



FROM NATURE TO SPACE: ARCHITECTURE THROUGH PERCEPTION

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Architects commonly attempt a depiction of organic forms when their works are inspired by nature, regardless of the building site. When aiming for affinity between structures and natural scenery, authors like Aravena, Holl, and Pallasmaa, among others, have conceived spatial operations by applying a phenomenological approach, in which they realise perceptions from nature through architectural aspects such as protection, views, and orientation. This method acknowledges a relationship between place and space, where intentions towards tangible facts then become design statements. Although spaces resulting from such a process may present an effective response to the environment, they can also offer further outcomes beyond the realm of form. The hypothesis is that, in addition to recognising a bond between architecture and nature, it is also plausible to associate such perceptions with the inner ambient of buildings, by analysing features such as daylight. The case study of a single-family house in a rainforest near Valdivia, Chilean Patagonia is presented, with the intention of addressing the above notions through a discussion of the actual effects of inhabiting a place, by way of a series of insights, including a revision of diagrams and photographs that assist in understanding the implications of this design practice. In addition, figures based on post-occupancy behaviour and daylighting performance relate both architectural and environmental issues to a decision-making process motivated by the observation of nature.

Keywords: Architecture, Perception, Nature, Design statements.

Introduction

When addressing architectural design methods in regard to context, Pritzker winner Alejandro Aravena (2000) claims that architecture functions by either formal affinity or contrast to a specific location. Furthermore, when that location is nature, some authors have considered representations of organic structures as the preferred method of empathising a setting, whereas others, such as Adriá and Klotz (Klotz et al., 2013) validate the use of rational shapes in order to establish a distinction between natural and built environments. Still, most of these examples appeal primarily to forms, and thereby neglect users and their perceptions of inhabiting a rural area. However, it is indeed possible to approach design from the point of view of the user, and simultaneously establish a relationship between space and place. Such is the objective of a proposal that employs insights from nature to first connect an observer with a place, and then to link an inhabitant with a built space. In this context, a series of questions arise from the use of perception as an architectural design method. How can insights into a place be converted to actual spaces? What are the consequences on users and environmental behaviour? How do the above behaviours connect with each other? This research focuses on answering these questions, with the aim of distinguishing a

process towards an effective response of structures to a given place, such as a forest, whilst being conscious of further practical outcomes of designing with natural phenomena in mind. The hypothesis is that using an insight such as visual domain as a design statement connects actual environmental performance with perceptions, such as the day-lit appearance of a room. These concepts are evidenced by dedicated literature review, as well as within the study of occupancy behaviours, in terms of both recorded insights and quantitative data.

Perceptions in Architecture

One question posed by this research is how perceptions of phenomena can transform into spaces. When approaching insights within the architectural realm, various authors refer to the concept of *intention* in order to develop ideas, where the latter seems to rely on the disposition of each observer. As such, Norberg-Schulz (1979) defines the word perception as an unconscious collection of impressions, which become active depending on the individual attitude, or intention, towards recognising a specific phenomenon. Likewise, intentions can shape a connection with a given environment. In this regard, Pallasmaa (2006) states that a combination of conscious attitudes and passive insights can lead inhabitants to a more profound attachment with places or spaces. Furthermore, according to Holl (2011), intentions in architecture are what distinguish its resulting perceptions from pure phenomenology, as this is frequently associated with a scientific realm. In this context, it is also possible to acknowledge that another role played by perception in architecture, is the establishment of a relationship between places and their inhabitants. On conceiving the above relationship, Heidegger (1971) suggests that the way people interact with spaces then constructs the action of inhabitation itself. However, there are further elements involved in this interaction, as Rasmussen (1962) emphasises when noticing surfaces, orientations and built forms, and how they combine with the intention of effecting human senses. Moreover, Aravena (Pérez et al., 2007) explains that making a connection between inhabitation and built form is the means to outline architectural facts directly from insights. By developing such argumentation, facts can subsequently become design statements.

