
Tesis doctoral

Justify Beauty

Architectural Sensorium

Lamila Simisic



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Justify Beauty

Architectural Sensorium

Doctoral Thesis by Lamila Simisic

Director: Prof. Dr. Alberto T. Estévez

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School of Architecture

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Architectural Sensorium

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i. Abstract

The thesis traces architecture intertwined with its environment and what could be a possible organ that is part of such communication. It is giving an articulation, towards Architectural Sensorium. Powerful differences of symbiosis between environment and architecture are stressed by notion of Beauty. Obsession with the Beauty on the beginning of the 21st century, parallel to similar obsession in the beginning of 20th, might bring us some new understandings and insights in our creative doctrine. Intentionally this thesis studied notion of Beauty rather than aesthetics. It is exploring a new, wild, and brave Beauty. Similar to relation between art and culture sits relation between aesthetics and Beauty. While culture contrary to art, expresses continuity and coherence art possesses singularity of a wildness and surprising nature.

This thesis attempts to address question, whether architecture could be built out of nothing. Although it is important for architecture to be recognized and to recognize in its discourse the convergences of science, technology, biology computation or philosophy, this research still has more concern towards searching a niche for or of possible architecture, somewhere which does not belong to any particular domain.

Part of this research focuses on how Beauty inscribes possible life, that starving for merge between human and human within artificial realm, and finally to be displaced elsewhere. It analyzes procedure and methods of decomposition of body of Beauty, to make it eligible to become part of possible world. Examinations of literal and artistic creations are relied on brave, unconventional and wild examples rather than on architectural masterpieces.

Question to be answered is: can we Justify Beauty and is there any relevance in its justification and implications; is it important to create architecture with Sensorium; and what sits out of relation between Beauty and Sensorium? This has created a framework for further contributions, besides of rethinking of power of Beauty, to give an importance of Architectural Sensorium towards Global Sensorium.

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To Simo

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CHAPTER 1

1 An Introduction

And where shall I go now?"

"The net is vast and limitless.

***_Ghost in the Shell a 1995 anime film directed by OSHII
Mamoru***

1.1 Motivation

The space that surrounds us is a dynamic field and it should be accepted and perceived like that. The dynamism is reflected in constant confrontation or sometimes even abstract aspirations, towards self-sustainability. System of built environment as an essential part of our surroundings is also a dynamic field. It is in constant striving for renewal, whether it is case of the renewal of concept, form, function, or among others its materiality. Ideas that will become part of this research, even naïve ones and sometimes without the established outcomes, will try grasp these systems, their revitalized capacities and by it greatly help in

understandings the importance and characteristics of their dynamism. Natural, built, and artificial environment is unassailable archetype, perpetually novel, intelligible, and transmissible. Perpetually novel environments belong to our complex era. This era is a smart, sometimes invisible, aspire sustainability, from time to time also ethical and poetical. From our non-humble attitude towards the unexpected, we strive to investigate it. Architecture, as a part of environment, is a subset of the evolution of the Earth. It has to be re-conceptualized due to the modern comprehensions of the world. It has to incorporate in its discourse climate changes, energy-environment problem, quantum mechanics, an artificial world more than natural, and many more. Almost everything we research or design today is interdisciplinary. Even though thesis consisting of interrelations between technology, biology, anthropology, computation, philosophy, and architecture; still architecture is in main focus. Aim of this thesis is to snap niches of something that belongs to other disciplines, not necessarily and only to architecture and by that belongs to nowhere. The research will try to magnify participation of architecture inside of constantly changing environment. As Kevin Slavin, algoworld expert, in the essay *Design as Participation* said about nowadays participation:

The designers of complex adaptive systems are not strictly designing systems themselves. They are hinting those systems towards anticipated outcomes, from an array of existing interrelated systems. These are designers that do not understand themselves to be in the center of the system. Rather, they understand themselves to be participants, shaping the systems that interact with other forces, ideas, events and other designers.¹

Beauty, long-repressed factor, which justification this thesis is looking for, is selected in order to magnify philosophical questions related to architecture, as well as to search for theoretical and philosophical discourse within discipline of architecture. New production techniques implemented in architecture are enabling new aesthetical and functional forms, which should be examined.

¹ Slavin, K. (2016). *Design as Participation*. (D. Hillis, Ed.) *Journal of Design of Science*, 1 (1).

I have started architectural education in my home city Sarajevo, Bosnia and Herzegovina. The School is more oriented towards engineering part of discipline. I have finished one year as Erasmus student in Barcelona, Universitat Politècnica de Catalunya (UPC), Escola Tècnica Superior d'Arquitectura de Barcelona (ETSAB), and I have learned other approaches of education in architecture. As a young architect, I worked in an office on projects of different scales and participated in many competitions. One of them, Bosnia and Herzegovina pavilion for Expo Shanghai, brought me the first prize. I can say that somehow, I have proven my education as an architect, but it could be said as well, that all that experience provokes my intentions from *making* towards *thinking*. I have decided to work on my education in a field that could be called Haute Couture architecture. For that intention, I have moved once again to Barcelona to join master studies in Biodigital Architecture at Universitat Internacional de Catalunya.

Joining master of Biodigital Architecture made me able to work and produce projects that I have been admiring before. Professor Estévez's approach of directing aforementioned master program opens an emotional² touch towards architectures not in manner of melancholy but joy. So, biolearning³ becomes natural joy of my life.

Currently, I am teaching at International University of Sarajevo, Bosnia and Herzegovina, design studio and digital architecture and fabrication courses. I also manage Model Lab at the same university. I am trying, by taking advantage of innovations in architectural design process, to teach students to gain new architectural forms, which can carry the idea from the past, but definitely its upgrade. I am also attempting to improve understanding in a way that the essence of architectural creation is presented through the design process itself, as well as through co-evolutionary construction between different scientific and technical practice.

² ESARQ an "emotional school" see in: Estévez, A. T. (2015). Biomorphic Architecture. In A. T. Estévez, *Biodigital Architecture & Genetics writings* (pp. 60-85). Barcelona: ESARQ, Universitat Internacional de Catalunya.

³ Refers to biolearning see in: Estévez, A. T. (2014). Learning from Nature: Architecture and design in the first biodigital age. In A. T. Estévez (Ed.), *2nd International Conference of Biodigital Architecture & Genetics*. Barcelona: ESARQ (UIC).

My PhD thesis lies down on the conclusion, or we had better say, question stated in conclusion of my master thesis "Architecture of Clash" (2008); how to provide an object, which participates in the environment through its own membrane, with inclusion and democracy, and making that object become equivalent to the real world (for more information see Appendix).

The thesis discusses projects that are responsive architecture whether they are mimicking Nature, or oriented to environmental sensation, spatial or psychological realms, physically transformative, resonant on spatial forces, changing political and social codes.

Our perpetually novel environment challenges us to implement new knowledge and methods in architecture, but in other disciplines too. What should be stressed out is theoretical concern of these new techniques or better-said clash between ontological and epistemological discourse within architecture.

We are living in the era when Digital and Natural world are closer than ever. We have ability to transmit digital data to physical form, from computer to production machine. We have ability to change spatial definition of physical concepts with changes of data input. Architecture becomes more and more responsive to surroundings and expresses its aliveness.

Nobel Prize's winner Herbert Simon, in his book *The Sciences of the Artificial*, says this century eruption in complexity is associated with terms of "chaos," "adaptive systems," "genetic algorithms," and "cellular automata."⁴

While it is important to understand interrelation of architecture within, among others, new technologies, new social and environmental awareness or new economy, each of the mentioned terms will be briefly examined in following section.

⁴ Herbert, A. S. (1996). *The Sciences of the Artificial*. London: The MIT Press, p. 169.

1.2 Current Interests

Every step forward on our planet brings some relevance, which reflects our next steps in architecture.

This century has seen recurrent bursts of interest in complexity and complex systems. An early eruption, after World War I, gave birth to the term "holism," and to interest in "Gestalts" and "creative evolution." In a second major eruption, after World War II, the favorite terms were "information," "feedback," "cybernetics," and "general systems."⁵

Holistic approach brought to architecture's district a disciplinary shift to one more open gaze, providing links and crossings among experience, trajectories, and investigation.⁶ Nowadays shift goes from interdisciplinary, where people work together from different disciplines, to the antidisciplinary⁷, where people work in specific field of study that do not fit into any academic disciplines. We are fast-forwarding to collaboration of "One Science".⁸

Holistic approach of the disciplines comes running to the next level of importance, information, and cybernetics. Cybernetics derives from the Greek "kybernetes" meaning "steersman" + -ics; perhaps based on 1830s French cybernétique "the art of governing." Norbert Wiener coined the term cybernetics around 1948.⁹ Cybernetics is trying to unify systems, whether it is electrical, mechanical or even social and biological, with its environment.¹⁰ First-order of cybernetics uses feedback to regulate unity and second-order of cybernetics is about self-adaptive complex unity.¹¹ Gordon Pask early proponent and practitioner of cybernetics, in his project *The colloquy of mobiles*, exhibited at the ICA, London, in 1968, attempted to go one step further in direction of fabrications of an active/reactive

⁵ Herbert, A. S. (1996). *The Sciences of the Artificial*. London: The MIT Press, p. 169.

⁶ Gausa, M. (2003). Holistic. In M. Gausa, W. Muller, V. Guallart, F. Soriano, F. Porras, & J. Morales, *The Metapolis Dictionary of Advanced Architecture Edition ACTAR* (p. 276). Barcelona: Actar.

⁷ Ito, J. (2014, October 2). *Antidisciplinary*. Retrieved May 9, 2016, from Joi Ito's Web: <http://joi.ito.com/weblog/2014/10/02/antidisciplinar.html>

⁸ Ito, J. (2016). Design and Science. (D. Hillis, Ed.) *Journal of Design of Science (JoDS)*, 1 (1).

⁹ Etymonline.com. (2001). *Cybernetics*. Retrieved 2016, from Online Etymology Dictionary: <http://www.etymonline.com/index.php?term=cybernetics>

¹⁰ Pask, G. (1971). A Comment, a Case History, and a Plan. In J. Reichardt, *Cybernetics, Art and Ideas* (p. 76). Greenwich: CT: New York Graphics Society.

¹¹ Ito, J. (2016). Design and Science. (D. Hillis, Ed.) *Journal of Design of Science (JoDS)*, 1 (1).

environment with properties of an “aesthetically potent” environment. “Aesthetically potent” environment is an environment that people are liable to enjoy by exploring it, learning about it, forming a hierarchy of concepts that refer to it, or seeing themselves reflected in the environment.¹² Paskian environment has great importance at beginning of 21st century in search for shared and aesthetically potent environment of natural and artificial world.

*Man is always aiming to achieve some goal and he is always looking for new goals.*¹³

Terms explained above, according to American polymath Herbert Simon, are terms on importance of previous eras. In light of motivation section and concepts listed in, it is important to briefly comment current interests and their value as the concepts of the world order.

Chaos

Wolfram mathematics pointed out that “chaotic systems are distinguished by sensitive dependence on initial conditions and by having evolution through phase space that appears to be quite random.”¹⁴ World is chaotic and by that unexpected and random. Life is based on exchange of order and disorder. Relevant for this research is concept of the order, disorder, and entropy, looked through lenses of Schrödinger’s explanation of the life. In his short book *What is life*, Schrödinger wrote that living organisms, by process of change or exchange, called metabolism, are freeing themselves from low level of entropy, that has no help in producing aliveness; and by that keep staying in safe mode, or mode that is far from state of maximum entropy which will cause death. Sucking orderliness from its environment is a device by which an organism maintains its high level of

¹² Pask, G. (1968). The colloquy of mobiles. (J. Reichardt, Ed.) *Cybernetic Serendipity*, p. 34.

¹³ Pask, G. (1971). A Comment, a Case History, and a Plan. In J. Reichardt, *Cybernetics, Art and Ideas* (p. 76). Greenwich: CT: New York Graphics Society.

¹⁴ Weisstein, E. W. (n.d.). *Chaos*. Retrieved May 13, 2016, from MathWorld-A Wolfram Web Resource: <http://mathworld.wolfram.com/Chaos.html>

orderliness/life or low level of entropy contrary to maximum level of entropy/death.¹⁵

Adaptive systems

*An adaptive system (or a complex adaptive system, CAS) is a system that changes its behavior in response to its environment. The adaptive change that occurs is often relevant to achieving a goal or objective. We tend to associate adaptive behavior with individual plants, animals, human beings, or social groups. However, relatively simple systems can also be adaptive.*¹⁶

It seems that adaption is addicted to extrinsic environmental and intrinsic embedded elements, but as well as to interrelation between extrinsic and intrinsic. If we add that both extrinsic and intrinsic environments possess great randomness of orderliness and entropy we come to the point of great complexity of systems, which should be somehow described. Stuart Kauffman in lecture *The End of a Physics Worldview: Heraclitus and the Watershed of Life* together with senior Italian French mathematician Giuseppe Longo of the Ecole Polytechnique Paris, explains, that we will find ourselves beyond Newton, Einstein, Schrodinger, even Darwin, that evolution is not described sufficiently by quantum mechanics alone or classical physics alone.¹⁷

*Not only do not know what WILL happen (cointosses), we do not even know what CAN happen. Same for econosphere's evolution, history, and life. Then reason is an insufficient guide alone for living our lives! What of our Enlightenment? Need reason, emotion, intuition, sensation, metaphor, all we have.*¹⁸

¹⁵ Schrödinger, E. (1944). *What is Life?* Cambridge: Cambridge University Press.

¹⁶ New England Complex Systems Institute (NECSI). (2011). *Concepts: Adaptive*. Retrieved May 15, 2016, from New England Complex Systems Institute solving problems of science and society: <http://necsi.edu/guide/concepts/adaptive.html>

¹⁷ Kauffman, S., & Longo, G. (2011). *The End of A Physics Worldview: Heraclitus and the Watershed of Life*. New England Complex Systems Institute and the MIT Engineering Systems Division, MIT.

¹⁸ Ibid.

