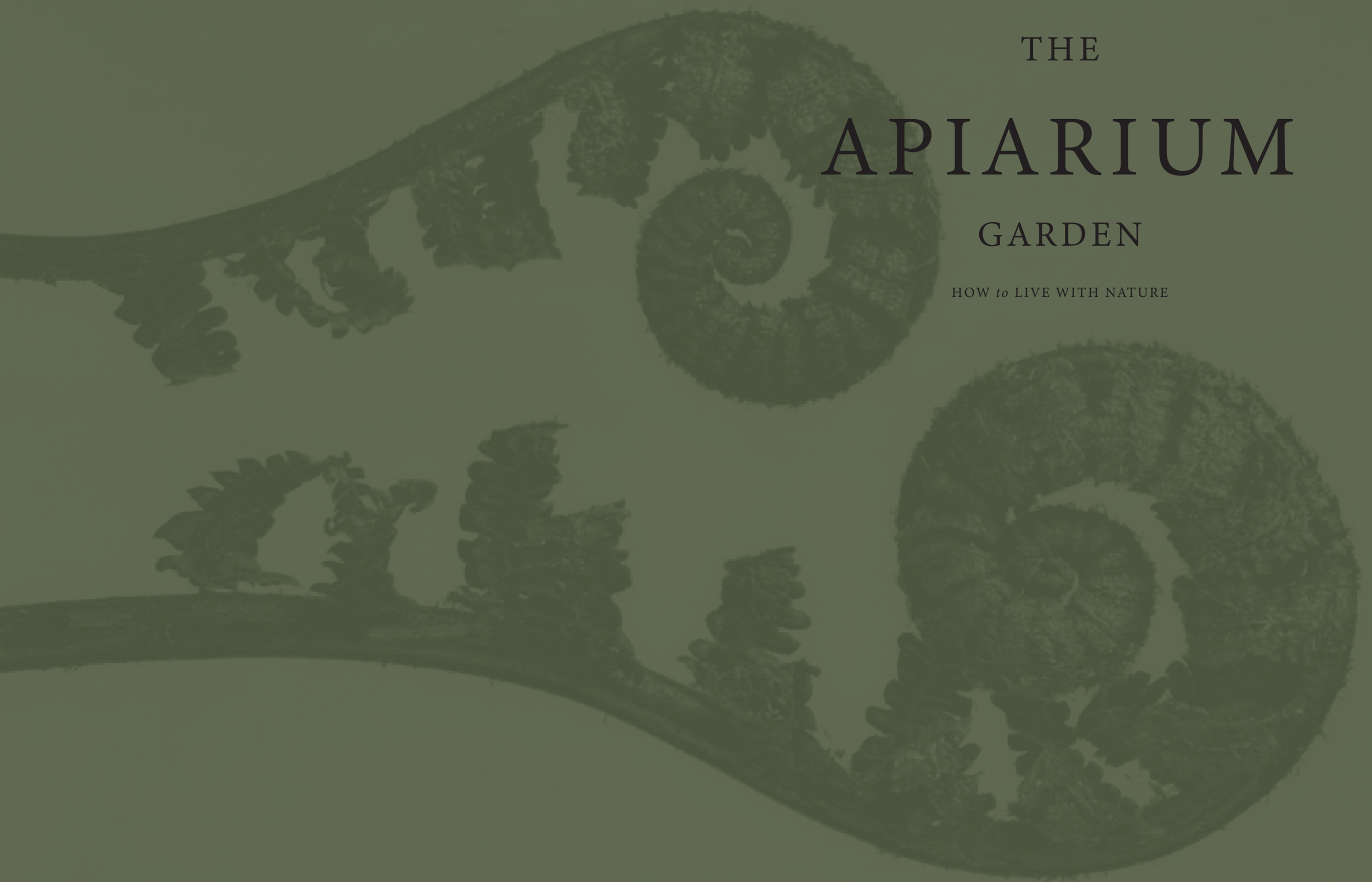
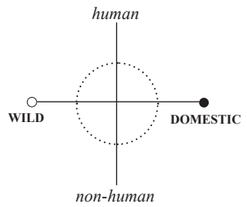
THE APIARIUM GARDEN

HOW *to* LIVE WITH NATURE



Reflection

THE ENCOUNTER



„Or: *How to live with nature?*“

Msc4 Positions in Practice
Reflection
How to live with nature: Apiarium- A garden for bees and humans in the fortress of Belgrade.

