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Photo, front cover: Magnus Rönn
Photo is describing a Lumen Prototype from an exhibition 2024 at Louisiana in Denmark called *The Living Structures*. The exhibition is the first in a new series 'Architecture Connecting', spotlighting the evolution of architecture in an era of climate crisis and the social, cultural and political challenges this reality poses.

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DANISH INTERIORS AND ECHOES FROM JAPAN: STRATEGIES FOR A SPATIAL DESIGN CONNECTED TO NATURE

CARMEN GARCÍA SÁNCHEZ

Abstract

To maximize contact with nature in promoting the health and wellbeing of populations, design strategies are urgently needed, as exemplified by numbers 3 and 11 of the United Nation's 17 Sustainable Development Goals. As an important alternative to large-scale nature-inclusive actions, which are not always possible due to space limitations, the design of the built interior environment offers an important and unexplored research field for increasing the human connection to nature.

This article examines how interior design acts as an extraordinary experience of the phenomenon of nature in four post-war domestic buildings in Denmark as an inspiration for contemporary design practice. Intriguing analogies, in terms of how this interaction with nature takes place, with particular traditional Japanese architecture inform the research.

The case studies offer unique biophilic experiences through sophisticated and original design expressions, whose timeless lessons are prevalent today.

Based on a methodology that links architectural research and praxis, this phenomenological study provides innovative biophilic design strategies and inspiration, extending its theory and practice into a new dimension. The objective is to advance knowledge of nature-based solutions that have the potential to improve health and wellbeing through daily interaction with nature in communities. Furthermore, the study delivers a new understanding of post-war Danish domestic architecture from a contemporary perspective as well as insights into the impact of traditional Japanese architecture on it.

Keywords:
biophilic design, spatial design, nature-based solutions, architecture, Danish architecture, Japanese architecture, design strategies, sustainability

Introduction

Change your brain, your body, or your environment in nontrivial ways, and you will change how you experience your world, what things are meaningful to you, and even who you are (Johnson, 2007, p. 2).

This article examines how interior spatial design acts as an extraordinary experience of the phenomenon of nature in four post-war domestic buildings in Denmark and through what means to inspire a contemporary design practice. Intriguing analogies, in terms of how this interaction with nature takes place, with particular traditional Japanese architecture inform the research. The insights shed light on the integration of a variety of biophilic design[1] strategies into the buildings analysed, extending its theory and practice into a new dimension. Moved by the desire to contribute to future sustainable building design – in the sense of sustainable beauty and nature connection – the objective is to advance knowledge of nature-based solutions (NBS)[2] that have the potential to improve health and wellbeing through daily interaction with nature in communities. In addition, the study enriches the current understanding of post-war Danish domestic architecture and of the impact traditional Japanese architecture had on it. This article represents one part of the contribution of an innovative research project carried out in Denmark and Japan.[3]

State of the Art and Relevance

In the Anthropocene,[4] the unprecedented growth of the global population, rapid urbanization, the transformation of urban areas, and the digital revolution are increasing human beings' disconnection from nature (UN DESA, 2021). The dominant model of developing and designing the modern built environment deprives communities of the documented human health and wellbeing benefits of daily interactions with the natural world[5] and leads them to a growing placelessness (Kellert, et al. 2008, p. 13). Furthermore, the longing for nature has emphasized the diversity of the world population and the issue of inequality, as evidenced by the global pandemic. Alienation from nature is a consequence of how we have chosen to design and develop our world, but it is not inevitable. To maximize contact with nature in promoting the health and wellbeing of populations, new and creative design strategies at different scales and levels by diverse disciplines (Keesstra et al., 2018) are urgently needed (UN, 2017, p. 6), as exemplified by the United Nation's 17 Sustainable Development Goals – mainly number 3, "Good Health and Well-being", and number 11, "Sustainable Cities and Communities" – whose target date for achievement is 2030. These circumstances call for significant change and challenge architectural design practices for improved building designs and healthy sustainable urban environments at a global level. Despite there being extensive research into NBS, there is nonetheless a lack of research and useful small-scale architectural design solutions

1 Biophilic Design is a little-explored emerging approach that pursues sustainable design strategies to create or increase the sense of connection between people and nature through the experience of the built environment.

2 The European Commission has defined the relatively new term "nature-based solutions" as a series of actions inspired by, supported by, or copied from nature in order to address a variety of challenges in sustainable issues, while providing economic, social, and environmental benefits (EC, DG RTD, 2015, p. 5). The term brings together democratic values and the right of people to access nature, but also the rights of nature. The focus is primarily on the urban scale. Research on understanding the impact of nature-based design in architecture is still limited.

3 The individual research project NATURE-IN (New sustainable Nature-inclusive architectural devices for the transformation of our interior dwelling space: through selected case studies) has been conducted by PhD Architect Carmen García Sánchez, the Principal Investigator, as a postdoctoral researcher at the Royal Danish Academy Architecture Design Conservation, Institute of Architecture and Design, in Copenhagen, and as a visiting researcher at the Centre of Excellence for Privacy Studies PRIVACY, Faculty of Theology, at the University of Copenhagen, and at the Institute of Science Tokyo (formerly Tokyo Institute of Technology), Department of Architecture and Building Engineering, in Ryo Murata's research lab. The project is funded by the European Commission, within the H2020 Excellent Science – Marie Skłodowska-Curie Actions programme, Engineering Scientific Area.

4 The Anthropocene, a term coined in 1995 by Nobel Chemistry Laureate Paul Crutzen, is recognized as a new geological epoch in Earth's history, beginning around 1800, in which humankind has become the dominant force on the planet.

5 Contact with nature enhances human health and wellbeing, improves mental and physical health and quality of life at all ages, and increases productivity, creativity, and even clarity of thought. This reduces

for creating nature-connecting domestic interiors. This is mainly due to the following: 1) Territory and urban scale are the focus of the majority of the studies[6]; 2) Most of the studies that focus on case studies merely provide evidence of their benefits; 3) The lack of communication between researchers, practitioners and policy-makers, although there are increasing efforts to improve this[7]; and, 4) The need for a change in society's behaviour – as stressed by leaders like Professor Ezio Manzini,[8] who extends the role of designers to the creation of ideas of wellbeing (Manzini & Staszowski, 2013).

The design of interior space in the built environment[9] offers an important and little-explored research field for increasing the beneficial human-nature bond as an important alternative to large-scale nature-inclusive actions, which are not always possible due to space limitations. Different bodies of knowledge contribute to the study and enhancement of this relationship, including neuroscience, psychology, philosophy, ecology, and architecture.[10] It is important to understand that human beings' complex behaviours result from complex interactions with their environment. The environment influences them and vice versa.

Redefining the concept of nature and the relationship between humans and their natural environment is essential in this context. The traditional, outdated and dualistic Western understanding should thus be replaced by a new unitary concept of nature and culture: no longer above or at the centre, but within nature.[11] This brings up the unitary Japanese concepts of nature and culture, seibutsu no sekai **生物の世界** and fudō **風土**. Japanese biologist Kinji Imanishi argues in the English edition of his seminal book A Japanese View of Nature: The World of Living Things (2002) that nature should be understood as a dynamic web of relationships with humans and highly diverse living things, in which a role exclusively for humans is not possible. This assertion is linked to the meaning of fudō (Berque, 2004), a term stating that human beings or culture and nature together create a continuously changing milieu in which active interplay takes place, rather than being detached from each other.[12] The consequences of this way of thinking are manifold. Moreover, the interaction between nature and architecture as a means of mediation must also be reconsidered. New forms of inhabiting the world are needed, ones linked to a "new way of looking at nature", and an understanding that everything is connected as a component of a whole (García Sánchez, 2021).

Some post-war Danish domestic buildings from the 1950s and early 1960s – a golden age for Danish architecture – offer exemplary sensory experiences of the human-nature connection mediated through architectural space. Although some scholars have drawn attention to this affiliation,[13] a thorough architectural analysis of what design resources are displayed and how this link is achieved is nevertheless lacking.

urban and domestic violence and decreases social tensions. See, for instance, Engineer et al. (2020); Kaplan & Kaplan (1989); Maller et al. (2005); Ulrich (1984); Zhong et al. (2022).

6 See, for instance, the following recent or ongoing projects: 1) EU-funded research projects: Think-Nature, Urban Nature Lab (UNaLab), URBAN GreenUP, Varcities, Urbinat, Regions4Climate, Reconect, Connecting Nature , Upsurge Supported by Nature; and 2) Council research projects: S-ituation, S-Ummation, A-dvice, GuideNbS.

7 Some of them are mentioned in the previous note.

8 An Honorary Professor at the Politecnico di Milano, Dr Manzini is an author on sustainable design and the founder of DESIS, an international network on design for social innovation and sustainability, among many other high impact achievements.

9 Please note that the definition of interior space is not associated exclusively with the artificial environment, although it is commonly understood as such. For this reason, the author stresses that the interior space being referred to is situated in the built environment.

10 Neuroscience, focussing on the relationship between the human nervous system and the development of human perceptions and intuitions of architectural space, as well as the subsequent processing and interpretation of sensory information. Psychology, examining the interplay between the physical construction of spatial experiences and the human mental processes, including the dimensions of emotional and cognitive behaviour. Philosophy, exploring fundamental questions and ideas about the knowledge and wisdom of human life and nature throughout history to the present day; Ecology, studying the interrelationship of life – including human ecology (involving individuals, groups and societies) – with its environment. Architecture: encompassing the study and development of evidence-based design.

11 See, for instance, Prominski (2014).

12 This is a difficult idea for people from the West to understand.

13 See, for instance, Chen-Yu et al. (2020); Harlang & Monies (2003); García Sánchez (2015); Sheridan (2014).

Furthermore, recent studies and exhibitions have discussed and evidenced significant parallels between some of these buildings and traditional Japanese architecture,[14] an architecture that on the other hand intentionally articulates a rich set of mechanisms to emphasize the sense of connectedness with nature. These parallels have not yet been presented or analysed from a biophilic design perspective.

