behind the presence of these hybrid nests all indicate challenges posed to both humans and more-than-human entities.

There are two main reasons these hybrid nests exist. First, the birds don't find enough organic materials when living in the same area as humans. This highlights the issue of sealed soil surfaces such as streets, parking lots, and buildings in urban areas, which often do not leave enough space for vegetation. This ultimately can lead to further problems like extreme heat in summer and the risk of flooding when the ground cannot absorb water. The second reason is the presence of waste in cities, and of course, in the ocean, where a significant amount of waste eventually accumulates. Plastic is often used with the intention to contain or package products/food, but its design does not consider its interaction with non-human entities.

When discussing waste, it must acknowledge that from a planetary perspective, there is no waste. This means that throwing something *away* is not possible, as there is no *away* on the surface of the planet (Fairs, 2019). It must be considered that *away* means somewhere, not nowhere. Somewhere, human waste will interact and merge with the more-than-human world.

These observations can be applied to the impact modern humans have on the planet in general. The modern lifestyle spreads non-biodegradable materials and replaces vegetation with concrete.

"Our slabs protect us from the elements. They keep the rain from our heads, the cold from our bones and the mud from our feet. But they also entomb vast tracts of fertile soil, constipate rivers, choke habitats and – acting as a rock-hard second skin – desensitise us from what is happening outside our urban fortresses. Our blue and green world is becoming greyer by the second. By one calculation, we may have already passed the point where concrete outweighs the combined carbon mass of every tree, bush and shrub on the planet" (Watts, 2019).

Everything more-than-human is forced to adapt and merge with these technological artifacts, often suffering under the interaction or even being swallowed by it, disappearing completely.

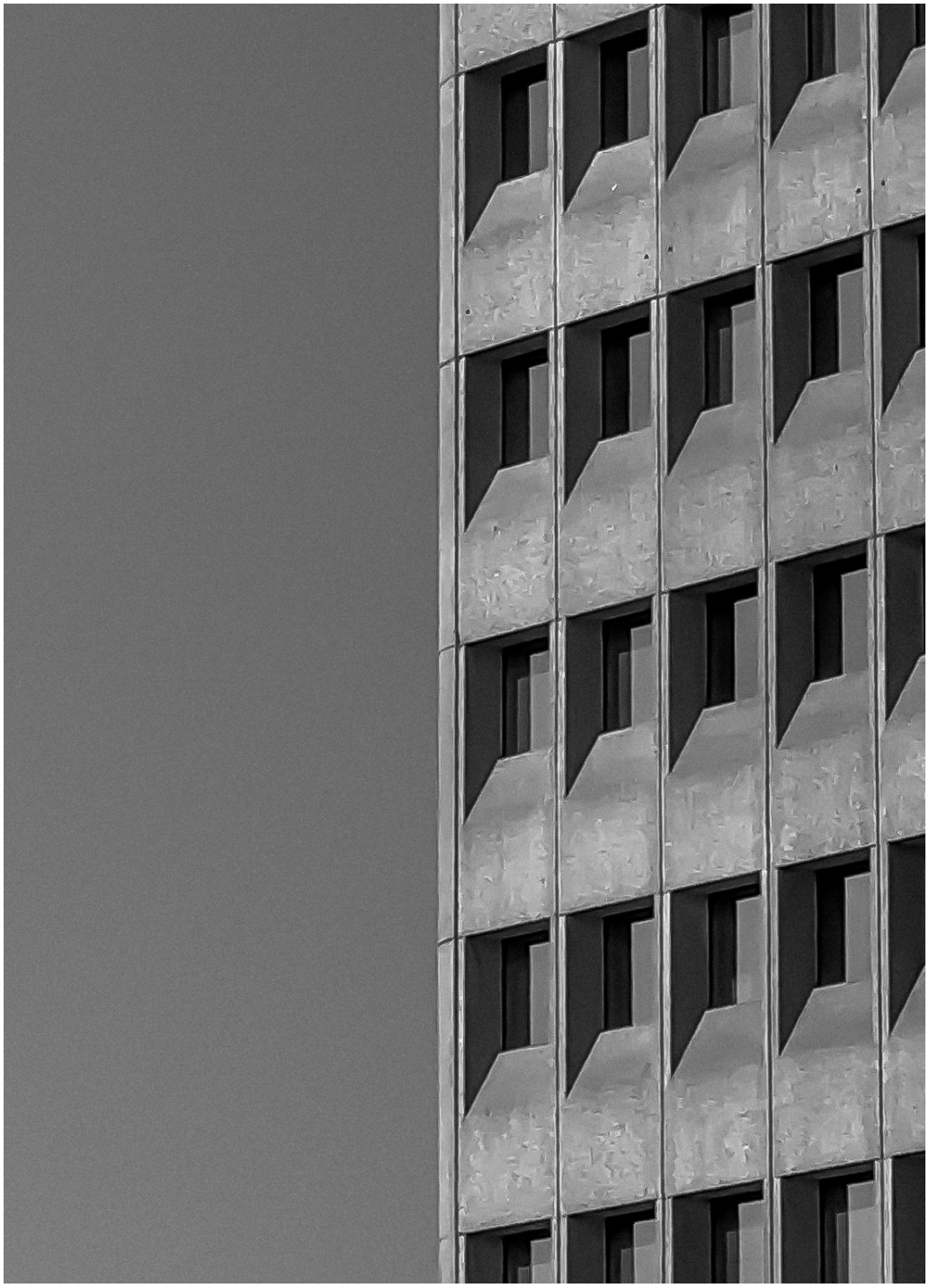


Figure 21: *Captured in Rotterdam Weena, 2024. Building in Brutalist architecture style.*

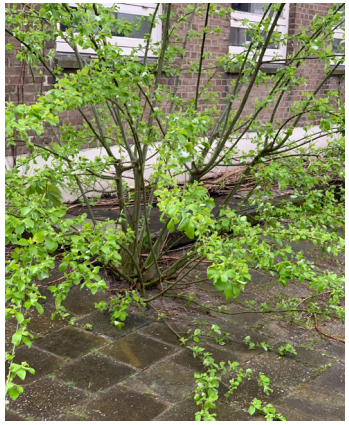
PLANT/ CONCRETE SURFACES

Figure 22: *Captured in Rotterdam Noord, 2024: Tiles with grass growing between the cracks.*

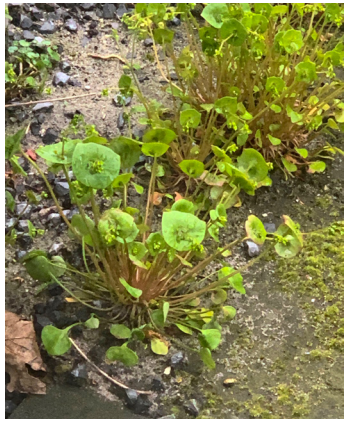
Plant/concrete surfaces can be found all around us in urban areas. They are ever-present but often ignored or categorized as weeds. However, if one pays attention, countless different plant species can be found reclaiming space in urban areas thanks to their adaptation to challenging conditions. The British scientist Dr. Bethan Stagg, who researches fields like environmental education, counted how many different ruderal plants she could find on her 350-meter walk to her closest supermarket. She found a total of 41 different species (Stagg, 2023).