Genetic algorithms

A genetic algorithm, coined by Holland in 1975, is a class of adaptive stochastic optimization algorithms involving search and optimization. The idea behind genetic algorithms is to mimic a natural selection processes by mutation, selection through measuring against fitness function and repetition until suitable solution is found.¹⁹

Relevant for this research is Holland's works from 1992, presented in the book *Adaptation in Natural and Artificial Systems* of making possibilities to learn what moves have to be changed to yield better performance of system. Learning process is based on interaction with environment provided by detectors and effectors and measurements of the system performance.²⁰

Cellular automata

The founder of the cellular automata (CAs) is John Van Neumann.²¹ CAs are used in crystal modeling, reaction-diffusion system, population dynamic, ecology, immunological system, insect swarm system and similar.²² For the purpose of presenting the CAs, John Horton Conway has placed small dishes on a tartan floor of his house. Starting with a few randomly arranged dishes he would be adding and removing them following three simple rules in order to show how these rules, working together, are able to create unlimited complexity.²³

Cellular automata come in a variety of shapes and multiplicity of patterns. Fundamental properties of a cellular automaton is the type of pattern on which it is computed, the color cells it may assume, and the neighborhood over which cells affect one another.²⁴ We could say that there are only four different types of

¹⁹ Rowland, T., & Weisstein, E. W. (1999). *Genetic Algorithm*. Retrieved May 18, 2016, from MathWorld--A Wolfram Web Resource: <http://mathworld.wolfram.com/GeneticAlgorithm.html>

²⁰ Holland, J. H. (1992). *Adaptation in Natural and Artificial Systems*. Cambridge: MIT Press, p. 172-173.

²¹ Bentley, P. (2013). *Digital Biology - How nature is transforming our technology*. Zagreb: Izvori, p. 236.

²² Ibid., p. 237.

²³ Ibid., p. 236.

²⁴ Weisstein, E. W. (1999). *Cellular Automaton*. Retrieved May 18, 2016, from MathWorld--A Wolfram Web Resource: <http://mathworld.wolfram.com/CellularAutomaton.html>

patterns: nothing happens (plain pattern), periodic patterns, chaos, order at the edge of chaos (complex non-periodic patterns).²⁵

Recognition of above mentioned interests could become key catalyst for deeper understanding of what architecture could become. Anatomy of a city is a result of interactions of real and artificial. It is obvious that architecture and studied terms are coming from different but at the same time remarkable common areas. Architecture, among other fields that sit in relation with mentioned terms like it is evolution, mathematics, control, artificial intelligence, ecology, is expressing complexity and uncertainty. Modifying architecture to meet demands of this era will enrich our practice with new approaches.

Current interests of this era revealed interaction of the system and environment, whatever could system presents or where it is resides. Research of this thesis will look for possibilities of architectural exploration and exploitation of environments, and vice versa.

1.3 Problem framing and statement

Explained interests, in previous paragraph, are trying to at reflects what could be a possible world, that we all share. One of the problems which could be observed is whether architecture accepts in its discourse these new understanding and if does, do we, architects do our best towards illuminating these interests in our design. What is time lapse of making new concerns possible for overall implementation? Is the term, architecture, good enough to comprehend architecture of 21st century or we need to coin new term, which will reflect the historical continuity and discontinuity of the future. When shift in our discipline will be done, or have architects become immune to changes?

Second problem is whether and how architecture could resonate with new insights of the world we live. Word resonate is derived from Latin resonant

²⁵ Chu, S. K. (2008). *The Architecture of Possible Worlds, 3rd International Conference Digital Art and Architecture, Net.Art and Virtual Universes*. University of Barcelona, Faculty of Geography and History, Barcelona.

“resounding”, expressing intensive force of sound.²⁶ It is chosen because of desire to make architecture talking and echoing its surroundings/environments. The question that should be asked is related to enormous understanding of what environments could possibly be. So we as architects should ask ourselves to what environmental part we should reflect, adapt or better say resonate architecture and vice versa.

Third problem, that should be discussed, is how we architects work on resonance, regarding architectural concept, structure, form, material, and similar. Whether is the concept and structure an undergoing act of adaptation, reflection, and resonance, or its main purpose.

Fourth problem, should architecture be a goal or intention oriented and does it have to have mechanisms for resonance of its environment. If there are mechanisms of architecture, designed to continually resonate environment and to adapt it and reflect it, in order to balance exploration and exploitation what is position of humans in this framing. Simply saying, whether we depart architecture from humans.

Fifth question is, what part of past of architecture design is relevant to future adaption, and are there any limits of exploration and exploitation. There are many architectural objects, which already serve to idea of adaption, reflection or resonance. How to compare a benefit that comes out from these objects, and how to weigh “success” when environment is, fast-forwarding system?

The basis of this thesis and ground notion of problem statement is context of current interests as well the five possible problems, which arise questioning of interrelation of architecture and the environment.

Architecture practice, in its run to respond on interests of era we live in, is going slowly. Mostly it is reflected via technical constructs. Theory should have central role to illuminate practice. Theory should enable us to better understand the

²⁶ Oxford Dictionaries. (2016). Retrieved May 15, 2016, from Oxford Dictionaries Language matters: <http://www.oxforddictionaries.com/definition/english>

processes and should suggest procedures of acquired actions. Theory should provide us with means of our actions.

Speaking of architecture, which arises from the activity of performer, an architect is a designer of the space or better-said designer of possible voids and the so-called audience. Audience, in this case, could be even dust of environment.²⁷

Lifespan of concepts, materials, and its structure are all concerns of time. By that architectural objects are becoming historical facts. Timeless architectural “beings” are consisted of their aesthetical facts. Objects could jump from its historical fact to its aesthetical ones.

There are many unknowns in these discussions, but by delimiting our thoughts about architecture we are challenging future. Development of theory, new materials, mechanisms, and technical infrastructure in this century will enable next generations to deal with unknown. It may be that some empty niches of architectural “beings” of today will become novel functions of tomorrow. Like in Darwinian pre-adaptations, where a part of organism with no use in the current environment finds a use in different environment.²⁸ As mentioned, at the very beginning of this chapter, “And where shall I go now?” “The net is vast and limitless.”²⁹; every niche in architecture will have or already has multiple functions, which could not be counted.

Natural systems are provided with techniques for interrelation with its environment, artificial ones use algorithms and strategies in order to predict and adapt. Architecture is nowadays designed in artificial world with all benefits we could get from that environment, but should acknowledge its skills of resonance in natural environment.

We human beings are born with senses, reflexes, and learning mechanisms. How is architecture manifested? This research will try to analyze possibilities of

²⁷ Compare with performance in music in: Kostelanetz, R. (2003). *Conversing with Cage*. New York and London: Routledge.

²⁸ Kauffman, S., & Longo, G. (2011). *The End of a Physics Worldview: Heraclitus and the Watershed of Life*. New England Complex Systems Institute and the MIT Engineering Systems Division, MIT.

²⁹ Oshii, M. (Director). (1995). *Ghost in the Shell* [Motion Picture].

architecture through the basic strategies that baby born is equipped. The idea is to grow architecture. Explained terms of chaos, cybernetics, adaptive or genetic systems are inevitable part of environments and as well are taking part in future beings of architecture. Nature is not constructed under Gaia theory, it is not self-regulating system, but on the contrary it is dynamic and perpetually novel system. Architecture, which started as sensory, reflective, and learning processor in its perpetually novel environment will aspire to its uniqueness.

1.4 Initiating questions

Our lives are new, we are empowered by unfolding webs of niche creation, enablement and radical emergence, not merely entwined in a web of causal laws. We may become re-enchanted and move beyond Modernity.³⁰

We are living new lives said Stuart Kauffman, and our reality is beyond imagination say Adriaan Geuze and Matthew Skjonsberg.³¹ If we add to that artificial, we are coming to more complex expression of the world through result of interactions of real, artificial and imaginable. Imagination is dual possible, actual real or artificial real. Stuart Kauffman believes in dualism of real Actuals, Res Extensa derived from Descartes and real Possibles, Res Potentia derived from Aristotle.³² Origin of Imagination is from Latin imaginare “form an image of, represent” and imaginari “picture to oneself”; while Possible is Latin possibilis, from posse “be able”.³³ Together Imagination and Possible could be “to have the freedom to picture to oneself new possible scenarios to catalyze change”. We are entering to an epoch of architecture with new scenarios and new materiality.

From the above-discussed current interests, problem framing and statement following set of initial questions are formulated:

³⁰ Kauffman, S., & Longo, G. (2011). *The End of a Physics Worldview: Heraclitus and the Watershed of Life*. New England Complex Systems Institute and the MIT Engineering Systems Division, MIT.

³¹ Geuze, A., & Skjonsberg, M. (2012). Dancing with Entropy. *Architectural Design*, 82 (5), pp. 124-129.

³² Kauffman, S. (2010). *Res Extensa, Res Potentia and the Poised Realm*. Retrieved May 16, 2016, from National Public Radio: <https://www.npr.org/sections/13.7/2010/08/17/129250892/res-extensa-res-potentia-and-the-poised-realm>

³³ Oxford Dictionaries. (2016). Retrieved May 15, 2016, from Oxford Dictionaries Language matters: <http://www.oxforddictionaries.com/definition/english>

(Q1) What theoretical assessments and procedures are needed to process and evaluate evolution of the architectural discourse in the world we live in?

(Q2) What might be materiality for forming and structuring architecture, that resulting as interaction of contemporary scientific, technological, and industrial design?

(Q3) What is sensibility of architecture that responds on characteristics of world we live?

First order of cybernetics defined by Wiener as a “control and communication in the animal and the machine”³⁴, has its further development in complex adaptive systems, where observer is a direct participant of the system, rather than being placed outside of the system.³⁵ An environment has nature of perpetually novel system and understanding. So, if the complex adaptive systems are reminiscent of the first order of cybernetics, so something else will become reminiscent of the complex adaptive systems, and so on. Adding to this that exchange of order and disorder in pattern, is necessity of aliveness,³⁶ we could raise the following questions:

(Q4) Does architecture have to be goal-seeking system regarding its allure for adaptation to its environment, or could be per se adaptive? Does adaptation have to have trigger? Does it have to be collective interaction as evolution?

Nature intertwined information into patterns, human kind patterns also possess information inside, computer made patterns as well, can we by observing all these patterns get bounds of architectural “being” able to sense, respond, reflect, resonate, adapt, change, copy and paste the environment. The idea is to strive for non-forced design, instead of stuffing form with material.

(Q5) Designing out of space and time with (un)material. Moving forward from design based on algorithms taken from Nature or design deploying new materials

³⁴ Wiener, N. (1985). *Cybernetics, Or control and communication in the animal and the machine* (2nd Edition ed.). Cambridge, Massachusetts: The MIT Press.

³⁵ Slavin, K. (2016). *Design as Participation*. (D. Hillis, Ed.) *Journal of Design of Science*, 1 (1).

³⁶ Schrödinger, E. (1944). *What is Life?* Cambridge: Cambridge University Press.

like biomaterials, to designing by (un)material, in order to emancipate architecture is finally stress out notion of Beauty. Here the question may be raised: What (un)material in the context the architecture may entail.

From initial questions, three core fields of architectural research are derived, as a theoretical resource for entanglement of possible hybrid theory, called Architectural Sensorium. The following troika structure is proposed: *Genetic architecture, Material Ecology, and Performance-Oriented Architecture*.

1.5 Theoretical platform

Initial platform of knowledge fields are *Genetic architecture, Material Ecology and Performance-Oriented Architecture*. These fields are chosen based on three initiating questions, which by possessing troika of senses, reflexes and learning mechanisms, will aspire to perpetually new scenarios to answer constantly new environment whether environment is understood as inner or outer attribute.

Genetic Architecture

Karl Chu, principal of the architectural studio METAXY, with professorship at the School of Architecture at the Pratt Institute and Co-director of the Biodigital Architecture Program at ESARQ, Universitat Internacional de Catalunya pointed that “evolution of life and intelligence on Earth has finally reached the point where it is now deemed possible to engender something almost of out nothing”³⁷ that architects work on “a radicalization of the prevailing paradigm of architecture...by developing a new concept of architecture that is adequate to the demands imposed by computation and the biogenetic revolution.”³⁸

Genetic architecture is based on monadology that deals with the construction of possible worlds. Monad here presents a minimal unit of a system or the single bit of information, capable to self-replicate, self-organize and self-synthesis into evermore-new constellations of emergent relations and ensembles. These capabilities are essence of genetics and biology but genetic architecture should

³⁷ Chu, S. K. (2006). Metaphysics of Genetic Architecture and Computation. *Architectural Design*, 76 (4), p. 39.

³⁸ Ibid., p. 42.

not be understood neither as a representation of biology nor a form of biomimesis. Its theoretical origin is traced in John von Neumann system for self-replicating.³⁹

Importance of genetic architecture for this research is in internal condensation of forces that are intertwined into form and which are taking precedence on external forces. Internality is reflecting an individuation of form of new architectural “beings”.

Even though genetic architecture through its essence of self-replication, mutation, self-deletion, self-organization, and synthesis, demonstrates its prediction mechanisms it has luck in currently recalculating mechanisms. This thesis will search for supplement of recalculating the route, if any changes internal or external ones, occurs during emergent of form.

Material Ecology

Material Ecology coined by Neri Oxman is trying to understand Nature’s ways of creation, generating form from matter. Material is becoming progenitor of the form rather than its subordinate. Oxman proclaims new materiality which is followed by ecological failure of modern design and growing presence of advanced fabrication methods, defining Material Ecology as “an emerging field in design denoting informed relations between products, buildings, systems, and their environment”.⁴⁰

Interesting for this thesis is that by material ecological approach, a form is arising from inside forces driven by process of morphogenesis. As Oxman said, in an interview for The Editorial, “in the Biological Age, designers and builders are empowered to dream up new, dynamic design possibilities, where products and structures can grow, heal and adapt.”⁴¹ We are on a very edge to make possible

³⁹ Chu, S. K. (2006). Metaphysics of Genetic Architecture and Computation. *Architectural Design*, 76 (4), pp. 38-44.

⁴⁰ Oxman, N. (2013). Towards a Material Ecology. *32nd Annual Conference of the Association for Computer Aided Design in Architecture (ACADIA)*, (pp. 19-20). San Francisco.