Methodology

The research methodology is mainly driven by an examination of the four case studies, the resources and knowledge Danish architects relied on when designing them, and their contexts. The study combines a theoretical and empirical approach – taken from architecture, landscape, and biophilic design perspectives – based on an extensive review of literature, historical drawings, and pictures, interviews with building users about their perception of nature from the interiors,[15] as well as first-hand qualitative analysis of case studies in Denmark and Japan as a core research strategy. In addition, prominent scholars with a focus on biophilic design and on Danish and Japanese architectural and landscape design have been interviewed about the questions that emerged.[16] Fieldwork was conducted during different weather-related and seasonal conditions in order to document the understanding of nature transformation as perceived in the selected Danish cases as well as in some influential Japanese buildings.[17] The four cases presented were selected based on: 1) Their shared special relationship with nature, the chance for users to appropriate exterior space, and being in a perfect state of conservation for fieldwork; 2) The diversity of architectural expression, contexts, and building materials; 3) The different project programmes to achieve a rich set of solutions; 4) The influential capability linked to beauty criteria; and 5) Their prominent Japanese inspirations. They are structured thematically rather than chronologically in order to facilitate a deeper understanding of their characteristics.

The Biophilic Design Approach

Biophilic design, an emerging approach that pursues sustainable design strategies to create or increase the sense of connection between people and nature through the experience of the built environment, has great potential in this framework. Biophilia[18] has been defined as an ancestral and deep-seated, innate inclination of humans to connect with natural systems and processes, but also constitutes a broader affiliation with them (Wilson, 1984). For biologist Edward O. Wilson, biophilia is "a complex of learning rules" developed over thousands of years of evolution and human-environment interaction. He argued that the brain evolved in a biocentric world, in adaptive response to natural forces, rather than in a machine-regulated world (Kellert et al., 1993, p. 32), and held that modern humans have a genetic tendency to pay attention to, affiliate

14 See, for example, the following publications: Balslev Jørgensen (2004); García Sánchez (2015; 2017); Gelfer-Jørgensen (2013); Lund (2008); Solaguren-Beascoa (2014), and various exhibitions that have echoed this Japanese impact on: 1) Danish architecture and design: Enriched Simplicity 豊かなシンプル Japanese influx on Danish Architecture & Design 1950–2020 at the Royal Danish Embassy in Tokyo (2021), and 2) Danish crafts and design Japanomania in the North 1875–1918 at the Kunstmuseum (2017), and Learning from Japan (2015–17) at the Design Museum Danmark, both in Copenhagen.

15 The present study would not have been possible without the extraordinary collaboration of the residents of some of the case studies and Realdania, a Danish philanthropic association that owns and rents out some of them and provided access.

16 Mainly distinguished Professor of Design History Dr Penny Sparke of Kingston University, London, Japanese Associate Professor Dr Eng. Architect Ryo Murata of the Institute of Science Tokyo, Department of Architecture and Building Engineering, and Danish architect and Professor of History of Architecture Dr Peter Thule Kristensen of the Royal Danish Academy Architecture Design Conservation. The bibliographic sources, originally written in Japanese, have only been considered in translation. The author has counted on the instrumental support of Japanese scholars to clarify any misinterpretations of ideas that may arise.

17 In order to expand the author's knowledge of Japanese architecture and landscape design, and to understand how the connection with nature is performed, historical buildings and their gardens were studied in Kyoto, along with others in Nara, Tokyo, Kanazawa, and Takayama: a selection based on the buildings presented in the book by Tetsuro Yoshida, with additional recommendations from Dr Murata. In addition, the existing Zui-ki-tei, a replica of the original tea ceremony house, was studied as well.

18 The Latin word biophilia, a term coined by German-American social psychologist Erich Fromm (1973) and

with, and generally respond positively to nature. The origin of this evidence for the continuity of nature is the theory of evolution and its modern incarnation in genetics.

Biophilic design represents a biological understanding of architecture. It is perceived by all the senses, sometimes without visual contact or a physical link to the natural surroundings. Besides the visual sense, other sensory responses to nature – her stimuli and forces – are of great significance to us and have a particular impact on our memory, notably, touch, sound, smell,[19] taste, time, and motion (Kellert & Calabrese, 2015, p. 11). These senses could be associated with the five sensory systems defined by American psychologist James J. Gibson: visual system, auditory system, taste-smell system, basic orientation system, and haptic system (Bloomer & Moore, 1979, p. 44). Biophilic design leads to subjective multisensory experiences, to what French philosopher Gaston Bachelard would call a "polyphony of the senses" (Bachelard, 1969). This quite new design approach refers to the desire to connect to a place and the natural environment as well, and to how a specific scenery can evoke responses related to personal memories. The idea of its mental process departs from the understanding, extensively developed by neuroscientists, that the human mind and body have evolved in a sensorily rich world.

The human bodily constitution and senses "think", in the fundamental sense of identifying and processing information about their situation in the world, and mediate sensible behavioural responses (Pallasmaa, 2009, p. 136). The human senses are usually interconnected, giving a complete picture of the environment, which is a medium of multisensory engagement. However, some senses are more important than others under different circumstances.[20] When we come into physical contact with an environment, we feel its overall character, atmosphere, topography, sounds, colours, scale, odours or fragrances, and material presences (Rasmussen, 1964, pp. 39–44). Our body, which is in ongoing communication with the environment, is part of our system of memory, meaning that it is grounded in our bodily experience (Johnson, 2007, p. 12). However, it is not our physical setting, but the whole complex of physical, biological, social, and cultural conditions that constitute any given experience, taken in its fullest, deepest, richest, broadest sense. In addition, the innate affinity for the natural world must be learned to be fully functional, it must be cultivated and earned (Kellert, 2012, p. xiii), requiring repeated and sustained engagement with nature (Kellert & Calabrese, 2015, p. 6). Conversely, scientists have raised the dramatic idea that if human biophilic tendencies are not sufficiently stimulated and nurtured, they will eventually atrophy and become dysfunctional (Kellert, 2012, p. 11). These insights are worth noting in order to understand how biophilic impressions are obtained and processed.

popularized by pioneering biologist Edward O. Wilson, literally means love for life. Fromm defined biophilia as "the passionate love of life and of all that is alive; it is the wish to further growth, whether in a person, a plant, an idea, or a social group" (Fromm, 1977, p. 485). The following publications are regarded as seminal references on the topic: Biophilia: The Human Bond with Other Species (Wilson, 1984) and The Biophilia Hypothesis (Kellert et al., 1993).

19 Juhani Pallasmaa points out how a particular smell makes us unconsciously reenter a space completely forgotten by the retinal memory (Pallasmaa, 2012, p. 58).

20 Sight has become one of the main ways in which humans think and use the "mind's eye" to visualize creative ideas, just as we use our real eyes to picture our environment. Some senses deal with distance (mainly sight and hearing, but also smell) and others with proximal depth. Although sight is a particularly important sense for humans, hearing gives an idea of the reflectivity of surfaces and also provides some assessment of space. Smell is very powerful in activating the retrieval of memory sequences. Taste is usually associated with food, but can sometimes be used for other purposes. Tactile sensations are much broader in their scope than is often imagined. The sense of touch enables us to feel shape, texture, and pressure. The haptic sense involves feeling temperature, humidity, and pain through skin. Finally, movement is perceived by the kinaesthetic sense (Bell, 2012, pp. 39–40).

Biophilic design in architecture has occurred throughout history, although not under the term biophilia. It is historically reflected in traditional living close to, but respectful of the natural world, materials, and patterns, or in vernacular architecture, which cannot be understood without its connectivity to the environment. Since pioneer Professor Stephen R. Kellert published his first classification (Kellert et al., 2008, p. 15), there have been diverse attempts to summarize elements, attributes, and patterns of biophilic design.[21] They provide a useful toolkit for biophilic design analysis and practice. Designs inspired by forms, geometries, and patterns found in the natural world, their manifestation, or the perception of natural processes linked to the passage of time – such as aging and seasonal and temporal changes – contribute to indirect experiences of nature and thus lead to biophilic stimuli. The use of local and natural materials, sometimes raw or unprocessed, enables the enjoyment of one's senses to transmit messages and promote a connection to nature (fig. 1). Biophilic design is also a place-based relationship (Kellert et al., 2008, p. 12), is about establishing a connection to the genius loci or "the sense of spirit of the place", about the fundamental ways in which we attribute meaning to, for example, a particular site in order to achieve a sense of security and identification with it – a "sense of belonging" to the environment.[22] A typical palette of traditional architectural materials conveys a feeling of connection to the culture and history of the site in relation to its identity. The feeling of refuge, prospect patterns, and mystery – linked to opportunities for exploration and discovery that evoke incomplete experiences of wonder – are classified as some biophilic attributes among others whereby imaginative experiences occur. Its design refers to sensory experiences of energy, rhythm and balance, horizontality and verticality, gravity, orientation or flow, and implies a perception of harmony in which the sense of beauty prevails.[23] It is therefore a complex and rich approach whose categorization is a work in progress.

21 American environmental designer and lead proponent of biophilic design William D. Browning and his collaborators categorized fourteen patterns resembling Kellert's revised classification in 14 Patterns of Biophilic Design (Browning et al., 2014). But there are other interesting publications as well: Nature Inside: A Biophilic Design Guide (Browning et al., 2020; Kellert, 2018; Ryan et al., 2014), which defines a fifteenth pattern, and Down-ton et al. (2017).

22 According to Roman belief, every "independent" being has its genius, its guardian spirit. This spirit gives life to individuals and places, accompanies them from birth to death, and determines their character or essence (Norberg-Schulz, 1980, p. 18).

23 As James Wines has said, "If it isn't beautiful, then it isn't sustainable" (Kellert et al., 2008, p. 244).

Figure 1
Natural materials express their age as well the story of their origins. Picture of different pieces of wood (Yoshida, 1952, p. 113)

Danish Architects and Nature

Figure 2
Cultivated Danish landscape.
PHOTOGRAPH BY THE AUTHOR

There are many reasons, key figures, and circumstances for talking about the connection to nature and the domestic space in Denmark, whose narrative has had a continuity, rather than a disruptive shift, from the past to modernity and beyond. Post-war Danish architects, those of the so-called the third generation in Denmark, showed a conciliation with nature that can trace its roots to the country's long tradition of agriculture and fishing (fig. 2).

Jensen Klint, leader of the artistic movement Skønvirke, played an important role in Danish architecture's journey towards modernity. He advocated learning from the buildings of the past, including those of other cultures, and pursuing a personal style in creating new designs for modern human life, not by imitating them but by applying their lessons (Jensen, 2009). His sources of inspiration were nature's rules of growth and mathematics, tools that could regulate the new architecture. Swedish historian and author Lisbet Balslev explained how "an organic character grows according to the rules of nature" in Klint's work (Frampton, 1995), which is exemplified by his masterful architectural work on Grundtvig's Church, erected in Copenhagen between 1921 and 1940. The yellow brick building seems to emerge from the earth like a mineral formation, thus calling to mind his unbuilt Crystal Knot project (1907). He deliberately

selected a humble material for constructing a spiritual site. The effects of daylight link parishioners to divinity in a unique way (fig. 3).