I decided to conduct the same test as Dr. Bethan Stagg. On my way to the supermarket, which is approximately a 250-meter walk, I used an auto-recognition app called *Leaf Snap* to identify all plants growing on or between asphalt, pavement, and walls with 95% accuracy. Without searching actively, I came across more than 20 different plant species, mostly ruderal plants, but also a few pioneer plants and invasive species *(see next page)*.

Whorled mallow (Malva verticillata),



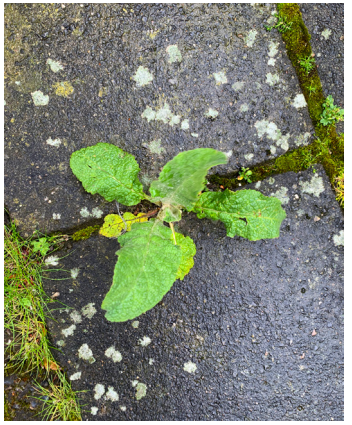
Willow tree/Bebbs willow (Salix bebbiana)



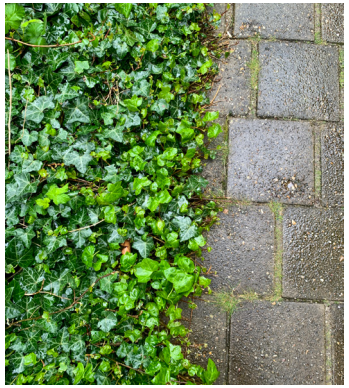
Miner`s lettuce (Claytonia perfoliata)

Smooth cats ear (Hypochaeris glabra)

Sycamore maple (Acer pseudoplatanus)



Mullein (Verbascum thapsus)



English ivy (Hedera helix)

Wall Rue (Asplenium ruta-muraria)

Horseweed (Erigeron canadensis)

Common Blackbarry (Rubus allegheniensis)

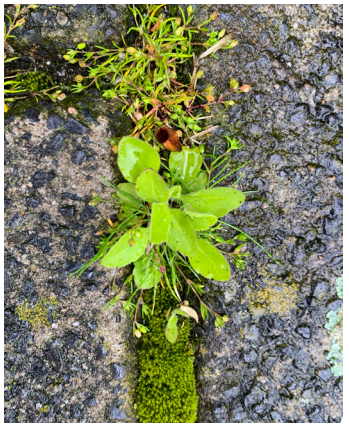
Common plantian (Plantago major)

Maritime Sunburst Lichen (Xanthoria parietina)

Small- flowered Cranesbill
(Geranium pusillum)

Black medick (Medicago lupulina) or Clover

Thale-cress (Arabidopsis thaliana)



Top: Bird-eye pearlwort (Sagina procumbens)
Middle: Unkown
Bottom: Moss campion (Silene acaulis)

Mind-your-own-business
(Soleirolia soleirolii)

Milk Thistle (Sonchus oleraceus)

It became apparent that countless small plants use every little crack or surface to establish themselves. After these observations, I couldn't unsee all the plants growing on or between these stone and asphalt surfaces. When biking, I had to remind myself to focus more on the traffic and stop looking left and right at the countless and diverse ways plants were growing on or between human-made surfaces *(see figure 23)*.

The European Environment Agency defines soil sealing *"as the destruction or covering of the ground by an impermeable material"*. Since the mid-1950s, cities in the EU have expanded their total surface area by 78%, leading to widespread soil sealing (European Environment Agency, 2015). Compared to other European countries, the Netherlands has the second-highest percentage of soil surface covered, with 7.4%, after Malta, which has 16.2% (European Environment Agency, 2020). While most common plants struggle to persist on areas covered by surfaces such as asphalt and pavement, plants used to rough conditions manage to persist.

There are three main plant groups that partly overlap and are found on buildings, between cracks, on pavements, railways and more: ruderal plants, pioneer plants, and invasive species. They all have in common that they have found different ways to persist in certain rough conditions, such as nutrient shortages, strong or limited sunlight, extreme heat, dryness, etc.

Ruderal plants are resilient species that thrive in disturbed environments, whether natural or human-induced. They quickly colonize cleared areas, utilizing nutrients to reproduce rapidly. A famous example would be dandelions. However, ruderal plants often struggle to compete with more established plant species in the long run (Oxford University Press, 2018). Pioneer plants are also the first to grow in changing environments and reproduce quickly. However, unlike ruderals, they also inhabit extremely nutrient-poor environments, like bare stones. Pioneer plants include lichens, mosses, fungi, and more (Sottosanti, 2023). Invasive plant species are non-native plants introduced to an area by human activities.

Figure 23: *Captured in Rotterdam-Zentrum, 2024: Fern growing on canal walls.*

However, the term *invasive species* was subject to corruption and should not be understood as an objective naming. In the book *Beyond the War on Invasive Species* by Tao Orion, the author looks back at the origin of the term, investigating the demonization of non-native species by corporations selling chemical solutions. Toa argues that between 1960 and 1990 scientific research papers increasingly referred to spreading species as *invasives* or *environmental weeds*, replacing the neutral term *naturalization*, which acknowledges the validity of the process by which species adapt to new environments (Orion, 2015). Through this, a categorisation within the notion of nature took place, categorizing plants into *natural (native)* and *unnatural (invasive)*. A plant species that is seen as invasive in the Netherlands would be English Ivy for example *(see figure 25)*.

Some of these plants have fascinating abilities that allow them to grow on or between sealed surfaces. Shepherd's Purse is a springtime weed characterized by its petite white flowers. Originating from Europe and Asia, it can be found in various regions, including the Netherlands. When moistened in the soil, its seeds exude a sweet, mucilaginous substance that attracts and digests small insects and invertebrates. This unique trait makes Shepherd's Purse a *protocarnivorous* plant, as the nutrients from the insects can feed the seedlings during germination (Nafici, 2015), *(see figure 24)*. Mosses also have fascinating abilities. Some species can solely live off the nutrients provided by rainwater, withstand extreme heat, and survive extended dry periods (Mchale, 2020).

It's not just small plants that can endure soil sealing. Trees display impressive strength by utilising so-called turgor pressure. This force is exerted by the liquid within their cells as it presses against the cell walls. These specialized cells are primarily located in the roots. Interestingly, a developing root can exert a pressure output of up to 0.6 megapascals, which is roughly three times the pressure exerted by a typical car tire (Stagg, 2023).

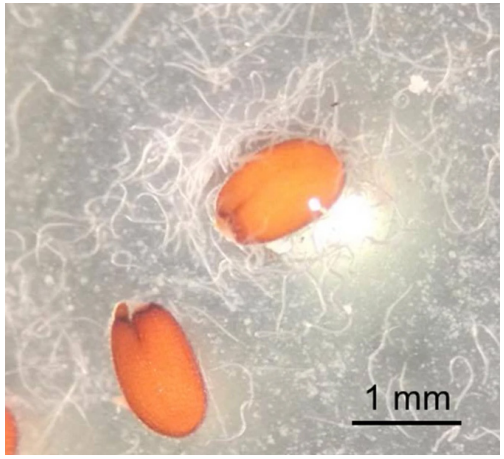


Figure 24: *Image from Roberts, H.R., Warren, J.M. & Provan, J. Evidence for facultative protocarnivory in Capsella bursa-pastoris seeds ,2018.*

Figure 25: *Captured in Rotterdam Liskwartier, 2023: English Ivy growing on street lamp.*

This creates cracks or openings on biking paths, streets, or pavement. From a plant perspective, this can not only be understood as an adaptation but an act of resistance against sealed surfaces, which often need fixing after being cracked open. These cracks also allow ruderal or pioneer plants to grow in them *(see figure 27)*. The disruption caused by human intervention is, in turn, disrupted by plants. The human-made flat surfaces become uneven again bringing back a mix of irregularity.

