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# Unfolding Utzon: The Nature of Utzon's Approach for Structural Design

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## Abstract

The Danish architect Jørn Utzon's architecture is a fusion of form and structure inspired by nature and the visual universe of different cultures. The organic conception of form is clearly evoked in much of Utzon's architecture following his genesis idea of an "Additive Architecture" founded in his inspiration from nature where he saw that an infinite variety can be generated by a modest number of elements. The paper outlines how Utzon used the repetition of a component as the expedient by which complex geometrical and constructional problems can be rationally solved, as in the case of the shells of the Sydney Opera House.

**Keywords:** Architecture, tectonics, Jørn Utzon, spatial structures, additive architecture.

## 1. Introduction

For many the architecture by Jørn Utzon is synonymous with the design of the Sydney Opera House (1973) that was made a UNESCO World Heritage Site in 2007, being one of the 20th century's most distinctive buildings and one of the most famous concert halls in the world.

*"It stands by itself as one of the indisputable masterpieces of human creativity, not only in the 20th century but in the history of humankind."*

[The UNESCO World Heritage Committee, 2007]

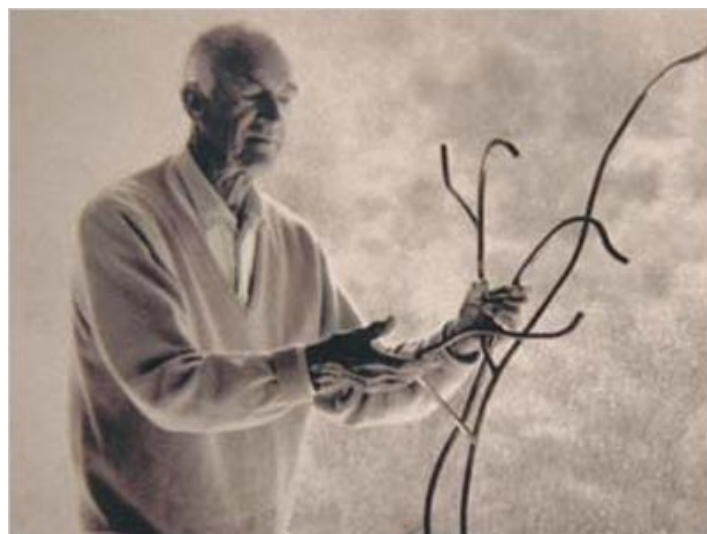


Figure 1: The essence of Danish architect Jørn Utzon's architecture is a fusion of form and structure inspired by nature and the visual universe of other cultures. (Photo: Ole Haupt)

However Utzon's architecture is more profound than the Sydney Opera House. Among others examples his architecture includes the Melli Bank in Tehran, Iran's National Bank (1963) and the National Assembly of Kuwait (1985) as the most finest examples of Utzon's architecture where features of the the traditional bazaar in the Middle East influenced his way of thinking and creating his modern form of architecture.

*"We had the idea of constructing the building around a central hall, a bazaar street, in such a way that all departments met in side roads off the bazaar road, just as we know from the bazaars in the Middle East and North Africa..."*

[Jørn Utzon]



Figure 2: The National Assembly of Kuwait. (Photo: [www.wikipedia.org](http://www.wikipedia.org))

Prior to these projects Utzon designed his own house (1952) in Hellebæk, where he introduced 'the open plan' in Denmark inspired by his studies of Frank Lloyd Wright's houses. Careful consideration was given to the surroundings, especially the environmental factors such as sun, view and shelter from the wind. This one-storey private home project was followed by Utzon's courtyard housing project, the Kingo Houses (1958) in Helsingør, a project with 63 L-shaped houses which can be seen as a prototype for the Fredensborg Houses (1963) consisting of 30 terraced houses with gardens and 47 L-shaped atrium houses form a three-winged estate. The materials chosen for the houses were tiles and wood, traditional Danish materials. Utzon originally called this concept for 'private life' due to the balance between the private space and the public areas organized for community life where – a nordic tradition – which Utzon explained in following quote.