Yet, within inhabitation, the human body and its senses directly receive perceptions. When associating intention and form, Pérez (Pérez, 2014) emphasises the concept of architectural spaces planned to house a corporeal frame, enabling users to appreciate light, temperature, textures and other tangible features. Furthermore, Kapstein (1988) affirms that every human act has a spatial aspect functioning within a specific structure. However, unlike conventional or rigid structures, the anthropoid moves as a dynamic, fluid figure, as Ito (Daniell, 2011) states, in relation to portraying perceptions from spaces in architecture. Within most discussions, comprehending natural phenomena from an architectural point of view comprises also a particular notion of *place*. When underlining its relevance, Heidegger (1971) associates place with space, as the former provides substantial meaning to the latter. Likewise, Kapstein (1988) claims that perceptions of the features from a place, such as daylight, become indispensable facts when connecting space with context. In addition, Pallasmaa (2011) views architecture as both a place and an extension of nature, thus allowing senses to perceive several types of experiences from the environment.

In order to transform natural phenomena into spatial operations, there is a series of illustrated methods that begin with recorded perceptions of a place, and end with the intended response to architecture. For instance, Holl (2011) accepts the above as the result of mixing an architectural programme with site experience (insights), an idea that he refers to as *building the site*. In addition, Norberg-Schulz (1979) validates experience as the way to discover interactions amid different phenomena, which thereby help to configure noticeable exchanges between a space and a built form. To an extent, when registered in either natural environments or open places, conscious perceptions appeal to human search for *shelter*, or refuge, based on a sense of safety. Pallasmaa (2011) remarks that this judgement of protection from a shelter is imperatively completed with the possibility of views over its proximity, or with a visual domain in the broader context. Likewise, Rasmussen (1962) refers to the case

of a campfire at night, surrounded by a ring of darkness, as a type of space where participants feel safe, if only to be able to look at each other. Furthermore, Aravena (2000) connects protection with the sense of orientation in a forest by questioning the actual edges of nature, and the sort of visual directions that architecture shapes when in search of such orientation again based on-site experience. Ultimately, Del Sol (Castillo, 2009) associates safety with the concept of *interiority*, as a suspended void within which individuals can gaze in a tranquil manner.

Methodology

Insights from natural phenomena, compelled by aspects such as protection, views, orientation, or daylight, must prove to be a solid basis when intended as design statements in architecture. The case study selected addresses this claim, through the consideration of a small-scale project in the countryside, in order to have a close appreciation of design decisions during project development, and their resulting impact on inhabitation. A case of a house in Valdivia, located at 39°49' S, 73°14' W in the northernmost border of Chilean Patagonia, emerges to verify perceptions of pristine sceneries, and their use as intentions within architectural work. This study addresses inception to completion, and the resulting impact of inhabiting a built environment within natural phenomena. Also included is a detailed report of the site, programme and architecture of the house. An analysis of user perceptions and daylight performance complete a general view through the establishment of a relationship between these elements. Gathering corporeal impressions of the use of spaces through observation, in the form of diagrams, and through feedback from users (inhabitants, visitors, etc.) is the selected means for establishing the occurrence of a specific occupancy phenomenon, and its relation to the built environment. In addition, figures of onsite daylight factor provide a more accurate impression of the ambience. Daylight factor particularly refers to the percentage of natural light that reaches a specific spot within a building, and as proposed in this research, is calculated using illuminance levels of several measuring points from a virtual grid applied to the house. On the connection between perceptions and environmental performance, specialised sources such as McNicholl (McNicholl & Owen Lewis, 1994), Phillips (2004), and McMullan (2012) have agreed in stating that the insight of a bright room reaching a level of external illuminance belongs to a daylight factor above 5%. This percentage provides a reliable figure to quantify perceptions of natural lighting in a given space. Finally, perceptions from the distribution, or uniformity, of light within a given space can help to relate these results to further quantitative data. Calculations of uniformity are based on the ratio between minimum and average daylight factors within a room, where a value=1 belongs to perfectly disseminated light.

Case Study

“My prescription for a modern house: first, a good site. Pick that one at the most difficult spot -pick a site no one wants- but pick one that has features making for character: trees, individuality, a fault of some kind in the realtor mind. That now means getting out of the city. Then, standing on that site, look about you so that you see what has charm. What is the reason you want to build there? Find out. Then build your house so that you may still look from where you stood upon all that charmed you and lose nothing of what you saw before the house was built but see more. Architectural association accentuates the character of landscape if the architecture is right”. Frank Lloyd Wright (as cited in Kaufmann, 1955).



Figure 1. General views. Source: the author

More than 90% of people in Valdivia live within urban boundaries, whereas approximately 85% of its land officially belongs to rural zones (Ilustre Municipalidad de Valdivia, 2011). Given such particularity, the architectural brief of a residence in a rainforest located ten kilometres away from the city centre, challenges the insight-based design method from such a condition. To what extent can perceptions of nature become spaces for city dwellers? The query points to a relationship between space requirements from an urban family, and the prospect of inhabiting a natural environment.