Figure 26: *Captured in Rotterdam Noord, 2024: Roots cracking concrete on bike path.*

Figure 27: *Captured in Rotterdam Noord, 2024: Roots crack concrete with plants growing between.*

Figure 28: *Captured in Rotterdam Noord, 2024: Tree cracking concrete.*

Another intriguing perspective on plants' interaction with humans is formulated by the American professor and journalist Pollan in his book *The Botany of Desire,* in which he explores how human desire interacts with different plants. In the second chapter, he discusses the human desire for beauty and how certain plants fulfill this exact desire. Consequently, they are evolutionarily very successful as they are propagated and protected on a large scale.

"The desires of other creatures became paramount in the evolution of plants, for the simple reason that the plants that succeeded at gratifying those desires wound up with more offspring. Beauty had emerged as a survival strategy" (Pollan, 2014).

This shift in perspective reveals that humans not only hold power over plants, but plants also possess a influence on humans. Acknowledging this helps to unleash the potential that plant/concrete surfaces hold when not just beeing ignored. The modern way of living often accompanies a phenomenon called plant blindness, which renders plants relatively unnoticeable and underappreciated compared to animals (Ro, 2022). These plants grow between or on human-made structures without any active human efforts to support them.

There are already technologies that embrace these surfaces, enabling them to contribute to making urban areas more biodiverse and avoiding concrete deserts. One example of actively utilizing the resistance and adaptability of plants is in grass-pavement parking lots, where cars can move while plants grow between extra-large designed gaps *(see figure 30)*. Another example is green rooftops *(see figure 29)*. These technologies demonstrate an approach where, on a small scale, more-than-human entities are considered in human making.

Despite the potential benefits of these methods, it's important to see the whole story, in which these ruderal plants can also be seen as the last survivors of a desertification fueled by concrete.

Figure 29: *Captured in Rotterdam Weena, 2023: Green Rooftop.*

Figure 30: *Grass-pavement parking lot . Image from 123RF*

ANTI-BIRD TREES

Figure 31: *Captured in Bristol, UK 2017: Anti-bird spikes on tree. Image by Tom Wren (edited)*

Plant-technology hybrids can also be created intentionally, as this example shows. In almost all european cities, anti-bird spikes can be spotted to prevent mostly pigeons and seagulls from sitting or nesting on certain buildings, walls, or balconies. Sometimes this is effective, and other times birds just nest between the spikes *(see figure 33)*. In Rotterdam, there is a known case of crows using these anti-bird spikes to build their nests from them, as discovered and captured by the photographer Garry Bakker in 2009 (Hiemstra, 2023), *(see figure 34)*.

This can be interpreted as birds using the very thing that‘s supposed to stop them from breeding for the very act of breeding. An unforeseen interaction of technology with the more-than-human world. It is no coincidence that birds once again play a role when it comes to plant-technology hybrids. They are great a indicator species to look at the state of ecosystems and urban areas as they are active, diverse, and widespread animals and therefore very embedded in their surroundings (Begazo, 2022).

The majority of bird species use trees or bushes as nesting sites. More than half (58%) of the species can nest in or on trees (Chia, 2023). Trees provide nesting sites, food and protection from weather and predators. But what happens when the natural inclination of birds to inhabit trees conflicts with human interests?

In the UK, there are two officially reported cases where trees were turned into spiky plant-technology hybrids to prevent birds from following their natural interactions with trees. The anti-bird spikes were thoroughly placed on branches of the designated trees using cable ties or nails.

The first case occurred in Bristol back in 2017, where residents attempted to protect their parked cars from being defecated on (Ward, 2017). The second case happened in front of Westminster Council in London in 2022. This time, not a private resident, but the council comissioned the spikes be installed. After receiving a lot of criticism, the council explained that they installed the spikes to prevent pigeons from defecating on the bench below. Eventually, the spikes were taken down, and the council looked for different solutions (BBC, 2022).

Figure 32: *Captured in Bristol, UK 2017: Anti-bird spikes on tree. Photo by Anna Francis*

Figure 33: *Pigeon nesting between anti-birld spikes. Photo by Adam Sedgley*

Figure 34: *Captured in Rotterdam, 2009: Crows in their nest made from anti-bird spikes. Photo by Garry Bakker*

While this isn't a common phenomenon, there are other methods used to prevent birds from interacting with trees. Another example is the coverage of trees with nets, as seen in agriculture to protect fruit trees or in urban areas. In 2020, nets were placed over 20 trees on the Cambridge campus *"to discourage birds from nesting"* during building work (BBC, 2020), *(see figure 35 & 36)*. In an article about this incident, the english nature photographer and author Chris Packham told the BBC: *"At a time when many of our British bird populations are in free fall and the majority of people are trying to conserve them, these nets are totemic symbols of the destruction or disturbance of their habitat"* (BBC, 2020).

Figure 35: *Captured in Cambridge 2020. Anti-bird nets put on trees. Photo by Stefan Rousseau*

Figure 36: *Captured in Cambridge 2020. Nets put on tree (BBC)*

The last example shows how trees can be turned against their nature to support wildlife and hurt them instead, to break their natural attraction. On an American website called *birdbarrier.com,* it is possible to buy a setup to turn a tree into an electroshocking plant-technology hybrid that prevents wildlife from sitting on tree branches *(see figure 38)*.

These examples demonstrate the sometimes clashing interests of humans with the more-than-human world and imply a disrupted relationship. While the reasons for these actions seem understandable it is the approach that is flawed. Birds, after all, require habitats, and nutrition also in urban spaces. These examples show how human technology can be used to work against the needs of the more-than-human world by turning trees into a form of hostile architecture, which in different forms is also practiced against humans in city centers.