⁴¹ Oxman, N. (2017, March 1). Neri Oxman #99. *The Editorial Interviews With Visinaries on Emerging Ideas Around Us*. (H. Legg, Interviewer).

to create materials from scratch, to become Nature. As Neri Oxman explains, projects from being speculative, becoming applied ones:

Consider, for example, the ease with which one can transition from an MRI body scan of, say, a residual limb, to a 3D print of a prosthetic device (with, by the way, 20 times the print resolution of the scan!). Or, consider the ability to 3D print synthetic; wearable skins that not only contain biological media but can also filter such media in a selective manner. Imagine the possibility of 3D printing semipermeable walls, which can allow certain molecules or ions to pass through them. Given that some of today's printers can 3D print in 16-micron resolution—hair thickness resolution, still visible to the naked eye—it is possible to imagine designs where the channels inside a wearable contain micro-pores that can, as printing resolution increases, filter microbes and replenish the body. In this way it is possible to imagine controlling the exchange of sucrose, biofuel and other nutrients between the wearable and the skin. These synthetic, multi-material, and liquid-containing garments could operate like the human skin, as both barrier and filter.⁴²

So we should ask how this creation would become coherent with our environment and by ourselves in person. Advocated by Kant and posited by Von Uexküll:

All reality is subjective appearance. This must constitute the great, fundamental admission even of biology...Kant set the subject, man over against objects, and discovered the fundamental principles to which the objects are built up by our mind. The task of biology consist in expanding in two directions the results of Kant's investigations: (i) by considering the part played by our body, especially by our sense-organs and central nervous system and (ii) by studying the relations of other subjects (animals) to objects.⁴³

⁴² Oxman, N. (2017, March 1). Neri Oxman #99. *The Editorial Interviews With Visinaries on Emerging Ideas Around Us*. (H. Legg, Interviewer).

⁴³ Von Uexküll, J. (1926). *Theoretical Biology*. London/New York: London, K. Paul, Trench, Trubner & co. Ltd.; New York, Harcourt, Brace & company, inc. p. xv.

As a supplement to Material Ecology this research will foster intimacy between tangible and sensitive, organic and inorganic milieu by adding to material ecological approach Uexküll's laws of our subject:

...we must abandon our fond belief in an absolute, material world, with its eternal natural laws, and admit that it is the laws of our subject which make and maintain the world of human beings.⁴⁴

Performance-Oriented Architecture

Performance-Oriented Architecture, as principally authored by the scholar Michael Hensel, is based on the efforts commenced in the 1940s and 1950s of the paradigm shift in the humanities and science.⁴⁵ Michael Hensel and Achim Menges in *Performance-Orientated Design Precursors and Potentials* for journal AD, explains how form is not pure shape of material object but milieu of conditions, modulations, and microclimates that emanate from exchanges of environment and objects.⁴⁶ Performance is presented as driving concept for design where form and function are in synergetic relation within natural, cultural and social environment. Performative capacity is characterized by four domains of "active agency" the human subject, the spatial and material organization and the environment.⁴⁷

What makes Performance-Oriented Architecture particularly engaging, in relation to this thesis, is its focus on putting architecture in the service of the natural environment, which will empower learning mechanisms and reflection of architecture on perpetually novel conditions of its environments.

A consequence of material practice or abiotic elements lays in partitioning of space and modulation of environments, which can absorb and satisfy multi-functional and aesthetic criteria and preferences. In addition to these abiotic

⁴⁴ Von Uexkull, J. (1926). *Theoretical Biology*. London/New York: London, K. Paul, Trench, Trubner & co. ltd.; New York, Harcourt, Brace & company, inc., p.89.

⁴⁵ Hensel, M. (2010). Performance-Oriented Architecture - Towards a Biological Paradigm for Architectural Design and the Built Environment. *FORMAkademisk*, 3 (1), 35-56.

⁴⁶ Hensel, M. (2008). Performance-Orientated Design Precursors and Potentials. *Architectural Design*, 78 (2), p. 48-53.

⁴⁷ Hensel, M. (2010). Performance-Oriented Architecture - Towards a Biological Paradigm for Architectural Design and the Built Environment. *FORMAkademisk*, 3 (1), 35-56.

elements, we have seen that Performance-Oriented Architecture involving biotic elements, e.g. humans or inhabitants who are active part in “structuring a field of possibilities” and that architecture by that can open “new social formations and institutional form”.⁴⁸

By addressing architecture through only external forces we are stressing forms only from outside. However, as a supplement to Performance-Oriented Architecture, this thesis is seeking and requiring for stressing form of future architectural “beings”, from inside as well. Forms are articulated by internal forces in order to provide individuation.

From the previous discussions, concept of dealing with architecture it could be observed through (i) generic term such as self-replicating, self-organizing and self-synthesizing, (ii) perceptual selecting, exploring, and focusing on attention, and (iii) behavioral categories of action, interaction, and transactions. Each of these terms could be considered as isolated, but actual architectural behavior manifests most of them.

To recapitulate our image of the World and how it can be taken to be, we could introduce an inactive approach with embodied actions. An inactive approach emphasizes that “cognition is not the representation of a pre-given world by a pre-given mind but is rather the enactment of a world and a mind on the basis of a history of the variety of actions that a being in the world performs”.⁴⁹ Embodied actions defined by Varela, Thompson & Rosch, could be seen via two points (i) that cognition depends upon the kinds of experience that come from having a body with various sensorimotor capacities, and (ii) that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological, and cultural context.⁵⁰

As a supplement to the concepts of genetic, material ecology and Performance-Oriented Architecture, this thesis will look for sensory niche display as hybrid

⁴⁸ Hensel, M. (2010). Performance-Oriented Architecture - Towards a Biological Paradigm for Architectural Design and the Built Environment. *FORMAkademisk*, 3 (1), 35-56.

⁴⁹ Varela, F., Thompson, E., & Rosch, E. (1991). *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge: MIT Press, p. 9.

⁵⁰ Ibid.

theory of Architectural Sensorium (ability of the architecture to receive and interpret sensory stimuli). In this research, sensorium is not percept, as human's sum of organisms rather as an architectural sum of possibilities to seat sensation. In the embodiment hypothesis recognizers portrayed and determine world by mutual interaction between physiology of the organism, its sensorimotor circuit, and the environment.⁵¹

If we conceptualize architecture as an "alive creature" it could be possible that architecture will not stand longer as a passively reflector of the outside world but active constructor of its own reality. Hybrid theory of Architectural Sensorium implies relations from epistemological, how architecture can be acquired, to ontological question, what is architecture.

Following discussions are extension previous ones, in order to fully liberate picture of new possible scenarios of (im)possible. Focus of the research is not fostering on humans but on architecture. It will search for "organs" embodied in architecture "beings" for seating sensation of social, ethical, material, aesthetical, environmental, sustainable or intellectual stimulus. Forming sensorium within architecture is an attempt to liberate meaning of form articulation. It is looking for form that arises within the system itself and not merely from the outer world and people perception and perambulations.

In relation to previous and in order to fully understand architecture via justification of the Beauty, this thesis is introducing following questions related to seven continua: pattern in Nature, ones made by humans and computers, information, senses, environment, and bounds. Architecture is conceived via mixing this seven continua encrusted imagination, mythology, philosophy, and (im)possible.

(Q6) Does the brave new world, we are creating, have its geometry? Is that geometry a never-ending pattern? How could architecture advance, proceed; reinsert itself into a pattern of successfulness?

⁵¹ Varela, F., Thompson, E., & Rosch, E. (1991). *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge: MIT Press, p. 9.

Patterns do possess attributes related to theoretical troika relevant for this research. They are expressed via morphodynamic, morphogenetic, and performative processes. In this research, we observe their self-similar, self-adaptive, self-organizing, and self-deleting attributes. Patterns of contemporary architectural thoughts are not perceived as ornamentation but rather as an idea of complexity of our era. The complexity is measured by wealth and variety of the parts that an object is made out; and by wealth and variety of different states that can manifest.⁵² Related to this, the thesis will search for state of the art projects, which do present patterns with isotropic properties or uniformity in all orientations, and anisotropic where properties vary systematically, depending on direction.

Three design approaches are taken into consideration while talking about patterns. Patterns designed by Nature, by humans and made by computation. These considerations represent background of this research, from which are derived three correlations important for settings of questions of senses, bounds, environments, and information.

Patterns found in Nature such as patterns of leaves of plants (Fig. 1.1.), which are tissues by multitude of tubes that use their network to capture light, to transport fluid to farthest points by own transport mechanisms and to support their own structure and by that demonstrate their multi functionality.⁵³ In order to accept the environmental conditions, Nature has a way to change its local matter distribution and give an answer for the change in surroundings. Signals from the outside world can change a cell gene expression.⁵⁴ On one single plant, leaves can have different shapes depending on the place of the leaves on plants.⁵⁵

On the other hand, we have human-made patterns expressing immense complexity. Nuns of Benedict's monasteries in the island of Hvar, Croatia,

⁵² Wagensberg, J. (2003). Complexity. In M. Gausa, W. Muller, V. Guallart, F. Soriano, F. Porras, & J. Morales, *The Metapolis Dictionary of Advanced Architecture: City, Technology and Society in the Information Age* (p. 123). Barcelona: Actar.

⁵³ See: Michael Hensel in Special Issue: Techniques and Technologies in Morphogenetic Design AD: Architectural Design vol. 76, Issue 2, edited by: Michael Hensel, Achim Menges, Michael Weinstock, 2006, p. 20.

⁵⁴ The University of Utah, Genetic Science Learning Center, [Online], Available: <http://learn.genetics.utah.edu/content/epigenetics/intro/>, 2010

⁵⁵ Wolfram S., (2010). Stephen Wolfram's New Kind of Science, [Online], Available: <http://www.wolframscience.com/nksonline/page-1005b-text> 2010, p. 1005.

traditionally produce lace last 100 years (Fig. 1.2). Their knowledge of lace making, made by agave treads, Benedictine nuns are passing from generation to generation. Since there is no written code it is impossible to copy and paste their patterns. There are three different methods of lace making regarding technique: from centre, from the end, and from the net.⁵⁶ This lace looks like it is influenced by the forms found in Nature and works of the D'Arcy Thompson, Alan Turing, and Ernest Haeckel. It is irrelevant to talk about if the nuns of Benedict's monasteries use the computer techniques and algorithms for the production of the Hvar lace but their work strongly remind to the form expressed in the work of evolutionary artists like Andy Lomas and his project "Aggregation" (Fig. 1.3). Pattern could reflect information of its environment and provide new forms for architecture. This thesis will try to discover dynamic notion of pattern, designing static forms. While oscillating between dimensions, patterns are giving form. Oscillation could be multiple so do the forms. New forms are taking us further.

Among other terms related to this research, one of the most relevant is the concept of information. Information accepted as a descriptor of matter, energy and thus space and time. Matter and Energy, fundamentals of physical attributes and properties of architecture, are extended by notion of Information defining its virtual property.

Raphael Bousso is a theoretical physicist and string theorist known for the proposal of Bousso's holographic bound, a general relation between the curved geometry of space-time and its information content. Information tells space-time how to curve; space-time tells information how to disappear. There is evidence for a universal relation between geometry and information.⁵⁷

In quantum mechanics information cannot be lost. We are surrounded by information we are receiving, producing, transforming information and evolving it again into network. As it is explained by Bousso, amount of information that one can fit on surface, let say of box, at a density of one bit per Planck tile, is sufficient to tell you absolute everything that could happen to that box. Meaning

⁵⁶ Hanibal Lucic Museum, Benedictine Convent, Hvar, Croatia, Dalmacijapapir d.o.o., 2010, p. 4.

⁵⁷ Bousso, R. (2014). Perturbative Proof of the Covariant Entropy Bound. *FQXi 4th International Conference on Physics of Information*. Puerto Rico.

that amount of information is limited by area, not volume. Boundaries are tiled by one bit per Planck.⁵⁸ Architecture is designing void using boundaries. If boundaries are inseparable from form:

(Q7) Can information design the boundaries of architecture? How to integrate the concept of information into architectural design? How can architectural design help us understand the deeper role of the concept of information? If architecture is about idea, does architecture then represent a physical view of an idea?

Boundaries have fundamental role in how we live and communicate. It is well known informative role of the bounds from the ancient time. Walls have a role of shelters, storytelling, and even our individual textile wrapped around our bodies transmits information to our environment. This thesis looks at boundaries, their spatial pattern representation and how these patterns read information from its environment. Final form is not related to its classically accepted spatial performance but also culturally, politically, aesthetically performances of its environment.

We use our senses as receptors of information that surround us. We appreciate and respond to complex emotional or aesthetic influences; we are sensible to our environment. To be insensible means to become anaesthetic. The word anaesthetic is derived from Greek anaisthetos "insensate, without feeling; senseless, stupid"⁵⁹ Ulysses, according to Homer, anaesthetizes his sailors, putting them wax in the ears in order to survive. Song of siren (Fig. 1.4.), according to legend, is so seductive that one cannot resist it; and so powerful that obscures the mind and conducts our will, leading us to disaster. It is generally known that beautiful does not always end with enjoyable experience. Let us take for example the fortifications of the city, whose form amaze us, while their idea was somewhat frightening, in the fight against evil, and war. By making its people insensible to the Beauty of the siren's songs, Ulysses meant to survive them. Senses are our receptors of Beauty; anesthetizing could help or hinder. Our view

⁵⁸ Bousso, R. (2014). Is Information Fundamental? *Closer to Truth*. (R. L. Kuhn, Interviewer) PBS.

⁵⁹ Etymonline.com. (2001). *Anaesthetic*. Retrieved 2016, from Online Etymology Dictionary: <http://www.etymonline.com/index.php?term=anaesthetic>

of the world is shaped by accumulated impressions, thus influencing our creative apparatus and our involvement within it.

Le Corbusier in his argument of *The Engineer's Aesthetic and Architecture* said:

*The Architect, by his arrangement of forms, realizes an order which is a pure creation of his spirit; by forms and shapes he affect our senses to an acute degree and provokes plastic emotions...it is then that we experience the sense of beauty.*⁶⁰

(Q8) If we evaluate senses do they become more real, passing from virtual to real? If we anaesthetize them is it possible to reach limit or borders of virtual and real? How can we use experience in architecture and modify its sensory guidance to the more beneficial ways of making?