Designing a house in the woods beyond city borders may also address the search for shelter, as previously defined. There is a series of intentions related to the idea of a safe refuge, which purposefully shape the recording of onsite perceptions. However, late amendments on the project brief, such as the requirement of shared zones for both reading and working, plus other comfort features for guaranteeing user satisfaction, such as natural lighting, determine a number of adjustments in the architectural programme. The original outline of 115 m² includes three bedrooms, two bathrooms, and a common space consisting of the kitchen, dining and living areas, as shown in the plans below.



Figure 2. Plans. Source: the author

The plot is a trapezoid of 0,8 hectares, distributed over a continuous slope of thirty-five percent. First insights are a vast downward perspective from the top of the site, southern to a small valley below, and a panoramic view of the rainforest hills that surround the northern front. This visual domain served as the purpose for choosing to keep the house as high within the lot as possible. Additionally, concerning site

perceptions, a physical proximity to native evergreen species of up to forty metres high, such as Coigüe or Laurel, gives the experience of weakness throughout the body, which emerges from looking at treetops whilst stepping on the leaning soil that sustains them. This sense does not give a fear of falling, but rather an impression of emptiness that charms the observer, similar to the feeling of vertigo emphasised in Kundera (1984).

Noticing such a form of vertigo as an aspect of the relationship between tree heights and steep ground drives the design statement to propose an extension of the above insight towards the domestic space, in terms of both visual and corporeal range, by incorporating the vertical dimension of vegetation and soil, as shown in figure 3. Moreover, the lack of flat ground makes it possible to visualise the architectural programme as organised through a number of overlapped levels; each with a narrow, square floor plan. The latter operation seems to update an idea of Wright (Stungo, 1999) in reference to working with tree heights to establish practical affinity with nature, whilst constraining the horizontal extension of buildings. Connecting site entrance with the above volume occurs through the addition of external steps and a pedestrian bridge, directing people towards a sheltered void in the south-eastern corner on the first floor, where the main door is located.



Figure 3. Design concept. Source: the author

As mentioned, the development of vertigo strives to sustain an upright perception while inside, but also achieve a sense of orientation associated with the pursuit of shelter and safety. From the receiving hall on the first floor, constant external references of aspects such as scenery and daylight, complement the domestic domain through a series of windows, besides both visual and physical links to all internal levels. Likewise, in a shared reading zone next to this receiving space, a mezzanine provides descending views of the ground floor, surrounding landscape, and outside northern light through a double-height fenestration, as shown in figure 4. On the top floor, the staircase arrives to a shared working zone, having an ocular domain to the southern woods. Areas such as the kitchen, dining, and living room occupy an open plan on the ground floor, from which it is also possible to see the internal heights.

Albeit private spaces fit into the remaining parts of the structure, some remain subject to extension in terms of usable floor area; such as the two separate bedrooms on the top floor, which grow in the form of a cantilever, beyond volume boundaries towards southern and western directions.



Figure 4. Mezzanine. Source: the author

Actual Perceptions

One of the most surprising and recurrent insights following occupancy, is a sense of disorientation when attempting to leave, also described as difficulty in finding an exit door when coming from anywhere inside the house. These are impressions of visitors, as well as actual inhabitants, while initially adapting to their environment. Likewise, another verified insight is the feeling of vertigo, which coincides with the same architectural facts of the site, applied as a core spatial operation and refers to either a corporeal attraction or a weakness towards the height of internal voids, as shown in the sections below.