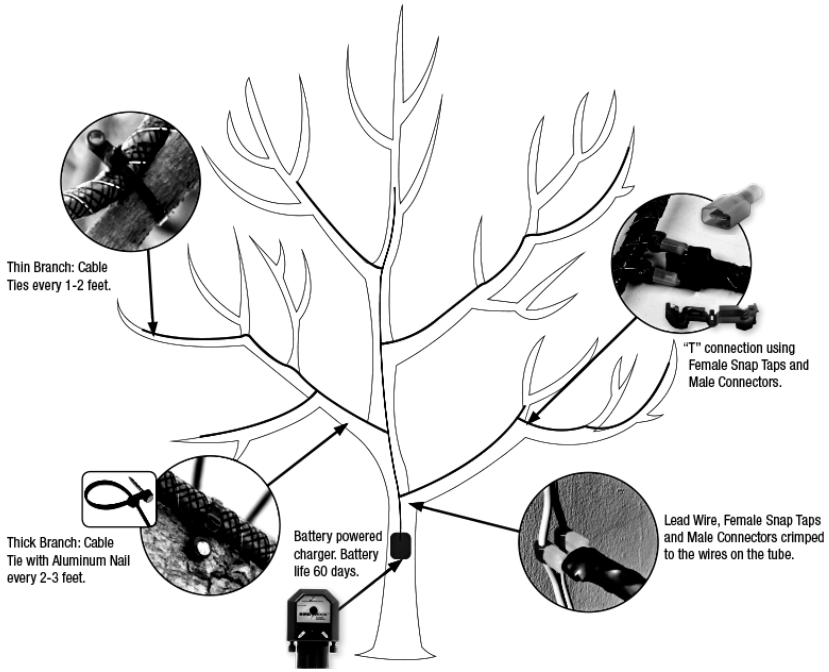


Figure 37: *Tree-Shock installation guide. From BirdBarrier.com*

Figure 38: *Bird-shock cable installed on tree. From BirdBarrier.com*

Figure 39: *Charger of Tree-Shock installed on tree. From BirdBarrier.com*

EMBODIED RESEARCH

Figure 40: *Built Plant-Technology hybrid.*

To embody and communicate my observations and research, I've undertaken a series of experiments to create a plant-technology hybrid. This hybrid not only reflects my findings but also acts as an entry point into the subject. The hybrid consists of a plant, an interactive animation of a plant, a relay switch, a bare conductive touchboard, a projector, a speaker and a full-spectrum light. Through the interactive format, the participant becomes part of the installation, representing the anthropogenic influence. When the plant is touched, the digital plant decays, while the full-spectrum light above the real plant turns on, supporting its growth. This demonstrates the destructive but also the supportive potential of human influence in a condensed setup. It allows the participant to experience an immediate transformation of their environment (sound, light, and visuals), bridging the gap between human influence and its often delayed or indirect consequences on the more-than-human world. The Hybrid encourages reflection and shows the responsibility held by human technology when interacting with the more-than-human world.