Figure 3
Grundtvig Church (1921–40) in Copenhagen.
PHOTOGRAPH BY THE AUTHOR, DECEMBER 2016

His son Kaare Klint developed an anthropological approach through his studies based on human proportions for the manufacture of furniture and established the Cabinetmakers School linked to the Royal Danish Academy of Fine Arts' School of Architecture (fig. 4).[24] He phased in Jensen Klint's lessons at the so-called "School of Klint" within the Academy. There, an intimate relationship with architectural tradition and its own craft, a special sensitivity towards the landscape, and an architecture partly generated by nature, its principles of order and growth, were instilled in young Danish architects.

24 The Royal Danish Academy of Fine Arts' School of Architecture (the Academy) in Copenhagen, currently named The Royal Danish Academy_ Architecture Design Conservation, has provided education in the arts for more than 250 years, playing a key role in the development of the architecture of Denmark.

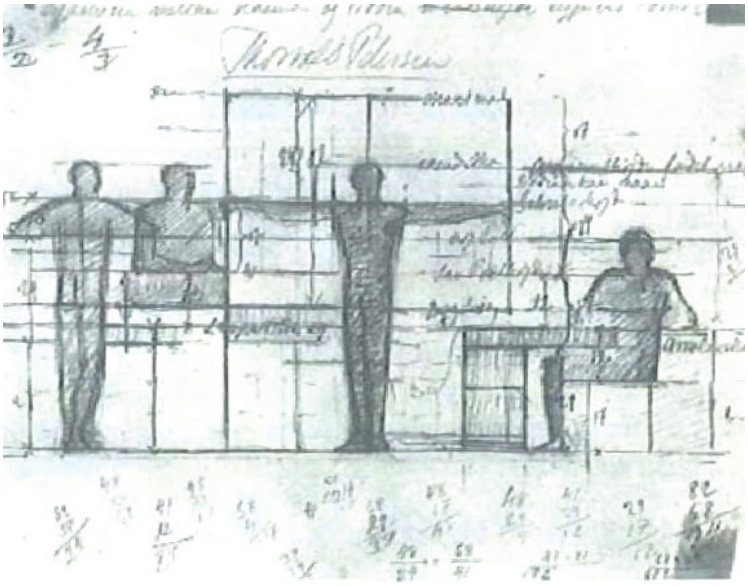


Figure 4
Human template, original drawing by Kaare Klint.
DANISH NATIONAL ART LIBRARY, COLLECTION OF ARCHITECTURAL DRAWINGS

In a heyday of architecture, there was the prevalent idea that the architectural problems of that time were closer to anonymous primitive buildings than to more complex and sophisticated buildings. Guided by these circumstances, Danish architects gradually became interested in vernacular architecture. Such architecture linked to a specific place and featuring a refined harmony between building and landscape, climate and available materials, was an architecture that human beings understood better (López Peláez, 2018, p. 15). Moreover, returning to vernacular craft was regarded as a manifestation of nature.

Influential Danish architect and Academy Professor Kay Fisker explained how contemporary buildings had to be characterized by naturalness and liberation, and how the Nordic style of architecture was distinguished by unpretentiousness "anonymous" architecture, while pointing to the interconnectedness with the garden and the surroundings as a continuation of a healthy, vivid tradition (Søberg, 2021, p. 119). The already growing population in Copenhagen was a problem shared by other European cities and led to a debate on how to expand urban areas.

Stemming from England, the garden city idea, which promised a better place to dwell, also found its expression in Denmark. English domestic architecture from the nineteenth century, known through the book Das Englische Haus (1904) by German architect Herman Muthesius and subsequently published in English (Muthesius et al., 1979), had an impact on Danish architecture (Søberg, 2021, p. 17). The English house had an irregular floor layout and a garden in which plants and trees grew in their natural manner, in line with the Picturesque movement. English people understood that the advantage of living in a private house over the multistorey dwellings was living in connection with the ground and in closer contact to nature, and the greater bodily health benefits this brought

(Muthesius et al., 1979, pp. 8–9). American historian Henry-Russell Hitchcock had presented his book Modern Architecture: Romanticism and Reintegration (1929) and coined a "new tradition". He described how craftsmanship and proportioned design were of particular importance to contemporary Scandinavian architecture and linked it to English domestic architecture. American naturalists Henry David Thoreau and John Muir had also produced influential publications about contact with wild places and the concept of "wilderness" formed in the nineteenth century and articulated in their texts, in which they endeavoured to show their non-anthropocentric sensibility.

Fisker's contribution to the development of the Danish welfare state had a clear influence on the third generation of architects, who sought to create simple architecture whose formal effect could be described in biological and psychological terms as "healthy" and without "pretensions". The design of the Aarhus University campus (1931),[25] a leading exponent of traditional Danish functionalism, was praised for "its free and vibrant interaction of nature and architecture" (Søberg, 2021, p. 101).

25 The Aarhus University competition was won in 1931 by C. F. Møller and Fisker, in collaboration with P. Stegman and landscape architect C. Th. Sørensen.

The international networks established by the Academy enabled young faculty members to become visiting lecturers at MIT and Berkeley. This opportunity allowed for an in-depth study of American expressions. Fisker highlighted the architectural work of renowned figures such as Rudolph Schindler, Ray and Charles Eames, Richard Neutra, and Marcel Breuer, and identified various similarities between Scandinavian and the Bay Area architecture. It was designed to be experienced from the interior space rather than based on its external appearance (Fisker, 1950). Fisker emphasized the harmonious integration of its architectural design with the natural surroundings as the most significant value, and claimed this, along with the use of surfaces in natural materials, to be the "conditions of life" that architects had to create (Fisker, 1947). In addition, he drew attention to the influence of Japanese architecture, while the American historian Lewis Mumford described the Bay Area architecture in the *New Yorker (1947)* as a meeting of *Oriental and Occidental architectural traditions (Mumford, 2006, p. 291).*

The Japanese Approach

Fisker contributed to the orientation towards Swedish architect Erik Gunnar Asplund's work as well. It is particularly relevant that Asplund in his inaugural lecture, "Our architectonic concept of space", upon becoming a professor at the Royal Institute of Technology in Stockholm in 1931 (Asplund, 2001), was already concerned about humans' disconnection from nature, and stated that architects should confront this problem as part of their role as designers of the scenery of human life.[26] Asplund selected a picture of the Baba Villa in Nasu, Japan, designed by Japanese architect Tetsuro Yoshida[27] (fig. 5), an important figure in the

26 He and his peers had demonstrated an exceptional interplay between architecture and nature to form a unitarian scenery at the influential Stockholm Exhibition (1930).

27 It was first published in Yoshida (1931), p. 22. It was also reproduced on the opening page of Byggmästeren's publication of Lecture 303 and in Yoshida (1935), p. 78, and Yoshida (1952), p. 103.

Figure 5
Picture of the Baba Villa, Nasu, Japan, Yoshida's own design (1927) (Yoshida, 1935, p. 78; Yoshida, 1952, p. 103). Asplund showed this image as the opening illustration for his argument for Spenglerian "infinite space" in his inaugural lecture at Stockholm's Royal Institute of Technology (1931).

cultural exchange between Japan and the West, to support what was regarded as a "new conception of space" in contemporary architecture. Yoshida had been travelling around Europe and become fascinated by Swedish National Romanticism. The Swedish master had interviewed Yoshida a month earlier and expressed a particular interest in Japanese architecture (Kim, 2008, p. 53). In his lecture, Asplund referred to the Spenglerian notion of "infinite space" and the concept of "the dissolution of the room" in the traditional Japanese house. He claimed that the new formal architectural values behind the "infinite space", where architectural space opened itself to the exterior, to nature and human life, led towards a breaking up of the building, and the reduction of material weight and mass and an emphasis on structure expression. His statement concerned movement, change, and adaptation to varying circumstances, as well as values that could represent the new, long-awaited architecture and its reconnection with nature.

Danish architects were familiar with traditional Japanese architecture indirectly through American architecture, various seminal publications, including *Das Japanische Wohnhaus* (1932) by Japanese architect Tetsuro Yoshida, and *Das Japanische Haus und Sein Leben* (1936) by German architect Bruno Taut,[28] and through the teachings of various professors at the Academy.[29] The Katsura Rikyū 桂離宮 Imperial Villa in Kyoto, the most refined example of the Sukiya 数寄屋 style (which was first built in the early 1600s and expanded over the years) was an important source of inspiration (Balslev Jørgensen, 1997, p. 11).

In cosmopolitan Stockholm, some Danes[30] also came into direct contact with Japanese architecture through studying the first Japanese teahouse in Europe. The Zui ki tei 瑞暉亭, a real teahouse or chashitsu 茶室 rebuilt on the grounds of the Ethnographical Society (1935) (fig. 6), [31] gave them first-hand knowledge of the extremely refined parallel to half-timbered construction (fig. 7), the use of honest materials, and the

28 See Das Japanische Wohnhaus (Yoshida, 1932), and its extended version, Japanische Architektur (Yoshida, 1952), and Der Japanische Garten (Yoshida, 1957). They became his trilogy in German, a language that some Danish architects could read. A translated into English version was also published: The Japanese House and Garden (Yoshida, 1955). Other influential publications were Japanese Homes and Their Surroundings by American orientalist Eduard S. Morse (1886), The Book of Tea by Japanese philosopher and art critic Kakuzō Okakura (1906), Das Japanische Haus und Sein Leben (1936), and its English version, Houses and People of Japan (1937), London (1938), (1937), both written by German architect Bruno Taut.

29 At the Academy, Carl Petersen, Kaare Klint, Kay Fisker, and Steen Eiler Rasmussen highlighted Japanese references and features in lectures and articles.

30 They had fled the German occupation of Denmark. For instance, Jørn Utzon, Halldor Gunnløgsson, Tobias Faber, Ole Helweg, Finn Monies, Karen and Ebbe Clemmensen, Erik Christian Sørensen, Eva and Nils Koppel, Arne Jacobsen, and Poul Henningsen.

