

# Architecture of Resonance

Attuning Architectural Aesthetics to our Embodied Well-being

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## Problem Statement

Over the last couple of decades, a growing number of empirical experiments have been conducted on the influence of environmental aesthetics on human well-being and behavioral responses, under the heading of evidence-based design.<sup>1</sup> A profound trend that is part of this, is biophilic design; the inclusion of natural elements like plants, daylight and views on nature, by which buildings mainly appear to have a facilitating role. Especially in hospitals and medical facilities the design trend has booked substantial successes in improving recovery rates and both patient and staff satisfaction.<sup>2</sup> Evolutionary psychologists explain this appeal to nature as a universal trait that we inherited from our stone-age ancestors.<sup>3</sup> With support of this theory, architects and urban planners have become even keener to implement green additions to their designs.

However, although the health benefits of natural environments can be seen as a great discovery, the implications for *architectural* aesthetics in the form of buildings and urban spaces are less clear. Departing from the notion that sensing certain aesthetic features in our surroundings are essential to our well-being, as demonstrated by biophilic design, there might still be an important lack of them in the modern urban environment. Multiple studies have shown for example that people living in rural areas, surrounded by more natural landscapes, are considerably more satisfied in life than urban citizens, despite having less economic opportunities.<sup>4</sup> Therefore we might argue that we need an even better understanding of our biological sense-driven needs and the role that architecture can play in addressing them, especially beyond its mere facilitating role towards natural design elements.

The Biophilia hypothesis that underlies biophilic design is just one of the evidence-supported theories that the evolutionary sciences might essentially provide. Therefore, I wonder what other insights they might bring as relevant for architecture in relation to our well-being. Is there a consistent way of detecting aesthetic dissonances and opportunities in relation to our human nature? Are there forms of architecture that deeply resonate with our senses and physiology? My research question can be stated as follows:

*What can we learn from the evolutionary sciences about architectural aesthetics in order to enhance physiological and emotional well-being in a modern urban habitat?*

## Theoretical framework

Evaluating the posed research question, the containing terms need to be discussed and framed in order to clarify the research direction, and the motives underlying them.

### Evolutionary Sciences x Architecture

What is key in the research question is the *lens* – the way of indicating and evaluating phenomena – that evolutionary psychology (used as a collective term for the evolutionary sciences) has to offer for architecture. Evolutionary psychology draws from the expertise of other scientific fields, such as biology, clinical psychology, neurology, ethology to test hypotheses on the evolutionary origins of universal human traits.<sup>5</sup> Human universals are an important aspect, as they appear cross-culturally and cross-historically. Examples of *outcomes* of these traits idiosyncratic to our species are phenomena like language, mythology, art and ritual ceremonies, whom all have their roots in prehistory.<sup>6</sup> Strictly speaking, ‘human nature is the inherited regularities of mental development common to our species’.<sup>7</sup> Further, in terms of evolution, the human brain has not dramatically changed so much over the last 200.000 years, which makes an understanding of our ancestry life conditions only more relevant.<sup>8</sup> The biophilia hypothesis is an example from the evolutionary sciences, revealing how we inherited an innate urge to connect with other forms of life and nature. Especially this outcome has had strong implications for the field of architecture and design as explained in the introduction.<sup>9</sup> Moreover, notably in the last two decades, many neuroscientific studies have been done on experiences that were previously only covered by phenomenological theory.<sup>9</sup> As these results have piled up, it might be the time now to recover the possibilities of the proposed disciplinary crossover between the natural sciences and architecture.

