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synthesis

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INTRODUCTION

The fact that the world works, that things happen, that matters behave, that space changes, manifest the forces of transformation outside human influence. As architects and designers we are responsible for creating the world and its order, but our understanding of what space really consists of is limited. Our impression of the universe, of modern physics and biology does not yet profoundly influence the way we build

Through this text I will introduce topics regarding the dimension and production of space. The space which we inhabit and experience every day. How the dimension of time is internal to the world² and essential to all parts of creation in the world. How time manifests itself throughout the world and how the world is held together by a wholeness consisting of multiple centers which relate to each other.¹

The problems the world is facing are huge and universal, while we are small and insignificant. In the space and networks surrounding us we might find solutions. Inside the deep geometric reality of order which we hardly understand.

TIME

Time doesn't exist, there is no future or no past, only present. Time is relative, the topic of what time consists of has long been under debate. This section is based on a theory from Carlo Rovelli seven brief lessons on physics, the theory suggests what time is in physics.

Space mostly consists of air. Air itself is atoms moving, atoms are always moving. The atoms of cold air move slowly, while hot air moves more quickly. Heat only moves from hot things to cold, due to the law of probability. As soon as there is heat the future is different from the past.² In cases where heat exchanges do not change, the future behaves like the past. For the motion of the planets in the solar system heat is almost irrelevant, and the motion could in fact happen in reverse. Time is internal to our world, between quantum events that compromise the world and are themselves the source of time.²

Carlo Rovelli states that time is the appearance of heat, and without heat the future behaves like the past. With the appearance of heat the future is different from the past.

We can sense this space, this change of temperature, its freezing cold or its sweating hot, it's a sensation to us, (we take this for granted, it's "just" temperature, but in fact it is the physical space we are surrounded by) now if we try to think of that sensation to understand what time is, time is change, it's the contrast from warm to cold, simple yet crucial for the production of any structure. The time dimension is essential for the production of life.

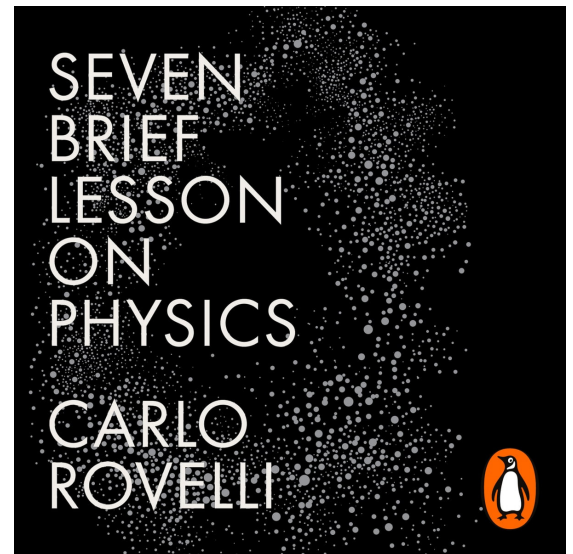


Figure 1



Figure 2

Carlo Rovelli is an Italian born physicist and writer, specializing in the field of quantum gravity. He is one of the founders of the loop quantum gravity theory.

LIFE

In the book "Nature of Order", ~~Cristoffer~~ Alexander suggests that space contains different degrees of life.¹

Life is a quality in space itself and applies to every physical structure of all kinds that take shape in space. The air we breathe, the stones, the grass in the fields, the trees, the concrete which form our buildings all contain life to some degree, we then transform these materials into new structures which also contain life.