31 Swedish photographer, ethnographer, and Japanologist Ida Trotzig played an important role in its construction. Danish architects Karen and Ebbe Clemmensen drew up detailed plans of the original tea house, which, unfortunately, burnt down in 1969. A new teahouse was built on the same site in 1990 and can still be visited.

harmonious integration with nature of their native tradition. Moreover, the tea ceremony expressed the ancient Japanese belief in the power of nature. Shintoism was an imageless, constructive, aesthetic logic expressed in the relationship between garden, house, everyday objects, and the participants in the whole ritual, argued Balslev Jørgensen (Balslev Jørgensen, 2004, p. 50). The interior of a Japanese house exhibited at the large architecture and design exhibition H55 in Helsingborg in 1955 and included in publications of the time[32] revealed a lively interest in Japan.[33] Furthermore, various Danish architects travelled to Japan.[34]

It is remarkable that, in Japan, the enjoyment of nature has traditionally been a priority, and society lives in communion with it. The Danish buildings studied mirror some architectural resources from Japan, whilst Danish identity remains in the background.

The most important idea from Japan was the concept of space as a continuous medium, which flows everywhere, extending outwards, connecting interior with exterior, and often with the Japanese garden – one of whose basic functions is to create contact with nature (fig. 8). It is designed in such a way that it takes on a different appearance with the coming of each new season. It is a garden to be contemplated in connection with the cycles of life and its changes. In the traditional Japanese conception of space, space is a subjective perception and a changeable

32 See, for instance, in Norway by Arne Korsmo, "Japan og Vestens arkitektur," Byggekunst, 3 (1956), pp. 70–75, and in Denmark by the Dane Per Lassen, who had lived in Japan for a year, "Traditioner i japansk bygningskunst", Arkitektur DK, pp. 121–37, and (1958) "Moderne japansk arkitektur", Arkitekten, 60, pp. 17–29.

33 Other important post-war Nordic buildings, such as the works by Alvar and Aino Aalto and Heikki and Kaija Siren in Finland, or Arne Korsmo and Sverre Fehn in Norway, manifested an affinity for traditional Japanese architecture in them. See, for instance, Chen-Yu et al. (2017); Fehn (1964); Grijalba (2014); Korsmo (1956); Lund (2008); Rincón et al. (2022); and Rodríguez (2014).

34 Among them, I can name to Jørn Utzon, Halldor Gunnløgsson, Paul and Hanne Kjærholm, Vilhelm Wohlert, Finn Monies, Hinrich Bornebusch, Harald Plum, Bertel Udsen, Erik Korshagen, and so on.

Figure 6
Zui Ki Tei 瑞暉亭, the Japanese tea house in the garden of the Ethnographical Museum in Stockholm, which was rebuilt in 1935 and burned down in 1969.
ORIGINAL PHOTOGRAPH OWNED BY THE MUSEUM OF WORLD CULTURE, SWEDEN, COLLECTION OF HISTORICAL PHOTOGRAPHS, PHOTOGRAPHER UNKNOWN

process in the mind of the beholder, and not an outside object (Fridh, 2017, p. 113).

While modern architectural theory and critique have evinced a strong tendency to understand space as an intangible object delimited by material surfaces, Japanese thinking sees it as dynamic interactions in several dimensions founded on a relational understanding (Pallasmaa, 2012, p. 64). The Japanese concept of ma 間 points to a state in which space and time are undifferentiated, described as continuum over space and time or the emptiness contained by the walls rather than space as a repository.[35] This emptiness or ma is constantly undergoing transformation as a result of the layout of physical elements that offer a variety of uses (Thompson, 2015, pp. 120–21).

35 See the different definitions of ma by Japanese architect Arata Isozaki, and how its meaning has been expanded since the importation of Western ideas (Isozaki, 2006, p. 94–95, p. 327–28).

Figure 7
Danish farm, Open Air Museum, Lyngby.
PHOTOGRAPH BY THE AUTHOR, SUMMER 2020

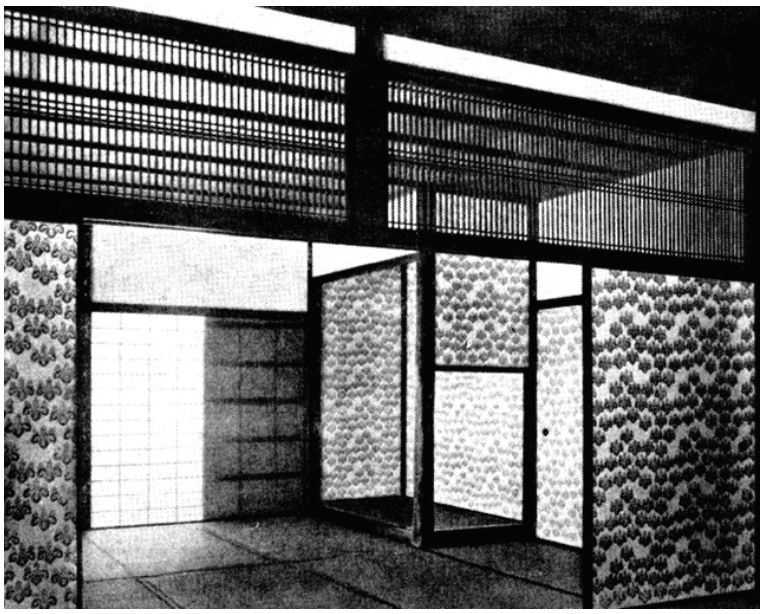


Figure 8
Ko-shoin 書院, Katsura Rikyū 桂離宮 imperial villa (Yoshida, 1952, p. 148).

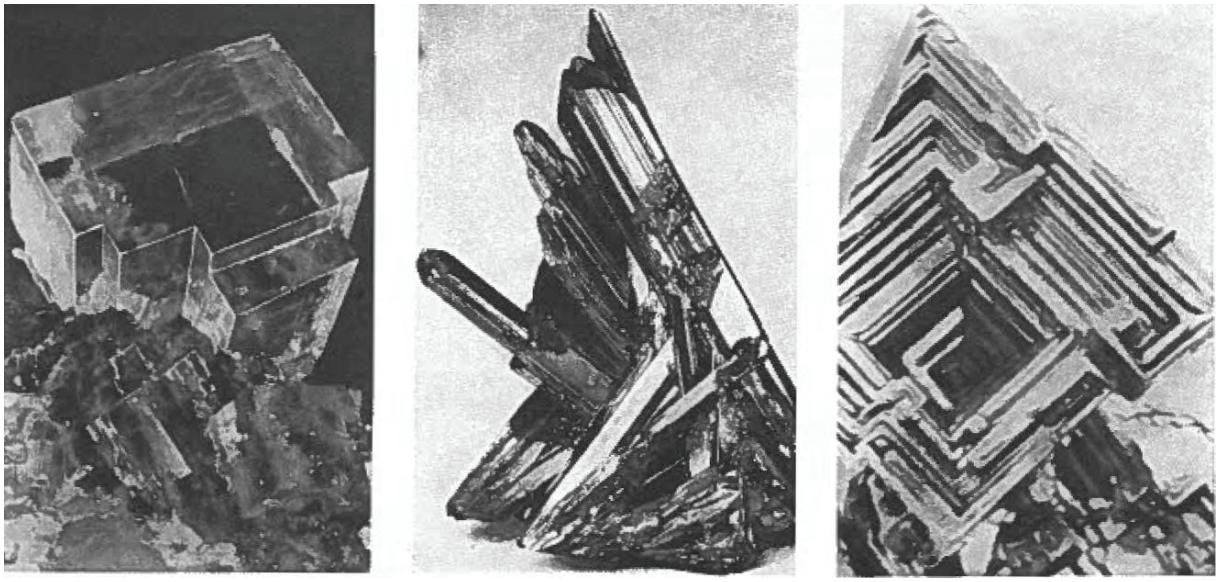
Another concept was its flexibility and the way in which the interior space could be divided and flexibly integrated, and was thus open to a variety of functions. Flexible space and movable furniture facilitate transformation in small houses; space is multifunctional. The structure is a simple exposed skeleton of posts and beams, and almost all the exterior and interior walls are thus movable and non-structural. The design concept has a remarkable clarity. The heavy sculptural roof floats over the transparent enclosure. The living spaces are modest in size, in keeping with human size, which regulates the dimensions of the rooms and the structural order of the building. In addition to these concepts, features of Japanese architecture such as simplicity, delicacy, harmonious standardization, naturalness, abstraction, additive architecture, and skilful workmanship were of particular interest for modern Danish architects. The books on the Japanese house referred to above had already drawn attention to the relationship between interior and exterior, house and garden, and house and undomesticated nature (Balslev Jørgensen, 1997, p. 11).

Post-War Case Studies

Danish architect Jørn Utzon was a pioneer in the search for an architecture shaped by a deep feeling for nature. His architectural work was engendered in large measures by natural forces (Frampton, 1995, p. 250) and informed by diversity of human cultures. He, along with Norwegian architect Arne Korsmo, shared a common interest in nature's logical forms and structures (figs. 9, 10, 11). They understood that everything in nature is constantly undergoing change and evolution and that this principle could be extended to every architectural work. Architecture should express this growth and change. They expressed a desire for an architectural design that would serve as a setting for human life, based on humankind's original architectural sensibility (Lund, 2008, p. 100). In a revealing manifesto "The Innermost Being of Architecture" (1948) (Weston, 2002, pp. 10-11), Utzon stated what explains his later "additive architecture" approach (Utzon, 1970).

The true innermost being of architecture can be compared with that of nature's seed, and something of the inevitability of nature's principle of growth ought to be a fundamental concept in architecture, Utzon (Weston, 2002, p. 23).

But this flourishing of architecture in Denmark resulted in different and varied coexisting approaches that complete a collection of inspiring architectural designs beyond the most internationally renowned ones.



Figures 9, 10, 11
Photos of mineral formations (Faber & Utzon, 1947, p. 67). Utzon and Danish architect Tobias Faber wrote their first manifesto in the form of the article "Tenser i Nutidens Arkitektur" (Tendencies in Present-Day Architecture). They published twenty-eight images evidencing their interests in international vernacular buildings and natural formations, among others.

Niels Bohr Guesthouse

Movement is one of the conditions for our sense of what our world is like and who we are. A great deal of our perceptual knowledge comes from movement, both our bodily motions and our interactions with moving objects (Johnson, 2007, p. 19).

The guesthouse designed by Danish architect and Professor at the Academy Vilhelm Wohlert (1957) for the winner of the Nobel Prize in Physics Niels Bohr represents an example of the movement of life (fig. 12).