For a long time, studying and evaluating the aesthetics of architecture has been primarily approached by the field of humanities and the social sciences.<sup>10</sup> The thoughts of Heidegger, Foucault, Lefebvre, and the like have been great influences in our architectural conceptualization and still are today.<sup>11</sup> Therefore, the focus on the natural sciences as the

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<sup>9</sup> In terms of getting a better insight in the origins of universal traits, human nature and intrinsic needs, authors like Edward O. Wilson (emeritus professor in biology, Harvard) and Matthew D. Lieberman (professor in social cognitive neuroscience, UCLA) have written extensively on the subject, especially on the role social behavior. Further, for a better understanding on the resulting cognitive patterns, notable authors are Daniel Kahneman (psychologist, economist) and Steven Pinker (cognitive psychologist, linguist).

research question proposes appears quite unusual, as I became aware in the masterclass about 'multi-disciplinary encounters'.<sup>12</sup> Some would immediately warn for a scientific diminution of the arts, referring for example to the scientific paradigm of 'efficiency', marked by processes of technologization as occurred in architecture throughout the twentieth century.<sup>13</sup> Yet, when it comes to evolutionary biology or neuroscience, I don't think this is necessarily the case. On the contrary, biology and the humanities traditionally have informed each other at critical junctions in the understanding of human perception and behavior.<sup>14</sup> Also today, (emerging) fields like 'neuro-aesthetics'<sup>15</sup> have been for example a great inspiration for artists like James Turrell, who strengthens his works by deepening his psychological understanding on our cognitive perception.<sup>16</sup> Simultaneously, according to Raymond Tallis in his critical work *Aping mankind*, we should not forget how the arts will always keep their important role for the production of novelty, so the natural sciences should definitely not be seen as a source that could provide all answers.<sup>17</sup> Furthermore, although my research interest bends towards the natural sciences, my eventual findings cannot escape a critical frame of reference in terms of architectural thought and application.

In the case of my research, I'll draw inspiration from the evolutionary sciences, with the aim to enrich my knowledge about the human perception, in addition to the knowledge I have acquainted over the last years in architectural theory. I want to deepen my understanding of intrinsic human needs and tendencies, and how they are related to the environment via our senses. What kind of spaces slow down our heart rate and reduce cortisol? What kind of shapes are *likely* to induce fear or actually give a sense of security? What patterns trigger our curiosity and enhance concentration? These are the kind of questions I hope to be able to address. The potential of the evolutionary sciences hereby I find its possible resonance with phenomenological theories like those of Christian Norberg-Schulz or Juhani Pallasmaa, certainly not to nullify them in terms of scientific diminution. Professor Harry Mallgrave, specialized in architectural theory demonstrates the promising fusion of neuroscience and architectural phenomenology, by emphasizing the fully embodied experience of spaces, and the paradigm shift that this might evoke in architecture: "The new [neuroscientific] understanding of emotion and feeling reveals something else about design that we rarely acknowledge – the fact that we are, first and foremost, embodied beings whose contact with our surroundings is conditioned by our emotional responses. In this regard, our cognitive understanding, ideas, and emotional feelings are shaped by the bodies in which they arise. They are shaped by the dynamic, living systems formed by the relationship of our nervous systems, bodies, and world – and herein lies the rub. Designers are generally taught to practice their craft as a visual art, which it is, to a limited extent. But what

this new research is revealing is the fact that we also experience this built environment in a far more multisensory way than we earlier supposed.”<sup>18</sup>

Nevertheless, it is of course important to be ethically conscious *how* evolutionary psychology and neuroscience is used as a source of inspiration. Because, when we formulate notions on human nature for example, the implications that possibly follow for society do not always turn out that well. In this case, we are sometimes hunted by notorious examples of the past. Most cruelly, misinterpretations of human nature have resulted in infamous ideologies like Social-Darwinism under the Nazis.<sup>19</sup> Three decades later, Milton Friedman’s economic theories for how the economy should be optimized is linked to the idea that we are foremost animals that behave in our self-interest,<sup>20</sup> as illustrated by the book *The Selfish Gene* (1976) by the renowned biologist Richard Dawkins.<sup>21</sup> More recent books like *Social* by Matthew D. Lieberman, or *Human Kind* by Rutger Bregman have fortunately opposed this in their turn by the view that we are most of all a social species. Closer to architecture, Modernist figures have defined our intrinsic human needs with a machine-like rationale various times.<sup>22</sup> On one hand, their utilitarianism resulted in better hygiene, safer houses and improved functionality; on the other hand, their reductive notions have sometimes led to undermining the intrinsic desire for variety, novelty and artistic expression, as illustrated in the strong criticism by post-modernism later.<sup>23</sup>