In the following reflection, I aim to answer the following five aspects as an integral part of the written content, rather than separate chapters of selfsame:

- The relationship between research and design.
- The relationship between my graduation (project) topic, the studio topic (if applicable), my master track (Architecture), and my master programme (Master of Science Architecture and Urbanism).
- Elaboration on research method and approach chosen in relation to the graduation studio's methodical line of inquiry, reflecting upon the work's scientific relevance.
- Elaboration on the relationship between the graduation project and the wider social, professional and scientific framework, touching upon the transferability of the project results.
- Discussion of the ethical issues and dilemmas I may have encountered in (i) doing the research, (ii, if applicable) elaborating the design and (iii) potential applications of the results in practice.

Written by: Linda Kronmüller
Tutors: Jorge Mejía Hernandez, Pierre Jennen and Aleksandar Staničić
External Examiner: Hilde Remøy

Reminiscence' Research Plan'

Project
Belgrade is a city in the Balkan peninsula and has hosted different empires through the centuries, which formed a vivid cultural heritage. When thinking about a possible future identity, the city must cope with its complex history, present memories alive in the city and a range of different narratives that interweave with selfsame.

Nevertheless, looking for a physical presence of Belgrade's past, the Kalemegdan fortress, on the confluence of the river Sava and Danube, embodies such agglomeration. It was for centuries that Belgrade's population concentrated only within the fortress walls. Thus, until most recent times, the fortress reflects on the history of Belgrade itself. Located in Belgrade's municipality of Stari Grad, it is the oldest section in the urban tissue, symbolic of its core. Nowadays, the area enfolds several cultural sites with public programs, such as Belgrade Zoo.
Besides these city-specific attributes, Belgrade's artificial environment has- as for every big city- grown to an enormous extent. Therefore, the boundary between natural and artificial, these contradictions, has grown ever-expanding. However, as large cities witness climate change and its consequences, they can no longer afford to antagonise and keep nature out. How can a ‚Co-habitation in balance 'support the process of forming alternative approaches?

Zoos have always reflected human's relation with flora and fauna. In doing so, Belgrade's Zoo needs a rethinking of its initial function. Partly situated in the fortress's heritage, it can become a prime example of human-animal encounter: At this point, one between humans and bees.

The new garden - having a picnic and strolling around in the green (humans and pollinators; but also other forms of life)- has an integrated small taberna, alongside an apiarium for honey production and a kitchen garden. It aims to shift the human-centred perspective by highlighting overlooked species and a yet neglected scale. Therefore, it enhances the spatial intersections beyond synanthropic conditions. Furthermore, the proposal proves possible small-scale scenarios for multi-species design in urban context altogether. Thus, to stimulate envisioning possible futures for Belgrade and fulfil the upco ing agenda of an inclusive, sustainable environment.

Foreword

"How will we live together?"[1]
This year's Biennale-question, what having a good life (together) means, concerned already Aristotle and is continuously evolving societies- which brought up the city as human's most "natural "environment.

Co-habitation of humans with other life forms in the urban context is an urgent issue since the boundary between natural/ artificial and nature/ culture has frown ever-expanding in the Anthropocene. Adaptation to the given circumstances affords a retracement and critical reflection of the encounter's history. The current changes due to COVID-19 influence how we engage with our cities in the future. We build houses designed to withstand the forces of nature, but as we are witnessing climate change, we can no longer afford to keep nature out.

For example: What if, instead of growth and development as the startng point of creation, we take erosion and decay as methods in thinking through nature? What if, instead of newness, ageing became highly covetable?

1. Methods

*Description of methods**
The experimentation with interdisciplinary methods, such as imagination as methodology, allows shifting the human-centred perspective, highlighting overlooked species and a yet neglected scale. Nevertheless, the research split up into three lines of inquiries: **where** (space), **what** (program) and **why** (occupant(s)). All of these parts have in common that the investigation was done without any field research. The computer was the primary tool and served as the provider for different methods to contact experts: Interviews via skype, mail, websites, online articles and online archives.