Paola Antonelli, senior curator of The Museum of Modern Art (MoMA) gallery's Architecture and Design department, explained in a conversation *Without Design, Innovation Doesn't Happen*, that design is every creative process that has goal and involve at least one of the senses. Important to her is connection of design, the world and designer's idea of trying to make things better.⁶¹ By joining a space outside of our and looking to somewhere else, thinking and doing something else could take us to redesigning notion of architecture.

(Q9) How to produce increasingly fit architecture in environments which are highly uncertain? What is environment? Should we extend our knowledge of the environment? Can we understand ultimate essence of architecture as a construction of void?

Tschumi says about architectural practice:

⁶⁰ Le Corbusier. (1986). *Towards a New Architecture*. New York: Dover Publications, Inc, p. 1.

⁶¹ Kirkpatrick, D. (2015). *Without Design, Innovation Doesn't Happen: A Conversation with MoMA's Paola Antonelli*. *Techonomy*, pp. 26-31.

*We start by defining space. We start by activating space. That is what architecture does.*⁶²

Can we be more focused on what architecture could become, analog to introduction of the new human element of robotic products, RoboCop:

*It's not what man can create, it's what man can become.*⁶³

(Q10) How can we programme our design procedures so that problem-solving capabilities are built by “what architecture could become” rather than “how to do it”?

This thesis will try to give answer to mentioned questions, by processing amalgamation of senses with information, information with space, space with senses, pattern with information, space with pattern, and similar.

We are surrounded by brave new world that we are creating. It is obvious that boundary created between virtual and real is not bold any more. Dichotomy of artificial and natural is losing its boundary. Routs of mixed environments, natural and artificial, could be found in “aesthetically potent” environment of Pask⁶⁴. If music is everything we do⁶⁵, then architecture is everything we see. It is built out of material, which is not produced in advance but embedded in very process of creation, or creators, like Neri Oxman’s silk dome produced by worms.⁶⁶ While robots are unlocking their capabilities towards complex behavior, aesthetics of the objects has to be stressed in this mix of real, artificial and imaginary values. As a final stage, this research will include term Beauty in order to understand relations between architecture and new aesthetical concerns.

⁶² Khan, O., & Hannah, D. (2008). Performance/Architecture an Interview with Bernard Tschumi. *Journal of Architectural Education*, 61 (4), pp. 52-58.

⁶³ Billington, A. (Director). (2014). *OmniCorp's 2027 CES Keynote Presentation 'RoboCop' Viral Video* [Motion Picture].

⁶⁴ Pask, G. (1968). The colloguy of mobiles. (J. Reichardt, Ed.) *Cybernetic Serendipity*, p. 34.

⁶⁵ Kostelanetz, R. (2003). *Conversing with Cage*. New York and London: Routledge, p. 69.

⁶⁶ Oxman, N., Kayser, M., Laucks, J., & Firstenberg, J. (2013). Robotically controlled fiber-based manufacturing as case study for biomimetic digital fabrication. *Green Design, Materials and Manufacturing Processes* (pp. 473-478). Lisbon: Taylor & Francis.

Architecture demonstrates its edge position between confrontations to classical physical forces like gravitation and satisfaction of the implemented terms coming from quantum physics. What we expect from architecture or value of architecture changes from era to era. Today it has to be absolute technical mastery, and what we want is dramatic power, charm, assertiveness, radiance, social reflection, philosophical concern, reflection and communication of ideas, simulation of the senses and constructive narratives. One value has curiously vanished from the horizon and it is value of Beauty. Beauty as a value hardly exists from twenties of last century. Did Sullivan kill the Beauty by saying the "Form follows function" or did he extend it by that. Our hearts do have a function to pumps blood, but they as well make heartbeats, which do have value of Beauty.

Architecture is like ballerinas on a dancing floor, which are in a permanent confrontation with the force, energy, momentum, inertia, velocity, and acceleration. The elegance or Beauty of their body manipulations is not a simple reflection of their movements' sum, or resistance to the forces around them, but also a skill of a dancer to create the illusion by performing the impossible.⁶⁷ Architecture built in the Actual world with tendency to become part of the Possible world, looks forward to forces of Imaginable velocity, and allures for the obviously Impossible. Alles ist Architektur⁶⁸ got a new dimension. Can we say that architecture is, if I say, that it is? For Alberto Estévez it is, including bioluminescent plants, digitalization of DNA, transition of growing cells into architectural materials, or demystification of the scale of architectural objects by implementation of the 1:1 scale architecture.⁶⁹

This thesis will search for niche of precious possessions of Beauty, defined by Charles Baudelaire:

⁶⁷ See in Laws Kenneth, *Physics and the Art of Dance: Understanding Movement*, Oxford University Press, 2002.

⁶⁸ Hollein, H. (1968). Alles ist architektur. *Bau*, 1 (2), 3.

⁶⁹ Estévez, A. T. (2015). Biodigital Architecture. In A. T. Estévez, *Biodigital Architecture & Genetics writings* (pp. 130-133). Barcelona: Escola Tècnica Superior d'Arquitectura (ESARQ).

*That which is not slightly distorted lacks sensible appeal; from which it follows that irregularity-that is to say, the unexpected, surprise and astonishment, are an essential part and characteristic of beauty.*⁷⁰

Intentionally this thesis will study Beauty more than aesthetics in architecture. It will explore new, wild and brave Beauty of architecture, similar to relation found in-between art and culture. While Culture contrary to art, expresses continuity and coherence, Art possesses singularity of a wildness and surprising nature. Aesthetics vs. Beauty has same relations. Why it is important, because it is everywhere.

*I can't understand why people are frightened of new ideas. I'm frightened of the old ones.*⁷¹

In addition, it has to be said that the purpose of this research is not to make a book of Beauty, not because of the author's incompetence, but because of the understandings that the notion of Beauty is so wide, same like the notion of architecture. So, making a book of Architecture and book of Beauty are the tasks obsolete in understanding and interests and could present ultimate fetishization. Notion of Beauty is dynamic matter; as well as sensitive, responded, reflected, adapted, changeable, resonated, copied and pasted. By possessing these attributions, becomes of the interest for this research. So, the scope of this research will not give the reader all ever written or said about Beauty. It will be focused on comparison, or better-said supplementation between state of the art in architecture and philosophy. The idea is to set theoretical concern towards question, where architecture is, in the relation to the new understandings of the world.

It is a well-known link between architecture and science, a lot is written about that. What is about the relationship between architecture and philosophy? Whether architecture can change philosophy or philosophy can change the architecture?

⁷⁰ Baudelaire, C. (2006). *Intimate Journals*. (C. Isherwood, Trans.) New York: Dover Publications, p. 41.

⁷¹ Kostelanetz, R. (2003). *Conversing with Cage*. New York and London: Routledge, p. 211.

We know two philosophical camps “continental” and “analytic” philosophy. As it is discussed by Marcus Gabriel “continental” philosophy is imaginative, creative, unorthodox, while “analytic” philosophy is argumentative detailed and countering objective.⁷² In this research, or search for Beauty, it is not defined exactly, and the research does not have the purpose to compare those two stages of philosophy. The idea is to search for contemporary philosophical comprehensions, what Beauty could be and how these understandings, could raise question of theoretical concepts of architecture; or should architecture, or does architecture do have those capacities to augment philosophy. So it will merge and extract contemporary thoughts from both philosophical camps.

1.6 Objective

From the very title of the thesis, it can be concluded that what is written here, is not within one discipline. This research, besides architecture, enters the field of biology, computer science, materials, and philosophy. We architects do have a duty to implement all knowledge opened to us, by new insights of science and technology. This research will search for niche in-between disciplines, the importance that does not belong particularly to one discipline only. Other duty of us, architects, is to reinvent philosophical root of our discipline. Even though this thesis has taken into consideration discoveries inside other disciplines and their contribution on better or more beautiful possibilities, the focus would be directed to searching architectural solutions of architectural problems. Nature intertwines information into patterns, human kind patterns also possess information inside, computer makes patterns as well. Can we by using knowledge of all these patterns produce boundaries of architectural “beings” able to sense, respond, reflect, adapt, change, copy and paste the environment?

Question on what architecture could present and how does it fit together and respond to its environment whether it is physical, imaginable, and recently virtual is an age-old problem. What has changed over last decades is that we have much better argumentative and conceptual tools and more freedom in thought in order to make major leaps in discussion of these questions. The thesis attempts

⁷² Gabriel, M. (2016). Markus Gabriel. Purple MAGAZINE. (M. B. Kacem, Interviewer)

to contribute to architectural theory and its orientation to search for theoretical concern of state of the art architecture.

On theoretical level, the objective is to identify and supplement theoretical concern of architectural discipline, by involvement of philosophical discussion of nowadays determinism. The idea is not to define all terms of current interests, but rather to identify that architecture is dynamic structure in constant search for novel concepts that could be understood only in between different disciplines, somewhere that is elsewhere.

On applied level the objective is to formulate and develop a tentative series of discussions on architectural objects, which participate in the environment through its own membrane, with inclusion and democracy, making those objects become equivalent to the real world. It will stress out theoretical base and applied projects done with open minded, exciting views against the established main stream of time, with radical result but by spelling out the analytical details of the concept employed. It will search for future architectural “being”, designed without material, which understand Beauty as a matter of emergence in the space that surrounds it.

Architecture is an expression of its time in so far as it reflects the corporeal essence of man and his particular habits of deportment and movement, it does not matter whether they are light and playful, or solemn and grave, or whether his attitude to life is agitated or calm; in a word, architecture expresses the “Lebensgefühl” (feeling for life) of an epoch.⁷³

Concerning the technology development and its application in architecture now, it is possible a direct transfer of design structure’s data from the computer into the production machine. Technology of construction is now different: a brick wanted to become something (Louis Khan) by now, and today bits want to become something (Fig. 1.5.). This research seeks for different systems of material with self-organization capacities that could be used across numerous of scales - from

⁷³ Scruton, R. (1979). *The Aesthetics of Architecture*. London: Methuen, p. 53.

creation of material to the performance of elements - within a larger functional economy of an overall system.

1.4 Organizations and Structure of Thesis

The dissertation is structured in four parts: First: Introduction and Methodology (chapters 1 and 2); Second: Foundation (chapters 3, 4 and 5); Third: Body of Thesis (chapters 6, 7, 8 and 9); Fourth: Conclusion (chapter 10). Each section represents one, out of ten chapters that make up this work. Each is trying to give an answer to the questions defined in introductory chapter.

First three chapters after Introduction and Methodology present background of the research, Chapters 3, 4 and 5, provide concept and ideas from the fields not necessarily architectural, respectively of biology, material science, engineering and design computation. Combined, these three chapters make up the background segment of the thesis, including exploration about Nature ways of making patterns, Human's ways and Computer ways, to be useful and significant in support of its arguments. Chapter 3 (entitled: Nature. Can We Crack the Formula?), discusses the concepts and strategies of Nature that can contribute to defining the role of spatial pattern for generating future adaptable bounds. What is important to highlight is that the chapter deals with concepts, phenomena, and strategies that contribute to the idea of communication and adaptability between the generated form and its environment. Chapter 4 (entitled: The Original Us) is about pattern designed by humans pointing towards the potential integration between pattern and environments in what these patterns occur. Also, definition of materials and engineering of human-made pattern is given. Here, human ways of making pattern are considered vis-à-vis Nature's ways as the potential substance to be recomposed and reformed. Chapter 5 (entitled: Bit Wants to Become Something!) provides review of state-of-the-art computational tools, techniques, and technologies that carry the potential to support this research. Also, computational theories, which traces path of design generation and fabrication technology.

Chapters 6 through 9 provide the core chapters of the research description: they represent the body of knowledge and experimental frameworks associated with new design approaches.

Chapter 6 (entitled: Unfinished!) presents existing concepts, methods and technologies tested in a new situation, showing what works - or what doesn't - and why, and so defining their limits. It also shows examples that are relevant to the methodological and technical overview of research topic. Based on intervention of environment on spatial patterns design methods to be taken into consideration are the ones, which were expressed in the patterns presented in the previous chapter.

Chapter 7 (entitled: Fast Forward) presents the methodological and theoretical frameworks designed to explore some of the issues and questions raised in the previous chapter. Providing taxonomy of observed and empirically measured phenomena of interest.

Chapter 8 (entitled: Techniques for Early Diagnosis of Beauty) presents collection of design experiments, design products, and design tools demonstrating the relevance for research topic for the thesis.

Chapter 9 (entitled: Dialoguing with Philosophy) lays out the theoretical and technical foundation with philosophical interrogation. Throughout this chapter, we discuss the theory, technology, and philosophical standpoint, which may contribute to the development, definition and implementation of method of Architectural Sensorium. The new method should contribute to the development of design that emerges through the interrelation with the environment, but not as a mere geometrical design forms. Interrelation of spatial pattern and its environment promotes objects with graduated properties perfectly distributed and highly customized to fit multiple of functions. Philosophical views are inevitable aspect of design development, as this does not become mere performance of skills and techniques. This approach aims to offer a new ways of design as well as deepen the sensibilities of designed objects and their environment.

Chapter 10 (entitled: Conclusions) presents conclusion, conceptualization, propositions, and answers pointing to restated questions and future studies.

Chapters are organized in order to fully answer questions, from initial ones, via additional and final ones. Namely chapters *Nature, Can We Crack the Formula?*, *The Original Us* and *Bit Wants to Become Something!* will try to give an answer to questions Q2, Q6, and Q7; chapter *Unfinished!* to Q1, Q2, Q4, Q6; chapter *Fast Forward* to Q3, Q7, Q8, Q9, Q10; chapter *Techniques for early diagnosis of Beauty* will try to catalyze all questions through lenses of value of Beauty; and chapter *Dialoguing With Philosophy* to Q5, Q8, Q9, Q10.