Wohlert designed a detached architectural piece raised above ground level so as to preserve the open space of the surrounding forest. Guests reach the building through the woods after departing from the main house. The abstract wooden box is used seasonally, can be closed in the cold Danish winters, and be progressively opened during the warmer seasons by means of a flexible system. It is an organic manifestation that has the capacity to gradually transform itself via the different positions of its layers according to natural processes such as variations in daylight or temperature (García Sánchez, 2015). The choice of black and white for architectural elements provides a deliberate foil to the changing colours of nature, underscoring the passage of the seasons. These have been identified as natural patterns and processes, as biophilic design resources. Furthermore, the two contrasting colours contribute to increasing the intensity of nature's presence.

The terrace, which evokes an elevated veranda or Japanese engawa 縁側, is a delicate, freely open platform with a dual character. It is an extension of the interior space or an extension of the forest, a transitory space. This space acts as a buffer between indoors and outdoors and provides users

with a strong connection to the natural surroundings through different senses, such as experiencing the sound of the birds, the caress of the breeze, or the smell and sound of raindrops.

Moreover, it serves a contemplative function typical of the Eastern tradition, becoming an exciting place of exchange between nature and human activity. Large shutters, which bring to mind the Japanese shitomido 蔀戸, keep out both light and inclement weather, and enable the building to be completely sealed for reasons of security and privacy (fig. 15). Wohlert had not yet visited Japan, but he was familiar with Japanese architecture through the references mentioned. The inspiration from the East was a constant in his work, as Balslev Jørgensen argued (Balslev Jørgensen, 2004, p. 79).

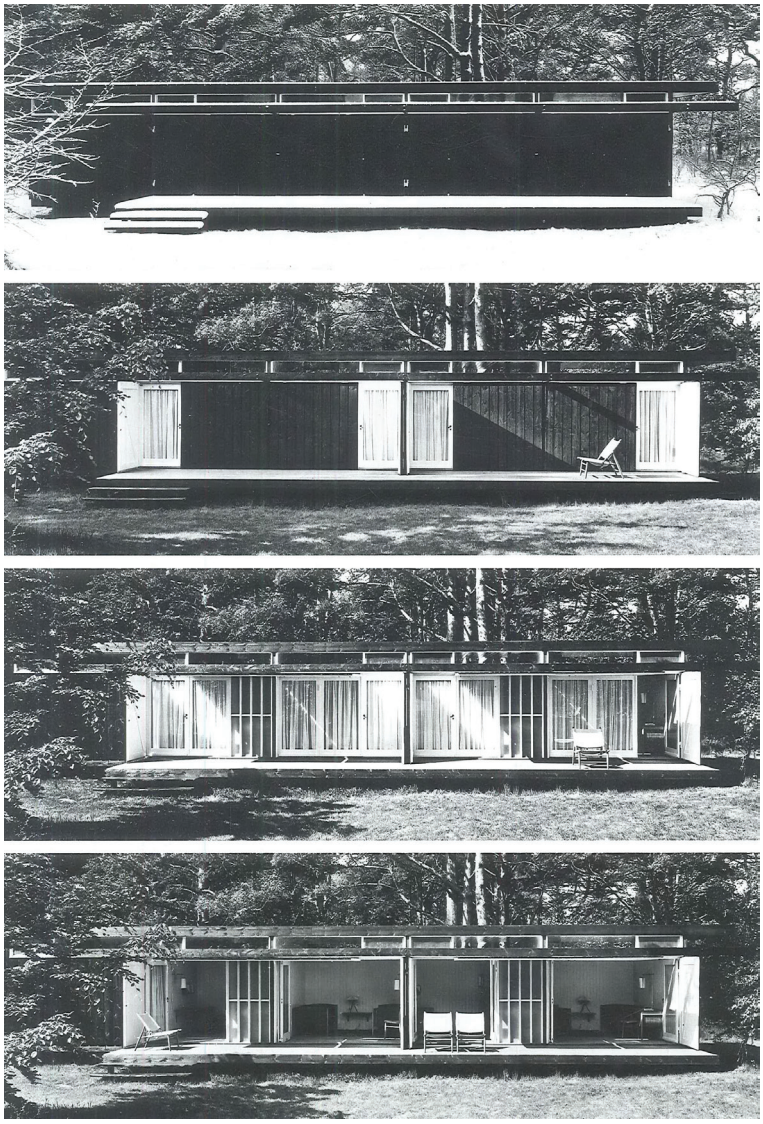


Figure 12
Historical picture of the guesthouse in different seasons.
PHOTOGRAPH BY JESPER HØM (SHERIDAN, 2014, P. 56).

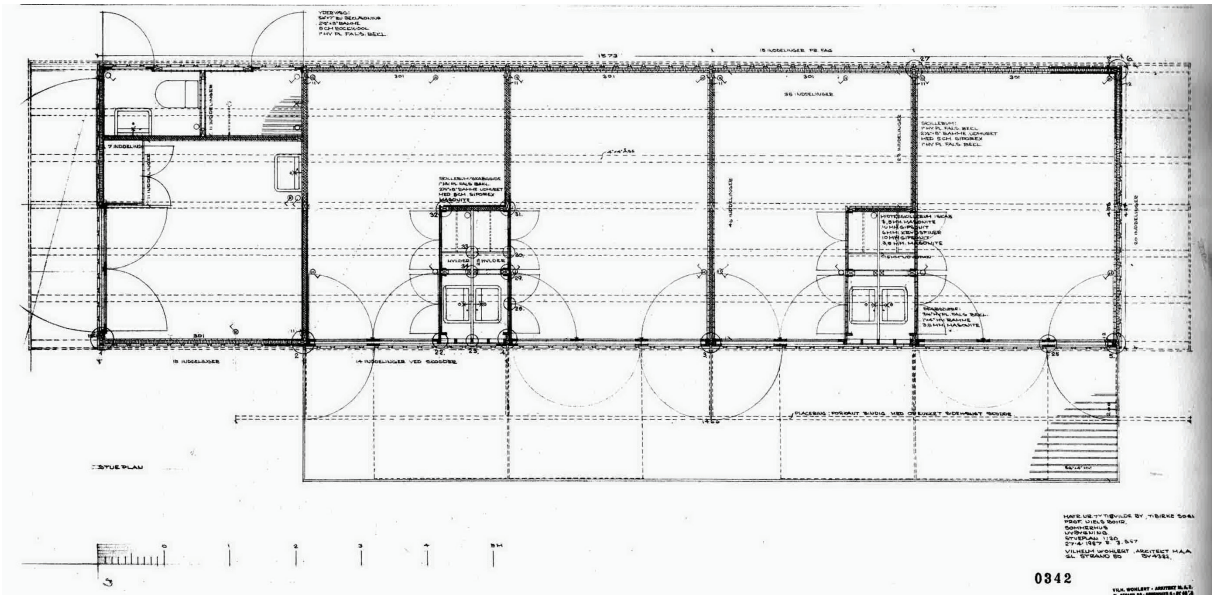


Figure 13
Original drawings: layout of the guesthouse (Pardey, 2007, p. 26).

Figure 14
Layout of the module that orders the guesthouse, by the author.

What is embodied is the approach of the Japanese concept of wabi-sabi 侘寂 beauty, which refers to that imperfect and incomplete non-permanent beauty associated with humble and modest objects – the beauty of conventional things. A beauty that is also based on its usefulness, as expressed by the Danish term brugkunst – the art of creating an object. The modular framework of the anonymous Danish tradition of building with timber is manifested (figs. 13, 14). In its efficient use of materials, the building displays the elegant economy found in nature. The simple module of 1:2, which orders every constructive element and merges all the parts into a whole fitted to man's measurements, comes

from Kaare Klint's lessons at the Academy, but traditional Japanese architecture is also behind Wohlert's work. The size of the traditional Japanese room and house is regulated by the number of tatami mats – which dimensions are linked to human body measurements at a ratio of 1:2 – a room contains. Additionally, it determines the dimensions of the *bay timber used in the room, the ken* **間**, according to a system known as kiwarijutsu **木割術**. The key to its aesthetic effect is the proportionality of its parts, its harmony and balance with its natural surroundings (Kellert et al., 2008, pp. 10–14), which convey serenity: a biophilic stimuli.

Its interior space extends out through the openings, flowing out towards the woods (figs. 16, 17, 18). It brings up the idea stated by Greek philosopher Heraclitus "ta panta rhei", or everything flows (Ballantyne & Smith, 2012), which is linked to the natural world in constant flux and impermanence.

Figure 15
寿月観 Jugetsukan, 修学院離宮 Shugakuin Imperial Villa, Kyoto.
PHOTOGRAPH BY THE AUTHOR, FALL 2022

Figure 16
Photograph of the guesthouse by the author, spring 2022.

Figure 17
Photograph of the guesthouse by the author, spring 2022.

Figure 18
Photograph of the guesthouse by the author, spring 2022.

Life is intimately and inextricably linked to movement. The experience of architecture takes place through the precognitive activation of embodied mirroring mechanisms involved in the simulation of actions and corporeal sensations (Freedberg & Gallese, 2007). This experience links users to life and the movement of nature and encompasses reflections on how they are attuned to natural light and its changing cycles, which regulate their body clock.[36] The guesthouse is an outstanding example of biophilic design, where the building alludes to the constant change and evolution of the natural world. It embraces the temporality and changeability of nature while emphasizing the intrinsic connection between the human body and the environment. Furthermore, its emptiness is constantly transformed to offer a variety of uses. The sensory variability associated with the transformation of the guesthouse is a biophilic attribute (Kellert et al., 2008, p. 9). This brings to mind Asplund's claim in his lecture in Stockholm in 1931 (Asplund, 2001), which concerned movement,

36 The body clock or circadian rhythm refers to the physical, mental, and behavioural changes that occur in most living things over a twenty-four-hour cycle, regulated primarily by the light or darkness of the environment.

change, adaptation to varying circumstances, and values that might represent the new architecture's long-awaited reconnection with nature.

The Louisiana Museum of Modern Art

Our sensorimotor capacities through our bodily movement are key to understanding how things and experiences become meaningful to us (Johnson, 2007, p. 19).

The Louisiana Museum (1958) in Humlebæk, designed by Danish architects and Professors at the Academy Vilhelm Wohlert and Jørgen Bo, offers a global experience of art, landscape, and architecture. Carefully tailored to its setting, it engages visitors with the most distinctive features of the place and its landscape in a unique way. The museum, conceived to interact with the artworks as they were installed in a domestic space – in terms of scale, materials, and the incidence of daylight – and expanded over the years, has grown and spread out like a living organism, opening itself up and interacting with the natural environment (fig. 19).