*"A desire for well-being must be fundamental to all architecture if we are to achieve harmony between the spaces we create and the activities to be undertaken in them. This is quite simple and reasonable. It requires an ability to create harmony from all the demands made by the undertaking, an ability to persuade them to grow together to form a new whole – as in nature; nature know of no compromise, it accepts all difficulties, not as difficulties but merely as new factors which with no sign of conflict evolve into a whole."*

[Jørn Utzon]



Figure 3: The Kingo Houses in Helsingør, Denmark. (Photo: [www.wikipedia.org](http://www.wikipedia.org))

Both these two housing projects are based on Utzon's additive approach, starting modestly with one house followed by more houses, taking into account the landscape and its character. Utzon has talked about the layout of the houses as "*flowers on the branch of a cherry tree, each turning towards the sun.*". The application of the additive approach can be seen in many of Utzon's projects besides the housing projects. Examples are found in the proposals for the un-built projects like the Silkeborg Art Museum (1963), the Farum Town Centre (1966) and the proposal for a major sports center in Jeddah (1969). However, the building system, the flexible "Espansiva approach" for low-cost housing only build as a prototype is perhaps the best and most well-known example. In addition to these projects using the additive approach the Bagsværd church (1977) and Paustian's furniture store (1987) should also be mentioned and of course Utzon's own houses Can Lis (1973) and Can Feliz (1994) at Mallorca and the furniture project Utsep (1968).



Figure 4: The furniture project – Utsep.



## 2. Inspiration and philosophy

*"I have benefited greatly from the many hours I have spent with my father. He was a pillar of support for me and my brothers in the many instances when we had to make important decisions in life. For me as an architect it has been ideal to have been attached to a large shipyard, where all trades were represented, and large-scale work was carried out. When I was about to draw the Opera House in Sydney, I was not really worried that I had to convert sketches into curved surfaces towering 60 meters, define them geometrically and have them constructed. As a child I had seen huge ship-hulls. My father helped me construct the large-scale models required. Without any specific agreement he made the wooden models. After a couple of days the delicate forms were in the drawing room"*

[Jørn Utzon]

The theme of nature as a source of inspiration was very much to the fore, when Utzon together with Tobias Faber presented their thinking on architecture at a lecture in Copenhagen. This became the basis for an illustrated article in *Arkitekten* in 1947, entitled "*Tendenser i Nutidens Arkitektur*" - Trends in the Architecture of Today, Faber and Utzon [2], a manifesto, presenting the themes and interests that would become increasingly apparent in later work, Carter et al. [1]. According to Utzon's own personal architectural credo "*The Innermost Being of Architecture*" written in 1948, Utzon states that, "*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*" Weston [5].

*"My laboratory is the beach, the forest, the sea and seashore..."*

[Jørn Utzon]

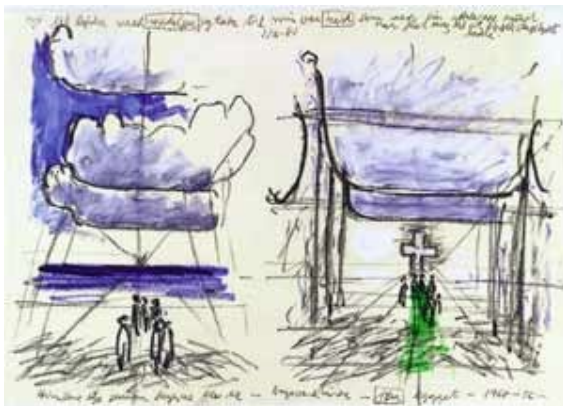


Figure 5: The Bagsværd Community Church by Utzon Architects in Bagsværd, Denmark. (Photo: arcspace.com)

*"Walking in a Danish beech forest is like going through a hall of pillars. This hall of pillars dissolves into branches and into a leafy crown represented by the roof".*

[Jørn Utzon]

The archetypal image of the beech forest was used by Utzon, in several projects and especially it was to serve as the catalyst for his design of the Paustian furniture showroom on the waterfront in the Nordhavn docks of Copenhagen, which opened in 1987. The metaphorical evocation of the birch trees, not only provides the spatial organisation, but also clarity of tectonic structural expression, with triangular gussets between the columns and beams providing lateral stability, Carter et al [3].



