The Interspecies Crossroads; Exploring making human-centered design a bit more inclusive

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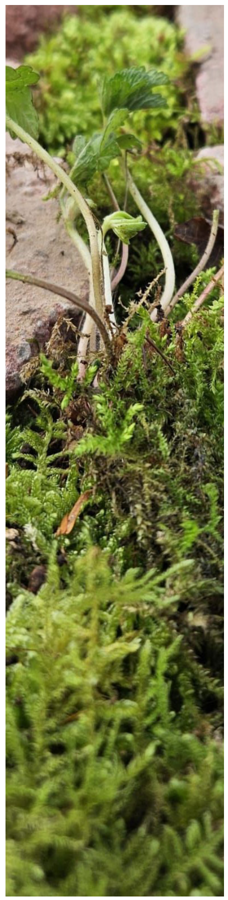
ABSTRACT

In our human-centered designed world we exclude other species from living. Where we build we lay concrete, burn away plants and remove “pests”. Recently more than human design is increasingly looking at the afterlife of products, or integration of more-than-human considerations in design. In this research we investigate how tolerant we as humans are for non-humans. We investigate this in the context of the TU/e campus, and we describe the design and development of a multi-species crossroad, where we transform a predominantly human space into a more inclusive space.

We contribute with the process and the gradually increasing awareness of the frictions of designing more than human spaces.

Authors Keywords

Materials experience; More-than-human design; Interspecies design; Inclusive design



INTRODUCTION

In design more-than-human considerations take increasing attention in HCI research [1], human architectural activities often come at the cost of other species and the environment [2]. This pictorial investigates this design space, and starts out by exploring the Atlas pond at the TU/e campus from a first person perspective. We find that we as humans are very present in the campus, we heavily control and maintain all the ecosystems around us. To transcend this anthropocentric perspective, our research dove into how tolerant we, as humans, truly are toward non-human entities [3], we aim to elaborate by transforming this space into a more inclusive environment where multiple species coexist.

Firstly, we explore materials found in and around the pond and enact materials in the ecosystem. In the process of doing we encounter a lot of thoughts and considerations which we deem important when designing for more than humans and we set ourselves the challenge to make this human centered design a little more inclusive. We highlight the process and discuss these thoughts as parts of our contribution.

Recent research [4] on designing shared living spaces between humans and other species raises questions about humans` tolerance for multi-species cohabitation. Additionally, our research also aimed to gain better insights of the needs of non-human species and the possible connection of fragmented spaces to promote harmonious living. We found that the pond in front of the Atlas building is an ideal observation spot where tracks of humans and other species overlap.

By deliberation and reflection on the materials and concepts we described a brief for a larger enactment on the location, to create a crossroad using leaves, waste bricks, moss, bricks, cornstarch and soil. We leave this enactment for three weeks, and monitor human and non-human visits. We present this fabrication as a case study to investigate the complex relations and demands humans and non-humans have for such a crossroad.

Our work contributes to the growing awareness of more-than-human design on the campus. By bridging the gap between different ecosystems and species, while allowing the engagement of human activities, we hope to further investigate the frictions inherent in our current space, and introduce the crossroad as a case study to better understand needs of multispecies and ways to incorporate them in the human occupied spaces and structures so as to co-exists.

The Atlas pond

The Pond is located on the campus of the Eindhoven University of Technology (TU/e), next to the Atlas building. As the only man-made lake on campus it is a daily passing spot for students. The Atlas building is built in the Brutalist architectural style, which focuses on materials, textures and construction methods to create highly expressive forms. The square shape of the pond echoes the geometric and structural elements of the Atlas building. The stone laid around it complements the style and choice of materials used in the Brutalist building and together they create a unified atmosphere of place.

Autoethnographic observations

To better understand the relations between us and the pond, we conduct an autoethnographic observation of the pond. We used sketches, photos and diagrams to record our observations and thoughts.

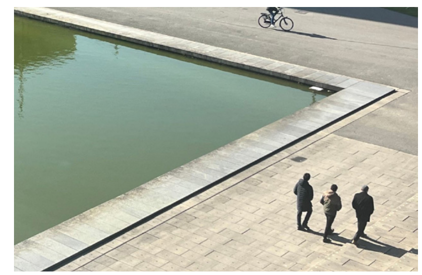
Among the static space on campus, the pond is a dynamic surface that does not seem to receive much attention. There is low engagement and interest in it, and it stands as a simple backdrop of everyday life. People seem to be afraid to get too close, due to the lack of barriers, so much so that those who walk over the stone frame are observed in a strange way. Human visits are seasonal, some organic inhabitants are also seasonal, however other organisms might not have a choice to be there, like the fish that lives there.

The pond itself seems like a simple expanse of water with no interactions and with simple aesthetic presence. You see nature breaking through the cracks here and there but the largely concrete/stone surroundings do not seem to facilitate this explicitly. However, it is also a collector of different external objects, not always beneficial for it , such as: plastic waste, cigarettes and bird droppings. These elements degrade the natural place, worsening the possibility of the existence of additional organisms.

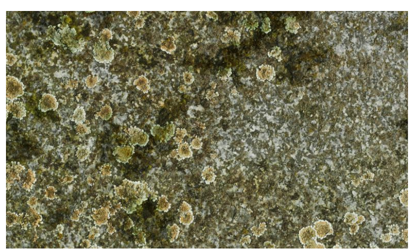
We as designers felt somewhat tentative, reflecting on the ponds presence, we felt the pond did not appeal to us personally, and it also did not really tailor to non-humans. Left us wondering why is the pond designed like this, who is it for?

The fish is the only observable living creature in the water, mostly traverses the lake alone.

Wild grasses grow tenaciously in the cracks of the stone slabs, like brave warriors.