The next step was enhancing the spatial intersections beyond synanthropic conditions and envisioning alternative, small-scale scenarios of symbiotic co-existence with the analysed species- beyond the zoo's boundary. In summary, to pinpoint the affordances for a design toolbox that enhances the politics of multi-species encounter. Thus, to fulfil the upcoming agenda of an inclusive, sustainable environment.

Furthermore, the sub-research aimed to retrace the (European) zoo's history (e.g. Zoo Belgrade, Serbia) as space for human-native animals encounter (e.g. pollinators) and derive a vision for co-habitation in the city altogether.

The design methods for the project have been the following:

- The project-specific research aims to address the affordances for spaces of human-animal encounter (praxeology).
- Besides, it studies both groups' field experience (ecology) when they come into contact (phenomenology). To learn more about the animal's scale (e.g. Insects, pollinators and especially bees in a first-hand experience (therefore, entomology).
- The epistemological research of the transversion and emergence of different scales and, hence, develop a new typological "vocabulary" for such trans-human architecture (material culture, morphology).

Synopses:

- Epistemes: Ecology- praxeology- entomology- phenomenology; material culture, morphology

- Key terms, concepts, theories:
- **Architecture**: *Edward Ford* (What is a detail?), *Junya Ishigami* (scale), *Neri Oxman* (nature, art & architecture), *Gottfried Semper* (material culture), *Alberto Perez Goméz* (the concept of love in architecture), *Nomeda+ Gediminas Urbonas Studio et al.* (ethics and zoo architecture).
- **Art**: *Wilhelm Worringer & Georg Simmel* (abstraction and empathy), Walter Benjamin (aura).
Biology- *Jakob von Uexküll* (human-animal perspective), *Heini Hediger* (Zoology)
Philosophy- *Aesop* (the role of fauna), *Platon* (beauty and decay), *Phillipe Descola* (nature and culture)
Et al.

* Note: The methods for the first semester are listed comprehensively in the research plan (p2).

Timeline: p2-p4
In the first half of the summer semester, the indicated literature and topics required an in depth-study, interviews, fieldwork, et al. The cooperation with experts in their respective discipline, literature recommendations between various topics (authors, films, conference papers) provide by tutors, have been a valuable source. Depending on the selected animal (bee), fieldwork with an apiarist was another way to approach it. All this was help develop a specific design methodology (manifesto) for the actual design that allows for experiments and testing the developed methodology in the third quarter. In the final step, the evaluation of the results and the writing of the actual manifesto is taking place.

[1]Biennale Architettura 2021 | Homepage 2021'

Observations

- Re-drawing the natural living environment and the anatomy of a honeybee in the scale 5:1.
- Material analysis/colour study: Munsell-scheme to analyse the present colour schemes in the brick facade (photographies).
- Mapping of historical texts, cartographies, photographies, paintings and drawings of the initial form of the moat (provided by the Cultural Heritage Institution of Belgrade)

Interviews

- Bee-keeper Jochen Narciß Sing (Germany); Skype Interview
- Biologist and expert for wild bees and insect-housing, Dr Paul Westrich (Germany); Mail-contact
- Interview with Nevenka Novakovic (director Kalemegdan fortress); Mail contact
- Garden architect F. Kollmar (planting for pollinators)

2. Results

Research Question: How to live with nature?
Putting nature in the foreground and envision a post-human design tool for the architects requires cooperation among disciplines of the life sciences, technique and art. However, this leads to a broad collection of different approaches for the same research topic.
The results made visible to me that there are many regulations for designing an ethical correct multi-species encounter. I kept the main line of inquiry generic for a reason- since the program was not established yet. In the following months, the interviewers provided me with helpful insights: For example, a beehive needs to be placed in a vibration-free spot, facing the sun. Nevertheless, I imagined many approaches at the beginning on' how to live with nature, I had to overcome with more profound research.

Subquestions: The Encounter

- What kind of new architecture image evolves when we expand the canon of scales in architecture with another species' scale?
- Does such an extension of the architectural canon also approach a multi-species encounter, where the visitor (humans) is neither superior nor inferior to other organisms or life forms (e.g. bees)?
- How can such design be transferred into the design of city-encounter?
- Which forecasts can we assume from changes for encounter in the cities for the urban context?