1.7 Hypothesis and question

Does architecture exist somewhere out there, as an artifact reified and objectified? Or does it rely on processes, which call for interaction with environment? Should we, embedded users into architecture, think about architecture as something which is perceived, conceptualized, enacted and perpetually perambulated in order to be meaningful? Does the vector of design process have to reevaluate “reason of being” notion of Beauty? Is Beauty only spiritual need or could be something else?

What would be after designing, among others, by algorithms and by usage of advances of biomaterials; are we striving to an unforced design, which does not intrude materials into form, but rather produce form with an (un)material?

Two compelling examples are relevant for introduction of design with (un)material. First is Marina Abramović’s piece *The Artist Is Present*, presented in MoMA New York, in 2010. Artist and visitor are placed at first, on the other side of a table, and then, when the table is removed, with nothing but space between them. Creation is perfectly silent and virtually immobile performance designed as an unattached precious interrelation between an artist, visitor, and space. Second example is 4’33” sound performance by John Cage composer, a philosopher, a poet, a chess master, a visual artist, a diarist, a mycologist, and an enthusiastic macrobiotic cook:

...You know that I've written a piece called 4'33", which has no sounds of my own making in it...My piece, 4'33", becomes in performance the sounds of the environment...These things bring me to my thought about silence: to me, the essential meaning of silence is the giving up of intention...a renunciation of intention which is effected through the multiplication of images. In this multiplicity, intention becomes lost and becomes silent, as it were, in the eyes of the observer. A non linearly nature.⁷⁴

From the initial study of current states of the art examples, methods, and theoretical orientations in the approaches of designs found in human art craft, Nature, and computational design, and its relations with architecture, a general hypothesis of Architectural Sensorium is formulated:

Architectural design could be clever, invisible, self-sustainable, ethical and poetical. Architecture could be understood not as an isolated egocentric, but the direct participant in the world's order. From the architectural design that was into design, and through design we came to the point to design for design, and architecture qua architecture. Our discipline allures to reinvent its coherence and an argumentation not as a model but as the very armature of the system itself.

Can we design with (un)material, an architectural "being" able to sense, respond, reflect, resonate, adapt, change, copy and paste its extrinsic and intrinsic environment?

Is the Beauty continual shaping of perpetually novel environment, which embedded in itself primordial power of Nature ways of designing the things? And if architecture emerges as a result of sensitive, responded, reflected, adapted, changeable, resonated, copied and pasted information from environment, what about Beauty? Does Beauty have ontological intrinsic notion or more performative unstable value?

⁷⁴ Kostelanetz, R. (2003). *Conversing with Cage*. New York and London: Routledge, p. 187.



Figure 1.1. Pattern find in Nature. Leaf texture. Photograph by the author.



Figure 1.2. Lace from Benedictine Convent at the island of Hvar (Croatia). Photograph courtesy of Hanibal Lucic Museum.

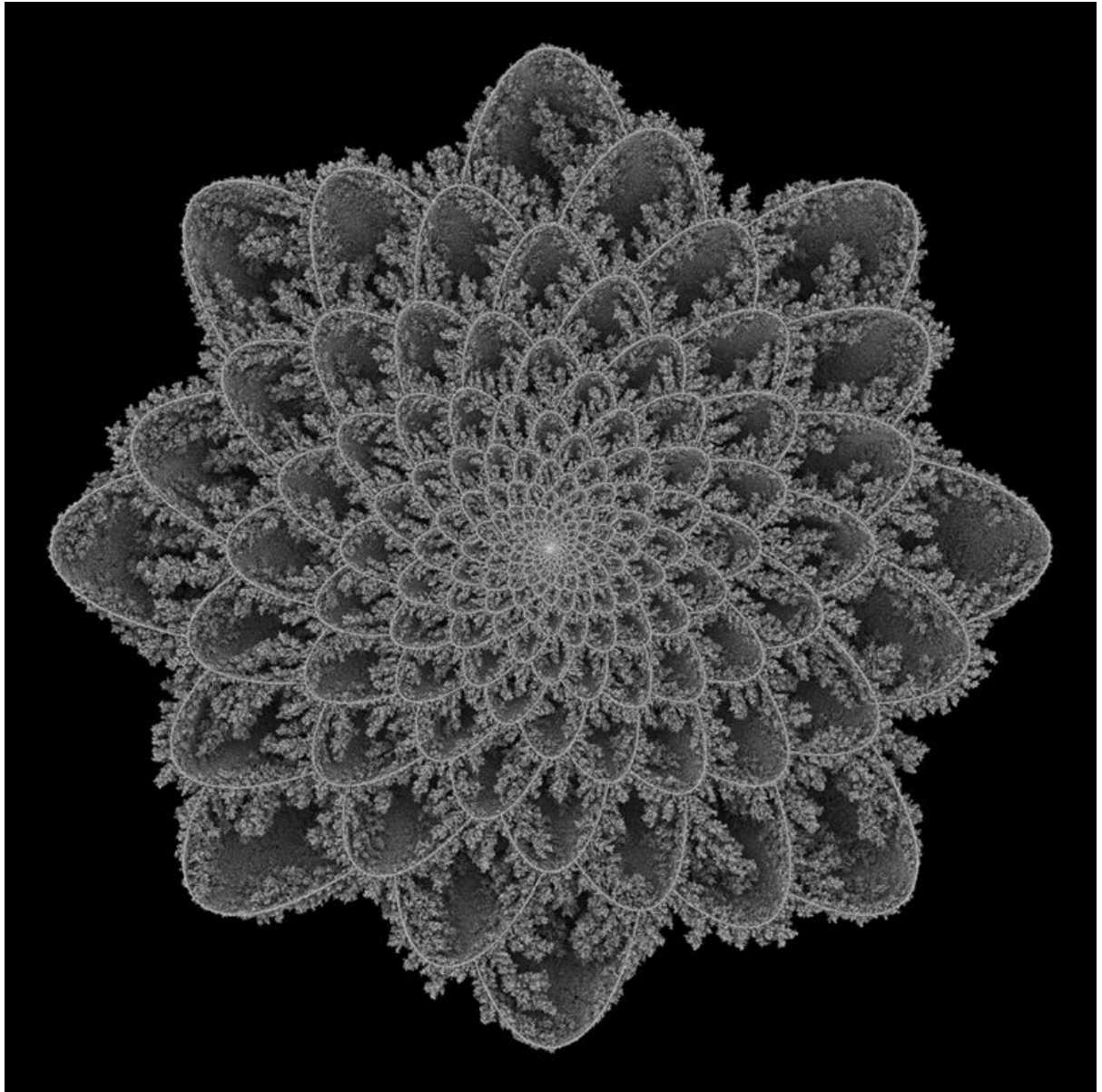


Figure 1.3. Andy Lomas, Images of Aggregation.

Source: <http://www.andylomas.com/aggregationImages.html>_16/12/2010.



Figure 1.4. Siren, tomb statue from the Dipylon Cemetery in Athens, 4th century BC; in the National Archaeological Museum, Athens, Alinari/Art Resource, New York, photo.

Source:<http://www.britannica.com/topic/Siren-Greek-mythology/images-videos/Siren-tomb-statue-from-the-Dipylon-Cemetery-in-Athens-4th/107405> _23/04/2016.

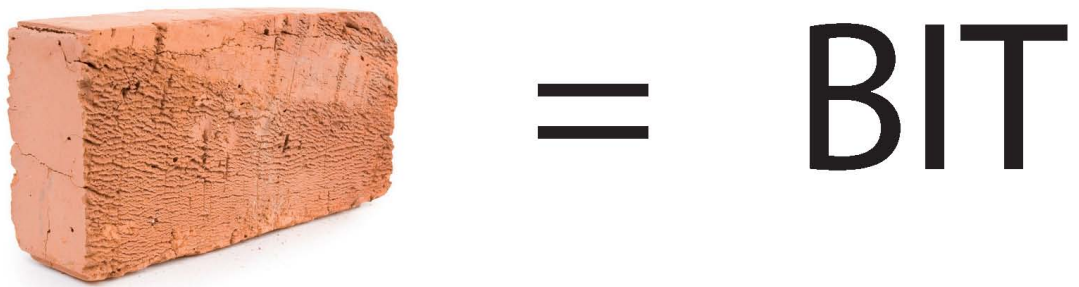


Figure 1.5. “Even A Brick Wants To Be Something” –said Louis Kahn, analogue to that today could be said “Even A Bit Wants To Be Something”. Montage by the author.

CHAPTER 2

2 Methodology

A story should have a beginning, middle and an end, but not necessarily in that order.

_ Jean-Luc Godard

2.1 Research Position

In regards to research position, thesis Justify Beauty is striving to find niche in between disciplines that does not necessarily belong to one disciplinary field and by it, belongs elsewhere. Root of thesis is architecture in relation to philosophy, engineering, computation, art, craft, and biology. Reason for across disciplinary approach is coming from broad research question about Beauty in relation to architecture, environment, information, boundaries, senses, and patterns. This position was elaborated upon in introductory chapter.

Research based on across disciplines not necessary calls interdisciplinary approach, neither means to feel like a citizen in one disciplinary field, and tourist in another.⁷⁵ Thesis will try to implement understandings based on across disciplines, by antidisciplinary approach. While interdisciplinary means that people from different disciplines work together, antidisciplinary is something very different. It is about working in spaces that simply do not fit into any existing academic discipline, but have specific field of study with own particular words, frameworks, and methods.⁷⁶

As an attempt to represent the antidisciplinary hypothesis, Neri Oxman proposes a map (Fig. 2.1.) of four modalities of creative exploration - Science, Engineering, Design, and Art:

The role of Science is to explain and predict the world around us; it 'converts' information into knowledge. The role of Engineering is to apply scientific knowledge to the development of solutions for empirical problems; it 'converts' knowledge into utility. The role of Design is to produce embodiments of solutions that maximize function and augment human experience; it 'converts' utility into behavior. The role of Art is to question human behavior and create awareness of the world around us; it 'converts' behavior into new perceptions of information, re-presenting the data that initiated the Krebs Cycle of Creativity in Science.⁷⁷

Known research strategies of Groat and Wang, are represented via basic diagrammatic form of cylinder. At the center of the cylinder, is a “core” that represents case studies and/or combined strategies. The periphery of the circle represents each particular strategy. Groat and Wang argued that those strategies close to each other have more similarities than those that are further apart. For

⁷⁵ Oxman, N. (2016). Age of Entanglement. (D. Hillis, Ed.) *Journal of Design of Science (JoDS)*, 1 (1).

⁷⁶ Ito, J. (2016). *Design and Science*. (D. Hillis, Ed.) *Journal of Design of Science (JoDS)*, 1 (1).

⁷⁷ Oxman, N. (2016). Age of Entanglement. (D. Hillis, Ed.) *Journal of Design of Science (JoDS)*, 1 (1).

the purpose of this research extracted is mixed strategy between Logical/Argumentation, Historical, Qualitative, Correlational (Fig. 2.2.).⁷⁸

Mixed method of research defined by Tashakkori, A., & Creswell, J. W is “research in which the investigator collects and analyzes data, integrates the findings, and draws inferences using both, qualitative and quantitative approaches or methods in a single study or a program of inquiry.”⁷⁹

Architecture is like kaleidoscope. This research will try to get mixture of qualitative understandings of architecture and art; and quantitative of natural sciences, computation, engineering, and biology. As a proposed framework of research in architecture, Groat and Wang are suggesting a three-part continuum. Objective-subjective continuum has two poles, and one intermedium step. One side, objective end, assumes the existence of reality that can be objectively described and measured. In a middle between objective and subjective, lie intersubjective researchers which, recognize the significance of values and meaning in framing the goals of the research and/or interpreting the results. On opposite pole of continuum sits subjective end, consisted of the constructivist approach that seeks to elucidate in-depth insights and interpretations of a given setting from the perspectives of the individuals who experience that environment.⁸⁰

Architecture, even though is predominantly applied, sits thorough continuum of subjective and objective, due the fact that has to be, besides applied nature, experienced by the individuals. This research will fly via continuum of research paradigms, from objective to subjective, on an adopted diagram of Groat and Wang (Fig. 2.3).

2.2 Research Span

While position of this research is trying to identify niche in-between science, engineering, design and art, research span is generally oriented to architecture,

⁷⁸ Groat, L. N., & Wang, D. (2013). *Architectural Research Methods*. New Jersey: Wiley, p. 15.

⁷⁹ Tashakkori, A., & Creswell, J. W. (2007). The New Era of Mixed Methods. *Journal of Mixed Methods Research*, 1 (1), 3-7.

⁸⁰ Groat, L. N., & Wang, D. (2013). *Architectural Research Methods*. New Jersey: Wiley, p. 76-79.

and into solving architectural problems with architectural solutions. Position of architect nowadays is “to protect not only man, but also life as a whole”.⁸¹

Christopher Frayling, British educationalist and writer, known for his study of popular culture, has defined three categories of research in art and design; (i) research into art and design; (ii) research through art and design; and (iii) research for art and design. Historical, aesthetical or perceptual research, and research into variety of theoretical perspectives on art and design falls under umbrella of research into art and design. Second, research through art and design covers materials research, development work, and action research. Finally, research for art and design ends with an artefact, where the thinking is embodied in the artefact, while the goal is not primarily communicable knowledge in the sense of verbal communication, but in the sense of visual or iconic or imagistic communication.⁸²

As a comparison to Frayling definition and differentiation of research of design and art, we could take The Royal Institute of British Architects (RIBA) division of three stages of architectural research. RIBA has divided architectural research as follows:

- (i) Architectural processes that include representation, theories of design, modeling environments;
- (ii) Architectural products that include aesthetics, materials, construction technology and so on; and
- (iii) Architectural performance refers to research into building once completed and might, for example, include issues of social occupation, environmental performance, cultural assimilation, and so on.

This research work is into art and design, exploring the concept of Beauty through art and design, materials and technology, and all for art and design.

⁸¹ Songel, J. M. (2010). *A Conversation with Frei Otto*. New York: Princeton Architectural Press, p. 8.

⁸² Frayling, C. (1993). *Research in Art and Design*. London: Royal College of Art, Research Papers. Frayling, C. (1993). *Research in Art and Design*. London: Royal College of Art, Research Papers, p. 5.