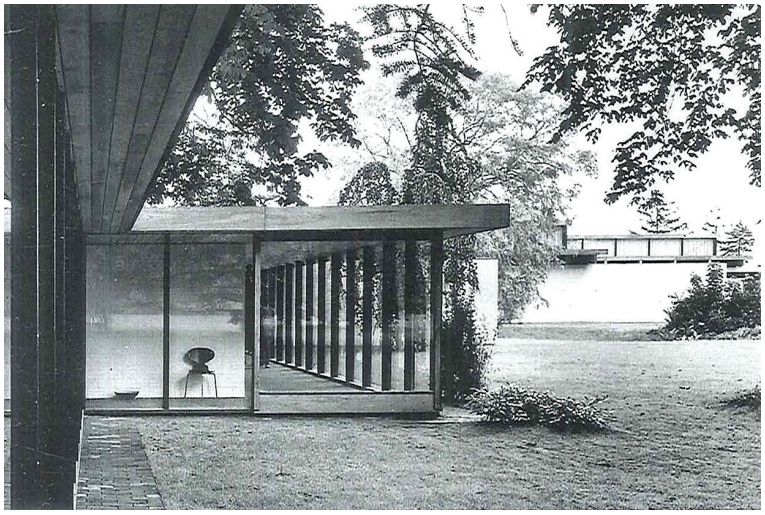


Figure 19
Historical picture of the North Wing of the Louisiana Museum.
PHOTOGRAPH BY JONES (PARDEY, 2007, P. 63).

In the Louisiana Museum galleries (1958), visitors perceive spaces and works of art by moving through the space, like experiences unfolding in time, rather than viewing them from a fixed vantage point (Leatherbarrow, 2021, pp. 101–22). The asymmetrical, winding path establishes a proportionally increasing rhythm, combining dynamic and still spaces, to choreograph the sequence of visitors' movements (fig. 20). The alternation of opaque and transparent enclosures contributes to their rhythmic sensory experience. Through the creation of an interesting environment in a limited space, visitors lose their usual sense of speed. The itinerary supplies surprises at every corner turned, such as an isolated tree or a strategically-placed freestanding work of art. An analogy can be drawn

between these design resources and the approach to the traditional Japanese tea house, where participants in the tea ceremony must follow a winding path laid out for a stroll through the Japanese garden in order to reach the hidden building (fig. 21). The surrounding landscape reveals its composition slowly, in stages, so as to release visitors' mental thoughts and prepare them for the experience of the ceremony. In Louisiana, visitors are gradually prepared for the ceremony of a symbiosis between human, art, and nature. The culmination of this experience is the contemplation of the Sound. The navigability of the natural landscape, enhanced by the centrally perceived focal scene, the view of the Sound, facilitates orientation and way-finding. At the same time, the guiding of the gaze towards the horizon gives a sense of freedom and infinite connection with the Swedish coast.

The connection with nature and a variety of landscapes provides a palette of colours and textures that changes with the seasons and weather conditions, and exerts a psychological influence and a restorative effect on visitors. Rhythmic interaction supported by daylight and artificial light sources, along with other sorts of movements in the building, evokes an incarnation of nature's pulse, analogous to the Japanese understanding that life in nature is inherently rhythmic (García Sánchez, 2015, pp. 168–69). In Japanese culture "the sense of change" also has to do with the essence of the representation of life, and with "cycles" as a vision of time that establishes itself and continues (Racionero, 2006, p. 55).[37] Louisiana has as many moods as there are moments in time. Never will a single day be like any other. The museum represents a clear example of how architecture emancipates its visitors to experience the slow and healing flow of time and responds to their search for a meaningful place (fig. 22).

The museum exemplifies an architecture of boundaries, where a horizontal spatial flow is set between its diverse spaces, linked to the natural world's constant flux and contributing to experiencing the interior as part of the natural setting. The low height of the flat-roofed galleries, fitted to human height, and the position of the visitors on the same level as the outside surface, enhances the connection with the garden owing to the special effect of compression and expansion of the space via the transparency of the glass (figs. 23, 24). Furthermore, visitors' constant movement is also part of this state of flux, a merging of human and nature, bringing back the unitary Japanese concept of nature and culture, seibutsu no sekai and fudō. In addition, the "architectonic ascetism" of Louisiana that Wohlert and Bo refer to (Brawne, 1993, p. 8) reflects their pursuit of refinement through restraint and the elimination of unnecessary elements that distract from the experience of the place; strategies that emphasize the connection with nature as well.

37 The design of the Louisiana galleries clearly expresses the influence of traditional Japanese architecture. This contradicts what author Michael Sheridan argues in his doctoral thesis A Qualified Utopia: The Work of Jørgen Bo and Vilhelm Wohlert at the Louisiana Museum of Modern Art, recently defended at the Royal Danish Academy Architecture Design Conservation, in which he denies any Japanese influence on their design (Sheridan, 2023, p. 81).

Figure 20
Louisiana Museum layout (1958).
ORIGINAL DRAWING, DANISH NATIONAL ART LIBRARY, COLLECTION OF ARCHITECTURAL DRAWINGS.

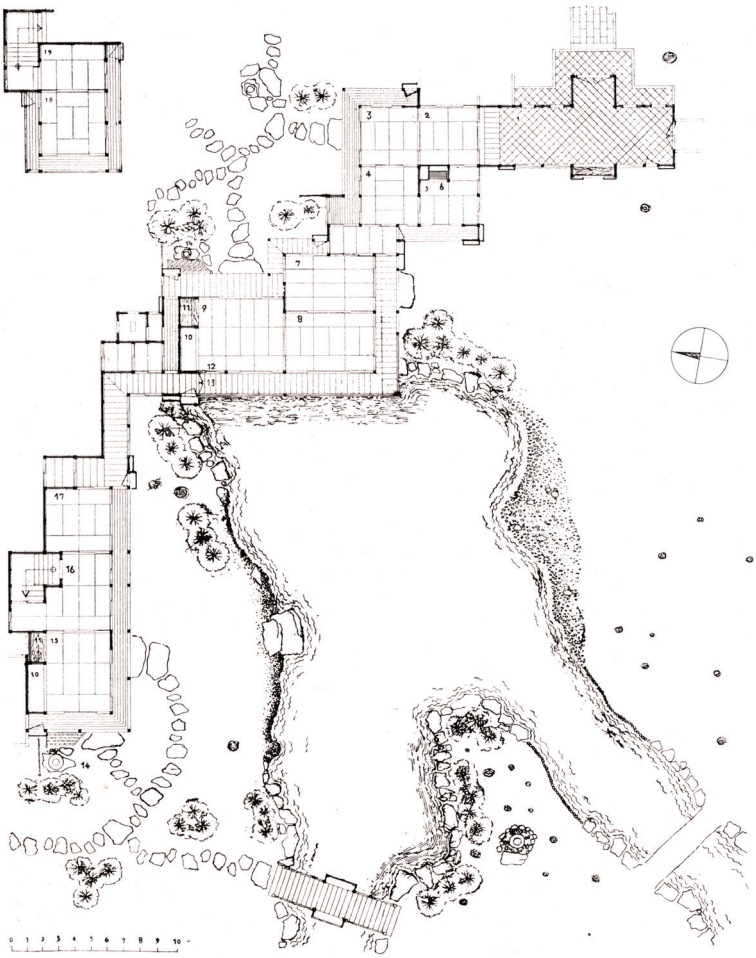


Figure 21
Illustration of Rins-hun-kaku 臨春閣 in Yokohama (Yoshida, 1952, p. 140)

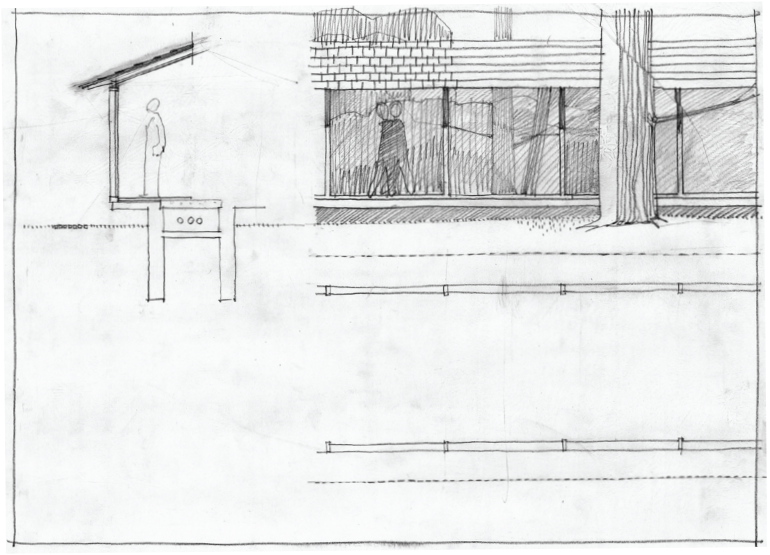


Figure 22
The illustration shows a preliminary study of the Louisiana Museum galleries section, which is designed with a raised floor and a sloping roof, an extension that calls to mind a Japanese eave o noki 軒. The decision to ground visitors in the galleries on the same level as the outdoors surface and to build a flat roof to give them a feeling of infinite extension towards the garden was carefully considered. The architecture is thus adjusted to the human scale, conveying serenity.

Figure 23
Louisiana Museum's galleries.
PHOTOGRAPH BY THE AUTHOR, FALL 2020

Figure 24
Louisiana Museum's galleries.
PHOTOGRAPH BY THE AUTHOR, FALL 2020

"Mystery", a biophilic design pattern associated with incomplete experiences of wonder and discovery, is strongly felt at Louisiana. Professor Keller explained how nature's aesthetic appeal enhances humans' imaginative capacity, prompting them to explore, discover, and imagine worlds of limitless possibilities (Kellert, 2012, p. 14). This is also related to the way in which an aesthetic experience is often provoked by particularly moving events, which become memorable and at times an apparent part of humans' identity, and consequently lure them to a particular place (Kellert, 2012, p. 14). This thus makes Louisiana a prominent example of human-nature interaction through architecture.

Karen and Ebbe Clemmensen Study-House

Nature is to be understood as the surrounding world. The nature with its forms, colours and spaces, is the place where our knowledge comes from, and therefore also what we first have to pay attention to for training of our eye and a development of our record of mental impressions and our emotional response (Sørensen, 1957, p. 169).

Danish architects Karen Clemmensen and her husband, Professor Ebbe Clemmensen, showed a delicate sensitivity to the character of the place in their study-house in Gentofte (1954). They had been living in Stockholm, where they were in close contact with Asplund's work and shared his humanistic approach and concern for the users of buildings. The project is a unique expression of their reading of the site, where the intimate union between the interior space and the garden arises from the creative use of resources and the selection of materials (fig. 25).