2a) Answering the research question concerning:

Hypothesis and subquestion
Hypothesis: The answer to the initial research question led to a private initiated restaurant design with a kitchen garden. Furthermore, the concept was to design a public space that provides space for a picnic and a path to explore the area by strolling around. The moat is a kind of model house, a public living room where Belgrade's citizens can enjoy a "simple" lifestyle according to the season whilst eating their meal in nature and perceiving the surrounding. The structure of the moat gives it indeed the appearance of rooms connected with floors. Each one deals with the initial question differently through the re-interpretation of architectural elements as design for all species."
Is detailing nothing more than small-scale architectural design, requiring a bit more technical knowledge simply because it occurs at the end of the process?"[2] asks Edward R Ford in 'The Architectural Detail'.
My applied approach to design details for multi-species (human, flora and fauna) requires another idea of scale and in-depth knowledge of the material and its assemblage in detail.
Furthermore, it requires an extension of the architectural canon. An old tree instead of a care-intensive beet, a tree trunk over a well-designed bench, the combination of raw stone with a smooth wooden plate over the clean steel furniture?
Each design has its specific time and space. Architects often embrace the completely new, polished appearance of their design over the appearance with time- when it is sometimes changed, old, dirty and broken. When designing with nature, one should embrace the decay and change over the years, the process of becoming the "natural" part of a ruin (the fortress). It is another understanding of simplicity than the 'white box design' which we often find in Modernism.
As mentioned earlier, all kind of scales is present in the environment surrounding us. When we expand our vocabulary, then we can work with new scales. "Architecture thus created will melt into the new environment now emerging and, simultaneously, give form to a new environment. That new environment- = architecture. This is another scale of architecture; the new image of architecture."[3]
Subquestion: The zoo as a controlled and bordered space of human-animal encounter reflects all along with the human relationship with flora and fauna: From the animal garden (Baroque) to exotic worlds (Colonial period) and up to own typologies (Modernism). Nowadays prevails an "invisible" architecture with amorph constructions to imitate the natural environment of wild animals. Along with ecological awareness and better cattle breeding disappeared the existing architecture. Spatial borders and fences dissolved and exchanged by ditches and water as a spatial barrier.
Zoo architecture is a continuously enhancing building class that encompasses an epoche's respective Zeitgeist for animal welfare and zoology. Nevertheless, animal and human's harmony is often an illusion, and unseen constraints can not belie captive breeding. Therefore, zoos' existence and future scenarios require a rethinking of their initial function.

Quantitative research results
In quarter three, I studied and was drawing the natural living environment and the honeybee's anatomy in 5:1. This research did not lead to a design approach, yet it was interesting to explore their natural habitat.
The material analysis and collection of re-usable material/ elements on the side made me aware of the site-specific qualities. The single brick provides nesting for small insects, but many build a wall and enclose the fortress (city). The analysis of the different stone- and bricks in the fortress, their texture and their colour-coding lead to a deeper study of surface in general and turned out as a primary line of inquiry for approaching encounter through the design of detailing (the surface).

Qualitative research results

- Bee-keeper: In a two-hour Skype interview with apiarist Jochen Narciß-Sing, a bee-keeper from Germany, he told me about the life cycle of honeybees the production of honey. He also explained how his relation to nature changed within becoming a bee-keeper—namely his connection to nature and an awareness of the circle of the seasons. Furthermore, the discussion turned into general thinking about what makes a sustainable lifestyle. He made me aware that bees need a specific environment to be healthy and that the fortress wall provides the perfect natural surrounding for beehives.
- Fortress Director: The interview with the fortress director gave some insights into the future of the moat. Namely, that there is no planned change in the fortress'/ moat program so far. At a later point, Mrs Novakovik sent my research plan to the zoo director, who was open to new suggestions regarding the zoo's moats.
- Biologist: In an interview with a biologist Dr Westrich, insect hotels are more of a gadget for children than a functioning resource for insects. He further pointed out that the fortress provides the perfect surroundings for bees already (natural cracks in the wall).