The judgment whether an object contains more life than another is a fundamental judgment about the world that occurs in every aspect of our experience of the world around us. We experience the sensation of one thing is more alive than the other, that something is healthier than the other, that something is blooming or that something is decaying. This concept makes us come up with facts about the world, to make observations about space itself.¹

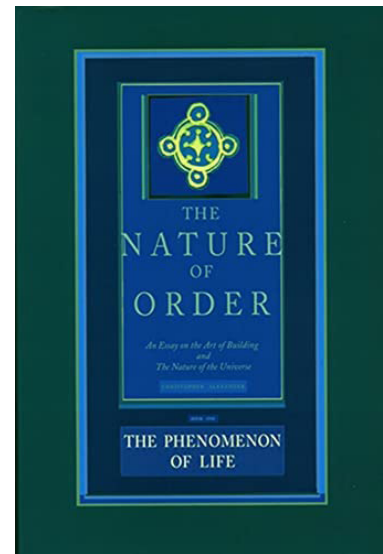


Figure 4



Figure 3

WHOLNESS AND CENTERS

Wholeness is neutral, it simply exists. Throughout almost every place in the world, in every ecosystem, materials, buildings, events and actions, there is some degree of wholeness, a defined system of centers which makes the organization of that part of the world. It exists whether the space is good or bad, alive or lifeless. ¹

The wholeness is made out of what we can refer to as centers, the centers create the wholeness. Centers work as an organized zone of space, it occurs in space, and it forms a zone which corresponds with other parts of space. Centers are made of other centers, its is not a point, not like the center of gravity, but a field of organized force in a part of an object which makes that part exhibit centrality.

Centers are induced within the wholeness, and come from the wholeness itself, because of this its parts are adapted by its size and shape, by their position within the whole. As the parts repeats there is never the exact same repetition, the centers are changed according to their position within the whole. ¹

The stronger a center is, the more impact it will have on others centers. The more it will impact the behavior, motion and organization of the other centers which come under its influence. ¹



Figure 3. Whirlpool



Figure 4. Net

WHOLNESS AND CENTERS



Figure 5. Coral

Cristopffer Alexander sets centers into 4 key idea

1. Centers themselves have life.
2. Centers help one another : the existence and life of one center can intensify the life of another.
3. Centers are made of centers (this is the only way of describing their composition)
4. A structure gets its life according to the density and intensity of centers which have been formed in it.

He states : "these four points, simply as they are, give us the secret of living structure, and of the way life comes from wholeness".

The nature of centers can only be understood reflexively, or recursively.

If we look at a tree, there's multiple centers, the branches, the blossoms, and the petals of the bloom. We observe these centers due to the fact that we can see the whole, the wholeness comes from the way that we interpret the centers : by recognizing that the tree is made from branches. Each individual tree acts as centers which make up the forest.

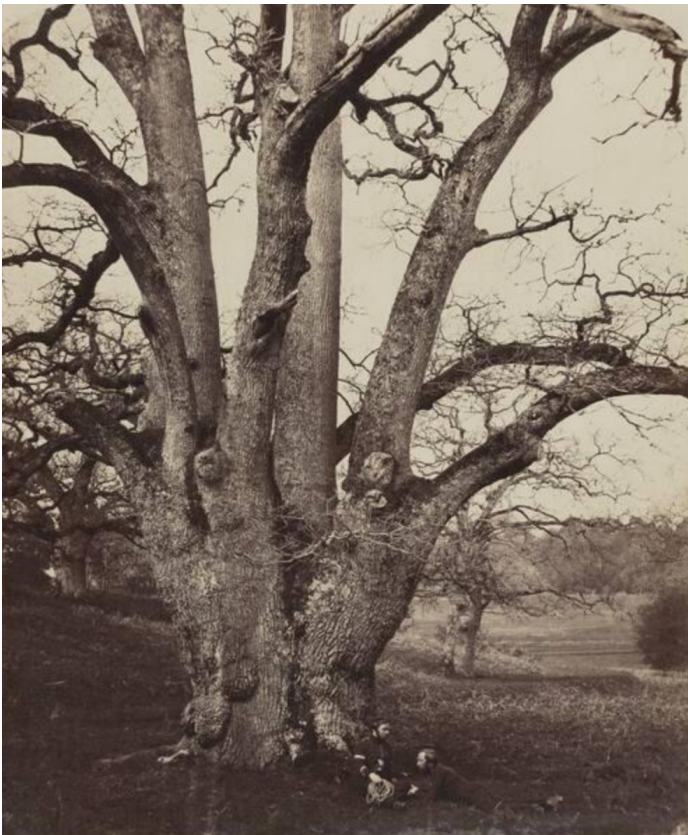


Figure 6. Tree

CONTRAST

Natural systems get their organization and energy from the interaction of opposites.⁴ In biology we see contrast through various concepts such as male and female, night and day, solid and liquid. Life does not take place without differentiation. Unity is created from distinctions. Centers are created of visible opposites, which are intensified when the not center, against which it is opposed, is clarified, and itself becomes a center. For the object to be whole the contrast has to be pronounced. Contrast is most powerful when opposite annihilate each other when they are imposed.