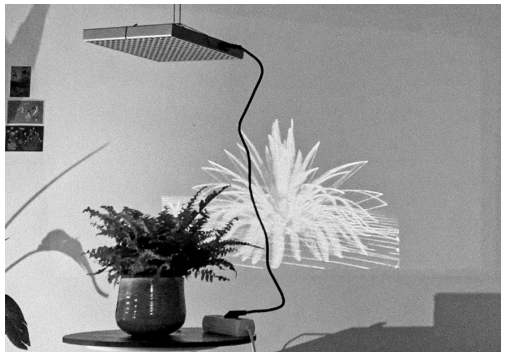


Figure 41: *Crafted Plant-Technology Hybrid on default.*

Figure 42: *Crafted Plant-Technology Hybrid when touched.*

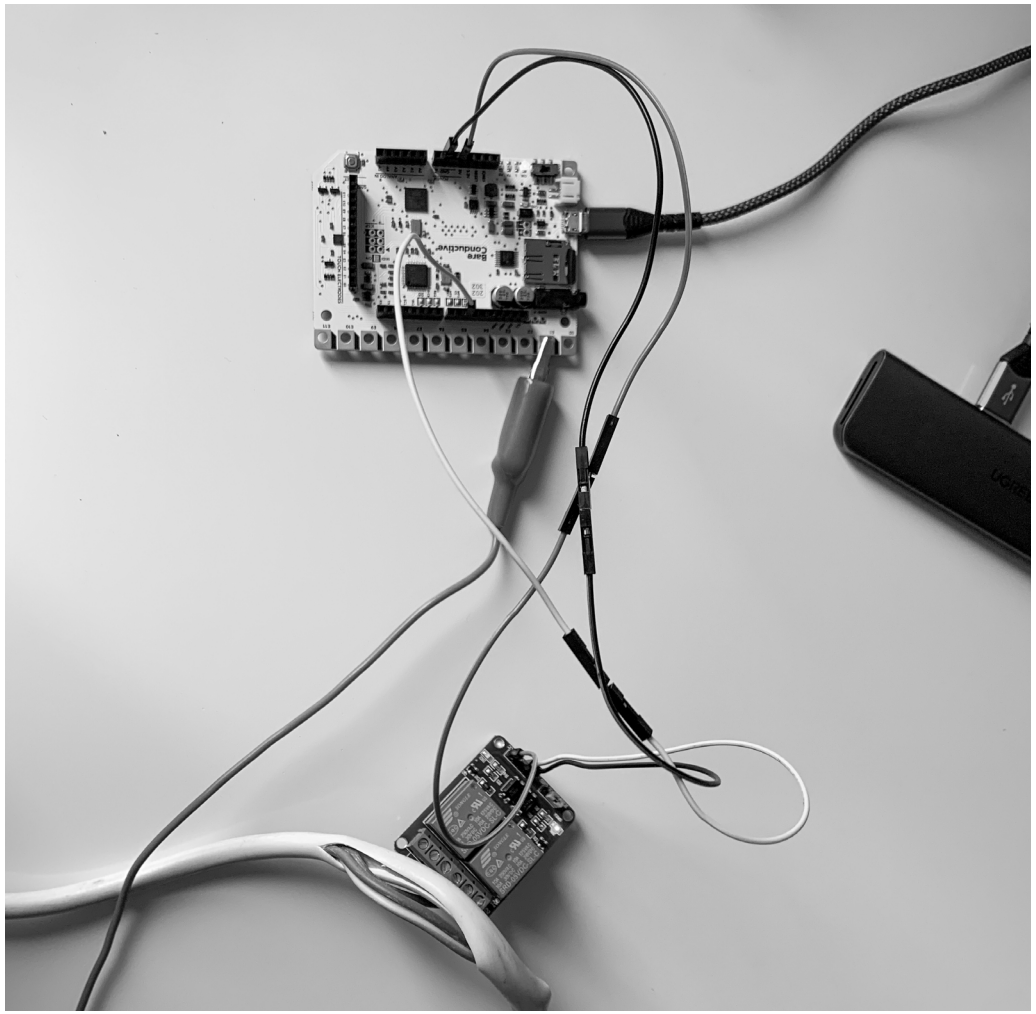


Figure 43: *Touch Board & Relay Switch.*

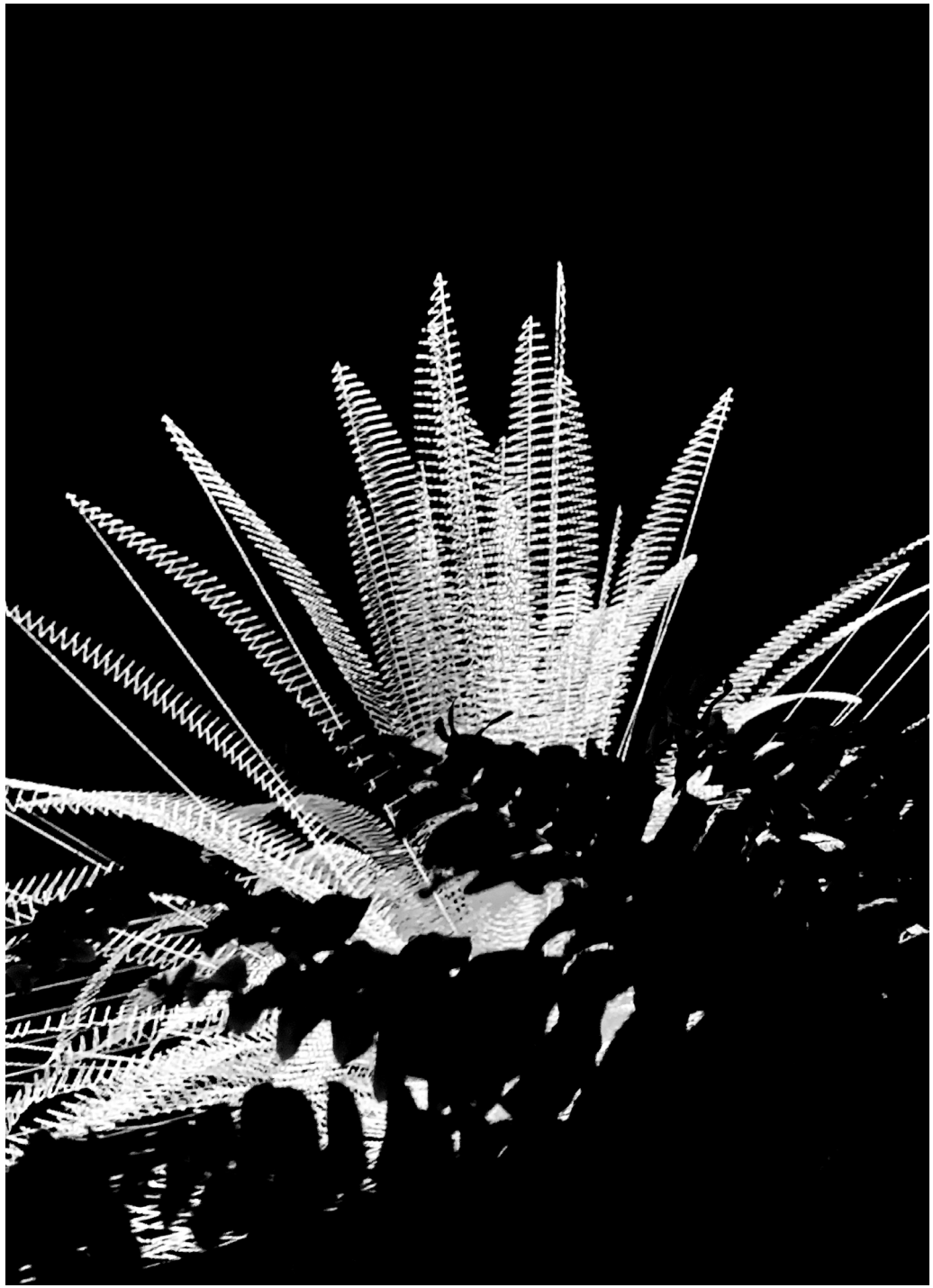


Figure 44: *Close-up of built Plant-Technology Hybrid.*

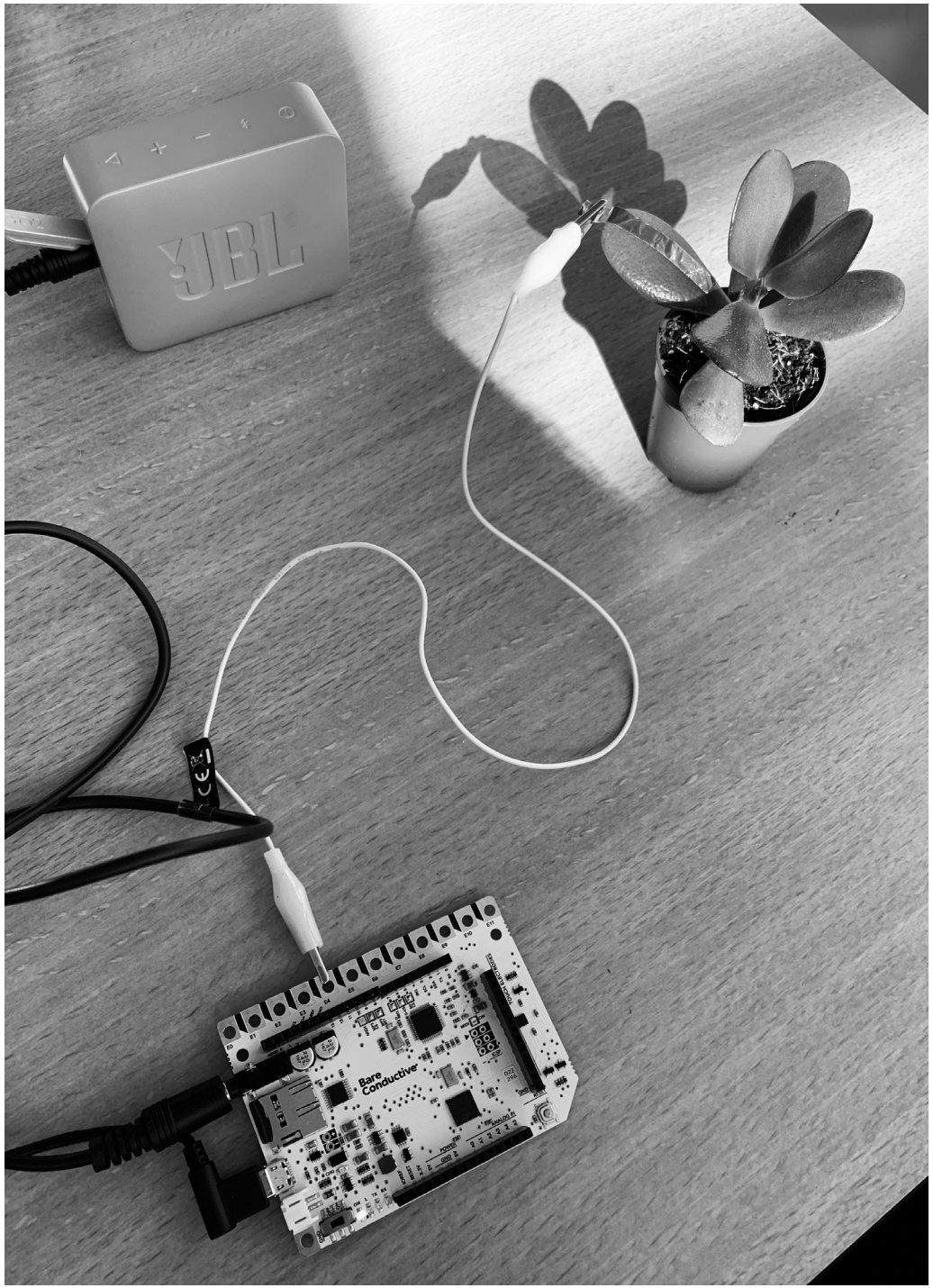


Figure 45: *Test with Touch Board, plant & sound.*

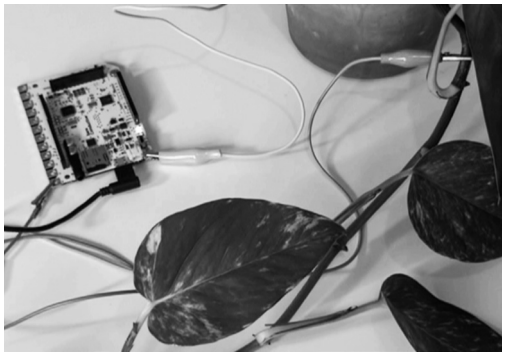


Figure 46: *Testing Devil's Vine Plant with Touch Board.*

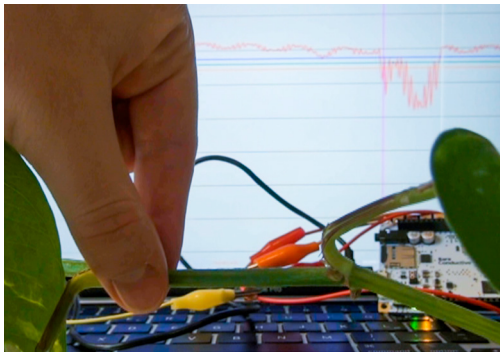