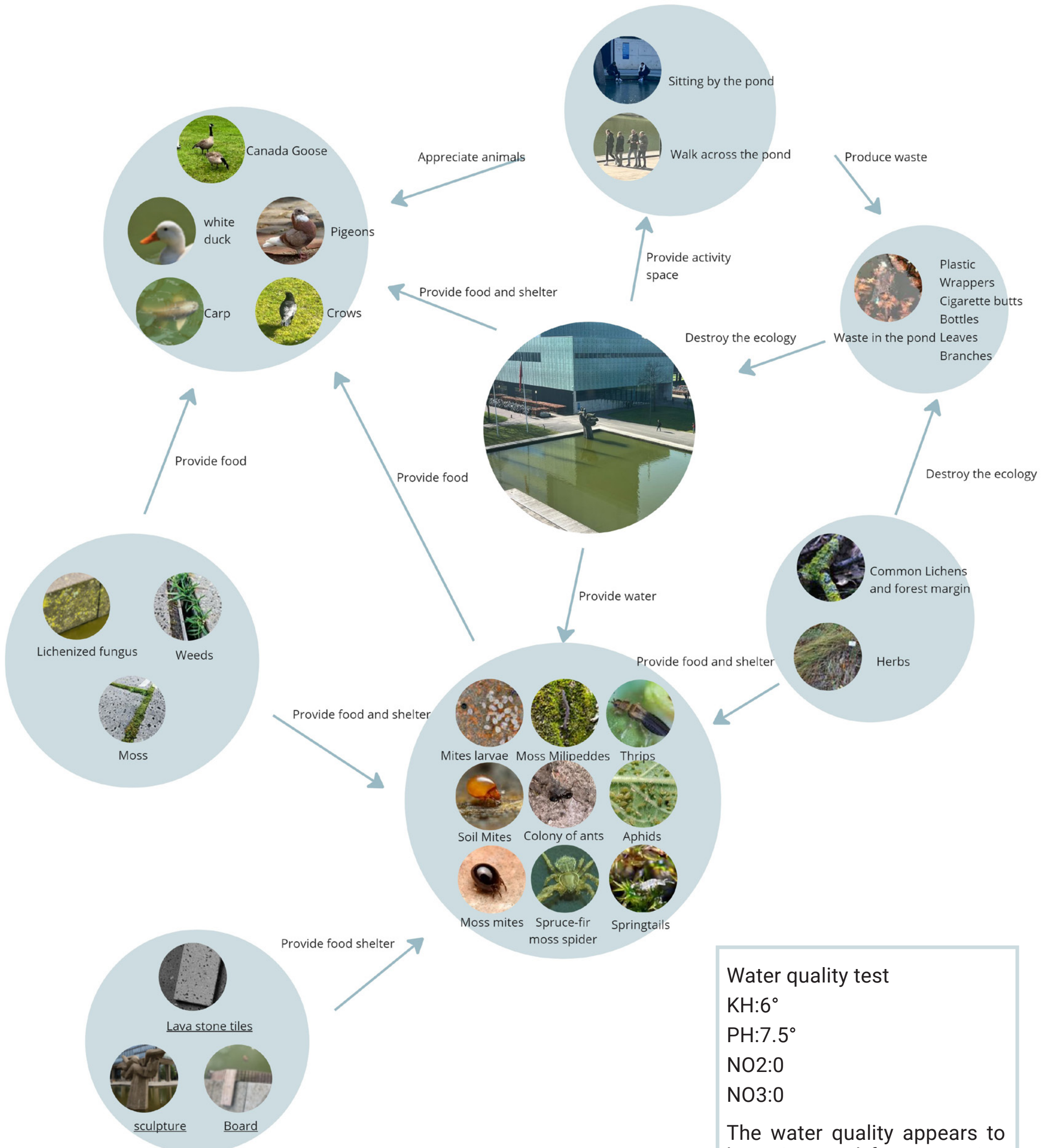
Pedestrians passed by the pond in a hurry, and few stayed for a moment.



The moss organic shapes follow the vagaries of the weather, extending with the rain over the entire frame of the lake.

Geese occasionally appear at the lake shore, but their excrement lingers on the stone slabs by the lake for a long time. They are not able to absorb into the concrete.

The lake surface bears the fallen leaves, trash, and reflection of buildings, creating interesting patterns, almost magic like.



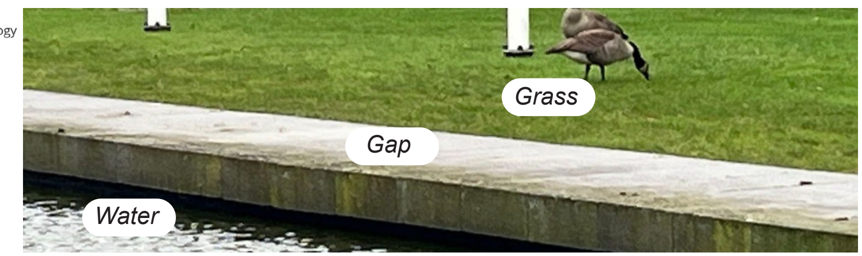
Water quality test
KH:6°
PH:7.5°
NO2:0
NO3:0

The water quality appears to be quite good for supporting aquatic life

Diving deeper

We observed that the stark boundary of concrete prevents the pond from seamlessly blending into the grass. This strict division demonstrates a clear separation between the water and terrestrial ecosystems. While large animals such as geese and ducks are able to adapt to and overcome human-designed concrete barriers, such barriers are not friendly to other organisms in the ecosystem, especially small invertebrates. But we were pleasantly surprised to find that small invertebrates were able to use the narrow gaps between the slabs to traverse the barrier, suggesting that organisms are able to overcome the barrier to some degree.

We analyzed the organisms in and around the pond, mapped their relations to the pond and to each other in the visual on the left. Moreover we contacted the TU/e department to further understand the maintenance system around it and we tested the water quality with the help of an aquarium expert and collected materials from the site.



This observations formed the inspiration to explore the site further in combination with interventions. We wanted to investigate how we could make this urban environment a bit less human-centered, without disregarding humans demands. We came up with the following demands for our explorations;

1.The installation should encourage thriving of organisms. To do so, it has to include all their living requirements, and facilitate entrance to the environment.

2.It is a crossroad, which means that all species in the area should be able to traverse their way over it. As a consequence, humans should not easily step on the critters paths. Simultaneously, the strcture should facilitate their passage through it. Moreover,sheltered and protected paths need to be provided for smaller critters and plants to live on this human pathway.

3.The design must be robust, all species have to be confident in their living environment, and the temporality of plants and animals re-entering a space cannot be ignored. The intervention has to survive for a significant time.

MATERIAL TINKERING AND EXPLORATIONS

Phase 1: Getting to know the materials

After getting a feeling for the location, we started tinkering with materials from the pond. While we were to discover the properties the materials could afford, we started to understand what role they were could play in our intervention. We started our material tinkering by trying to understand and explore the material properties and characteristics.

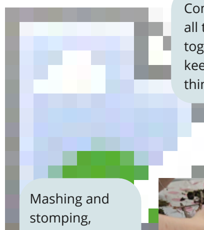
A very early insight is that we found a lot of insects and bugs residing in the moss. Which made us uncomfortable to use moss for destructive explorations since it would involve killing all those living things. A serious limitation to explorations, however the leaves and branches we collected did not seem to house a lot of other organisms. We were also very surprised to find a synthetic cloth which was inhabited by a piece of moss. We appreciated the adaptability of moss to different materials for its growth.

We were smashing and stomping the moist dry leaves and tried making layers of it. We shredded some leave and put them along with some moss in water for sometime to see if what happens. We found that the water with moss had green pigmentation while the one with dry leaves had nothing noticeable. We cut some moss leaves and mixed them with the dry leaves trying to create a malleable clay. We wanted to see the integrity of the materials and if they can stick together when mashed. We scrapped some branches and tried to mash its fibers with the leaves to see if it holds together.