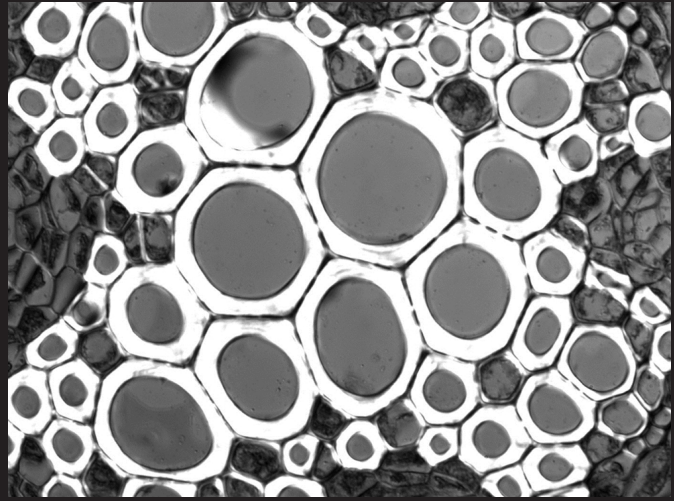


Figure 7. Cell



Figure 8. Waves

ALTERNATING REPETITION

Throughout this section I will use the word repetition and reproduction several times. The topic regards how space expands, and essentially how nature produces its architecture through repetition.

Centers assist each other most effectively by repetition. As mentioned previously: centers intensify each other by repetition.

The repetition that occurs when their life is alternating. There is a distinction between simple and alternating repetition. Simple repetition is when a simple element is repeated over and over again. Alternating repetition uses two elements, both existing as a center in its own right, repeated one after the other. The contrasting elements enliven each other and intensifies the field effect throughout the structure.¹

Alternating repetition occurs in almost every living thing. It can be observed though plants, animals, mountain ranges or waves on water. Repetition occurs because there are a limited number of forms available, the same condition produces the same structure.

Objects that contain life repeats themselves in a special way. There is a rhythm in the repetition, and when a center repeats itself, the rhythm is underlined by an alternating rhythm, where a second system repeats in parallel to the first system. The second system of centers provides a kind of counterpoint or opposing beat which intensifies the first system.