3. Discussion

3a) Research results
Summary of research results: Manifesto (current state):
1. *critical:* **production.** I am envisioning a food system in balance with a critical on human-centred production only.
2. *living:* **systems.** Providing living environments for more than one species and further benefits multi-species. The ongoing growth in the human population and resource consumption is changing the planet in fundamental ways. One consequence is the loss of biodiversity. Cities depend on biodiversity in myriad ways, yet species are being rapidly lost due to human activities.
3. *non:* **supreme.** Humans are not superior; neither is any species: An anthropocentrism.
No hierarchies or supremacies. Humans are dependent on pollinators and other species.
4. *multi:* **supreme.** "No single life-form or member of one species alone could ever colonise space." (Margulis et al.)
The research led to a design approach that does consider and appreciate imperfection, the decay of architecture.

Interpretation of research results
Wilhelm Worringer, Astraktion und Einfühlung (1908):
"In the urge to abstraction the intensity of the self-alienative impulse is . . . not characterised, as in the need for empathy, by an urge to alienate oneself from individual being, but as an urge to seek deliverance from the fortuitousness of humanity as a whole, from the seeming arbitrariness of organic existence in general, in the contemplation of something necessary and irrefragable. Life as such is felt to be a disturbance of aesthetic enjoyment. Popular usage speaks with striking accuracy of 'losing oneself in the contemplation of a work of art.
In this sense, therefore, it cannot appear over-bold to attribute all aesthetic enjoyment – and perhaps even every aspect of the human sensation of happiness – to the impulse of self-alienation as its most profound and ultimate essence."[5]

- Concerning space: Space is already giving many requirements as it is a natural surrounding with complex features. For example, Shape, Temperature, Soil, Neighbours (Zoo)
- Occupants: In the beginning, the idea was to design an apiarium and exhibition area; and to focus on the encounter between bees and humans. However, it turned out that focusing on one animal species is not sufficient in the process. The canon can be extended to other forms of life (flora and fauna).
- The program's idea changed over the months from a space in the zoo to a public garden with a small program attached. Nevertheless, this aspect is not the main point of attention concerning the role of occupants and the material.
- Material: The assemblage, the connection in detail, and the material's surface require an in-depth study and essential part of transferring the research results and findings into architecture. The idea of ruin architecture was not my main focus- yet is the chosen material can become a part of it. (for instance: no use of concrete for the foundation.)

As architects, we can build such a scientific framework. As architect Junya Ishigami formulated it accurately when saying in the introduction of his book, Another scale of architecture: "To see architecture no longer as a shelter (only), but as the embodied environment itself."[5]

[2] Edward R. ('Amazon.Com: The Architectural Detail (9781568989785): Ford, Edward R.: Books' n.d.
[3] Cf. Ishigami. P.10
[4]Wilhelm Worringer, Abstraktion und Einfühlung : ein Beitrag zur Stilpsychologie (München : R. Piper, 1911), http://archive.org/details/abstraktionundei00worr.
[5]"Junya Ishigami - Another Scale of Architecture: Amazon.de: Junya Ishigami: Fremdsprachige Bücher'.
[6] Zoo Buildings. Construction and Design Manual | Natascha Meuser | 9783869226804 | DOM Publishers

Further results
My graduation thesis locates itself in a row with projects that use narratives as a tool. Projects, such as 'Variations over a Birdcage' (Studio Ossidiana, 2018), take the aspect of allegory and narration in the foreground. Another example is the Japanese Architect Junya Ishigami and his idea of a new scale for architecture, taking nature and animals as the starting point to create a more subtle architecture.
Next to the narrative as a tool, tracing the zoo's history is another main line of inquiry: Natascha Meuser[7] (DOM publishers) published recently an extensive manual about zoo architecture- 'Construction and Design Manual. Zoo buildings' However, she emphasises that the analysed literature and research focus mainly on zoo buildings' anthropological and biological aspects, but not on the architecture itself. The publication offers noteworthy publications and names, such as Heini Hediger, Swiss Zoologist and former director of the Zoo Zurich, and his list of publications 'Mensch und Tier im Zoo. Tiergarten Biologie' (1965), Erik van Vliet's complete documentation 'Exhibiting Zoo animals, the Berlin Zoo documentation from 1841-1989.', and architect Bernhard Tschumi's 'Architecture Zoo. Parc Zoologique de Paris.' (2014). The Dutch Architect Aldo van Eyck challenged his students with assignments for animals and evolved proposals such as the 'Hippopotamus House' (1966) by urban planner Joost Váhl or Jan Verhoeven's 'Aquarium' (1958) ('Animal Encounters and the Architecture Collection').