Figure 25
Historical picture of Karen and Ebbe Clemmensen's study-house, south elevation from the garden.
PHOTOGRAPH FROM THE CLEMMENSEN COLLECTION, DANISH NATIONAL ART LIBRARY, COLLECTION OF HISTORICAL PICTURES.

To achieve the flexibility they were looking for, they arranged three independent architectural pieces in an informal way that brings to mind the free composition of the traditional Japanese house highlighted by Balslev Jørgensen (Balslev Jørgensen, 2004, p. 53). At the same time, the building manifests some of the lessons of Asplund's iconic summer house in Stennäs (1937) as well. The irregular lie of the land plays a pivotal role. The three architectural bodies are rotated, embracing the garden and the curves of the landscape. Positioned asymmetrically, they are adapted to the irregular shape of the plot by unfolding on four levels that echo the gentle gradient of the land. The interior thus becomes part of the garden's construction, enriching the experience of the natural scenery and flowing with the expression of the site as a whole. The building reinforces the sequence of the steep garden, whose inclination runs down to a marsh (fig. 26). The distinctly organic rhythmic displacement of the different architectural pieces, one over the other, manifests a strong connection with the irregular topography, and, therefore, with the earth and nature.

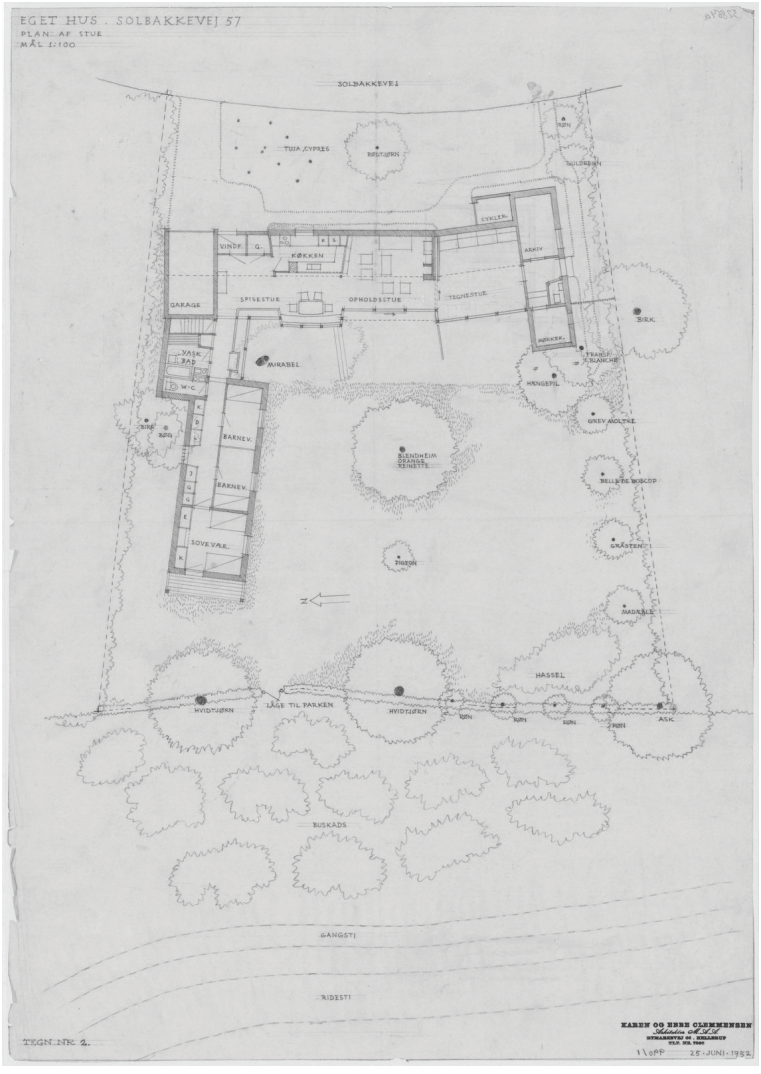


Figure 26
Original drawing of Karen and Ebbe Clemmensen's study-house and garden layout (June 1952), in which each plant species and its location is defined (18 August 1955).
DANISH NATIONAL ART LIBRARY, COLLECTION OF ARCHITECTURAL DRAWINGS.

The particular focus on the relationship between the interior and exterior by means of scale, orientation, and views responds to a thoughtful study (fig. 27). Nature transformations and its processes such as seasonal and temporal changes over the four seasons of the year are extensively perceived in every room, thus increasing the connection with the cycles of life.[38] Naturally growing deciduous trees, including fruit trees, are key to this experience. This is particularly noteworthy in the living area, where physical structures of dynamic relations take place in different dimensions. The arrangement of the building in this area facilitates a close relationship between the domestic space and the garden, which become integral parts of each other. The living space is experienced as a continuation of the exterior and is flooded with shifting daylight. The interior space is not just an immaterial object defined by material surfaces, but the result of dynamic interactions, coming close to the concept of "infinite space". Like in the traditional Japanese house, the perception of space is controlled by the flooring. The use of a single and continuous flooring material – without joints – and the absence of isolated heating elements contribute to horizontal flow in the space, cementing interaction. The smooth horizontal displacement of the sliding door or fusuma 襖 allows for the transformation of the architecture studio and its merging with daily life. It is then that the depth of the interior space empha-

38 See, for instance, Kellert et al. (2008), p. 3.

Figure 27
Historical picture of Karen and Ebbe Clemmensen's study-house and garden taken from the interior.
PHOTOGRAPH FROM THE CLEMMENSEN COLLECTION, DANISH NATIONAL ART LIBRARY, COLLECTION OF HISTORICAL PICTURES.

sizes the sense of spatial fluidity. These design resources, along with the parallel lines of the ceiling pattern, result in an effect of horizontal plane continuity, underscoring the flowing character and connectedness with the garden (figs. 28, 29). This spatial flow leads the residents' gaze outwards into the garden, guiding them towards imaginative experiences of nature.

The skilful articulation of the space in combination with the conscious choice of inexpensive natural materials and variety of soft colours continues the rhythmical order that can be found in nature. The carefully selected and balanced[39] retinal impressions follow an abstract pattern that intentionally echoes the subtle colour variations of the natural setting and blends chromatically into the colours of nature. This evokes the renowned blue-and-white chequered pattern at the Shōkintei 松琴亭,[40], the most important tea house at the Katsura Rikyū 桂離宮 imperial villa in Kyoto.

39 They were selected with the participation of Danish painter Lisbeth Andersen.

40 Shōkin means the sound of a koto (Japanese harp) and the whistle of the wind passing through pine trees.

Figure 28
Picture of Karen and Ebbe Clemmensen's study-house unfurnished. The area above the door is not partitioned, facilitating its airiness and the circulation, as in the sliding door in the picture below.
PHOTOGRAPH BY THE AUTHOR, FALL 2021.

Figure 29
The Shōkintei 松琴亭 tea house, Katsura Rikyū 桂離宮 imperial villa, Kyoto.
PHOTOGRAPH BY THE AUTHOR, FALL 2022.

The interior space evokes Japanese beauty or yohaku no bi 余白の美, a term that refers to the beauty of empty space or Japanese ma, which is associated with silence and lack of emotion. The emptiness of this space and its minimalism encourage contemplation of nature and lead to meditation, emptying the mind, a principle of the tea ceremony that offers a restorative effect.

The unfinished wooden ceiling and the large hipped roof, which descends to fit the human scale, give rise to an unaffected and simple atmosphere (fig. 30). By following the process of reduction, the focus of the vision becomes more concentrated. Additionally, the irregular spaces are revealed through movement. Different routes of exploration are available to the dwellers, which comprises an example of Asplund's sense of architectural "promenade" or "promenade architecturale" (López Peláez, 1990).[41] This facilitates the dwellers' personal experience of the house, while simultaneously offering a possibility to exercise one's own free will, fostering a sense of freedom: a biophilic response (Kellert et al., 2008, p. 4). In their study-house, the Clemmensens thus intentionally displayed an original and complete set of human-nature connecting resources that can inform biophilic design strategies.

41 Spanish Emeritus Professor Jose Manuel López-Peláez emphasizes the different routes offered by Asplund's projects, which create a network of relationships between their different parts (Peláez, 1990, p. 159).

Figure 30
Picture of Karen and Ebbe Clemmensen's study-house, from the studio.
PHOTOGRAPH BY THE AUTHOR, FALL 2021.

Erik Christian Sørensen Study-House

The first thing noted when watching nature is probably extension (Sørensen, 1957, p. 169).

The influential study-house in Charlottenlund (1955) of Danish Architect and Professor at the Academy Erik Christian Sørensen is not only a personal expression of modern architecture. Guided by the principle of growth, the project provides a model of asymmetrical organic architecture in which geometric order allows for natural variation, joining the different parts into a whole (Sheridan, 2014, p.160) (fig. 31).

Figure 31
Historical picture of Erik Christian Sørensen's study-house (1955), south elevation from the garden.
PHOTOGRAPH BY KELD HELMER-PETERSEN, DANISH NATIONAL ART LIBRARY, COLLECTION OF HISTORICAL PICTURES.

The building affects a flexible openness through its modular construction and display of transparencies and contrasting structural elements. Besides the architecture from California, he was specifically inspired by the floorplan of Mies van de Rohe's House with Three Courts (1934), but also by his vision of an unbounded, free-flowing space that extended itself. It is remarkable how, as opposed to other detached houses that he designed, Sørensen here balanced order with variation and used the grid as a guide rather than an unyielding diagram. In line with Japanese conception, the incomplete is regarded as part of the fluid process of life.

The structure of the building does not adhere to a rigid grid, but instead has deviations, missing columns, and subtle irregularities that give the space a casual character, showing Sørensen's commitment to the human experience (Sheridan, 2014, p. 169). It evokes the simple exposed post-and-beam skeleton of the Japanese house, but also the traditional half-timbered Danish house, characterized by rhythm and clarity of order (figs. 32, 33, 34).

The elegant use of wood as the predominant building material, a material procured naturally from the site, along with the extensive display of transparency and the blurring of limits, enhances the feeling of the interior space extending towards the garden. The continuation of the roof beams overhead links all the parts of the building and relates to the natural setting, the interior and the exterior, inhabited space and nature, everyday life and the natural world, thus emphasizing the dynamic interactions of the space, supported by the interplay of daylight. Various skylights provide an additional connection with the sky and its different variations. The predominance of the horizontal plane provides a strong connection with the earth, which offers order and security: a biophilic response.