Figure 9. Ocean

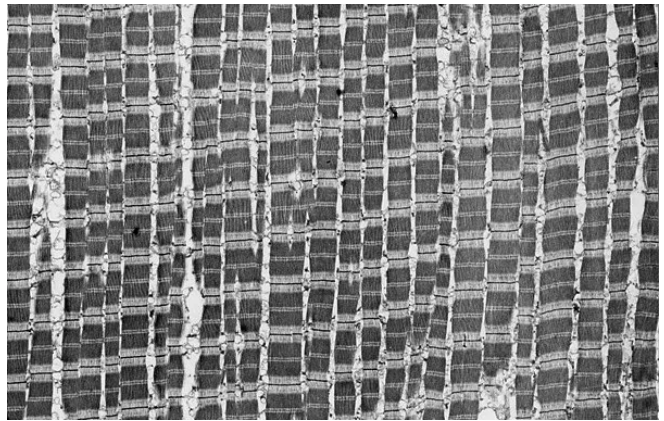


Figure 10. ~~Muscle~~ fiber



Figure 11. Dunes

ALTERNATING REPETITION

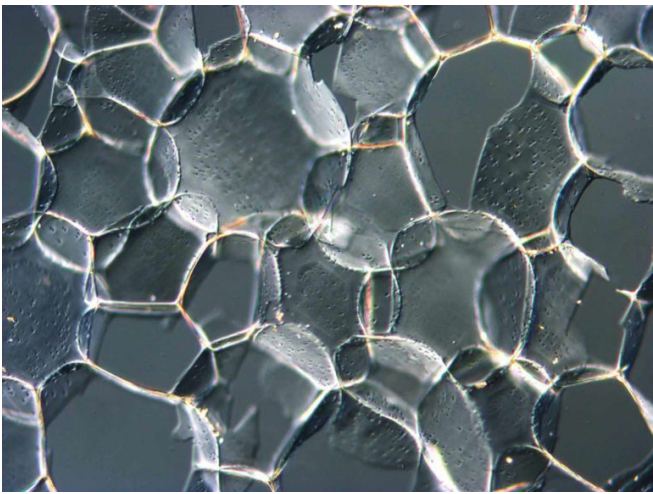


Figure 12. Bubbles

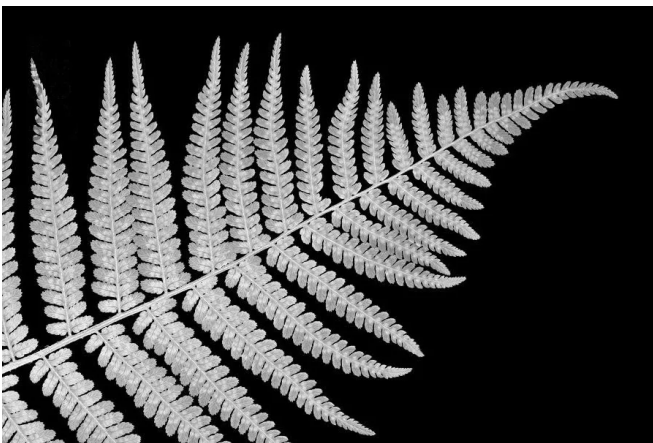


Figure 13. Fern Leaf

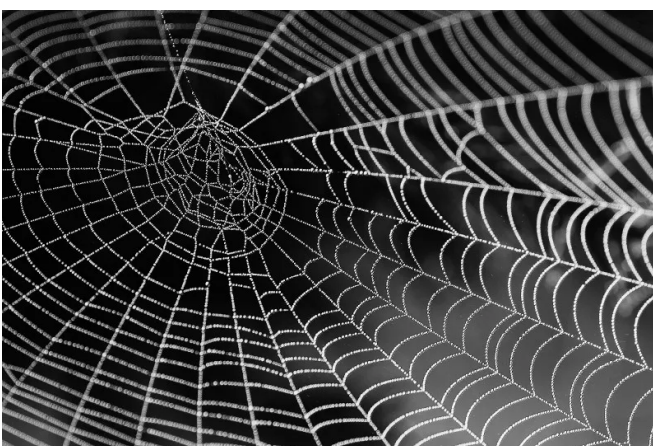


Figure 14. Spider Web

When nature repeats itself it alternates with a second structure, which also repeats. When trees in a forest repeats, so do the patches of undergrowth where more light falls, when its leaves repeat, so do the spaces in between and in effect, the sun shines through and reaches the leaves. The same can be observed with flowers when the petals repeat, so do the sepals which are behind the petals, when the blush of a flower repeats so do the space between the flowers.

When structures are intensified life is often caused by inexact repetition. It's the variation of repetition that is life-giving. As the centers are located in different positions in space, and non identical (modified) there's a subtle variation in the repetition.

There is a deeper aspect of the repetition, more vital than the variation, which concerns the character of the repetition, and the way they are repeated, there is a satisfying repetition of centers, and there is a banal repetition of elements. When both the primary and secondary centers are alive, alternation emerges. The difference between repetition that contains life, and the ones which are banal, lies in the alternation of the repetition. The space between the units in a whole repeats, and often the repetition itself repeats. The rule applies to all the elements within the whole. If applied to all the components, the entities, the space between the entities, and the sequence of repeating entities, the wholeness would appear in the result. ¹

ROUGHNESS

Life is dependent on contrast and repetition, structures containing life always have a degree of roughness to it. This is not caused by accident or inacuresay, it is an essential feature for the structure to become whole.