Synthetics enter the ecosystem and become a part of it, however still revognisable

Squeeshing can compact, the "dirt" continues to stay compact, the moss part is springy

Wet leaves quite easily become formed into a clay like substance



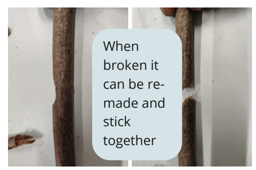
Compacting all the stuffs together keeps the thing together

Mashing and stomping, compacts the material, making it brittle

Layers of leaves stack together when decomposing, however can be seperated again

Extract color from fallen leaves (not obvious)

Extracting color from moss



When broken it can be re-made and stick together

100ml water
10g glycerol
22g vinegar
15 corn starch
The above/2 (40 grams of mixture)

15 g plucked (hydrated) leaves

Phase 2: Trying various binders to create a substrate

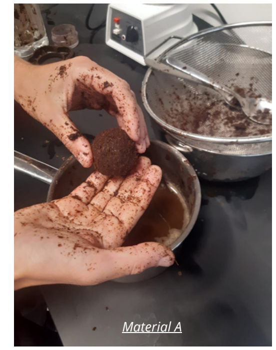
In phase 1 we found that it was very difficult to make a cohesive material from the leave fibers, hence in the next phase we tried mixing various binders like gelatin, agar agar, vinegar, cornstarch, glycerol, etc.

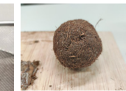
The experiments were all based on blended and shredded leaves (Material A). Without a binder the material already held together but easily crumbled when dehydrated, however when combined with binders the structure became stable while still hydrated.

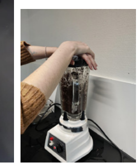
Sheets of material dried out quite quickly but became very brittle, while larger block of material took way longer to dry out, while also developing cracks in the drying process.

Bioplastics based on glycerol set quite quickly but continuously changed throughout the drying cycle. Gelatin was used and did seemed to prevent effective drying by retaining the moisture. Moreover a few of the samples started to grow mold after a week.

From this phase we concluded that the materials made continuously changed state, based on water intake. Some recipes were selected to further experiment with.







Made into a dough

Thin sheet of shredded leaves and agar agar

100ml water from blended leaves
Plus a bunch of blended leave (hydrated)
2 packets agar agar

Bioplastic before and after setting

100ml water
10g glycerol
22g vinegar
15 corn starch
The above/2 (40 grams of mixture)

25 g blended (hydrated) leaves

The substrate that later grew mold on it

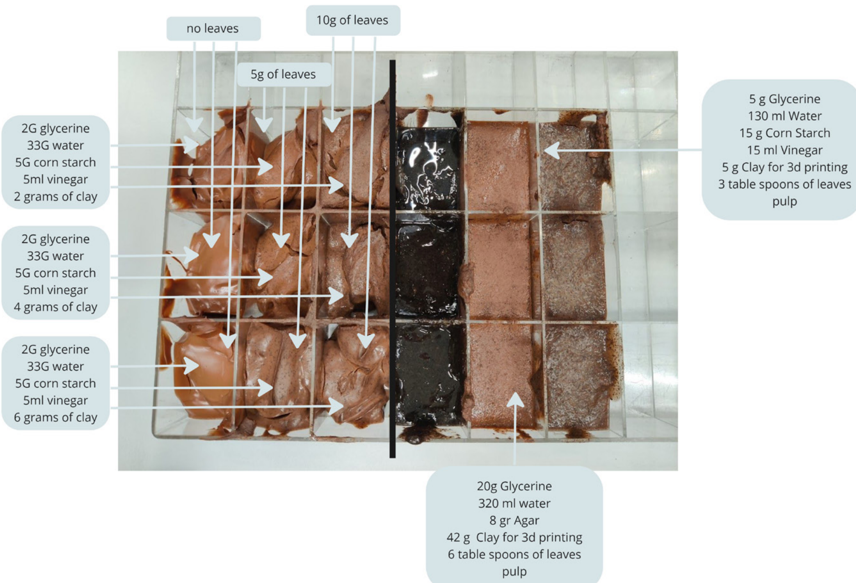
Agar agar 1 pakc
50 ml water
30 gram leaves plucked

Gelatin with leaves

3 sheets of gelatin,
50 ml water

Phase 3: Exploring sturdy materials

In this phase we aim at making a strong and sturdy substrate. We also thought of using resins, epoxy glues but considering the environmental factors, we realized this won't be a good direction. Hence, we started to refer to the 'Chemarts Cookbook' [11]. We made many samples by creating variations in the recipe based on difference in quantities of the ingredients. We tried shredding, milling and creating a fine paste of dry leaves to check the integrity of the material.

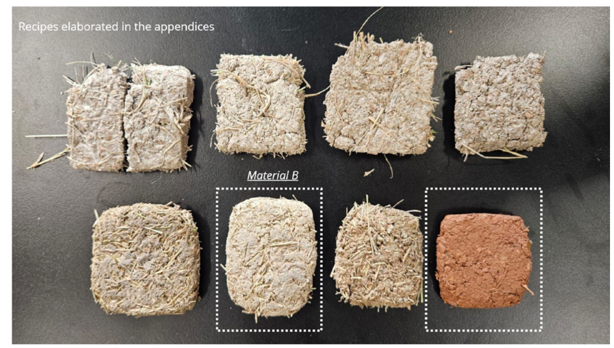


These are how the samples looked after drying (left). We observed that the samples had shrunken after drying. Some of the samples turned out to be sturdy while some were gooey and jelly like. The viscosity of the samples also seemed to have altered their sturdiness.

Phase 4: Observing and experiencing the substrate

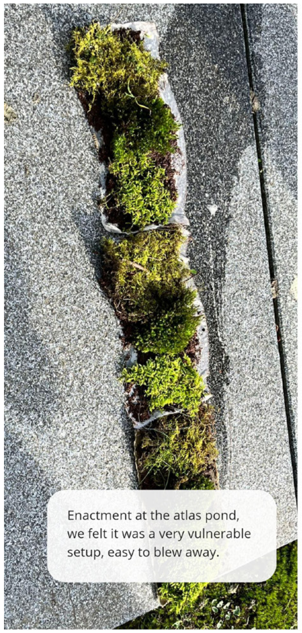
From the last phase we concluded that we required a substrate that was porous enough to hold the moss on top of it and it needed to retain water as well. Additionally, we realised some more material needs of the various ecological entities like ants, insects, bugs in the (system of our) site. (these are discussed in detail further in the report). Hence we started experimenting with our own recipes.

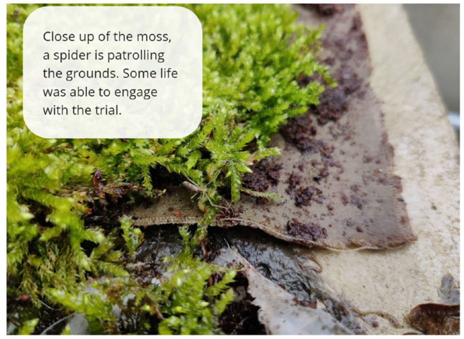
Considering that we are designing for the Spring, we realized that insects might use our crossroad for reproducing their young and building colonies. Hence, we use materials like soil, shredded dry leaves and dry grass stands for our substrate which would provide strength and stability while act as water and moisture absorbent and also some cornstarch as a binder. We refrained from using gelatin, agar agar, vinegar or similar materials as it may have a negative impact on the insects in the longer run. The water retained by the substrate would promote moss growth, which acts as an intermediate environment.