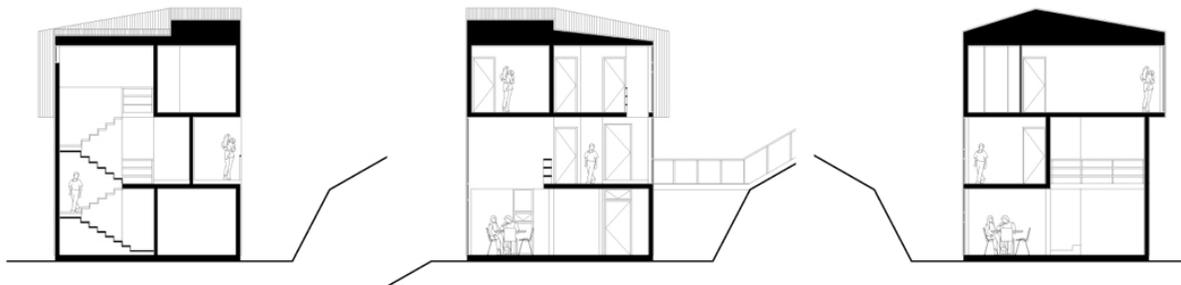


Figure 5. Sections. Source: the author

Nevertheless, it is possible to state that the result of a disorienting effect directly relates to an extension of site experience toward the domestic realm, as per design statements. This may occur for two reasons. First, the upright dimension built from interspersed and visually linked double-height spaces make all internal circulations strictly based on a single staircase. Without any hallways, corridors or foyers, users are obligated to keep climbing up or down in an endless vertical journey, notwithstanding the permanent references to outside through a number of windows, as shown in figure 6. However, these external references seem to indicate a broader landscape, as opposed to solely the immediate surroundings within the house, leading users to overlook their exact position within the site.



Figure 6. Staircase. Source: the author

Secondly, the insight of similar day-lit appearances within spaces, supported by the existence of various floor-to-ceiling windows throughout the building. This contributes to concealing additional indications of features in the context, such as direction, light, and time of day. Likewise, calculations of daylight performance from the virtual illuminance grid measured on-site, confirm 6.8% as the average external light reaching the interior. According to previously cited sources, a factor beyond 5% establishes the perception of being in a space as illuminated as outside. The confusion of users can also be attributed to an even distribution of light inside. However, when performing calculations of light uniformity within rooms, results show a despaired behaviour for each floor level: 0.1 for the ground floor, 0.8 for the first floor, and 0.7 for the top floor, as shown in figure 7. This seems to suggest that the sense of disorientation may grow as users reach the upper spaces, coinciding with on-site observations in terms of difficulties in finding a way to exit the house, especially recorded between the first and second floors.

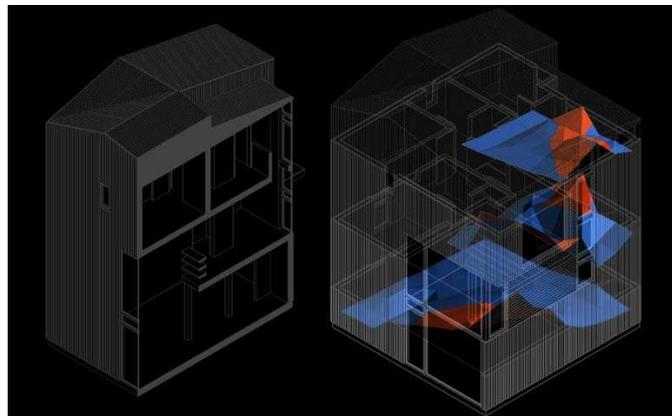


Figure 7. Distribution of light per floor. Source: the author

Conclusions

As evidenced by the literature review and case study, perceptions from places are actualised into spaces in a method. This begins with the establishment of a basic architectural programme, e.g. a house, in a specific location, e.g. nature, allowing designers to decide an intention prior to recording any experiences on-site, and whose final recipient is the human body. Nonetheless, insights may follow a disciplinary language when perceived, in terms of all actions, elements, qualities, and quantities involved, in order to

enable their transcription as architectural facts. After the above is outlined, facts are able to work as design statements, and likewise, intentions can then transform into spatial operations, always applied to a corporeal frame and not precisely to a constructed form. If perceptions transcend from an observer in a pristine scenery to an actual inhabitant of such a location, then it is possible to speak of a type of empathy between architecture and context, unlike within urban areas, where insights generally come from surrounding artificial environments. In this case study of a house in Valdivia, Chile, a number of registered observations exemplify the transfer of a perception, such as vertigo, from site experience to the built space, and also presents further results. In an effort to intensify the orientation towards a given landscape, both the amount and size of openings throughout the building affect the levels of light inside, in terms of achieving a day-lit appearance and its distribution within rooms. This type of environmental behaviour is associated with architectural statements in order to initiate an unexpected sense of internal disorientation on users. Although software simulations may observe critical spots when incorporating daylight during project development, they certainly do not predict human perceptions of the resulting space. Hence, an extended design method, beyond site experience, may arise from the integration of elements from the context, such as perceptions and prevailing conditions, and this should be confirmed in upcoming studies on phenomenology in architecture.

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