Roughness, which also can be described as irregularity, appears as an interplay of well defined order and the constraints of three dimensional space.¹

Ornament and function do not have distinction in nature. They complete each other. In architecture ornament often is created as a stylistic concept, where the function is distinguished from the production of the ornament. Nature does not create ornament without function. Ornament in modern architecture often works as a stylistic concept, where ornament and nature is separate.



Figure 15. Fish

MAKING SENSE

We live inside a space where the movement of atoms creates a dimension which we refer to as time, held together by centers correlating, to make up wholeness, which assembles structures. Repeating itself and creating slightly new properties energized by contrast. In this way space expands, and what we know as the world reveals itself to us.

Quote C A : “If we are to use the theory of centers – and the concept of life – as the basis of all architecture, it would be reassuring to know that wholeness, together with the properties which bring centers to life, is a necessary feature of material reality, not merely a psychological aspect of things which arises during perception of works of art.” (1)

To believe that every part of nature has wholeness, is to believe that we cannot look at nature correctly without seeing distinctions in the degree of life.(1) The traditional scientific view has been that structures are equal in value. A view based on wholeness comes out rather different. Humans do have the capacity of changing an environment in which has a deep beautiful structure into something that is harsh. Humans should acknowledge that they have the capacity to damage the world. Life may increase or degenerate to the degree in which the wholeness is upheld or damaged by human processes. In the activity of building the architect may reach a deeper level of value by including wholeness or he may break down the value by ignoring wholeness.

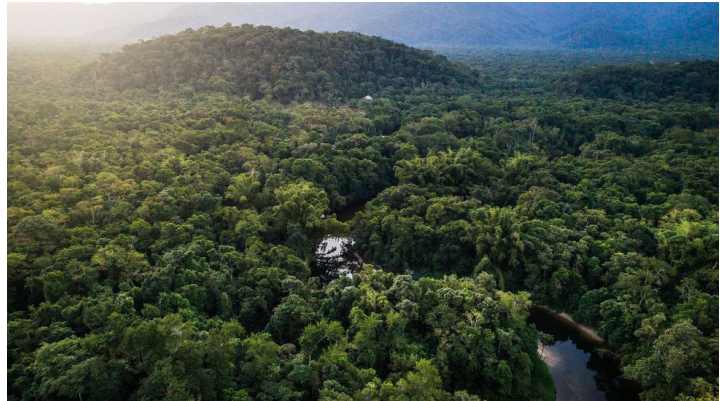


Figure 16. Forest



Figure 18t. Deforasation

The environmental situation seems hopeless, but there might be opportunity in a new approach.

ADAPTATION

Nature encapsles small feedback loops which have the ability to adapt. This is the reason things come with harmony, harmony which we as humans value. By slowly adapting to its context the outcome is detailed and profound, each structure has its unique character. Complex systems do not spring into existence fully formed, but rather through a series of small, incremental changes. Nature is in no hurry, it uses the dimension of time for what it's worth. This is an important point when comparing the creation of nature with that of human context. Nature works slow and humankind works fast.

Robert O'neill describes the domination of slow in his book A hierarchical concept of ecosystems. "The dynamics of the system will be dominated by the slow components, with the rapid components simply following along. Slow constraints quick; slow controls quick."⁴

The dimension of time is essential for this kind of production, and without the aspect of time the structure wouldn't appear. There is an importance of giving the system time in order to develop. What if buildings made to adapt to its context could be produced piecemeal instead all at once.

In the opening chapter of Stewart Brand's book How Buildings Learn³, he states: "Between the world and our idea of the world is a fascinating kink. Architecture, we imagine, is permanent. And so our buildings thwart us. Because they discount time, they misuse time. Almost no buildings adapt well. They're designed not to adapt; also budgeted and financed not to, constructed not to, administered not to, maintained not to, regulated and taxed not to, even remodeled not to. But all buildings (except monuments) adapt anyway, however poorly, because the usages in and around them are changing constantly."