What the previous errors might have in common is their reductive stance on what our human nature is and more dangerously, what our society is *ought to be* as a result, which obviously is in need for opposition and nuance.<sup>b</sup> At the same time, an informed notion of what our shared human nature might be, is not only valuable when it comes to our assumptions in design decisions, I think it is inescapable (think for example about universal human rights).<sup>24</sup> The classic opposition between *nurture* (traditionally studied by the humanities and social sciences) and *nature* (a view captivated by the natural sciences) seems to have played an important role in the previous errors, when one side tends to exclude the other, instead of reciprocal enunciation.<sup>25</sup> Nevertheless, in the last decade, researches have overcome the distinction and find more consilience, regarding human nature as a complex interaction between the mind, body and environment.<sup>26</sup> In my essay I will explore what perspectives this will open up for the architectural discipline.

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<sup>b</sup> Interesting reads I this respect are:

- Hannon, Elizabeth, and Tim Lewens, eds. *Why we disagree about human nature*. Oxford University Press, 2018.
- Tallis, Raymond. *Aping mankind*. Routledge, 2016.

Since ethical motives are crucial, I also want to refer to adjacent fields of design that appear to be less hesitant to test neuro-psychological theories on human perception and behavioral tendencies, like architecture professor and neuropsychologist Colin Ellard comically illustrates: “When we visit a shopping mall or a department store, we may walk in looking for a specific item – perhaps a blender – but we soon find ourselves entering an almost hypnotic state with lowered defenses, diminished reserve, and a heightened inclination to spend money on something we don’t need. This state, the holy grail for designers of retail spaces does not happen by serendipity but by careful design. Ever since we have had disposable income to spend on items that we want but don’t need, merchandisers have engaged in a kind of arms race to capture as much of our excess wealth as possible”<sup>27</sup>

While in architecture, we like to contemplate over Kant or Heidegger, industrial designers and graphic designers already find it more common to include behaviorology and clinical psychology in their curriculum (e.g. ‘consumer behavior’ courses).<sup>28</sup> There appear few objections against using techniques in guiding (social) behavior simply for marketing ends, and possibly with less regard for overall well-being, since they certainly not fight phenomena like ‘shopping addictions’.<sup>29</sup> Therefore, think it’s about time that we, as architectural designers and theoreticians adopt neuroscientific insight with more regard, as a necessary addition to our philosophical knowledge. I believe, and I hope, namely that as architectural designers we have an ethical responsibility in being aware of the sensory input that the users are exposed to on a daily basis. In my research, I will try to get a basic psychological understanding of how we tend to relate to our environment and what kind of sensory input we are vulnerable to as a result of evolution. In particular, what kind of aesthetic stimuli can be regarded as ‘nutritious’ or ‘detrimental’ in terms of our well-being?

### Aesthetics

In line with the presented research scope, I will try to approach the notion of aesthetics primarily from a biological or neurological perspective, complementary to architectural point of view. The Greek origins of the word aesthetics comes in quite practically: aisthētiko, which literally means “relating to the perception of [all] the senses”.<sup>30</sup> In this way, I focus fully on how architectural qualities (space, form, materiality) are perceived by the physical senses (visual, tactile, auditory) and how they give neurological impulses to the body and brain. Neurological theory can inform to a certain level how sensory impulses and common sensations are connected, leading to mood changes and even influences in our behavior.<sup>31</sup> However, the disciplinary merger of architectural taxonomy

and semiotics and those of neurology can create some issues when it comes to describing and evaluating environmental qualities. More about this in the methodology section.