Figure 6: The Paustian furniture showroom, Copenhagen. (Photo: arcspace.com)

## 2.1 Additive architecture

Utzon observed the additive approach in Chinese temples whose stacked timber structures are basically identical, differing only with the size of the building. In his "Additive Architecture" manifesto in 1970, Utzon [4], Utzon explains how he saw the phenomenon reflected in a group of deer at the edge of a forest or in the pebbles on a beach, convincing him that buildings should be designed more freely rather than in identical box shapes. Earlier, in 1948, he had expressed the same ideas in an essay titled "The Innermost Being of Architecture" stating: "*Something of the naturalness found in the growth principle in nature ought to be a fundamental idea in works of architecture.*" Utzon [4]

One can say that the Sydney Opera House Project was a "testing place" for Utzon's principles of additive architecture where he explored the synthesis of geometry, modulation and standardized production.. Due to Utzon's awareness on construction, the repetition of a component becomes the expedient by which complex geometrical and constructional problems can be rationally solved, as in the case of the shells of the Sydney Opera House, see Figure 7, and the beams in the National Assembly of Kuwait, see Figure 8. The construction of a complex geometry is simplified and rationalized with a brilliant solution that allowed to employ only a limited set of standard prefabricated components. The combination of prefabricated components in a structural assembly in such a way as to achieve a unified form that while incremental is at once flexible, economic and organic. Conversely, the variation of a component is related to his refusal of reductionist approaches: in his design he aimed to embrace the complexity and the multifarious, therefore a structural component can vary its shape and adapt to the states of stresses.

The application of the additive approach can be seen in many of Utzon's works including the courtyard housing schemes which began with the Kingo Houses (see figure 3), the tiling of the Sydney Opera House and perhaps the best example of all is the proposal for a major sports centre in Jeddah, Saudi Arabia, based on the use of a limited number of repeating elements. These are fine examples of tectonic architecture based on a contextual, functional social poetic elements related to structure and form.

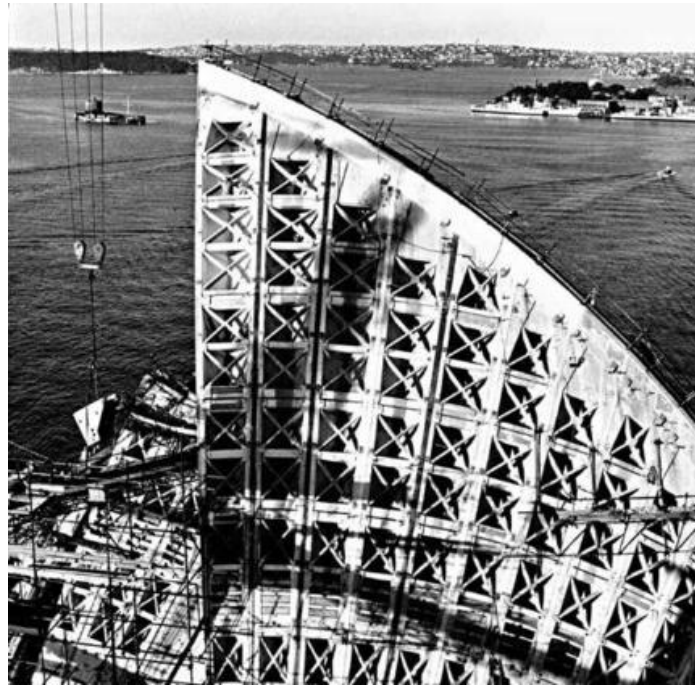


Figure 7: Stage of construction – the sydney opera house. (Photo: Mac Dupain)