What does it take to build something in a way that makes it easy to make comfortable little modifications so that once you've made them, they feel integral to the nature and structure of what is already there? You want to be able to mess around with it and progressively change it to bring it into an adapted state with yourself, your family, the climate, whatever. This kind of adaptation is a continuous process of gradually taking care.

VERNACULAR ARCHITECTURE

Looking at space in the past

If we look at the past, architecture was a simple form of addressing human needs, using local resources to provide shelter and comfort to cope with the climate and its different elements.

Vernacular buildings are the opposite of high style, academic architecture. It is the buildings that are designed by non professional architects. Vernacular architecture is cautious, imitative and immersed in its culture. The tradition of vernacular buildings can incorporate generational knowledge about long term challenges and maintenance of a building over time. It uses and accepts proven old solutions to old problems. Then the design ingenuity is used on new problems, if any. Buildings then evolve over generations, where the new buildings imitate the best of old buildings. This creates sophistication and simplicity. The houses will then become incorporated with the landscape and adjusted to the local weather and society. Vernacular design is not about style, it's about form. Style fools time. Vernacular architecture reduces the process into manageable proportions. It may seem like this kind of process compromises it to generate monotone structures, but it allows the designer to focus on the solution of particular problems rather than reinventing whole forms. The signature of the designer is then much smaller, but has in many ways the same forces. Vernacular design takes its surrounding environment into consideration.⁴

Properties such as air, light, heat and visibility are environmental factors which shape the design. For example by considering the seasonal changes of the sun's position. "Flow, continual flow, continual change, continual transformation"

The dimension of time highly manifests itself in vernacular architecture, formed by the experience of building over time.

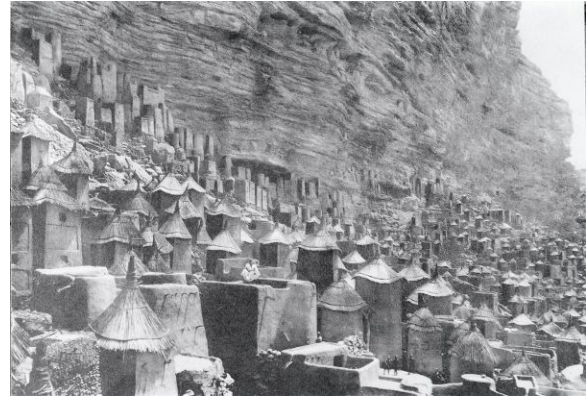


Figure 19. Bandiagara Village

The Bandiagara village is located south in Mali, on a sandstone plateau. It is believed that the first settlers were Dogons around the 14th century.⁶ The houses are built to benefit from the physical constraints of the location. By being located on a plateau the site has worked as an excellent defensive shelter. Whether on the plain, the cliff faces, or the high plateau the elements available have been exploited in order to build the village. The architecture of Bandiagara village is simple and contains centers, contrast, alternating repetition and roughness. The site manifests a system of development with strong geological features which is in harmony with its surroundings.

THE ISE TEMPLE (JAPAN)

The Ise Jingu Grand Shrine is located in the forest of Ise-Shima National Park south in Japan. It is one of the most important and holy Shinto sites in Japan.⁵

The Ise is known for its tradition of reconstruction, which is called Shiken Sengu. The site consists of two identical temples, and every 20 years an exact copy is made on the oldest site. This ceremony has taken place since 690 AD, or about 1300 years. It is produced using the same traditional techniques, hand tools, materials, and same set of drawings.