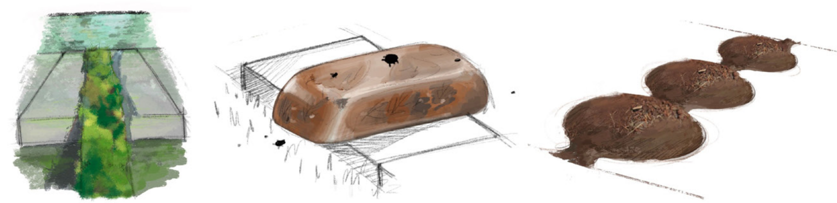
Above are the images of the dried samples. The variations were created by varying the amount of soil, cornstarch and leaves in the recipe mixture. The wet dough like sample slab dried quite fast. We started testing the sample's integrity and sturdiness. As evident in the pictures, some of them crumbled into powder when applied force. Some of the reasons were the size of the shredded leaves and fines of dry grass, excess amount of corn starch (binder). We also placed long strands of grass between layers of leaves dough to hold it together but it didn't seem to work.

Two samples were found to be very strong and sturdy (the ones highlighted with dotted lines). However, when their water absorbent ability was tested, the one on the right (clay colored) didn't do as well as the one on the left. Hence, we decided to use 'Material B' as the substrate to enact in the Bridge.





Initial sketches of the interspecies crossroad.



MATERIAL ENACTMENTS

In parallel to the material tinkering, we started enacting the materials outside. This was done in two different ways; enacting the materials and envisioning multiple actors interacting with the intervention, and secondly by placing samples in the environment and monitoring them over time.

Enacting how humans would cross an insect pathway like this would be very sensitive to damage. The cracks which house insects are a very natural barrier to the feet of humans passing by. Which inspired us to use crack like structures as a natural protection. Different idea's of a interspecies crossroad started to form, taken the shape of sketches, ideas, and prototypes.

For the longer term experiments we picked a spot which was a bit more secluded. Mostly because we did not have official permission for the Atlas pond, and we did not want human interference (yet). A small culvert at the edge of a grass patch and the waters edge was selected for its similarity to the Atlas pond. We initially attempted to introduce moss to the concrete to see how we could design on top of the existing concrete at the pond. However, the moss either dried out or was blown away by the wind. We experimented with creating a substrate of leaves and gelatin binder on top of fabric to hold the moss together. This worked better however unfortunately, some of the moss was still blown away by the strong wind and rain.

We also attempted to bridge the water and land using a web-like structure, as the height created by the slate around the pond made it difficult to bridge with only substrate and moss. Very quickly the moss that was on the waters edge died off.

After the initial placement We noticed an increase in critters around the moss we had placed. The integration of the small patches into the insect ecosystem went quite fast. And over time increasing amounts of insects started inhabiting the new habitat.

After four weeks of implementation, the moss samples were still alive, and housing plenty of insects. Part of the substrate did get washed out with rain, however plenty remained integrated with the moss' rhizoid system.

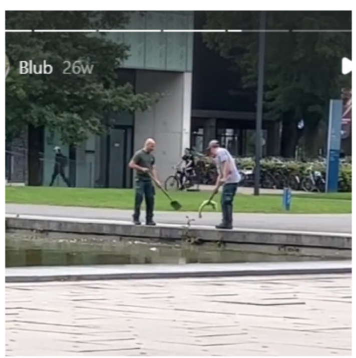
Human Ecosystem
The Atlas Pond is settled right at the center of the TU/e campus, and is a highly monitored and maintained public space. The professional maintenance personnel is organized from the TU/e and falls under the Real Estate department. The area in and around the pond is maintained by intermittent trash removal, upkeep of the two oxygenators, and removal of weeds and moss on an annual basis. The property around the pond annually cleaned with pressure washers and weed removal in between tiling, the grass is mowed and leaves are removed.

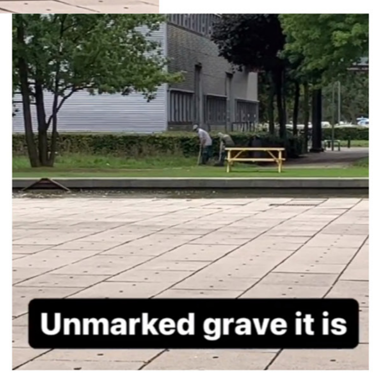
Student wildlife connection
A big carp, Egbert lives in the Atlas pond, it has an interesting following from part of the students. Namely he has his own Instagram, where all kinds of stories are posted and also the incident below is shared.

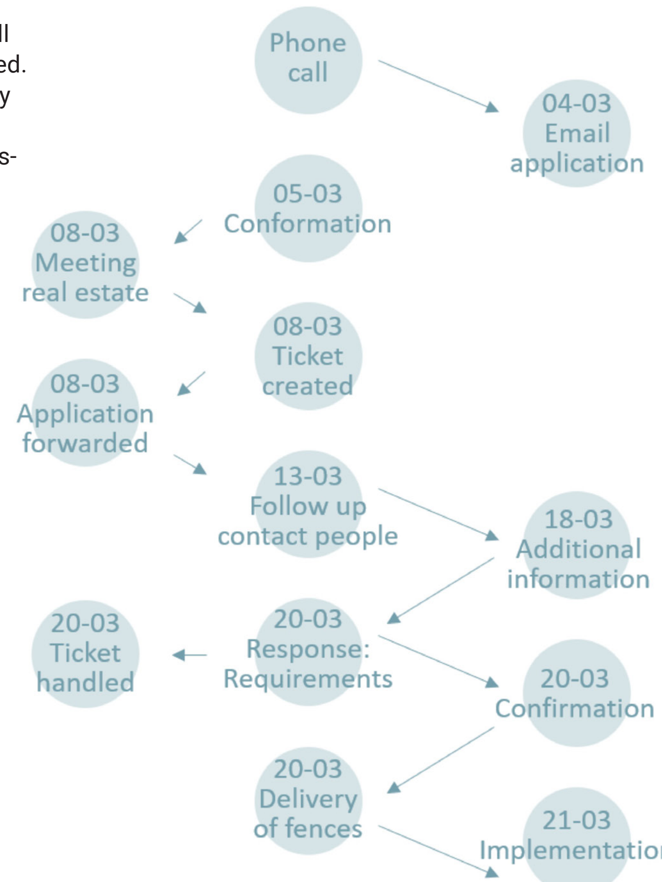
Incidents
Maintenance takes care of all kinds of incidents, one we can highlight from a picture reel on Instagram in September 2023. One of the fish in the pond died, of which a note was made to maintenance. The TU/e maintenance system rather quickly, within a day, catches on and disposes of the deceased body.