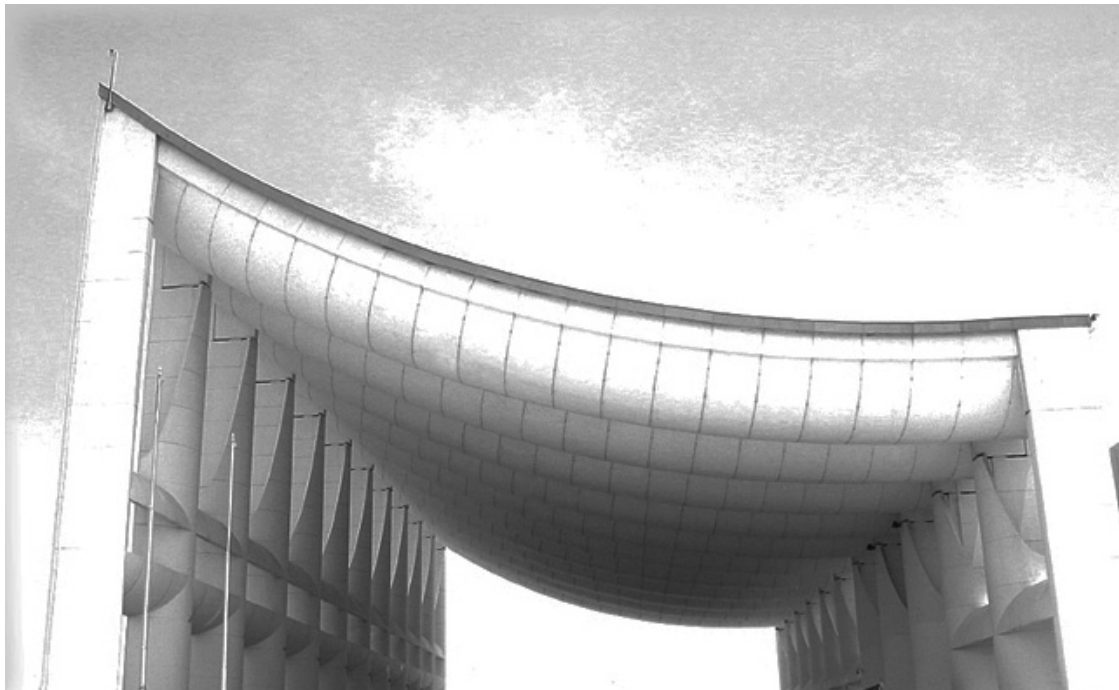


Figure 8: The National Assembly of Kuwait. (Photo: [www.wikipedia.org](http://www.wikipedia.org))

### 3. Conclusion

The present paper has introduced the principles of Jørn Utzon's architecture which is a fusion of form and structure inspired by nature and the visual universe of different cultures. The organic conception of form is clearly evoked in his architecture following his genesis idea of an "Additive Architecture" founded in his inspiration from nature where he saw that an infinite variety can be generated by a modest number of elements. Based on this approach many of Utzon's projects include original approaches to variation and repetition. Due to Utzon's awareness on construction, the repetition of a component becomes the expedient by which complex geometrical and constructional problems can be rationally solved, as in the case of the shells of the Sydney Opera House, the beams in the National Assembly of Kuwait etc. The construction of a complex geometry is simplified and rationalized with a brilliant solution that allowed to employ only a limited set of standard prefabricated components. The combination of prefabricated components in a structural assembly in such a way as to achieve a unified form that while incremental is at once flexible, economic and organic. Conversely, the variation of a component is related to his refusal of reductionist approaches: in his design he aimed to embrace the complexity and the multifarious, therefore a structural component can vary its shape and adapt to the states of stresses. Utzon unfolded also this understanding of additive components in his use of folded plates. For many of Utzon's projects the roof is a variant on the folded-plate structures which fascinated him. Folded-plate structures were not in themselves unusual for the late sixties, however Utzon had an ability to add layers of meaning without adding physically to the minimal structure. Utzon lifted well articulated folded-plate structures from role as an ornament into a modern construction, returning it to the constructive purity of its tectonic origin.

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