### Well-being and Resonance

In terms of well-being, I search for a physiological and psychological basis to depart from, that can be argued for as universal for human beings. For example, I imagine nobody likes to *involuntarily* experience a sense of oppression, sickness, sleep deprivation, stress etc. Simultaneously I think everybody benefits from feeling calm, inspired, focused, playful etc. In this regard, biologically there can also be referred to healthy hormone balances (cortisol) and stimuli that induce processes like homeostasis, essential to our body's vitality.<sup>32</sup> Here is also where the title of the essay comes in, *architecture of resonance*, as I wonder to what extent our body seeks resonance through the senses with the environment to maximize its well-being. This reminds me of the words of Juhani Pallasmaa: "Every place, space and situation is tuned in a specific way and it projects atmospheres promoting distinct moods and feelings. We live in resonance with our world and architecture mediates and maintains that very resonance."<sup>33</sup> I now wonder what neuroscience can reveal in this regard.

Part of my theoretical research will be mapping some intrinsic needs and tendencies that are key for us in experiencing sensations in a balanced variety, inducing overall well-being, and what role architectural aesthetics can play in it. How our ancestors have evolved is important in this respect, as it proposes a qualitative and contextual insight of the origins of our biological biases towards our environment.<sup>34</sup> A common example is our need for daylight during the day and a reduction of artificial blue light during the night to maintain healthy sleep cycles (circadian rhythms), reducing stress levels and balancing our mood swings as a result.<sup>35</sup> A room without any windows would not be helping with that of course.

### The Modern Urban Habitat

Although a specific site is might not be essential in my research (as I search for generic design principles), it can help to already pin myself to a *sort of site*. This will allow me to already specify my research for suited outcomes in terms of a design proposal later. As I explained in the introduction, the modern city – with a lack of natural landscapes and high demand for sensory input balance and variety – is probably most in need for biophilic design and the like.<sup>36</sup> However, contemporary metropolises, in all their diversity, complexity, and multitude in layers are very ambitious and ambiguous subjects for the sort of (neuro)phenomenological tools for analysis I hope to generate with my research. The phenomenological

scope is rather meant for the sensory perception on a 'street level' of specific site or public space, implying the personal human scale, not so much the urban scale. I will further elaborate in the methodology section.

Nevertheless, I would already like to focus some particular trends, which appear today as leading incentives in the formation of public spaces. I see how metropolitan architecture seems to become increasingly shaped in their aesthetics by utilitarianism & economic reductionism, and commercialization & commodification.<sup>37</sup> Typical about the motives behind these trends, is either the ignorance towards the sensory experience of the user (utilitarian), or the exploitation of it (commercial), sometimes followed in neat order.<sup>38</sup> Therefore, I suspect of my research that these are the sort of areas here most problems arise. Think for example about the experience of visiting a typical suburban shopping mall: The monotonous parking space and the repetition of the facade modules of the building exterior invokes sensory deprivation first (a sense of boredom); but as soon as you stand in front of the entrance, all kinds of environmental stimuli are fired to make your stay inside as long as possible and buy more stuff than you need.<sup>39</sup> Further, by focusing on trends with international implications, as portrayed by the global urbanization, I hope to make my research more relevant apart from typical Western cities.

## Methodology

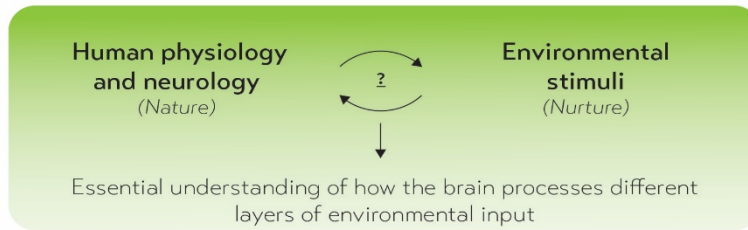
In essence, my research is mainly theoretical in essence, extracting from and distilling existing knowledge. Additionally, the research question will also be tackled later from an empirical approach in the transition from the research phase to the design phase. The theoretical part is about conducting knowledge through the use of academic literature and translating theory into practical design principles. The empirical part is about gaining a better understanding of the implications and applications of the theory in architectural design. (See scheme on next page)