Approval of experiment
As researchers we work within the campus, and their limitations. Unlike our own backyard where we can do as we please, there are instances that maintain safety and cleanliness.
This is rather significant, as in any public space there is a large network of ownership and upkeep, which will have to adapt when new designs or research is planned. We outline the process in the visual below. The agency handling the request was TU/e Real Estate.
Initially this process to us felt like a necessary unpleasantness, and we were surprised by the fast and accurate responses, and felt supported by the system. The system does seem to support new investigation and research by students.
In the end the Real Estate department had one specific demand to ensure safety, which was the requirement of physical barriers, as to passerby's would not stumble into the experiment. These barriers were provided by the TU/e campus, however did make it more difficult to observe humans stumbling into the enactment.

EGBERTTHEFISH







Study model

one day geese visited the place

From all the previous explorations a final model was designed. First an MDF plate was made to protect the concrete tiles underneath (required by the Real Estate). Atop of which stone tile fragments were placed. These were sources from campus waste streams, and served the purpose of protecting the cracks that formed in between them. In between the cracks a layer of substrate was placed based on our composite of soil, clay, cornstarch, blended hay and leaves. This substrate was found to retain moisture well, and did not wash out easily with rain. Atop of this moss was placed, held in place partly by the tiles, and the slightly sticky substrate. This integration was surrounded by fences and placed at the Atlas pond.

walking over it is fine, but biking is difficult

we had to costantly fix it because of the wind

The creation of this provisional prototype has proven to be fundamental for observing and understanding the reaction of the organisms involved. It also helped us to explore the different actors which would make use of it. We observed and maintained the installation for a period of four weeks. In which we were able to see some vitality in it. Ants, insects, and millipedes have moved into the crossroads, and seem to inhabit every corner of habitat.

However the maintenance of the system was rather high, in one case the whole wooden plate flipped over on itself. Which shows the high winds around the pond.

during sunny days it dried out

we started to connect the daily weather to the prototype, either worrying about it or being reassured

Reflecting on the installation some significant insights arose, the aesthetic values feel quite familiar and uncomplicated. The broken tile, in combination with organisms re-inhabiting the void space between tiles is something we see everywhere. It does however require attention when walking over it, its not as smooth and gap-less as “normal” paved roads.

FURTHER INVESTIGATIONS

In the first prototyped structure, there wasn't much control over the pathways and cracks due to the material used (waste tiles). This led us to wonder how we would have designed the structure if we had the opportunity to build it from scratch. From this point onwards, research on structure optimization and insect habitats design was carried out, culminating in the 3D printing test of clay for some of the results.

Structure considerations

As useful as the cement used in the prototype was for increasing the weight in the structure, it didn't allow for the creation of cavities hidden from light, as it was completely solid inside. Furthermore, it had a very brutal aesthetic associated with human architecture. Therefore, hypotheses about the possibility of encouraging organisms to interact with a structure that looked more natural and biomimetic were made.

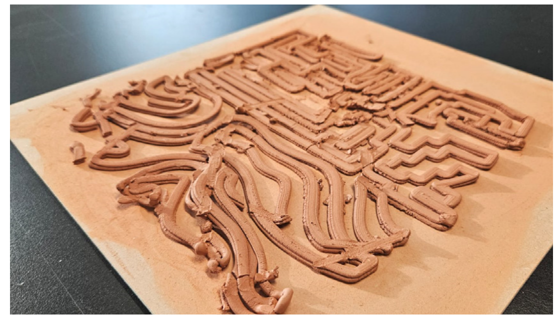
Inspiration and insect architecture

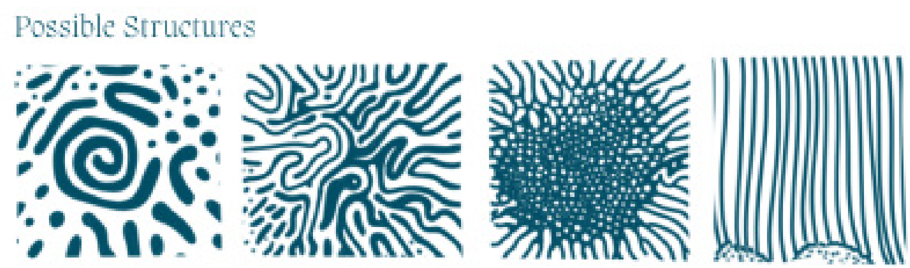
Biodiverse urban design, also called multispecies urbanism [6], along with more-than-human design projects inspired and gave useful insights for the design development. Starting from gardeners creating bug sanctuaries to help bolster the essential insect population [7], to architects trying to carve out spaces in the asphalt of the city to restore habitats that had long been paved over [6], many examples were considered. Thus, we have discovered how insect architecture can be instructive and adaptive, since insects build structures out of diverse materials [8]. These structures address universal issues present in civil engineering or architecture, such as "regulation of nest environments, optimal usage of building material, maintenance of sterile habitats, and detection and repair of damage" [8]. Furthermore, Biometric applications and waste-free engineering suggest that the nature of insect building processes is particularly suitable for computational modeling.

Bodo D. Wilts and Michael Meyes, both working in the field of biology, have summarized the structure functiones needed by each type of insect, connecting to their specific material motif usually built by them for their habitats [9]. Considering honeybees, mosquitos, sawflies, leafhoppers, social wasps, fire ants, army ants, weaver ants and termite as our living organisms we then found the exact characteristics for our design. . Layering and regular repeated patterns were the motifs needed, with general functions of thermoregulation, water active properties and collecting materials [9].

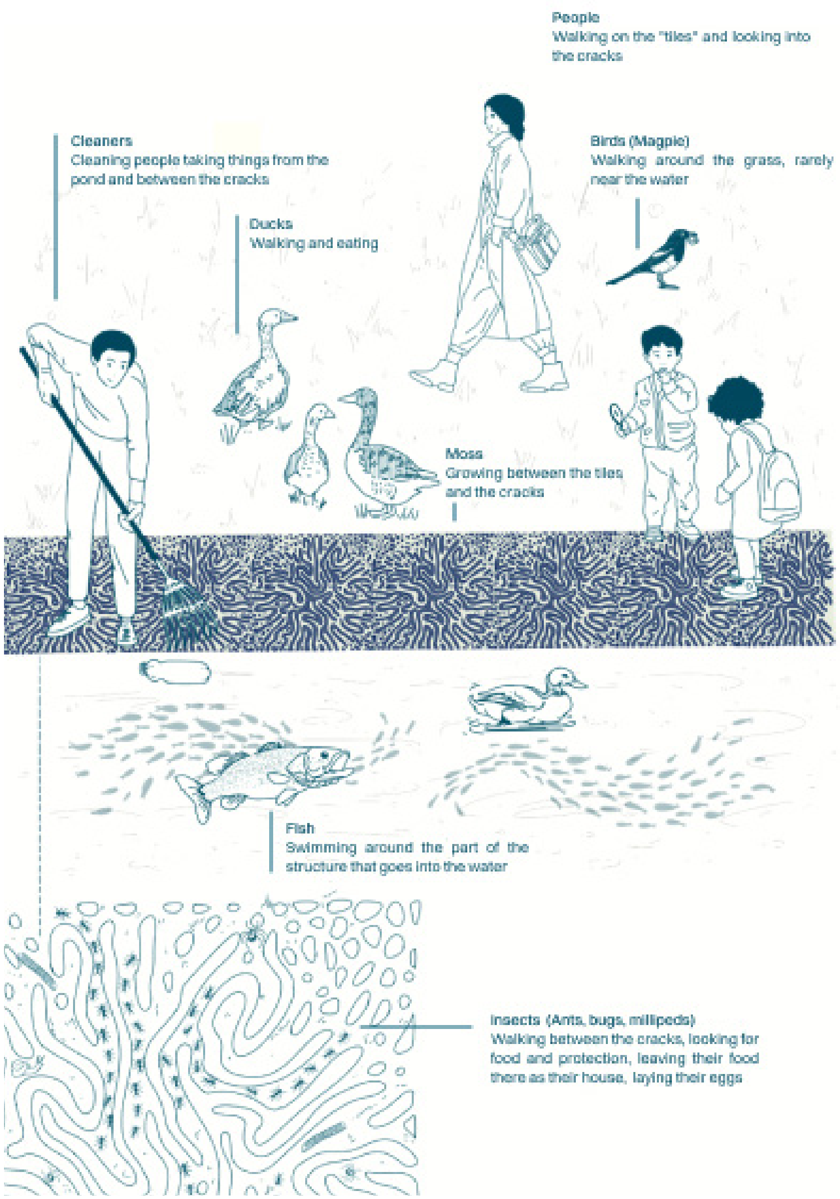
Moreover, ventilation of the environment is fundamental to prevent a build-up of carbon dioxide or heat that can prove fatal to the colony. This type of function can be achieved through architectural nuances [8]. Next, aesthetic considerations were made. We found projects that used specific colors to reflect what insects are attracted to in nature generally, such as light colors or white/grey and dark tones [10]. These aspects could be considered for the next developments.