Initiatives:
• Zooetics (2014-2018): MIT program for art, culture and technology interdisciplinary research project within the Frontiers in Retreat network and under Nomeda+ Gediminas Urbonas Studio et al. A multi-disciplinary collaborative enquiry at the intersection of art and ecologies and engaging with concepts of ecosystems for the merging of natural with digital life. ('Zooetics — About')
• Zoof- Zoo of the future: This is an open platform founded in the Netherlands, which develops counter-proposals for non-human habitats in the zoo. (Hartog)
• Total Space/ Animal Encounters: Het Nieuwe Institut. Rotterdam. Exploration of interdisciplinary exchanges. ('Animal Encounters and the Architecture Collection')
• Von Architekten und Insekten. ETH Zurich Archive collection: A cooperation between Department depart. Environmental Systems Science (Michael Greef) and the Institute for the History and Theory of the Architecture (Bruno Maurer). (Greeff)

3b) Limitations during the research process and of analysis
The current pandemic may affect in a lasting way how research is done and spread. It was not possible to travel to Belgrade. Also, interviews took place online. Direct exchange and feedback is a fruitful way to learn and proceed within a design process. Therefore, to present, discuss and exchange with colleagues was limiting the general input as well.

However, these limitations led also to nice contacts with people that were helpful to overcome these limitations. The contacts also helped me to reconsider myself and my skills as an architect. The approach to design a bee-friendly environment did not work out as it requires an intensive transdisciplinary encounter. For centuries, hives were constructed in various ways, but all specific to the environment of the place. In point of view, it is not helpful to "improve" the design of selfsame without transdisciplinary research, such as 'How Can Architecture Improve the Health of Honeybees?'[8] ; A research study by architect Kimberly Drennan and biologist Chelsea Cook.

4. Resume

In answer to the research question
The idea to design an apiarium was to design an example of how to live with nature. The initial idea of a new pollinator area within the zoo of Belgrade did not work as it leads to the ethical dilemma of adequate animal housing and the wish to exhibit.

Current state of- and future research
I am confident that I can contribute to the proposed research project as I focused on my master studies on the city as a civic space, the socio-cultural aspects of architecture. I believe such findings can contribute to the academic understanding of the ecologies for an encounter, but more than this, it may impact more comprehensive tools for design and architectural education. With a growing digitalisation in space and increasing dissociation of artificial and nature problems like decay in nature, understanding the historic steps for nature/city will allow the development of new methods and tools for integrating nature in "digitalised "cities. Likewise, the project contributes to the ongoing discussion about the complex interdependencies between nature for the city and vice versa for a sustainable environment.

Afterword

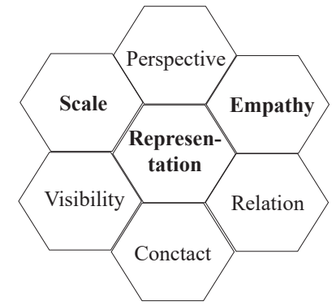
Flowers & Stones
"We need a new spatial contract"[10] , says Hashim Sarkis. How to live with nature? Due to COVID-19, the current changes influence the way we engage with our cities in the future. The Anthropocene brought up the city as human's most "natural "environment. Though, European cities host more than 10.000 animal species. Instead of continually fighting against flora and fauna, we will learn to find new forms of peaceful co-existence. We will appreciate the interspecies exchange with one another and become sensitive to each other's well-being and needs. The problems caused by changing climate and resource challenge the way we build. Therefore it also changes the way how to teach and design architecture. Putting the human, not at the centre of this can be one to reverse the perspective.