Although the final result is not an artefact, thesis is targeting a group of artifacts whose symbiosis will make it artefactual.

*When I paint, my object is to show what I have found and not what I am looking for.*⁸³

2.3 Research Design

Presented work mostly follows research design described by Karl Popper, German philosopher and mathematician.⁸⁴ It includes a dynamic circular design structure with a goal of not endings, where evaluation of new concepts and phenomena is leading to new guesswork. It consists of following steps:

- (i) Inspired guesswork;
- (ii) Diagnosing/Hypothesis (Problem statement);
- (iii) Investigate/Prediction (Tentative theory, Abductive reasoning);
- (iv) New concept/Phenomena Create;
- (v) Discuss/Evaluate; and
- (vi) Reflect/Conclusion.

To make qualitative and quantitative aspects of this research mix of following research strategies defined by Groat and Wang⁸⁵ is evenly distributed in each step of Popper's research cycle (Fig. 2.4.)

Inspired guesswork

Stimuli from out there, or the world that surrounds us, is shaping our creative apparatus. We are direct participants in that creation. Popper suggests that instead of being stumble upon our experience, and letting it flow around us, we have to "make" our experience.⁸⁶ Inspired guesswork is beginning and an end of this research is a beginning for some future ones. Popper argues about understandings of absolutely certain, demonstrable knowledge by saying that:

⁸³ Barr, A. (1946). *Picasso*. New York, p. 270-271; reprinted from "Picasso Speaks", *The Arts*, New York, May 1923, pp. 315-326.

⁸⁴ Popper, K. (2005). *The Logic of Scientific Discovery*. Taylor & Francis e-Library.

⁸⁵ Groat, L. N., & Wang, D. (2013). *Architectural Research Methods*. New Jersey: Wiley.

⁸⁶ Popper, K. (2005). *The Logic of Scientific Discovery*. Taylor & Francis e-Library, p. 280.

The demand for scientific objectivity makes it inevitable that every scientific statement must remain tentative forever. It may indeed be corroborated, but every corroboration is relative to other statements which, again, are tentative. Only in our subjective experiences of conviction, in our subjective faith, can we be 'absolutely certain'.⁸⁷

Inspired guesswork of this thesis is product of the author's own creative apparatus, bombarded in years by information about architecture and its position in world order. Started with creation and terminated with thinking. As Slavoj Zizek suggests:

Don't Act. Just Think.⁸⁸

Literature review

Literature review is a method, which is appointed for initial foundation of this thesis but also finds its application through entire thesis. It has explanatory, descriptive and exploratory purpose for framing questions of this research topic. For Groat and Wang, literature review and annotation of bibliographies, are stepping-stones for determination of research questions. Synthesis of both could offer new ideas.⁸⁹ Due the fact that question of Beauty is more than significantly broad, literature review, played a guide role for reduction of a large body of literature, and collection of references that are having direct bearing on a research topic. Groat and Wang proposed matrix of things related with defining literature review, to do thinking, finding, sorting and writing; and things to be clarified as topics, theory, method, and outcomes.⁹⁰ Besides mentioned, in order to cultivate thoughts regarding topic of this research, the author finds useful electronic database of online books, journals, and dissertations. Recorded talks and online collections of world famous museums, is also interesting, due the fact of their nature of living documents with ongoing development.

⁸⁷ Popper, K. (2005). *The Logic of Scientific Discovery*. Taylor & Francis e-Library, p. 280.

⁸⁸ Zizek, S. (2012). *Don't Act. Just Think*. [Video].

⁸⁹ Groat, L. N., & Wang, D. (2013). *Architectural Research Methods*. New Jersey: Wiley. pp.141-169.

⁹⁰ Ibid.

Case study

In a research strategies' cylinder, designed by Groat and Wang, case study is taking a central position together with combined strategy (Fig. 2.2.).⁹¹

*The case study is a research strategy which focuses on understanding the dynamics present within single settings.*⁹²

For Yin, American social scientist, President of COSMOS Corporation, case study is:

*An empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident.*⁹³

and

*A study of a particular case or set of cases, describing or explaining the events of the case(s). A case study may rely on quantitative or qualitative data (or both) but usually involves some field-based data.*⁹⁴

Case study method is found as effective way in research of architecture, by many scholars in which a particular setting or circumstance is investigated holistically using a variety of data collection and analysis tactics.⁹⁵ In this thesis, case study strategy will find its application in use of hypothesis development and background theory of first part, Chapters 2., 3., and 4., which talks about development and applications of patterns found in Nature, made by humans and computers.

⁹¹ Groat, L. N., & Wang, D. (2013). *Architectural Research Methods*. New Jersey: Wiley, p.15.

⁹² Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *The Academy of Management Review*, 14 (4), p. 534.

⁹³ Yin, R. K. (2009). *Case Study Research: Design and Methods*, 4th ed. Thousand Oaks, CA: Sage, p. 18.

⁹⁴ Yin, R. K. (2011). *Qualitative Research from Start to Finish*. New York/London: The Guilford Press, p. 307.

⁹⁵ Groat, L. N., & Wang, D. (2013). *Architectural Research Methods*. New Jersey: Wiley, p. 18.

Logical argumentation

Logical argumentation strategy by Groat and Wang “entails a self-contained system of logical order. In that regard, it is most similar to the philosophical or mathematical framing of closed systems. Although one uses words or sentences and the other numbers, both represent relatively pure forms of logical argumentation.”⁹⁶ An answer to the question “What is art?” requires logical argumentation strategy to be employed. In that regard, it is used as an instrument for evaluation and conclusion of proposed hybrid theory of Architectural Sensorium and way to find a solution of justifying Beauty.

Historical research

Historical research strategy within this thesis “draws upon evidence derived from archival or artefactual sources, largely because the research question focuses on a setting or circumstance from the past.”⁹⁷ This research will include historical interpretation of the philosophical comprehensions, material science, well known approaches of form found in architecture and what exactly led to today’s way of making architecture.

Qualitative research

Qualitative research seeks “to understand settings and phenomena in a holistic and full-bodied way. But, whereas historical research seeks discovery through archival and artefactual material from the past, qualitative research typically focuses on social and cultural circumstances that are contemporaneous.”⁹⁸ Qualitative research is applied in definition of new concept phenomena, discussion, and evaluation of defined concept in regards to understandings of contemporary, fast forward philosophical thoughts.

⁹⁶ Groat, L. N., & Wang, D. (2013). *Architectural Research Methods*. New Jersey: Wiley, p. 18.

⁹⁷ *Ibid.*, p. 16.

⁹⁸ *Ibid.*

Correlational research

Correlational research strategy has signature characteristic “that specified variables of interest are observed or measured in a particular setting or circumstance. Correlational research, similar to the qualitative strategy, focuses on naturally occurring circumstances, but it makes use of more quantitative data.”⁹⁹ In this regard, the thesis is applying this strategy in order to identify architecture with current interests of the world we live in. Strategy is used for observing architecture as a direct participant of world order, and not isolated egocentric. In second part of the thesis, correlational strategy is used in investigating architectural empirical and computational models in relation to the general hypothesis and each case study found in first part of thesis, defined as background.

Cinematic technique based methods

Cinematic technique based methods, present a supplement of how we can implement zoom, tilt, panning from one to another, tracking, bottom up, panoramic, mixture of focal lengths shots, into architectural research. As it is said by Jean-Luc Godard, in very beginning of this chapter, a story should have a beginning, middle and an end, but not necessarily in that order. Thesis is complementing to mentioned research methods by application of cinematic techniques of shooting. It is flying from macro, meso and micro points of view, in order to look at the stated problems and to observe phenomena by view of an architect but from different perspectives (see Fig. 2.5. for better understanding of distribution of cinematic techniques).

2.4 Contributions

The goal of this research is to enrich interaction between environment and spatial organization of the patterns, which will result in bounds that embody and convey information and by that become adaptable and sensible to its environment. The Thesis aims to provide following contribution:

⁹⁹ Groat, L. N., & Wang, D. (2013). *Architectural Research Methods*. New Jersey: Wiley, p. 17.

- The supplementation of the architectural discourse by development, creation, and control of hybrid theory of Architectural Sensorium;
- The verification of applied design elements and principles to a variety of art and design contexts;
- Functionality and aesthetic qualities of bounds;
- Redefinition and recontextualization of terms, information, bounds, senses, and environment within architectural discourse;
- Interrogation of philosophy into architecture and vice versa, in order to stress the basis for creative activity. Frei Otto, in *The Fundamentals of Future Architecture*, from 1997, says “While the understanding of nature and aesthetics are the key areas of philosophy, they have so far only been traditionally considered in historic terms. In order to have a current and future understanding of nature and art, philosophy still doesn’t provide any information. The architect is alone. He must look for his own ethics by himself if he doesn’t want to become guilty. He can build his own aesthetics, but this causes prejudices and makes designing difficult.”¹⁰⁰; and
- Connection of design done with materials with those ones done with (un)materials.

2.5 Summary

Circle of this research started by paying attention to the whispers of intuition, continues with articulations in diagnosing, investigation or identification, and terminates with design of hybrid theory of Architectural Sensorium. Includes reframing of key issues that are relevant to achieve purpose. Limitations and contributions lead to a new guessworks, and make possible preparation for a new cycle.

¹⁰⁰ Songel, J. M. (2010). *A Conversation with Frei Otto*. New York: Princeton Architectural Press, p. 14.

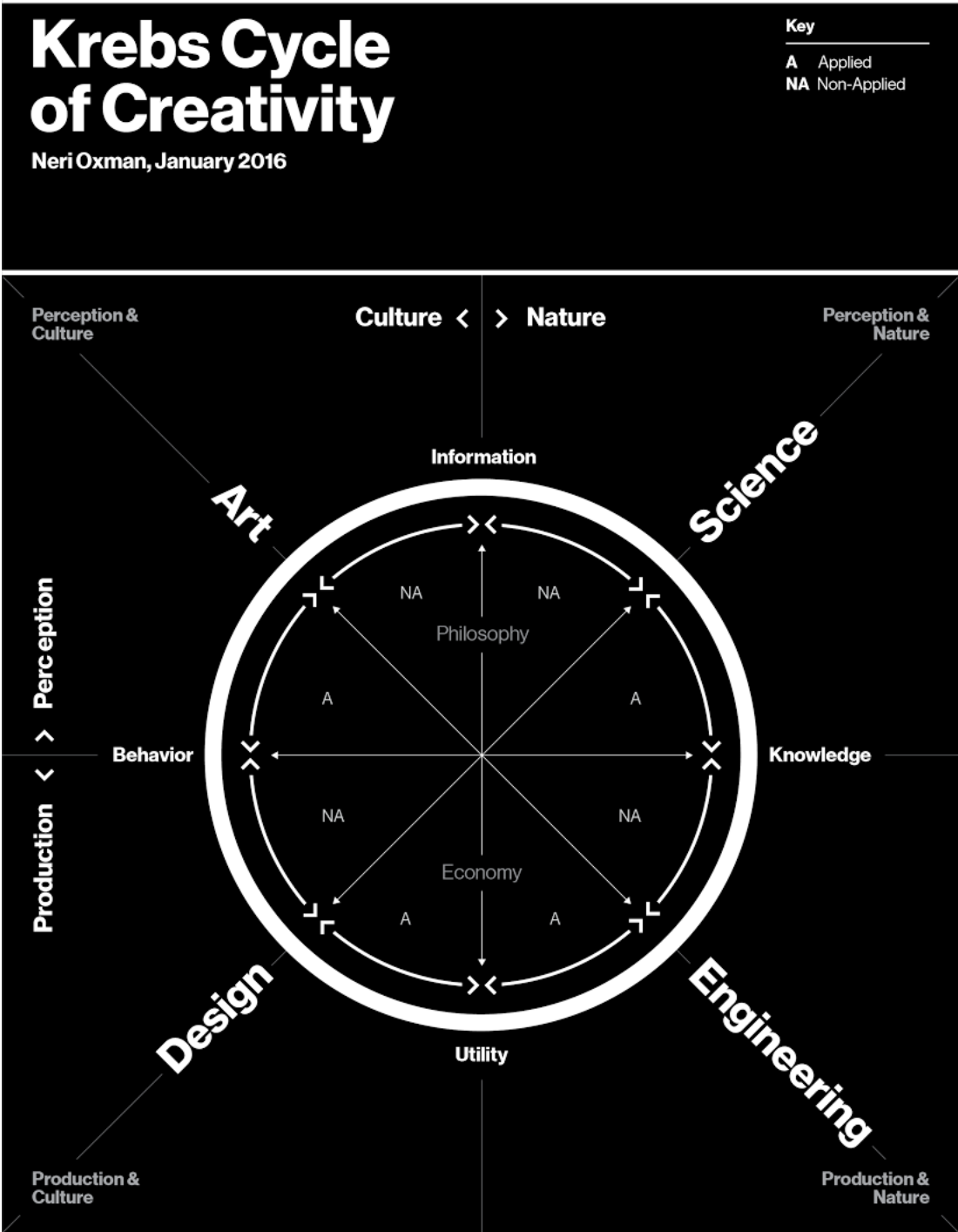


Figure 2. 1. The Krebs Cycle of Creativity is a map that describes the perpetuation of creative energy, analogous to the Krebs Cycle proper. Diagram by Neri Oxman.

Source: http://jods.mitpress.mit.edu/pub/AgeOfEntanglement_16/06/2016.