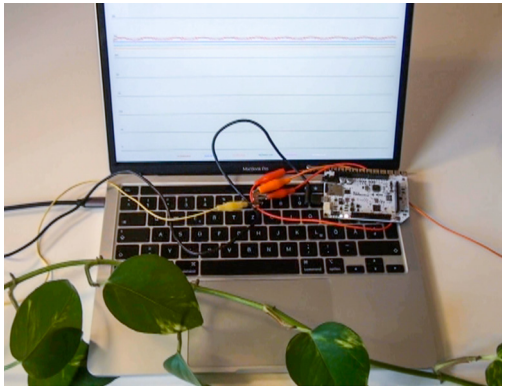


Figure 47: *Testing Devil's Vine Plant with graph.*



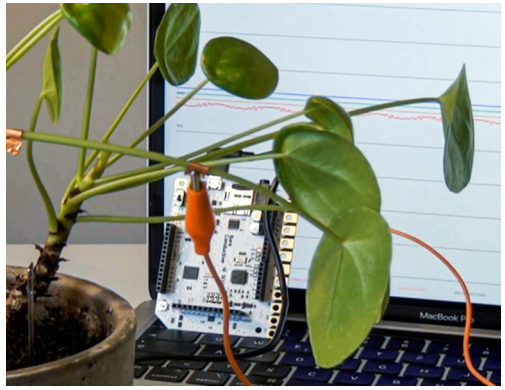


Figure 48 & 49: *Capturing touch signals with Devil's Vine & Jade Plant in a graph using the program Processing.*

Figure 50: *Testings with Pilea Peperomioides Plant to capture signals by touch.*

Figure 51: *Testing hybrid with round UV light.*

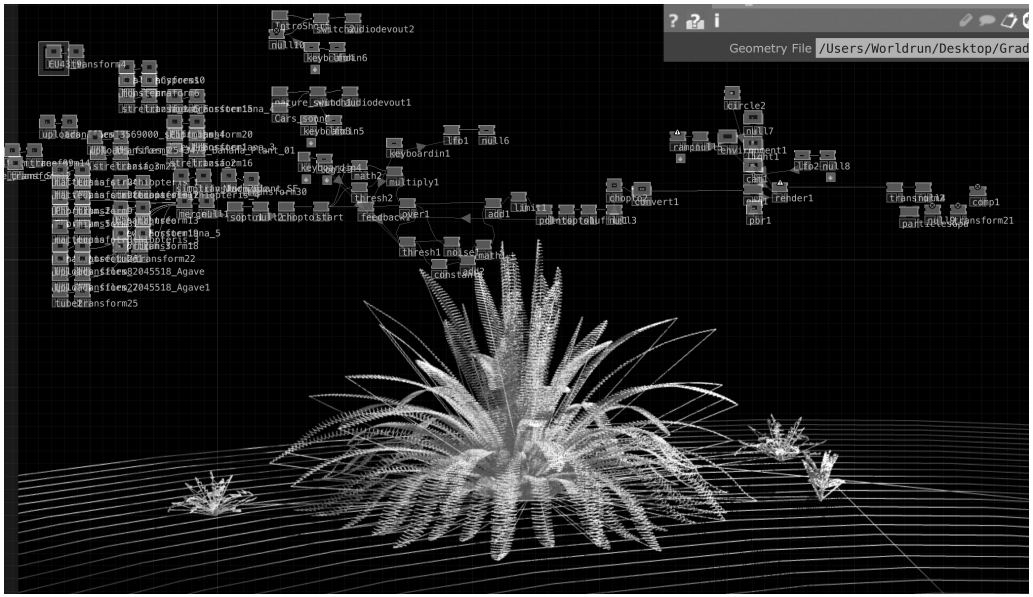


Figure 52: *Digital environment in Touch Designer to transform 3D models of plants, operate a sound switch, and a moving camera.*