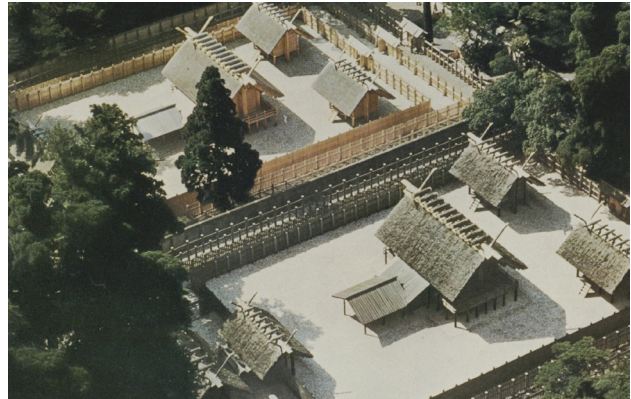
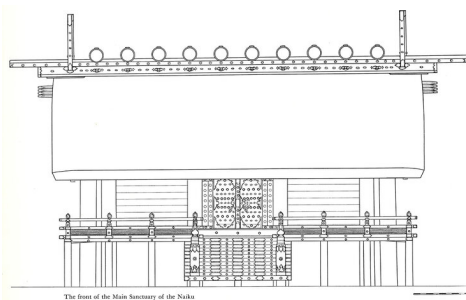
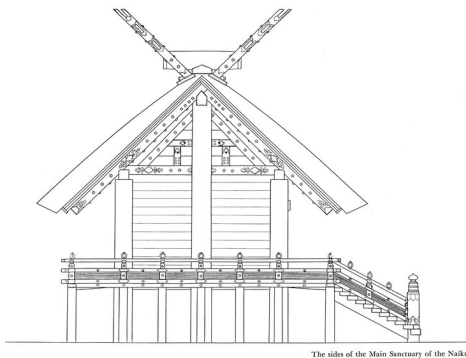


Figure 19. The Ise temple



The ceremony acts as a transfer of skills and techniques from one generation to the next, ensuring the temples to be reproduced accurately. It transfers knowledge which instructions have issues explaining. Dan Wang refers to this as “Process Knowledge”⁵, the knowledge of how to do things that can easily be written down. Process knowledge relies on a stable pattern of social interaction that can exist beyond the lifespan of a single individual.

Often we think of technology as something that maintains itself, that when society has learned something there’s no worry of that getting unclear. But all it takes is a generation which lacks a stable pattern of social interaction.

MODERN ARCHITECTURE

Human actions are often governed by concepts and vision. Under the influence of concepts, it becomes harder to remain in harmony with the wholeness. In the process of making architecture, buildings become isolated objects.

In the present architects have to make clearly conceived forms and think their tasks through from the beginning. A process which once took many generations of development is now done by a single individual. Any slow development of form today seems impossible, with culture pressures changing constantly. The form of our acquired knowledge is determined by the prevailing ideologies that develop and control technology. Driven by conflict and profit competition, the long term results might be disquieting.



Figure 21. Y



Figure 22. Y

“History gives us distance from the present, as if it were the future of the past. In the spirit of contemplation it releases us from prison of the present to examine the axioms of our time.”⁴

Architecture may have suffered by the loss of its old roots, because of the efforts to define a new architecture. The absence of reasoned discourse has created, in the world, an architecture ruled by money, power and images.

GENERATIVE DESIGN

In recent years there's been a growing interest in the field of generative design. The term refers to the use of software and technology to emulate nature's evolutionary processes. Designer Neri Oxman (Oxman) and David Benjamin (Living Architecture Lab) have developed companies and approaches based around the field.

The methods are futuristic, but in the same way immediate and hands on with physical prototyping and testing through making.



Figure 20. Living

David Benjamin refers to this new ecosystem of design as HyFi: “Hy-Fi is a reference to a kind of technical term called hypha, which is the type of living organism that we use to manufacture the building blocks of our project”.

In 2014 Benjamin won the young architect award, which gave him the opportunity to produce and exhibit his design on MoMAs “This Is For Everyone : Design Experiments for the Common Good”

The structure was made by two different types of bio bricks, one of mycelium and one made out of composed thermoformed multi-layer optical film to repel sunlight. Using bricks with similar properties Benjamin and his crew constructed a tube like structure which was made over the course of 3 weeks assembled by a few people.