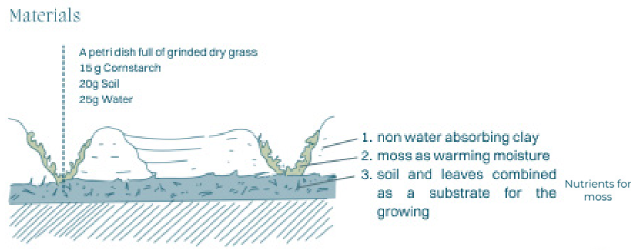
Finally, a biomimetic pattern inspired by the anthills and their nests was modelled and printed as shown in the figure A. A second exploration was done, prioritizng the creation of protective tunnels and dark paths. These physical examples lay the foundation for possible future investigations on more engineered structures. Computational design could be a good choice because it could create efficient structures that take into consideration all the requirement inputs for the organisms, finding the optimal design to foster their life. In fact, it wa salso stated that "With the recent advances in 3D-printing these computational models can be physically implemented to actualize large-scale, complex structures" [8].

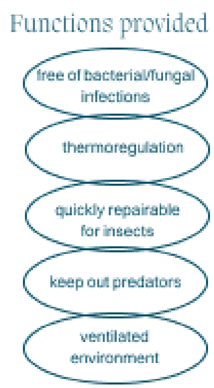


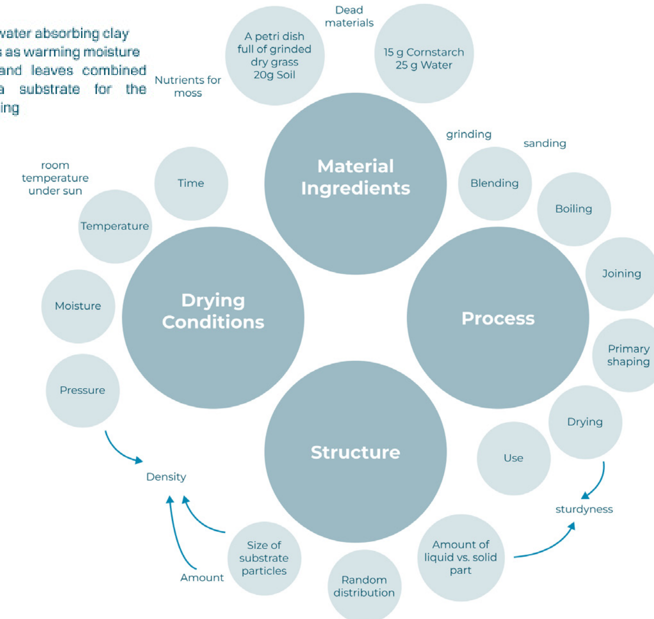


“FUTURE” CROSSROAD DESIGN









Chosen Material Taxonomy

Our vision is actually broader and wider than what we achieved to do, and that is why we tried to portrait what we imagine to reach ideally through an illustration of our ecosystem, from a large scale to a more focused one.

The system and its requirements

The structural design was conceived according to the needs of the organisms, in an attempt to promote and facilitate a harmonious coexistence. Multifaceted requirements were considered together, noticing all the different layers and leves of the ecosystem. The design prioritized a long lasting sturdy structure, with cracks to let light in and to show the path for the nonhumans. At the same time, the presence of humans was considered, trying to blend the implementation with their use. Creating a pattern that could hold the weight of passing users, would enable multiple types of behaviors without damaging the lives of the non-humans. Part of the reflection was also towards undirect users such as the cleaning personnel, whom should be able to clean while not disturbing the delicate balance of the ecosystem. Moreover, attention was directed towards non-water absorption to prevent the growing of slippery moss and algae that could endanger the walking users.

Fundamental to this approach was the consideration of the season. In fact, this design was imagined for spring, which is the time when ants and other insects reproduce. As a consequence, providing specific temperature regulation and air ventilation became one of the priorities, to conceive the nests to foster this activity. Multiple kinds of bugs already reproduce in moss, so all these elements could provide together a dwelling for them. Simultaneously, the structure was developed according other needs of small organisms, such as protection from predators and enough thickness to prevent the propagation of vibrations.

Finally, sensibilization through aesthetics and displaying of vitality was discussed. Nature does not need to be curated into a more anthropocentric type of aesthetic. Its own inherent beauty can flourish naturally through the co-creation that we have imagined. By showcasing the interdependence of life forms, people are reminded to decenter their human perception of space ownership.

Moreover, the pattern and repetition of the cracks recalls the movements of the water and its magic reflections, creating an ongoing visual interesting connection between different parts of nature. This way, we hope to create curiosity between all the entities and users of the design, into seeing and learning from each other vitality and particularities.

DISCUSSION

Human centeredness

In this pictorial we outline the exclusively human-centered design space around the Atlas pond. We find that the space is not only human-centered but non-human exclusive, the negotiations between humans and non-humans can be seen everywhere. Concrete walkways and paths take up space otherwise inhabitable by non-humans, grass is mowed, the pond has no plant/structure for aquatic species to find refuge. This controlling of non-humans continues indoors, where house plants get a very limited living area, mousses are not tolerated, and mold is combatted fiercely. Enacting in the design space illuminated this human-centeredness in our world and highlighted two main concerns in designing for an interspecies crossroad.