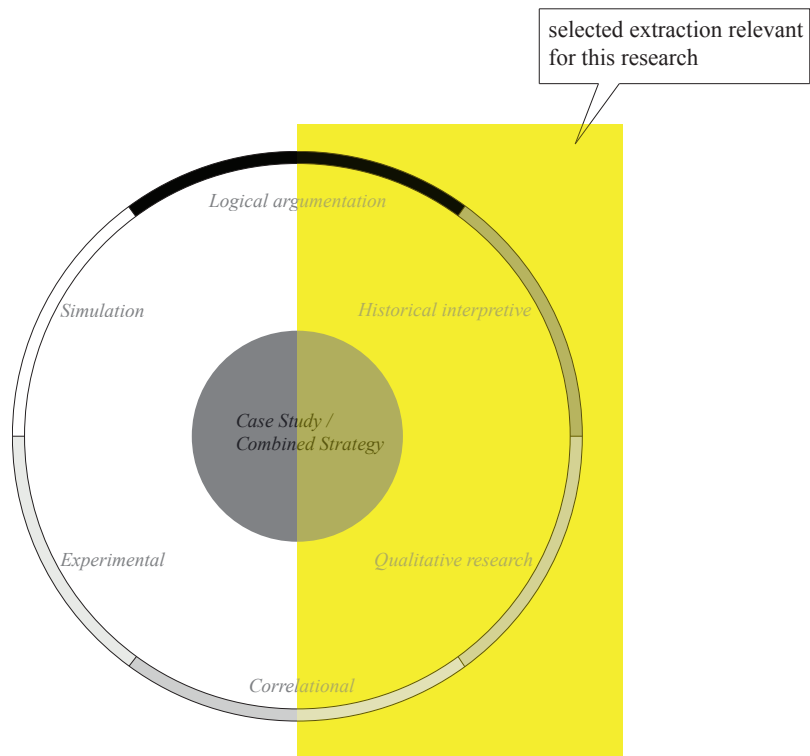


Figure 2. 2. An adaption of the cylinder of research strategies, defined by Groat and Wang (see full citation listed in endnotes) with selected extraction of: Logical/Argumentation, Historical, Qualitative, Correlational relevant for this research. Diagram by the author.

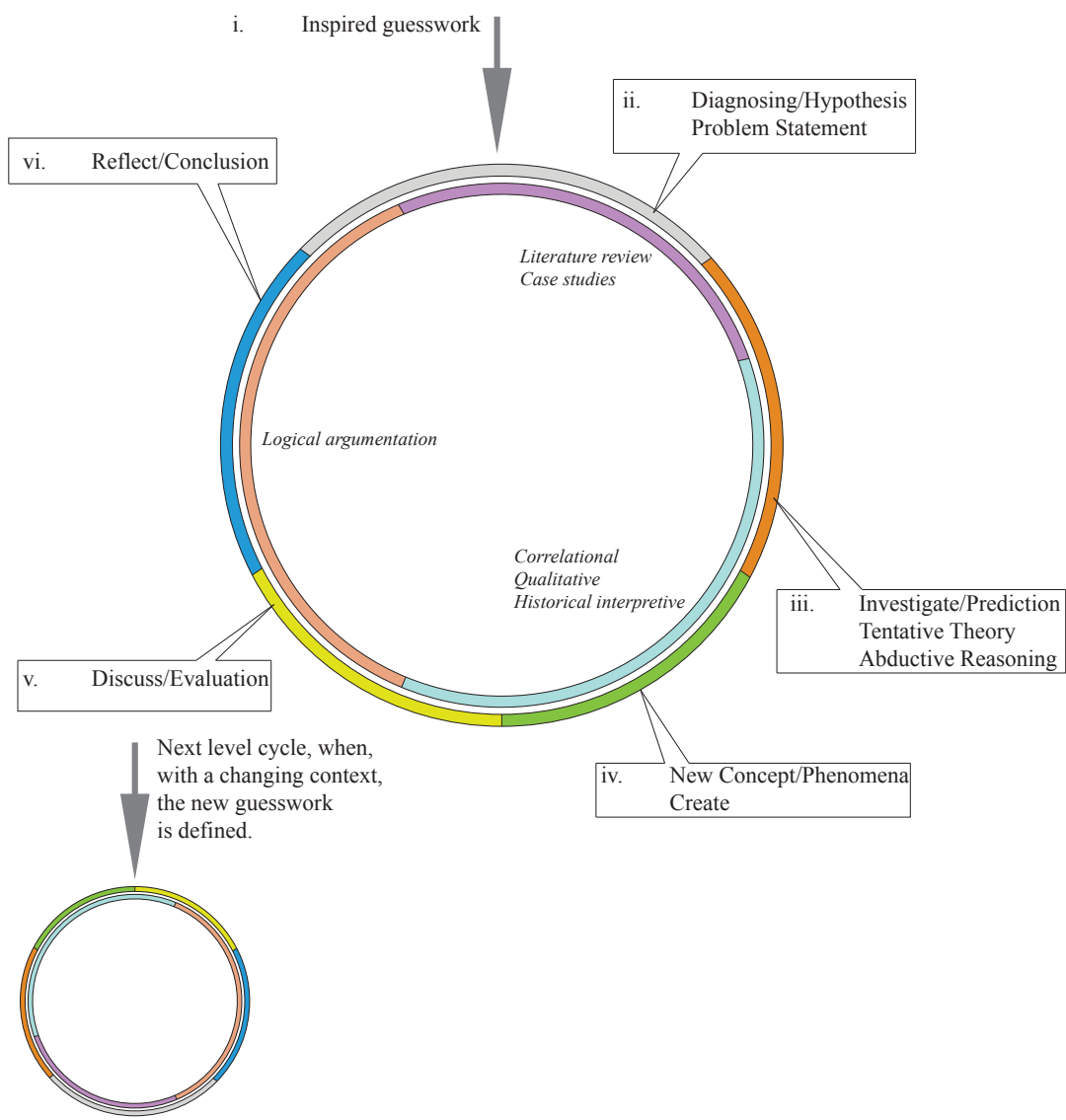


Figure 2. 4. Diagram of Popper and Dewey's cycle of research progression. Diagram by the author.

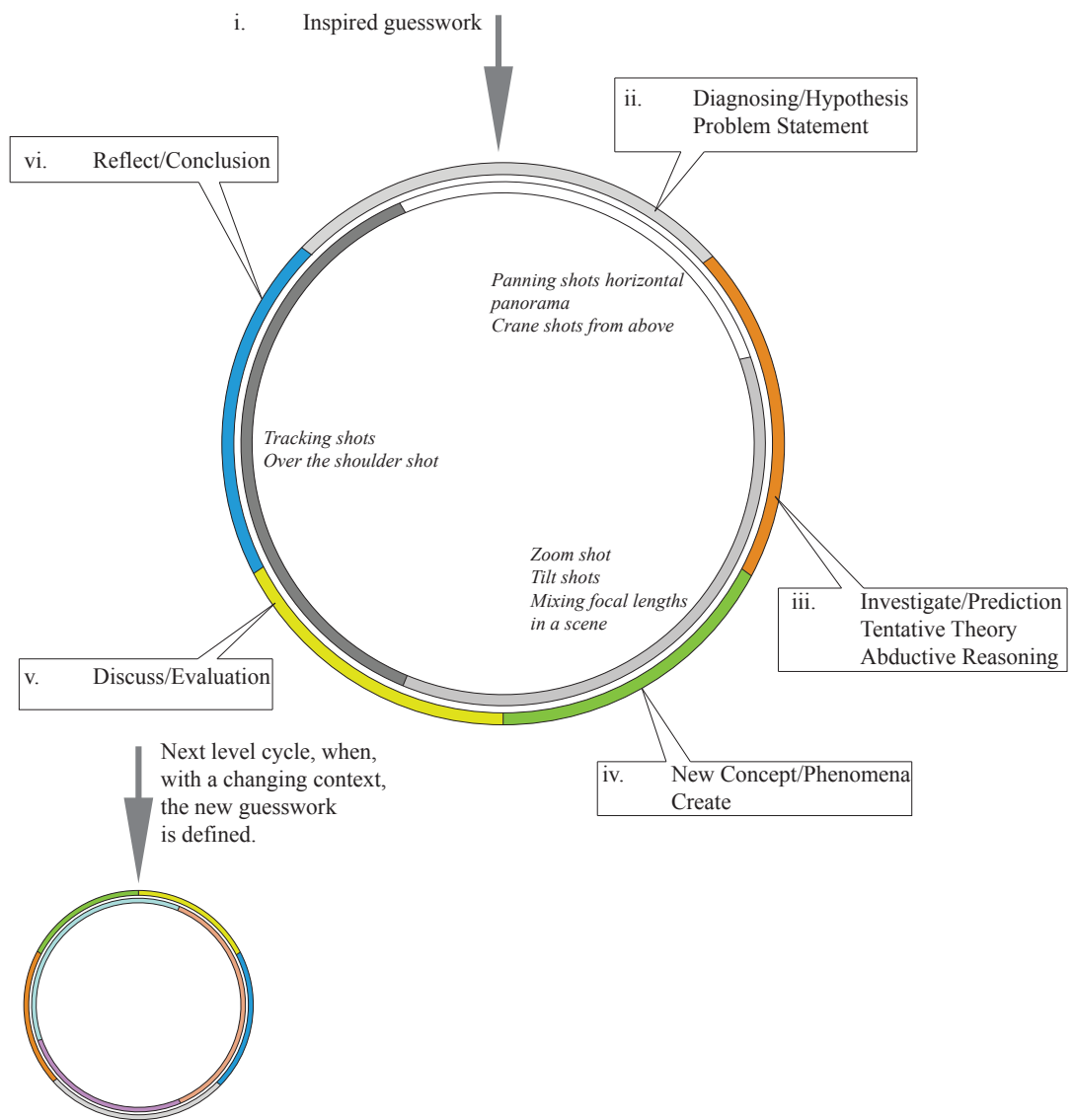


Figure 2. 5. Diagram of Popper and Dewey's cycle of research progression with application of cinematic technique based method. Diagram by the author.

CHAPTER 3

3 Nature. Can We Crack the Formula?

In all things of nature there is something of the marvelous.

Aristotle

3.1 Nature speaking via patterns

This chapter includes research related to patterns found in Nature. It consists of naïve understandings of biological, chemical, mechanical processes. The idea is to stress importance of natural ways of making and existing. Main focus is on natural interminable recalculation. Nature is reacting on changes that are occurring in its environment, by changing its local matter distribution.¹⁰¹ Nature do not celebrate crisis, it is demonstrably sustainable. Nature is recalculating its route. In this chapter research will strive to find what is that which makes natural

¹⁰¹ Learn Genetics, Genetic Science Learning Center. (n.d.). *The Epigenome at a Glance*. Retrieved July 26, 2010, from <http://learn.genetics.utah.edu/content/epigenetics/intro/>

patterns elastic and not just pure presentation of ornamentation but ontological idea of existence.

Nature has inspired human creation in design of forms, structures, design elements, methods and tools. Frei Otto in *A Conversation from 2004*, pointed that forms in Nature should be constantly observed in order to see what happens, paying attention rather on inanimate nature than animate, because animate one is more complex and opaque.¹⁰²

This chapter presents set of organic and inorganic aspects of creation. Idea is coming from learning from Nature about selection, explanation, and focus. By explaining it means to review the main characteristics of how Nature grows its form in order to be applied on design of buildings and its parts. Selection is led by success of pattern creation. It is focused on patterns found in Nature and properties of spatial articulation of these patterns, starting from very initial point, to all stages of growth and development, and terminating with adaptable process during life circle.

This chapter combines the general approach of the thesis, taking into consideration the relation between spatial patterns and the environment in which these patterns occur. The objective is to design and produce resonant surfaces of architectural objects. Taking into account the relevant facts for this thesis, this chapter discusses the concepts and strategies of Nature that can contribute to defining the role of spatial pattern for generating future adaptable surfaces. It is important to highlight that the chapter deals with concepts, phenomena and strategies that contribute to the idea of communication and adaptability, between the generated form and its environment.

3.2 Recalculation by Nature: Concept

French evolutionist Jean-Baptiste Lamarck insists on two principals in the existence of all Nature's productions, which are time without limit and favorable conditions. The second one, favorable conditions, or environing media consists of "the diversity of local causes, of habits, of movements, of action, finally of means

¹⁰² Songel, J. M. (2010). *A Conversation with Frei Otto*. New York: Princeton Architectural Press, pp. 32-35.

of living, of preserving their lives, of defending themselves, of multiplying themselves, etc.”¹⁰³ These different influences are producing actions by which living organisms become diversified by the new habits while structures, the consistence and organs become preserved and transmitted by generations.¹⁰⁴

*Those who have observed much and have consulted the great collections, have been able to convince themselves that as gradually as the circumstances of their habitat, of exposure to their surroundings, of climate, food, mode of living, etc., have changed, the characters of size, form, of proportion between the parts, of color, of consistence, of duration, of agility, and of industry have proportionately changed.*¹⁰⁵

Gradual creation of beings by Nature, has improved their powers.¹⁰⁶ Nature by achieving its successfulness has an ability to create complex, less complicated structures by using simple components. Each entity has been exposed and modified by influences of its environment.¹⁰⁷

An importance of environment, or milieu ambient, for life is reflected through Lamarckian exploration of monads, the most imperfect animals, which do not possess power of seeking the food, but still staying alive, by “an internal inhibition of absorbed matters.”¹⁰⁸ From monads to intelligent creations, Nature gradually employed importance from external stimuli to the internal ones. By that, Nature “transported into the interior of these animals that force productive of movements and of actions which in truth it would not dominate at first, but which she has come to place, in great part, at their disposition when their organization should become very much more perfect.”¹⁰⁹

¹⁰³ Packard, A. S. (2007). *Lamarck, the Founder of Evolution His Life and Work*. Gutenberg EBook of Lamarck, the Founder of Evolution, by Alpheus Spring Packard, p. 234.

¹⁰⁴ Packard, A. S. (2007). *Lamarck, the Founder of Evolution His Life and Work*. Gutenberg EBook of Lamarck, the Founder of Evolution, by Alpheus Spring Packard.

¹⁰⁵ *Ibid.*, p. 277

¹⁰⁶ *Ibid.*, p. 328.

¹⁰⁷ *Ibid.*, p. 323.

¹⁰⁸ *Ibid.*, p. 328.

¹⁰⁹ *Ibid.*, p. 330.

If there are less perfect forms that are instructed from outside, and more perfect that are instructed by inside, how can we understand architectural creations. Where would sit that inside and outside trigger of architecture?