Although the project got high recognition, and was innovative in terms of creating sustainable structures, it came with some problems. The structure itself didn't support a roof, and the bricks are easily damaged. Benjamin is criticized for ignoring any lessons from past builders, therefore some of the intended properties of the designs fail to work.

It is lacking the experience which vernacular architecture has. Of course you have to start somewhere, but by making the future we might have to look to the past.

FUTURE LIBRARY

The future library was conceived by artist Katie Paterson during the summer of 2014. It is made for the Slow Space public art program. The project is created to expand people's perspectives of time.⁷

In the year 2114, the wood from 1,000 spruce saplings growing will be turned into paper and used to print 1000 unpublished books -- which no one is allowed to read until then.

For each year from 2014 to 2114 one author is invited to write a piece of writing. It can be anything from one word to a full book, and will be kept unread until the year 2114. Simultaneously trees in a forest planet in 2014 will become the paper of the book.

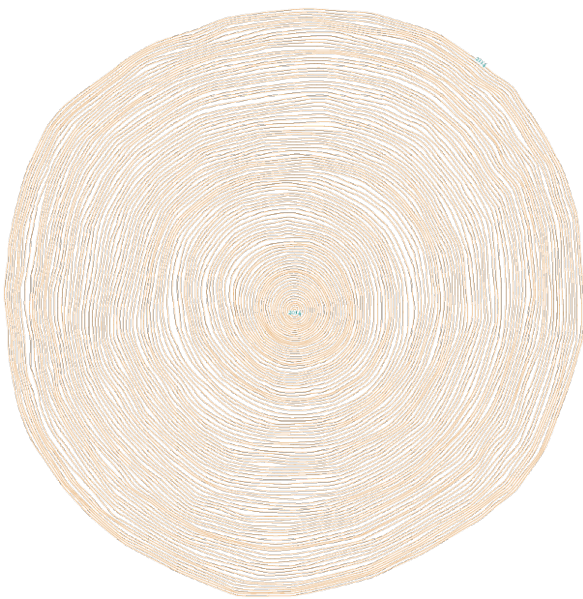


Figure 23. Future Library

The author of the 2019 edition Karl Ove Knausgaard states : "There's something fantastic, isn't there, about writing a book that's going to remain unread for a hundred years and won't be opened until everyone alive now is dead? It's almost like a novel in itself. The book will be travelling through time, and we know nothing of what the world will be like when it gets to where it's going. And nor will we ever. The present is like a ship whose constituent parts are constantly being replaced, so slowly and imperceptibly that those of us on board barely register the changes. The same thing is happening to us, the people on board, we too are gradually being replaced, one by one, slowly and imperceptibly – so while the books in the hold aren't changing, everything around them will be different when they get to where they're going."⁷

Literature in itself does not contain life, its black signs on white surfaces. For literature to become alive it has to be interpreted by a reader. While trees are quite different, it is living centers which make up forests. The project relates to a human made and a nature made concept, emerging simultaneously. How will we relate to these two concepts in 100 years?

Although the project does not relate to time in architecture it opens up on ideas about how to make something last, and also about what it takes to inspire people to think beyond short-term distractions.

FUTURE ARCHITECT

The ecosystem we live in was once crucial for us to survive, we turned our back to it, and we no longer understand it. These ecosystems are intelligent, in another way than of our own intelligence, not gathered in each individual, but existing as a bigger whole. The problems mankind are facing are huge and universal, where do we look for the solutions?

The solutions might be in the networks surrounding us. Biological science makes sense, makes sense of each other, as a unifying concept where centers relate to each other and make up wholeness. Could it be possible to incorporate a similar concept in the act of building where the different disciplines are unified, and like in biology, become one organic body of knowledge and inquiry. The missing link in time.

Considering long term responsibility and frequent adaptivity. Acknowledging that there is a dimension of time, which affects all structures, learning to work with it rather than against it. Applying it piecemeal instead all at once.

The future role of the architect could be changed, fundamentally. If we consciously chose to go this way, to create architecture as living structures, there might be a chance of rediscovering our loss to nature. Something of the same depths as that traditional craftsman, and vernacular architect were able to accomplish.

SOURCES

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