How tolerant are we for other species

Our selective approach to allowing non-humans into our living space is a design concern. As we found that the Atlas pond was mainly used for walking the physical distance between humans and non-humans living in the cracks was quite large. We've found that in the outside environment we are relatively tolerant for other species, when we are open to it we even like to interact with insects and plants. However when we are sitting somewhere we are not comfortable with ants and woodlice getting everywhere.

These thought experiments continued with our inside environments. Everywhere we go we create an environment where we pick and choose who gets to live alongside us (house plants, pets, etc.). Like in the outside environment there are plenty of places where other species are attempting to co-exist, we however almost religiously exclude them for a multitude of reasons, (mice, spiders, mold). In our homes we design things to be cleanable, to facilitate the extermination of unwanted co-inhabitants.

Throughout our research we became more and more interested by this tolerance towards other species, and future research could focus on stretching this tolerance further. On campus, in your garden, in the main atlas hall, in your living room, or in your kitchen?

Balancing needs

Every species needs are very important when designing spaces, considering these is necessity when one wants to create a space that is more inclusive. The human factors are always evident, it is the first thing that springs to mind when designing something, how will we cross? Why is this something WE want? How do we ensure no hassle for humans? And how do we keep is neat? You need to be aware of these needs, in the end it is humans which do need to fund/ build and maintain it. When reflecting about the Atlas pond, we all felt sad, and almost guilty, that we are taking so much space for ourselves and not even care about it. This led us to develop the interspecies crossroad, and as such also satisfies a need for us. The socio-human aspects of a multi-species crossroad is in our experience most important, because it makes it happen or not.

On the other hand are other species needs, which are much more based on environmental factors, and are possibly captured, however which organisms to design for becomes a lot bigger challenge. Which organisms are "worth" protecting and fostering. And how can be balance the non-humans wellbeing and the socio-human aspects.

Non-humans entering the human environment in the form of mold, which we battle on a weekly basis with chemicals

A non-human we tolerate, even care for.

a place were insects and other critters collect and live, also makes them very prone to predators, like fish in the water or birds picking. There is a human thought to protect every individual, on the other hand small critters are just part of the bigger ecosystem. As such we believe that increasing habitat, by benefitting individuals benefits the ecosystem as a whole.

Research in the field

This research was conducted from February to April in The Netherlands, which is a period of time which has a lot of rain, as well as increasing temperatures and sun levels. There was no freezing recorded and no consequent drought over 4 days. There were high levels of wind, over 30m/s for multiple days throughout the period. In our enactments we've found that these wind forces unexpectedly had great influence on the moss.

These factors are quite important as they directly influence the work and research outcomes. Wind-proofing our design became quite important for the research location, while more sheltered spots (like our culvert experiments) do not need this. This reinvigorates the importance of being in the space you aim to implement, and trial your designs.

Paying attention

What struck us about this project is the role of paying attention, when engaging with the moss, we at first did not see any organisms living in it. Only when getting close we found a whole heap of small critters living. The amount of life possible in just some grass or moss is just breathtaking. Knowing this we almost felt guilty walking over grass and/moss. In our daily life, we hardly have to pay attention to our surroundings, we get from A to B, without paying attention to what is happening beneath our feet. And there is nothing happening, at least not on concrete. However by placing concrete and maintaining it, we are already preventing non-humans from existing in the first place. Meier et all highlight that most humans are aware of insect loss, however counteracting actively is difficult (2020).

The act of inserting yourself into the design space, getting your hands dirty, zooming in, zooming out and paying attention is a powerful one. As it not only opens up your emotional connection to the subject at hand, but it also opens yourself up for unexpected encounters.

FUTURE WORK

Like outlined in future crossroad design, there are a lot of considerations in our vision, of which some are already considered others however might need more attention.

Because of safety concerns we could not observe human interactions with the system. The fences gave a feeling of sensitivity and distance to passerby's. The implications of a longer human crossroad interaction is pivotal for true integration into the campus eco-system.

We envision this type of architecture into more parts of the campus, our location is a low traffic area, however plenty of new considerations will arise when designing for higher traffic paths like vibrations caused by human and bicycle movements, degradation of the materials, repairing and restoring systems. Moreover we can envision more inclusive architecture not only inhabiting flat planes, but as other projects have already shown, vertical panels are an interesting prospect for more-than-human design on campus.

We envision a future scenario wherein 'more than human design' is embedded into fundamentals of human systems, so as to cohabit and co-exist, taking care of the needs of all the ecological entities including humans. Furthermore, we hope and aim for a change in people' sensibility through the display and exposition of these designs in more and more places. We hope people to be more adaptive and appreciative of the changes so as to reduce friction in the implementation of these interventions.

CONCLUSION

This pictorial describes the design journey of The Interspecies Crossroad. This journey was split into three main stages, starting off with an autoethnographic exploration of the location, followed by material experimentations following into material enactments on the site.

This process forces the act of paying attention, and being guided by the materials and location. Which in this project slowly developed an understanding of the design space. For instance how does the design space tailor for humans, and non-humans. Why certain spaces are difficult to inhabit for insects and others not, and how can we get into a human-ecosystem and experiment with alternatives. Implementation in the real world, highlighted problems not foreseen in the lab, and also generated a sense of responsibility for the inhabitants of our designs. During the enactments we hypothesize and experiment with a future vision for this crossroads, imagining the possibility of a fruitful and vibrant ecosystem, based on a holistic and harmonious coexistence. We let nature answer to our questions and surprise us by placing the prototypes into different sites of the university. Every mistake was helpful to understand how to design around the non-humans needs and to listen to the system more carefully. Thanks to other research, we understood that following insect architecture was the best choice for the structure, so we explored the possibilities of these patterns by 3d printing some of them.

During the project a set of concerns arise on which we reflect in the discussion. Especially around how we as humans co-inhabit spaces with other organisms, and our role in the environments around us. How tolerant we are to more-than-human designs in the traditionally considered human spaces. Multifaceted requirements needed decisions or points to meet upon, such as the human needs versus the non-human ones.

Thus our contribution is somewhat complicated, we present the process as a case study to learn about how to design with and for multi-species, and especially highlight the importance of getting out there and trying. We secondly present the set of arising themes as starters for further enquiries, and as a development of our vision in more-than-human design.

ACKNOWLEDGEMENTS

In this report some AI tools were used for translation purposes:

Throughout page 2,3 and 6 AI tool deepl.com was used to translate texts from Mandarin were translated to English, after which they were rewritten again.

Throughout parts of page 8,9 and 10 chat.openai.com and context.reverso.net were used to translate texts from Italian to English, after which they were partly rewritten.

Contribution statement

This study was designed by all of the authors. In particular, MG took the role of Designer Director, giving directions to follow for each task. SA and MG carried out the material exploration of phase 2, and during phase 1, 3 and 4 all authors helped. LZ and FZ built the crossroad prototype. MG printed the clay structures with the help of AD for the design of the pattern, while SA took care of the visual communication of the fliers and most of the project.

All authors wrote/read and approved the final manuscript.