"Architecture thus created will melt into the new environment now emerging and, simultaneously, give form to a new environment. That new environment- = architecture. This is another scale of architecture; the new image of architecture."[11]

(Junya Ishigami)

This year's Biennale-question, what having a good life (together) means, concerned already Aristotle and is continuously evolving societies. Putting nature in the foreground and envision a post-human design tool for the architects requires cooperation among disciplines of the life sciences, technique and art. However, this leads to a broad collection of different approaches for the same research topic. For instance, Neri Oxman aims for an approach that can be described as "shifts from 'leading nature' to 'being led by nature' from 'employer' to 'employee'."[12]

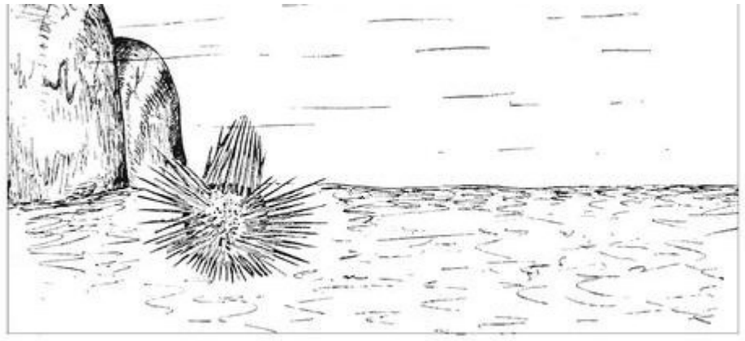
Reflecting on the research output gaining from studying the New Cemetery in Belgrade, it turned out that many parallels to the final design idea exist. The idea of taking care (putting a flower), empathy, and the performance of gestures of care translates for me in the surface design.

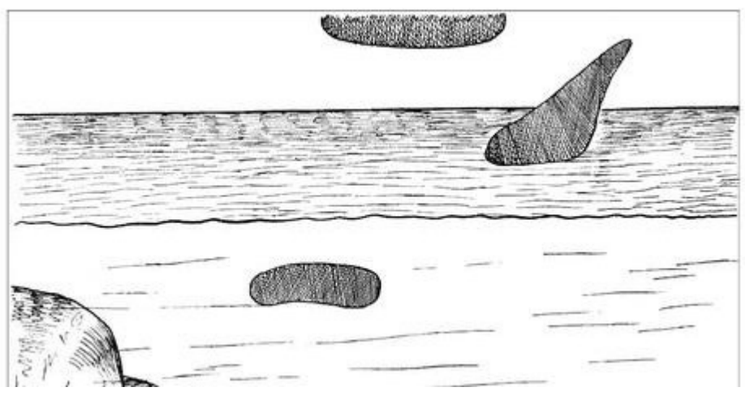


"No act of kindness, however small, is ever wasted."[13]
Aesop. *The Lion and the Mouse*

Linda Kronmüller (Delft May 10, 2021)

[7]Ibid. p. 18
[8]'Schedule & Abstracts: Thursday - Association of Collegiate Schools of Architecture', accessed 11 May 2021, https://www.acsa-arch.org/conference/109th-annual-meeting/schedule-abstracts-thursday/.
[9]Wilhelm Worringer, Abstraktion und Einfühlung : ein Beitrag zur Stilpsychologie (München : R. Piper, 1911)
[10]'Biennale Architettura 2021 | Homepage 2021', La Biennale di Venezia, 04 January 2021, https://www.labiennale.org/en/architecture/2021.
[11]'Junya Ishigami - Another Scale of Architecture
[12]'Designing Together with Nature - KooZA/Rch', accessed 15 February 2021, https://www.koozarch.com/interviews/designing-together-with-nature/.
[13] 'Äsop Quote – Google Search'.





Bibliography

LITERATURE ESSAYS/ WEBSITES FILMS

SOURCES: ALPHABETICALLY LISTED.