### The theoretical part

As explained in the theoretical framework, the main scope for collecting knowledge is theory from the field of evolutionary science. However, some additional architectural theory appears to be necessary to make a semiotic translation from one discipline to the other. My methodological strategy can be stated as follows:

PHASE ONE: THEORETICAL RESEARCH

primary exploration



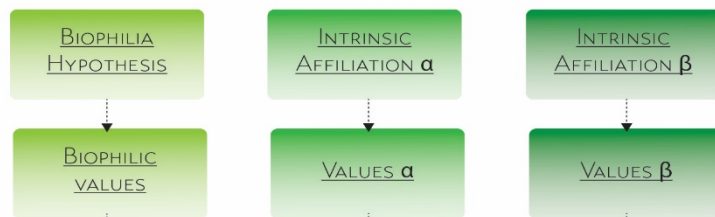
subquestions

How can sensory input resonate with biological processes to enhance well-being? (homeostasis, stress-reduction, cognition etc.)

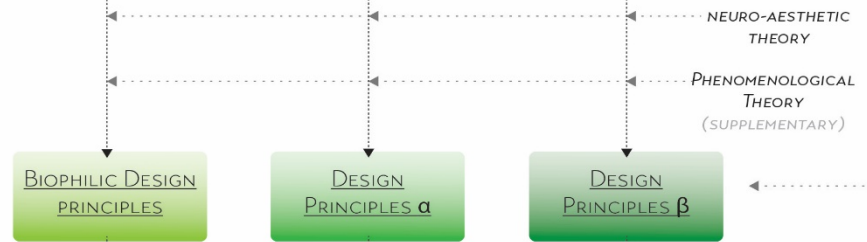
To what extent can architectural aesthetics simulate this form of input? (e.g. compared to the natural or social environment)

ON THE BASIS OF EVOLUTIONARY PSYCHOLOGY AND BIONEUROLOGY:

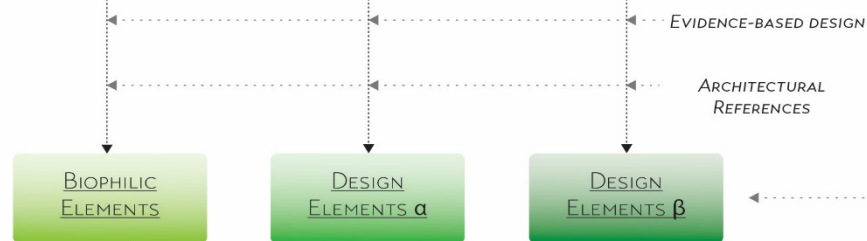
Formulate Biological needs related to the aesthetic environment



Taxonomic and Semiotic translation



Formulate Aesthetic qualities

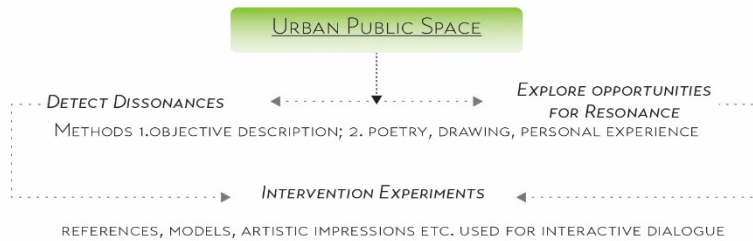


PHASE TWO: EMIRICAL RESEARCH (DESIGN PHASE)

FEEDBACK LOOP

ON THE BASIS OF THE RESEARCH OUTCOMES

Neuro-phenomenological analysis



First, I try to get a critical insight to what extent our emotional and behavioral responses – as related to our well-being – are learned (nurture) and biologically inherited or anchored (nature). Is this distinction still relevant? What nuances are there? How would human behavior for example fit in a model of a larger ecosystem of behaviors and processes? (Evan Thompson and Francisco J. Varela have written an interesting piece on this)<sup>40</sup>. Then, I draw an essential understanding of how the human senses are related to processes in the brain on the basis of neurological theory (notable was Jaap Panksepp in this regard, coining the term ‘affective neuroscience’). Next, I will try to achieve a qualitatively deeper understanding of environmental psychological impact of architectural aesthetics in general.