REFERENCES

[1] Olga Cielemęcka and Christine Daigle. 2019. Posthuman sustainability: An ethos for our anthropocenic future. Theory, Culture & Society 36, 7-8 (2019), 67–87ACM. How to Classify Works Using ACM's Computing Classification System. 2014. Retrieved August 22, 2014 from http://www.acm.org/class/how_to_use.html

[2] Fraser, I. M., Roberts, D. L., & Brock, M. (2023). The economics of species extinction: An economist's viewpoint. Environmental Conservation, 1-10. DOI: 10.1017/ext.2023.18

[3] Romani, A., Casnati, F., & Ianniello, A. (2022). Codesign with more-than-humans: toward a meta co-design tool for human-non-human collaborations. European Journal of Futures Research, 10, 17DOI: 10.1186/s40309-022-00205-71.

[4] Tarcan, B., Pettersen, I. N., & Edwards, F. (n.d.). Making-with the environment through more-than-human design. DRS Digital Library. https://dl.designresearchsociety.org/drs-conference-papers/drs2022/researchpapers/88/

[5] Romani, A., Casnati, F., & Ianniello, A. (2022). Codesign with more-than-humans: toward a meta co-design tool for human-non-human collaborations. European Journal of Futures Research, 10, 17. DOI: 10.1186/s40309-022-00205-7

[6] Berg, N. (2024, March 26). The buildings of the future won't just be for humans—They'll be for insects, too. Fast Company. https://www.fastcompany.com/91063391/the-buildings-of-the-future-wont-just-be-for-humans-theyll-be-for-insects-too

[7] Magazine, S. (n.d.). How to Create an Insect Habitat in Your Garden. Smithsonian Magazine. Retrieved 11 April 2024, from https://www.smithsonianmag.com/smithsonian-institution/creating-insect-habitat-ripley-garden-180961898/

[8] Sane, S. P., Ramaswamy, S. S., & Raja, S. V. (2020). Insect architecture: Structural diversity and behavioral principles. Current Opinion in Insect Science, 42, 39–46. https://doi.org/10.1016/j.cois.2020.08.005

[9] Schroeder, T. B. H., Houghtaling, J., Wilts, B. D., & Mayer, M. (2018). It's Not a Bug, It's a Feature: Functional Materials in Insects. Advanced Materials, 30(19), 1705322. https://doi.org/10.1002/adma.201705322

[10] What is the "celebration of insects"? Interview with Marlène Huissoud. (2019, November 4). DesignWanted. https://designwanted.com/marlene-huissoud-interview/

[11] Kääriäinen, P., Tervinen, L., Vuorinen, T., & Riutta, N. (2020). The Chemarts Cookbook. https://aaltodoc.aalto.fi:443/handle/123456789/44165

APPENDIX

Sample 5
A petri dish half with grinded dry grass and half with dry leaves (70% Grinded),20 g Cornstarch,10g Soil,25g Water

Result/ Observation:

Initially seemed to hold up well, sturdy and strong. The grass seemed to have brought everything together. But later once it was completed dry, the material in-between the grass turned into powder when crushed. So, the held the material well it had moisture but once dry, it couldn't hold it.

Sample 6
A petri dish full with grinded dry grass 15 g Cornstarch, 20g Soil, 25g Water, Half tablespoon, Honey

Result/ Observation:

25g is too much water, so had to add more dry grass. Once it became dry, it held very well. It was strong and was not easy to break apart since the dry grass held it together. One of the most promising ones!

Sample 7
A petri dish half with grinded dry grass and half with dry leaves (70% Grinded), 15 g Cornstarch, 20g Soil, 25g Water

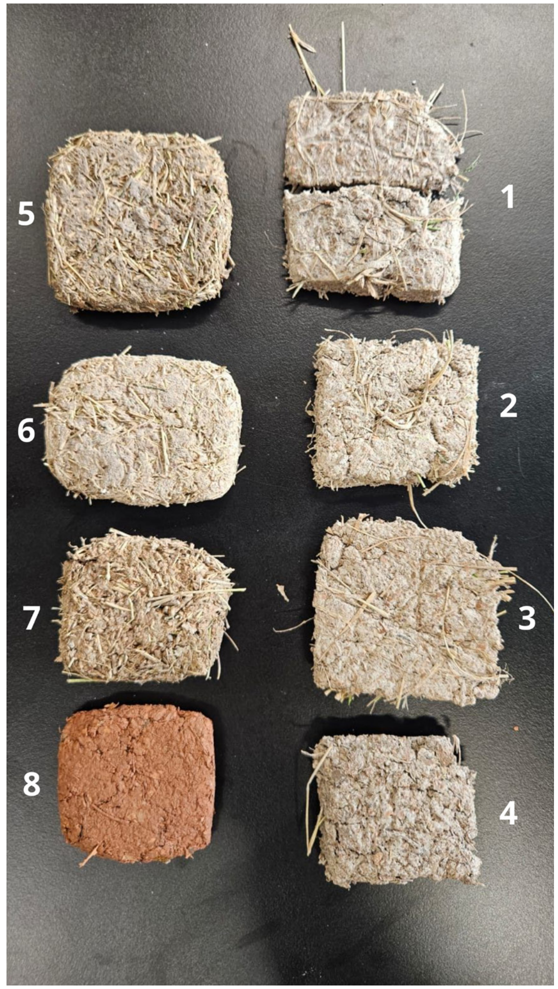
Result/ Observation:

It was also breaking off easily especially the crushed leaves that were mixed. The size of the crushed leaves seemed to be a bit larger than other samples. That might be the reason it was breaking off easily.

Sample 8
A petri dish full of grinded dry leaves, Molted clay, Soil

Result/ Observation:

Held up well, the consistency of the clay is critical here. Once it dried, it became very hard. It didnt have as rough texture as other samples.be the reason it was breaking off easily.



Sample 1
A petri dish full of dry leaves dust (70% grinded), 30 g Cornstarch, 10g Soil, Dry grass strands, 30g Water

Result/ Observation:

Long grass stands were placed in between layers of the material so that grass holds together the material. But it didn't work. The material sample was breaking off very easy and turning into powder. this turned out to be weakest of all 8 tries.

Sample 1
A petri dish full of dry leaves dust (70% Grinded), 20 g Cornstarch, 15g Soil, Dry grass strands, 25g, Water

Result/ Observation:

Long grass stands were placed in between layers of the material so that grass holds together the material. But it didn't work. The material sample was breaking off very easy and turning into powder. this turned out to be weakest of all 8 tries.

Sample 3
A petri dish full of dry leaves dust (70% Grinded),20 g Cornstarch, 15g Soil, Dry grass strands, 25g Water

Result/ Observation:

Seemed to hold up well initially. But then it was easily breakable as others. It also seemed very dry. 20g of cornstarch might be a bit more. Large pieces were breaking off of it.

Sample 4
A petri dish half with grinded dry grass and half with dry leaves (70% Grinded), 15 g Cornstarch, 20g Soil, 25g Water

Result/ Observation:

It was also breaking off easily especially the crushed leaves that were mixed. The size of the crushed leaves seemed to be a bit larger than other samples. That might be the reason it was breaking off easily.