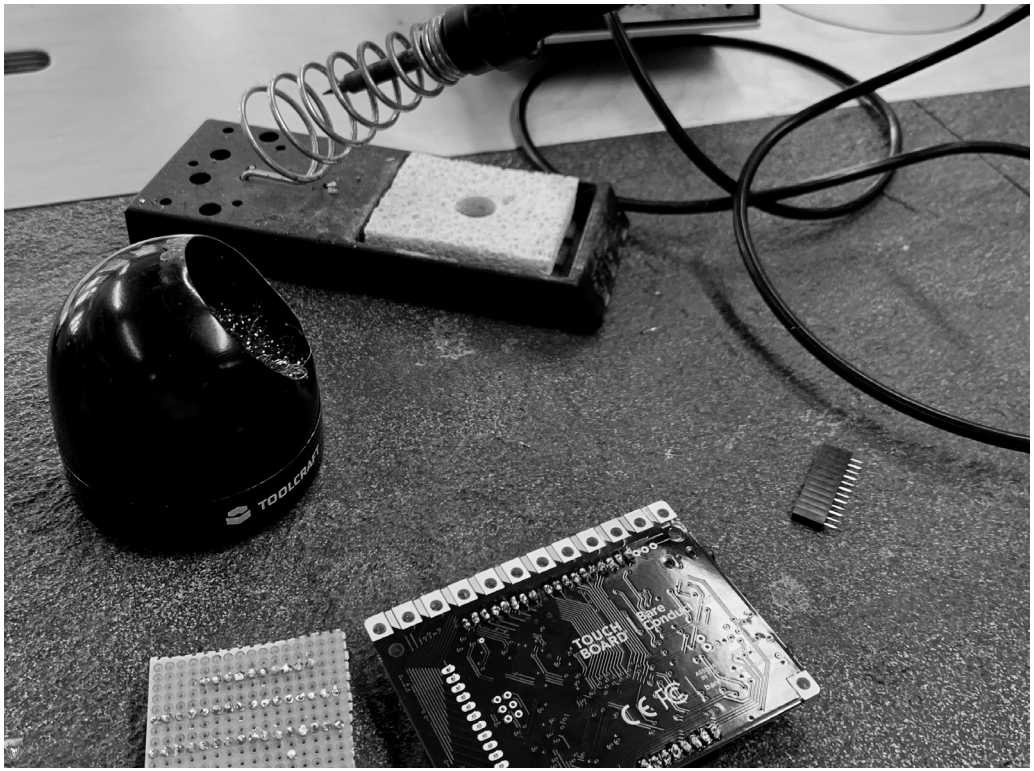


Figure 53: *Soldering Heads on a Touch Board.*

Figure 54: *Crafted Plant-Technology Hybrid when touched.*

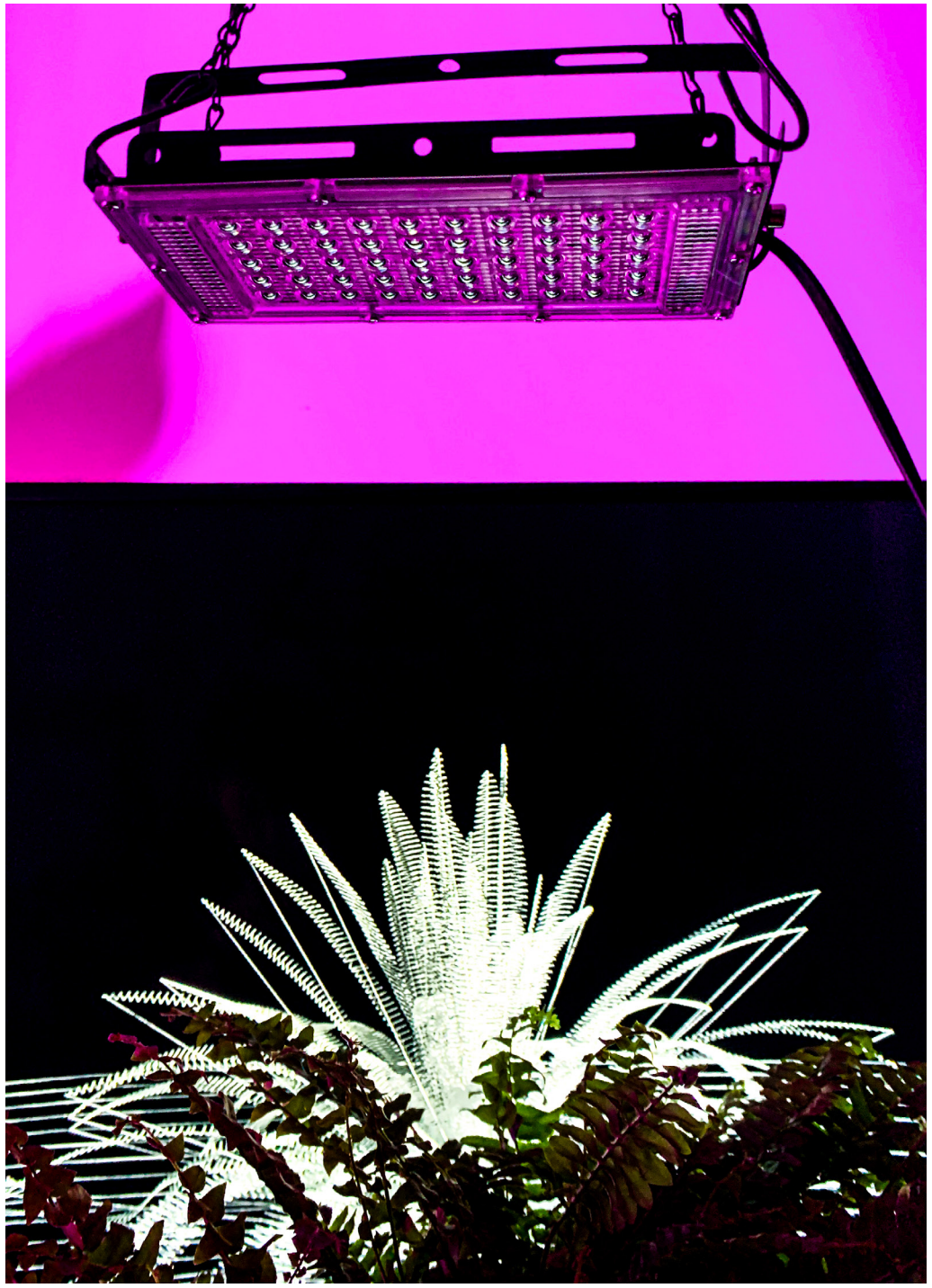


Figure 55: *Crafted Plant-Technology Hybrid on default.*

CLOSING STATEMENT

***Figure 56**: Captured during Expedition in Pacific Ocean. Plastic waste forming a floating island. From UC San Diego & UC California*

Through this text I explored distinct examples of plant-technology hybrids that relate to each other in multiple ways. There are common threads but also differences in the way they came into existence, representing different aspects of the hybrid landscape of the Anthropocene. All the investigated hybrids can most likely be found in urban areas as this is a space where human activity transforms the more-than-human world directly and on a large scale.

The creation of plastic/wood nests, as well as the plant/concrete surfaces, can both be seen as forms of adaptation to human influence. Both hybrids are created without direct human intention but rather as accidental by-products of placing waste where it doesn't belong or simply building infrastructure. In both cases, the creation was not intentionally planned by humans but rather an adaptation from the more-than-human entities. Other examples of accidental hybrids are plastic/coastal organism islands *(see figure 40)*. They are floating islands of litter in the middle of the ocean that allow coastal sea organisms like sea anemones to exist in the open ocean (Cornwall, 2023).

The anti/bird trees, on the other hand, are more accurately described as intentional human creations as they are designed to keep avians at a distance. Another example here could be artificial reef structures that are intended to be merged with natural and transplanted corals growing on the surface of this structure in an attempt to restore reefs (Reef Design Lab, 2022). While both of these hybrids are created intentionally, the intentions differ. One turns against the more-than-human world, while the other is an attempt to support and restore it. This potential of human technology to either disrupt or support the more-than-human realm is represented by the self-built plant-technology hybrid.

The hybrid nature of all the researched entities holds great potential, if not only their materiality is hybrid but also their function, serving both the human and the more-than-human world. As technology continues to evolve and integrate into every aspect of the planet, it becomes essential to take control and responsibility for its interactions with the more-than-human realm.

The Amstelstroom Bridge in Amsterdam showcases a design tailored to accommodate diverse wildlife. From specially crafted habitats for bees, bats, and birds, to underwater shelters for fish and mussels, committing to urban biodiversity (VenhoevenCS, 2022). This project demonstrates a shift in perspective, acknowledging the agency and needs of non-human entities, while still serving humans as a bridge.

However, who should define the intentions and needs of more-than-human entities? This includes a deeply observational approach to the more-than-human world, recognizing the hidden connections in shared ecosystems. Thus paying attention to detail and uncovering interconnectedness. *„We are just looking but not seeing,“* as said by the Soviet filmmaker Andrei Tarkovsky (Neue Züricher Zeitung, 2017). This quote reminds us to delve beneath the surface and understand the deeper layers of our surroundings through observation.

This also implies looking at familiar environments, like urban spaces, with a new observational lens, as demonstrated by this research. The consequences of the Anthropocene can not only be seen on global scales; they can also be observed in everyday life, on the way to work, when going to the supermarket, or simply for a walk.