- More Than Honey
- Antonelli, Paola, Neri Oxman, Jennifer Dunlop Fletcher, Joi Ito, and Heather Davis. Neri Oxman: *Mediated Matter*. 1. Edition. New York: Museum of Modern Art, 2020.
- Benjamin, Walter. T*he Arcades Project*. Translated by Howard Eiland and Kevin McLaughlin. Third Printing. Cambridge, Mass.: Belknap Press: An Imprint of Harvard University Press, 2002.
- 'Amazon.Com: The Architectural Detail (9781568989785): Ford, Edward R.: Books'. Accessed 11 May 2021. https://www.amazon.com/Architectural-Detail-Edward-R-Ford/dp/1568989784.
- Total Space. 'Animal Encounters and the Architecture Collection', 11 October 2019. https://totalspace.hetnieuweinstituut.nl/en/activities/animal-encounters/animal-encounters-and-architecture-collection.
- Architecture Zoo: Parc Zoologique De Paris. The Architectural Project. by Bernard Tschumi, Veronique Descharrieres (2014) Hardcover, n.d.
'Äsop Quote – Google Suche'. Accessed 11 May 2021. https://www.google.com/search?q=%C3%A4sop+quote&prmd=isvn&source=lnms&tbm=isch&sa=X&ved=2ahUKEwiqoMqdmsDwAhWrA2MBHSgpBWcQ_AUoAXoECAIQAQ&biw=1500&bih=858#imgrc=6grm3RHTAYIdhM.
- La Biennale di Venezia. 'Biennale Architettura 2021 | Homepage 2021', 11 January 2019. https://www.labiennale.org/en/architecture/2021.
'Designing Together with Nature - KooZA/Rch'. Accessed 15 February 2021. https://www.koozarch.com/interviews/designing-together-with-nature/.'
- ART THEORY. 'From Abstraction and Empathy - Wilhelm Worringer'. Accessed 11 May 2021. https://theoria.art-zoo.com/from-abstraction-and-empathy-wilhelm-worringer/.
Greeff, Michael. 'Von Architekten Und Insekten'. ETHeritage (blog), 31 July 2020. https://blogs.ethz.ch/digital-collections/2020/07/31/von-architekten-und-insekten/.
Hartog, Bart de. 'Zoo of the Future'. Accessed 15 February 2021. https://zooofthefuture.com/library/.
Hediger, Heini. Mensch und Tier im Zoo: Tiergarten-Biologie. Müller, 1965.
'Junya Ishigami - Another Scale of Architecture: Amazon.de: Junya Ishigami: Fremdsprachige Bücher'. Accessed 4 January 2021. https://www.amazon.de/Junya-Ishigami-Another-Scale-Architecture/dp/4861522846.
- 'Land Des Honigs (2019) - IMDb'. Accessed 4 January 2021. https://m.imdb.com/title/tt8991268/.
Margulis, Lynn, Dorion Sagan, and Roald Hoffman. Dazzle Gradually: Reflections on the Nature of Nature. Reprint Edition. White River Junction, Vt: Chelsea Green Publishing, 2007.
- 'Schedule & Abstracts: Thursday - Association of Collegiate Schools of Architecture'. Accessed 11 May 2021. https://www.acsa-arch.org/conference/109th-annual-meeting/schedule-abstracts-thursday/.
- 'Umgebung ("surroundings") and Umwelt ("environment") of the Sea Urchin.... | Download Scientific Diagram'. Accessed 11 May 2021. https://www.researchgate.net/figure/Umgebung-surroundings-and-Umwelt-environment-of-the-sea-urchin-Figure-taken-from_fig1335925053/amp.
- Studio Ossidiana. 'Variations on a Birdcage'. Accessed 15 February 2021. http://www.studio-ossidiana.com/variations-on-a-birdcage-2.
- Vliet, Erik van. Exhibiting Zoo Animals: The Book That Makes Its Author Redundant. 1. Edition. United Kingdom: Schüling, K, 2015.
- Worringer, Wilhelm. Abstraktion und Einfühlung : ein Beitrag zur Stilpsychologie. München : R. Piper, 1911. http://archive.org/details/abstraktionundei00worr.
- 'Zoo Buildings. Construction and Design Manual | Natascha Meuser | 9783869226804 | DOM Publishers'. Accessed 15 February 2021. https://www.naibooksellers.nl/zoo-buildings-construction-and-design-manual.html.
- Zooetics. 'Zooetics — About'. Accessed 15 February 2021. http://www.zooetics.net/about/.

- **Diagrams**: Linda Kronmüller
- **Image p. 18** *'Umgebung ("surroundings") and Umwelt ("environment") of the Sea Urchin....* | Download Scientific Diagram'. Accessed 11 May 2021. https://www.researchgate.net/figure/Umgebung-surroundings-and-Umwelt-environment-of-the-sea-urchin-Figure-taken-fromfig335925053/amp.