Second, I will continue my research by exploring scientific conceptions on human nature, its origins and what universal traits and biases we have genetically inherited (embedded in neural circuits). Relevant knowledge can be found in evolutionary psychology, by reading authors like Edward O. Wilson (evolutionary biologist), Leda Cosmides (psychologist), and Jerome H. Barkow (anthropologist) among others.

The implications of these insights for architecture will be formulated with the aid of architectural theory. Most notable I find in this regard authors like Harry Mallgrave – professor emeritus in architectural theory at Illinois Institute of Technology – a specialist on this matter; and Colin Ellard – a professor who works at the intersection of neuroscience and architectural design, conducting many of his own experiments as well with the aid of MRI-technology. Their insights will be complemented where needed by traditional phenomenologists like Peter Zumthor, Johani Pallasmaa, Kenneth Frampton among others. Mallgrave and Ellard in particular write about the relation between architectural aesthetics (form, space, materiality etc.) and how they are perceived by the senses (visual, kinesthetic, tactile etc.) from a neurological point of view. This follows in a disciplinary merger of neurology and phenomenology, and a semiotic translation that can be portrayed as follows on the basis of Mallgrave’s notions:

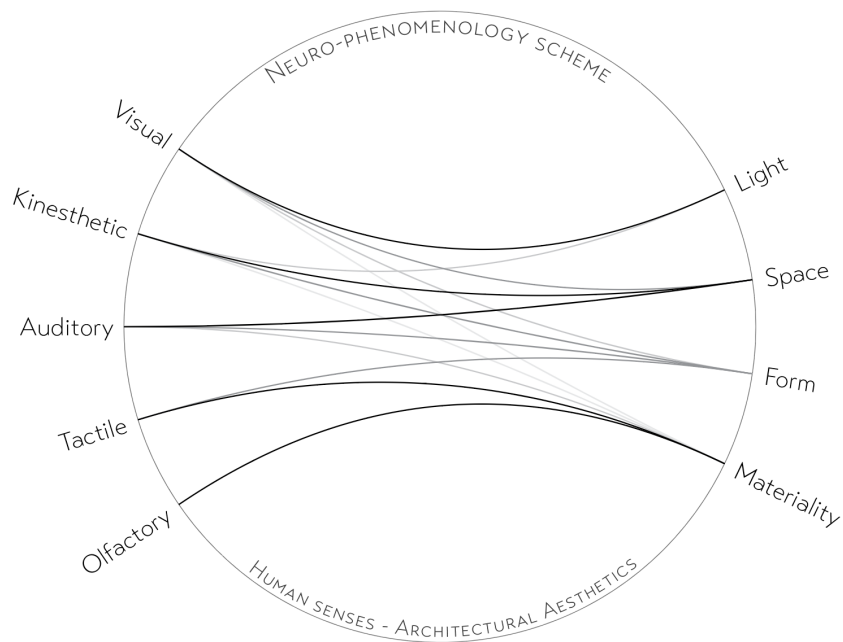


Figure 1: *The embodiment of architectural qualities via the senses*, based on the notions of prof. Mallgrave. The connecting lines tell how our bodily senses are influenced by light, space, form, materiality. The opacity of the lines express to what degree the aspects are related.

Next, I hope to translate their insights as much as possible with the aid of evidence-based design into concrete design tools. Authors like Stephen R. Kellert (social ecologist) and Judith Heerwagen (psychologist) can provide great examples of this as they have done with Biophilic design in their qualitative and quantitative studies on various references.<sup>41</sup> The resulting design principles will be the input of my own (site) analysis and empirical experiments.

### The empirical part

As I will focus on formulating universal human needs on the basis of evolutionary theory, the formulated principles and tools can therefore be used for analysis and design in essentially any built environment (like biophilic design). The *lack* of necessary features to enhance well-being on the site though, differs per case.