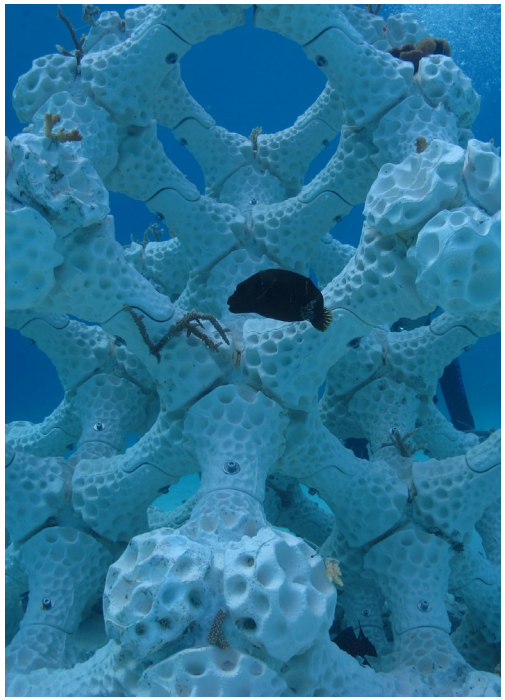


Figure 57: *MODULAR ARTIFICIAL REEF STRUCTURE made of 3D printed ceramics. Image from Reef Design Lab (2018)*

Figure 58: *Images of MODULAR ARTIFICIAL REEF STRUCTURE made of 3D printed ceramics. Image from Reef Design Lab (2022)*

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Figure 56: SIO/ UC San Diego (2012) Floating platsic watse , Spiegel Wissenschaft. University of California, San Diego. Available at: https://www.spiegel.de/wissenschaft/natur/insekten-brueten-auf-plastik-im-pazifik-a-832238.html. (Accessed: May 2024)

Figure 57: Reef Design Lab (2022) MODULAR ARTIFICIAL REEF STRUCTURE. Available at: https://www.reefdesignlab.com/mars. (Accessed: May 2024)

Figure 58: Reef Design Lab (2022) MODULAR ARTIFICIAL REEF STRUCTURE. Available at: https://www.reefdesignlab.com/mars. (Accessed: May 2024)

APPENDIX

GLOSSARY

Anthropocene
The Epoch during which human activity transforms the planet on a large scale.

Anthropogenic influence
Changes to the environment and ecosystems that result from human activities, such as pollution, deforestation, and urbanization.

Brutalist architecture
An architectural style characterised by raw construction, often exposed concrete and minimalism.

Hybrid landscape
A landscape that combines natural elements with human-made structures, resulting in a blend of nature and technology.

More-than-human
Refers to the concept that recognizes the value and interconnectedness of non-human entities, such as animals, plants, and ecosystems, challenging the human-centric view.

Neopelagic Communities
A group of ocean species, including both open-sea and coastal types, that live on floating plastic.

Next Nature
The concept that human culture and technology have integrated with the planet, creating a new form of nature. It is also the name of an organisation that shares the same philosophy.

Plant-blindness
The concept that describes the tendency of people to overlook plants and their importance in their daily lives.

Technological Artefacts
Objects that use human technology, such as computers, telephones, and machines, to create them or to use them as tools.

Technosphere
The part of the environment that includes all the physical structures and technology created by humans, like buildings, roads, and electronic devices.

Urban space
Areas within a city or town where people live, work, and interact, including streets, parks, and buildings.

Figure 59: *Image captured in Magnhilddalen, Norway. A wood cabin used to store dried fodder. Photo by Nora Hindrum Mikkelsen*

SURVEY (2024)

Notions of natural and unnatural

I wanted to find out how people used categories like *natural* and *unnatural*. Which entities were difficult to fit into these categories? On which entities did the respondents agree, and on which did they disagree? Lastly, what was their notion of these categories, and did they see them as sufficient to describe our world? It was a online form. Twelve people participated of which five wrote an answer for the last question.

How natural is what you see?

11 out of 12 answered

kind of natural 6 resp. 54.5%

natural 5 resp. 45.5%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

natural 9 resp. 75%

kind of natural 3 resp. 25%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

kind of natural 6 resp. 50%

natural 5 resp. 41.7%

unnatural 1 resp. 8.3%

How natural is what you see?

12 out of 12 answered

natural 10 resp. 83.3%

kind of natural 2 resp. 16.7%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

kind of natural 7 resp. 58.3%

natural 5 resp. 41.7%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

kind of natural 8 resp. 66.7%

natural 4 resp. 33.3%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

unnatural 11 resp. 91.7%

kind of natural 1 resp. 8.3%

natural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

kind of natural 9 resp. 75%

unnatural 2 resp. 16.7%

natural 1 resp. 8.3%

How natural is what you see?

12 out of 12 answered

unnatural 9 resp. 75%

kind of natural 2 resp. 16.7%

natural 1 resp. 8.3%

How natural is what you see?

11 out of 12 answered

unnatural 9 resp. 81.8%

kind of natural 2 resp. 18.2%

natural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

kind of natural 9 resp. 75%

unnatural 2 resp. 16.7%

natural 1 resp. 8.3%

How natural is what you see?

8 out of 12 answered

natural 8 resp. 100%

kind of natural 0 resp. 0%

unnatural 0 resp. 0%

How natural is what you see?

11 out of 12 answered

natural 10 resp. 90.9%

kind of natural 1 resp. 9.1%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

natural 11 resp. 91.7%

kind of natural 1 resp. 8.3%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

kind of natural 8 resp. 66.7%

natural 4 resp. 33.3%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

natural 12 resp. 100%

kind of natural 0 resp. 0%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

kind of natural 10 resp. 83.3%

natural 2 resp. 16.7%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

natural 12 resp. 100%

kind of natural 0 resp. 0%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

natural 10 resp. 83.3%

kind of natural 2 resp. 16.7%

unnatural 0 resp. 0%

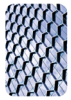
How natural is what you see?

11 out of 12 answered

unnatural 11 resp. 100%

kind of natural 0 resp. 0%

natural 0 resp. 0%



How natural is what you see?

12 out of 12 answered

unnatural 10 resp. 83.3%

kind of natural 2 resp. 16.7%

natural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

natural 12 resp. 100%

kind of natural 0 resp. 0%

unnatural 0 resp. 0%

How natural is what you see?

12 out of 12 answered

unnatural 11 resp. 91.7%

kind of natural 1 resp. 8.3%

natural 0 resp. 0%

natural/unnatural

12 responses

What is your notion of natural and unnatural?

7 out of 12 answered

It is very ambiguous, depending on your philosophical perspective human made objects can be considered a part of nature, as we are nature ourselves. (Biomimicry philosophy) humans tend to consider ourselves estranged from nature, whether it be above nature, the destructor. Nature is a force of life which we work with/against but recently is has become a symbol of tranquillity and purity.

Natural refers to things that exist or occur in the world without human intervention or influence. Unnatural mainly describes things which were curated through humans

The most natural photos are the ones where it covers the whole photo and doesnt look set up

I would describe something unnatural as being man-made or created. Something that did not occur on its own, nor evolved autonomously over time. Natural being the complete opposite of this, something unaffected, untouched and disturbed by human interference. Something that occurs, grows, eloves and occurs outside of humanities impact and influence.

No, because they are terms like black and white. There are many shades in between. There are things that are 100% natural, like nature left to its own devices. An organic garden is already less natural, while an English lawn is only somewhat natural and a synthetic lawn is unnatural. So there are many tones in between

Yes they are, do you must decide it by a reduced niveau, black or white,

Natural: is a condition in which no human being intervened. And unnatural is the opposite!

STATEMENT OF ORIGINALITY

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Yannic Münsch 18-05-2024

Figure 60: *Image captured in Germany. Power pole in a field with airplane contrail in the sky.*