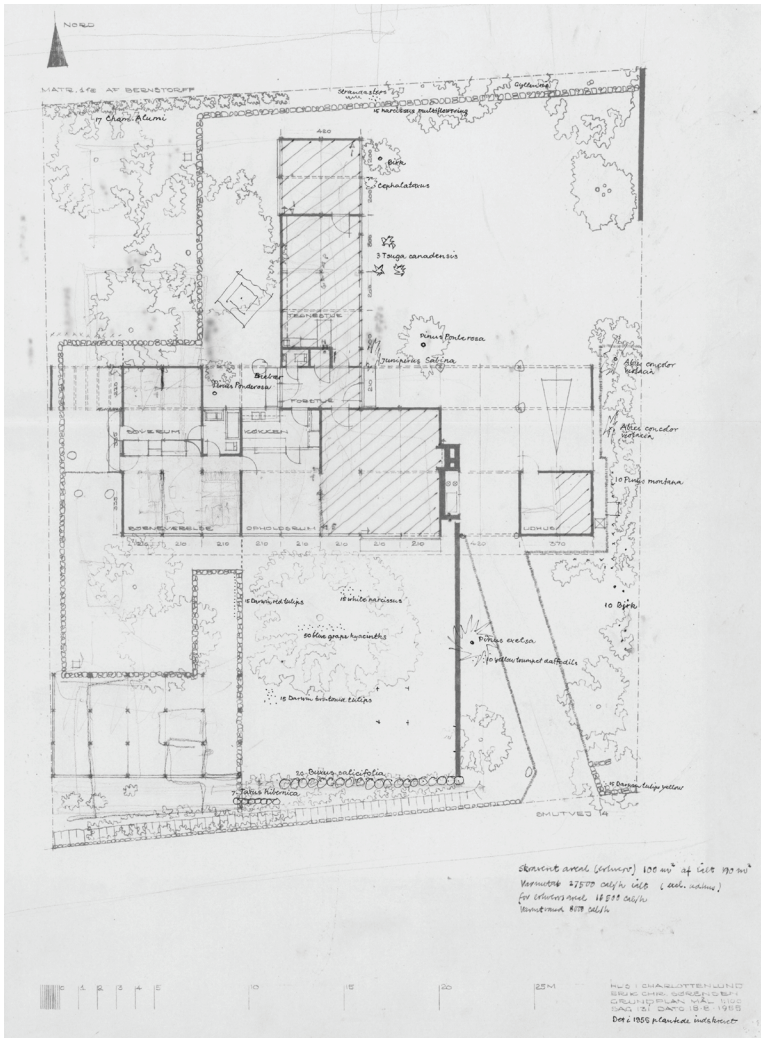


Figure 32
Original preliminary study of Erik Christian Sørensen's study-house and garden layout, in which each plant species and its location is defined (18 August 1955).
DANISH NATIONAL ART LIBRARY, COLLECTION OF ARCHITECTURAL DRAWINGS.

Figure 33
Historical picture of Erik Christian Sørensen's study-house (1955), living room interior in winter.
PHOTOGRAPH BY KELD HELMER-PETERSEN, DANISH NATIONAL ART LIBRARY, COLLECTION OF HISTORICAL PICTURES.

Figure 34
Tea house Shoiken 笑意軒, Katsura Rikyū 桂離宮 imperial villa, Kyoto.
PHOTOGRAPH BY THE AUTHOR, SPRING 2016.

Through its geometry, the exposed timber framework reveals its three dimensions, gives scale and orientation. In addition, the clear order and understanding of its tectonic structure, of how each of the building components has been put together, conveys a sense of gravity and security, and links the observer to earth, from which life supposedly springs, and, therefore, to nature. We are familiar with the force of gravity as a result of our own physical experience and read the weight and balance of a building in gravitational terms. Moreover, and this is crucial to understanding where the benefit of biophilic design comes from, we assess the beauty of an architectural piece because it mirrors the "basic conditions of organic life" (Wölfflin & Selzer, 2016, p. 20).

The interior space is experienced as a continuous means, in which the repeated bays of the framework are covered with a white gypsum board ceiling, which contrasts with the blackness of the structural elements

Figure 35
Erik Christian Sørensen's study-house (1955) living room interior.
PHOTOGRAPH BY THE AUTHOR, FALL 2020.

and contributes to the perceiving of their repetitive order. Outdoors, visible beam-ends produce a close, almost organic coherence. The contrast of the black coating on the timber makes the framework very abstract, but small cracks and knots, aspects that in a Western context would be called its imperfections, show that it is a natural material (fig. 35). These imperfections are signs of life that resonate, "traces of human life". Sørensen combined a modern conception of the space with a poetic one that reminds us that it is the work of a craftsman and is therefore linked to humans actions (fig. 36). He created a building cross-design language of particular spatial complexity that departs from certain rules and can be used in future buildings to display an open and organic relationship to the surroundings, and thus nature-connecting resources, or biophilic design (Kellert et al., 2008, p. 13).

Figure 36
Erik Christian Sørensen's study-house (1955) living room interior.
PHOTOGRAPH BY THE AUTHOR, FALL 2020.

Conclusions

The buildings presented offer unique biophilic stimuli through their sophisticated and original design expressions, in which transformative processes connect the users to the natural settings and reflect profound and original ways in which humans attach (geographical, cultural, and ecological) meaning to a place and perceive the passing of time. The experience of flow, rhythm, the minimalist space, material restraint, mystery, discovery, freedom, orientation, contrasting and mimicking colours, gravitational forces, incompleteness, and human scale and order can facilitate a connectedness to nature in a harmonious combination that gives rise to a deep sensory relationship with spaces. They enable subjects to interact with architecture and nature, to become part of a more diverse, harmonious, and richer context that reconciles and balances the dynamic relationship between two seemingly contradictory worlds: nature and culture, nature and humans. The ancestral human

desire to feel part of the surrounding nature resonates. These outstanding Danish domestic spaces exemplify how the built environment can serve to celebrate the extraordinary nature of existence, embracing the idea of architecture as a celebration of human existence. In addition, these spaces can sustain both cultural and environmental identities vis-à-vis the anonymizing effects of globalization.

The unfolding of how a positive connection through the interaction of nature and domestic interiors can be achieved is an unfinished chapter. However, this study reveals that a few post-war Danish architects intentionally designed according to various biophilic design principles and offered outstanding strategies for implementing them, even though the term had not yet been coined, which is an important finding. The protagonists were aware of the importance of living in daily contact with nature and of their role, as designers of human scenery, in making this happen.

Additionally, the study provides insights into the impact of traditional Japanese architecture on post-war Danish architecture that contribute to deciphering its complexity. Danish architects did not attempt to copy Japanese motifs, but rather strove to find their own architectural expression for their particular context – in line with the already mentioned teachings of Jensen Klint. On the hand, the study suggests that the enriching appropriation performed via a fruitful interpretation of the Japanese resources and ideas was one of the main drivers of their interest in this Asian culture – which is, however, difficult to confirm as none of them manifested this in their words. Apart from the main analysis, it is worth noting how Balslev Jørgensen's publications provide crucial revelations in this respect. Furthermore, the study acknowledges the important role of figures in the architectural historical panorama who directly or indirectly contributed to it, such as Professors Fisker, Asplund, and Yoshida.

In conclusion, a new understanding of post-war Danish domestic architecture is delivered from a contemporary perspective. These buildings are a source of inspiration whose timeless lessons are still prevalent today. Other post-war domestic buildings in Denmark display an original and prominent connectedness with nature and parallels with the East as well, including: Jørn Utzon's own house in Hellebæk (1952) and Middelboe house in Holte (1955), Kund Friis's study-house in Brabrand (1958), Halldor Gunnløgsson's house in Rungsted (1959), and Erik Korshagen's summerhouse in Rovig (1960). In this context, the awareness of nature is still very much a concern reflected in the work of contemporary architects in Japan, such as practicing architects and Professors: Tadao Ando, Kazuyo Sejima y Ryue Nishizawa (SANAA), Kengo Kuma, Junya Ishigami, Hiroshi Sambuichi, or Sou Fujimoto, but also, to a lesser extent, in Denmark. Studying them from this perspective can shed important

additional light on strategies for implementing biophilic design, with the aim of extending its theory and practice into a new dimension.

The combination of architectural strategies addressed in the study can be replicated in other scenarios according to their context. Some of them are not necessarily dependent on having a direct visual connection to nature. They can thus inform a domestic contemporary building practice in low- but also high-density urban contexts, and can lead to an inclusive biophilic design more broadly, so as to contribute to the implementation of NBS. Nature, with its immense benefits, constitutes an important ally in tackling some of the most important global challenges in profound and meaningful ways. Raising this awareness and importance of nature in the indoor environment could inspire a new respect for the whole natural environment (Sparke, 2021, p. 13). Biophilic design and its values are instrumental for the academic and professional-practice discussions about the discipline of architectural design. They have never been more relevant to redefining the contours of our built environment for decades to come.

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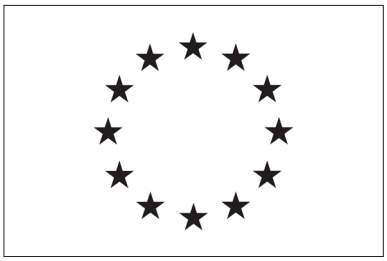

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Other Research Sources

Interviews with:
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Dr Carmen García Sánchez holds a Master's Degree in Architecture (1997) and a Ph.D. in Architectural Design (2016), both from the Universidad Politécnica de Madrid, School of Architecture. She is an experienced practising architect, an affiliated researcher at the Danish National Research Foundation Centre for Privacy Studies, University of Copenhagen, in Copenhagen (since 2024), and an assistant professor at the Universidad Rey Juan Carlos in Madrid (since 2025). In addition, she serves as an external scientific expert and consultant for the European Commission. Dr García Sánchez, author of an acclaimed doctoral thesis on post-war Danish domestic architecture, has recently carried out her study Nature-In as a post-doctoral researcher at The Royal Danish Academy Architecture Design Conservation, Institute of Architecture and Design (2020–2024), after being awarded a Marie Skłodowska-Curie individual research grant from the European Commission. Nature-In provides sustainable practical resources to enhance human contact with nature through the experience of architectural space. She has experience of teaching architectural theory and design, including biophilic design, at various international institutions.