My proposed strategy for analyzing a chosen site is twofold. I will map the embodied experience first by objective description of what is perceived by the different senses and evaluate it on the basis of my research outcomes. Secondly, I add my own poetic interpretation (words/drawings) of how I experience the place personally as an attempt to capture the essence of the place. I hope with this distinction between the two methods to clarify my intentions towards the location.

In my analysis I consider two aspects relevant. On one hand, I will on the basis of my research try to detect dissonances. I suspect for example that in a densely populated shopping street, there might be a lot of over-stimulation of the senses, evoking stress and disorientation. In this case the need for an intervention like a calming green pocket-park could be argued for. Another example might be a monotonous street with a closed facade, evoking a sense of boredom or even uneasiness. Here the use of color, form variation, rhythm etc. could be applied (apart from obvious utilitarian interventions). On the other hand, and maybe even more important, I will look out for opportunities for resonance. What qualities are already present at the site, but maybe undervalued? How can they be brought into a new light or strengthened? For example, maybe there is a great body of water in the form of a canal, bringing opportunities for stress relief, only the adjacent quays are very uncomfortable and give a repelling impression.

Further, the findings of my research will of course not be some sort of algorithm that creates a design on itself. It will only give certain clues for what is *likely* to change in the perception by an average person by applying the formulated tools. Here, experiments with the models and the aid of references come in. Research questions can be asked like: How can we apply these design tools in a coherent composition? Which combinations lead to the strongest outcomes, for example: what variety makes the space most interesting for the 'exploration instinct'? In terms of phenomenology: how do certain aesthetic features make you feel, and how to have a discussion around this? I hope with the latter research to make a clear transition from theory to design.

## Reflection

My first encounter with biophilic design was at the end of the bachelors at the TU Delft, during the concept phase of the design course BK6ON6. I was intrigued by the empirical findings I read about and the potential for architecture. The intuitive understanding of how architecture can affect our thoughts and perception is all of course dear to us, but I never imagined that some design interventions actually succeeded in improving recovery and performance rates with architecture. Yet many people around me did not sound so enthusiastic directly, as they did not seem to feel what implications 'evidence-based design' might have for architecture. Unfortunately, I had to wait a couple of years before I could further explore this perspective in more detail, and Explore Lab appeared to be the right place.

As I thought my fascination was quite clear, I assumed my research direction was as well. Therefore I was a bit hesitant at first to the

research plan course, because I thought it to be quite repetitive in respect to the courses I've had in the past. Moreover, I didn't expect it would cover my specific research scope. However, when I started to go dive deeper in the literature, I typically lost my direction. The more I read, the more I became aware of the context of the scope, its multilayered complexity and the connotations it came with. While I thought it was quite straightforward to go after my research findings like demonstrated with biophilic design, I suddenly found myself in an academical opposition between the natural sciences and the humanities. What was going on here? Why were my housemates from Industrial Design studying psychology and consumer behavior from a clinical perspective, while I at architecture had been studying ethics, history and metaphysics and such?

I think this is where the research plan course came in, with emphasis on the personal consults that did me a great favor. This helped me to zoom out and oversee what I was doing and what semiotic bridges needed to cross. I watched some lectures again to see how the different research methods – that I learned intuitively throughout the bachelors and masters – were set into perspective with each other. The masterclass about disciplinary mergers was for me most informative and encouraging in my exploration. Even though neuro-aesthetics or evidence-based design were not explicitly discussed, I saw that others were faces with similar challenges. By gaining this overview, I had an schematic image how my particular approach was positioned among the others. It became clear that I was all the time searching for a specific sort of phenomenology, based on neuroscience. The opposition I found myself in at first, turned into a more open attitude that helped me to align with other architectural authors who were dedicated to this matter, like Harry Mallgrave and Colin Ellard. In this regard I can definitely tell the merit of the course, although it would be of course helpful to have more in person workshops and consults, which hopefully will be the case in a post-corona future.

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## Notes

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