D'Arcy Thompson mentions regenerative processes in a book *On Growth and Form* (1945) saying that phenomena of regeneration or restoration of losses are related to growth. Mentioned process finding its importance's in thoughts of Aristotle, Trembley, Reaumur and Spallanzani.¹¹⁰ For Thompson regeneration is:

*...like growth in other cases, proceeds with velocity which varies according to a definite law; the rate varies with the time, and we may study it as velocity and as acceleration.*¹¹¹

Living organisms possess great capacities of regeneration, demonstrated by regeneration of small or even bigger parts of their entities. Sometimes these restarted elements, are running towards asymmetry, where size and form of entities and their parts manifests through correlations.¹¹²

3.3 Recalculation by Nature: Phenomena

3.3.1 Epigenetics

There are two mechanisms of passing information down from generation to generation, and these are, DNA sequence of our cells and epigenome.¹¹³ For this research on interests is epigenome, which do possess capabilities to listen signals from environment and to make cells to remember their past experience after the signals bleaches.¹¹⁴ Epigenome informs future choices by past experience and bringing envioning media into singular entities; by that process, making singular entities involved into world of many.

¹¹⁰ Thompson, D. W. (1945). *On Growth and Form*. New York: Cambridge: at the University Press.

¹¹¹ *Ibid.*, p. 271.

¹¹² Thompson, D. W. (1945). *On Growth and Form*. New York: Cambridge: at the University Press.

¹¹³ Barres, R. (2016). The legacy of our ancesors' lifestyle. (F. Theodoulou, Ed.) *The Biochemist, RNA Revisted*, 38 (2), pp. 36-39.

¹¹⁴ Learn Genetics, Genetic Science Learning Center. (n.d.). *The Epigenome at a Glance*. Retrieved July 26, 2010, from <http://learn.genetics.utah.edu/content/epigenetics/intro/>

Genetic code is stored and transcribed in DNA genomes. Language that overlays DNA and controls access to the information to be correctly read is epigenetic code. In 1940, British embryologist Conrad Waddington, coined term epigenetics describing it as interaction of genes with environment, that brings the phenotype into being".¹¹⁵ Epigenetic marks are chemical alternations of the genetic code that do not alter inherent genetic code, but just specific programme for a specific cell type. Also they are crucial in the process of make-up a unique individual from the spermatozoa and the egg.¹¹⁶

3.3.2 Biological systems

Organisms possess ability to sense their environment and to adapt to it. By that they ensure thrive and growth in a wide range of habitats.¹¹⁷ They are active inside of their entities and outside in surrounding milieu, by resonance and oscillation.

*We can say that all forms emerge from the dynamic processes by which natural systems, both living and non-living, produce organized arrangements of material in space and time.*¹¹⁸

Architecture of the past, a contrary is declared by stasis concept, through technical assumptions like are (i) permanence, (ii) usefulness, (iii) typology, (iv) procession, and (v) verticality; and through cultural assumption. In a book, *Animated Form*, Greg Lynn presents a concept of animated form by which he elucidated ways of evolution of form and its shaping forces; he suggests animalism, animism, growth, actuation, vitality and virtually. The form by Lynn is shaped by an envelope and the virtual force of the active context of environment in which it is raised. Virtual force will provide multiple positions of the form but not necessarily change its shape.¹¹⁹

¹¹⁵ Mellor, J. (2010). Introduction of Features Epigenetics. *The Biochemist*, 32 (5), pp. 6-7.

¹¹⁶ Barres, R. (2016). The legacy of our ancestors' lifestyle. (F. Theodoulou, Ed.) *The Biochemist, RNA Revisited*, 38 (2), pp. 36-39.

¹¹⁷ Woodson, J. D., & Chory, J. (2014). Sense and adaptation; Signaling between the nucleus and genome-containing organelles. *The Biochemist*, 36 (5), pp. 6-11.

¹¹⁸ Weinstock, M. (2010). *The Architecture of Emergence: The Evolution of Form in Nature and Civilization*. West Sussex: Wiley, p. 16.

¹¹⁹ Lynn, G. (1999). *Animate Form*. Princeton Architectural Press.

As a further support for this claim here comes replay, given by Schrödinger, what characteristics make a piece of matter alive:

*When it goes on 'doing something', moving, exchanging material with its environment, and so forth, and that for a much longer period than we would expect of an inanimate piece of matter to 'keep going' under similar circumstances.*¹²⁰

3.4 Connectivity

Nature has a way to make organisms to share information between different parts of singular entities and as well in-between entities.

To provide a specific example we can take plants, where cell position is fixed within a tissue, while patterning process depends on communication between cells. Communications of neighboring cells are divided regarding media of signals into two categories, molecular signaling, taking proteins and hormones as signals, and mechanical signaling using stress/strain as signals. In spatial sense, there is local communication between neighbors and global across a tissue. Both categories are playing main role in plant patterning event of the organization of areal organs about stem, known as phyllotaxis.¹²¹ Phenomenon of phyllotaxis will be examined in detail in case study of leaf of this same chapter.

Corals are living in colonies of thousands of simple organisms. They are sharing food, water and wastes by gastro vascular system. Trees in forests even though stationary, are not silent autonomous, but communicative organisms, which possess mechanisms, called *Earth's natural internet* (Fig. 3.1), to exchange information with each other.¹²² The stationary stage even increases importance of their communication. Plants are communicating above ground exchanging information like are enemy attacks and in underground environment sending the

¹²⁰ Schrödinger, E. (1944). *What is Life?* Cambridge: Cambridge University Press, p. 24.

¹²¹ Braybrook, S. A. (2014). Signaling in plant cell patterning. *The Biochemist*, 36 (5), pp. 11-16.

¹²² BBC. (2014, November 11). *BBC Earth*. Retrieved March 10, 2015, from Plants talk to each other using an internet of fungus: <http://www.bbc.com/earth/story/20141111-plants-have-a-hidden-internet>

signals from roots to roots.¹²³ Darwin has an idea of the “plant root brain” explained in *The Last Paragraph from the Power of Movements in Plants*:

*We believe that there is no structure in plants more wonderful, as far as its functions are concerned, than the tip of the radicle...it has acquired such diverse kinds of sensitivities. It is hardly an exaggeration to say that the tip of the radicle thus endowed, and having the power of directing the movements of the adjoining parts, acts like the brain of one of the lower animals; the brain being seated within the anterior end of the body; receiving impressions from the sense organs, and directing the several movements.*¹²⁴

Plants are direct participants in active exploration and modulation of their surrounding milieu. Their roots possess ability to sense, respond, and select their neighbors. Such ability has importance on an individual plant but as well on ecosystem as a whole.¹²⁵

3.4.1 Forces

In 1917, D'Arcy Wentworth Thompson, the mathematical biologist and zoologist, published the book *On Growth and Form*¹²⁶, a study of scale, growth, mathematics, metamorphosis, and processes. D'Arcy Thompson stated that the “form of an object is a diagram of forces”.¹²⁷ Besides interpretation of the motion of the forces in an organism, great role plays conformation of the organism itself, explained via interaction or balances of the forces. He insisted that shaping material in Nature is consequence of force that acts inside environment. Force origins the form and also causes its changes. He suggests that physical forces could cause transformation from one species to another, based on mathematical

¹²³ Roberson, A., Spence, C., & Bais, H. P. (2014). Underground communication. *The Biochemist*, 36 (5), pp. 32-36.

¹²⁴ Darwin, C. (1880). *The Power of Movements in Plants*. London: John Murray, p. 574.

¹²⁵ Roberson, A., Spence, C., & Bais, H. P. (2014). Underground communication. *The Biochemist*, 36 (5), pp. 32-36.

¹²⁶ Thompson, D. W. (1945). *On Growth and Form*. New York: Cambridge: at the University Press.

¹²⁷ *Ibid.*, p. 16.

principles.¹²⁸ In the same book, D'Arcy Thompson mentioned lecture of the Helmholtz, about principle of physiology:

*...there may be other agents acting in the living body than those agents which act in inorganic world; but these forces, so far as any they cause chemical and mechanical influence in the body, must be quite of the same character as inorganic forces: in this, at least, that their effects must be ruled by necessity, and must always be the same when acting under the same conditions; and so there cannot exist any arbitrary choice in the direction of their actions.*¹²⁹

In relevance to this, follows the speculation shall we in architecture design, instead of confronting to the forces which surround us, use it as principles for origin. Although Helmholtz shows that forces that emerge organic shapes, are the same as the ones that act on inorganic shapes, and by that in architecture too, we still need to find a way how to direct these forces into production engine of architecture.

3.5 Recalculation by Nature: Strategies

3.5.1 Chemical way of producing patterns

Alan Turing has been searching for mechanisms responsible for anatomical structures of organism, obtained as a result of reaction–diffusion processes along a certain pathway. He raised the question about Nature's making asymmetrical organisms out of systems, which are spherically symmetrical. Under the system, Turing supposes system in a stable homogeneous condition of two or three morphogens, or "shape formers". He was interested in a moment when system is becoming unstable, arguing that symmetrical system with some deviations, is reaching to new equilibrium, in which these irregularities play a role. By that process system is losing its symmetry. The results that come out of instability are patterns or morphogen concentrations, defined by six types of the "waves" when (1) one cell drifts from equilibrium followed by neighboring cells in same

¹²⁸ Thompson, D. W. (1945). *On Growth and Form*. New York: Cambridge: at the University Press.

¹²⁹ Helmholtz in the book of Thompson, D. W. (1945). *On Growth and Form*. New York: Cambridge: at the University Press, p. 12.

directions; (2) cell departure from equilibrium by the oscillation; (3) contiguous cells drift in opposite directions; (4) there is stationary wave pattern on the ring; (5) two waves are traveling via ring in opposite directions; (6) neighboring cells oscillate in opposite phases.¹³⁰ For Turing process of reaction - diffusion pattern making demonstrates its complexity and dynamic faculty:

*Most of an organism, most of the time, is developing from one pattern into another, rather than from homogeneity into a pattern.*¹³¹

3.5.2 Morphogenesis

Morphogenesis means the beginning of the form making. It is followed by changes of the form and processes of development of the form to become more complex. On embryo level, morphogenesis occurs as decision-making process, when cells respond on signals from environment or from their developmental history, and by that determinate pattern formation. Usually structural changes depend on interactions of new properties, with existing environment, and possess more than single instructional trigger.¹³² Morphogenesis occurs not just on embryo but also on tissue, organs and entire organism level.¹³³

Even though study on genetic basis does not give us all answers about cell and its behavior, neither that DNA structure decrypts all of its secrets, results of process of morphogenesis are possible to be observed. They terminate in a pure diversity of forms.

Naturalist, Ernst Haeckel, in a research of Radiolaria, a unicellular body marine organism which consists only of inner and external capsule, separated by a membrane, found extraordinary number of the lace-like structures. Haeckel provided a catalogue of Radiolaria's multiplicity of forms, consisting out of 4318

¹³⁰ Turing, A. M. (1952). The Chemical Basis of Morphogenesis. *Philosophical Transactions of the Royal Society of London. Series B, Biological Sciences*, 237 (641), 37-72.

¹³¹ Ibid., p.72.

¹³² Bard, J. (1992). *Morphogenesis: The Cellular and Molecular Processes of Developmental Anatomy*. Cambridge: Cambridge University Press.

¹³³ Hensel, M. (2006). Computing Self-Organization: Environmentally Sensitive Growth Modelling. *Architectural Design: Techniques and Technologies in Morphogenetic Design*, 76 (2), 12-17.

species.¹³⁴ He has divided four principal groups of ground-forms defined according to the nature of the centre of their bodies: (1) Centrostigma (or spherotypic), the geometrical centre of the body is a point, main axis wanting; (2) Centraxonia (or grammatotypic) the geometrical centre of the body is a straight line, the vertical main axis; (3) the Centroplana (or bilaterals) the geometrical centre of the body is a plane, the sagittal plane; and (4) the Acentrica (or Anaxonia), there is no geometrical centre.¹³⁵ Haeckel concluded:

*The skeleton of the Radiolaria is developed in such exceedingly manifold and various shapes, and exhibits at the same time such wonderful regularity and delicacy in its adjustments, that in both these respects the present group of Protista excels all other classes of the organic world. For, in spite of the fact that the Radiolarian organism always remains merely a single cell, it shows the potentiality of the highest complexity to which the process of skeleton formation can be brought by a single cell.*¹³⁶

Still and even it is unicellular, regarding the physical properties of its skeleton, Radiolaria possesses high degree of firmness and serves as protective and supporting apparatus (Fig. 3.2).¹³⁷

3.6 Nature Inspired Design Approaches

Previously mentioned book *On Growth and Form* of D'Arcy Wentworth Thompson, becomes an inspiration to 20th century thinking in art and architecture. Richard Hamilton, declared that *On Growth and Form* “charged my batteries for a number of years”.¹³⁸ Henry Moore Institute in 2014 exhibited a selection of Thompson's teaching models, which are held in the collection of the D'Arcy Thompson Zoology Museum at the University of Dundee. The display includes intricate glass models of jellyfish made in the Dresden Blaschka studio

¹³⁴ Haeckel, E. *Report on the Radiolaria Collected by H.M.S. Challenger During the Years 1873-1876, First Part: Porulosa (Spumellaria and Acantharia)*. The Project Gutenberg eBook.

¹³⁵ *Ibid.*

¹³⁶ *Ibid.*, p. 101.

¹³⁷ *Ibid.*

¹³⁸ Richard Hamilton on D'Arcy Thompson, from introduction of exhibition: D'Arcy Thompson's *On Growth and Form*. (2014, May/August 14-17). *D'Arcy Thompson's On Growth and Form: an introduction*. Retrieved May 1, 2016, from Henry Moore Institute Leeds: <http://www.henry-moore.org/hmi/events/multimedia-recordings/on-growth-and-form-an-introduction>

(Fig. 3.3).¹³⁹ Catalog of Haeckel's Radiolaria has inspired, among others, Le Ricolais to design structures based on triangular network of unicellular lace like organisms. Also there is correlation between Radiolaria's skeleton and geodesic dome of Buckminster Fuller.

Many forms of art, architecture, design, theater, and movies find their inspirations or DNA code, an essence, in works and processes that are directed by Mother Nature. Relations are not seen just under visual basis but mostly as a receipt for generating most economical, sustainable, complex clever and beautiful forms. Only some of raised approaches from these correlations, classified here as approaches of recalculations in Nature, are shortly described as follows.

3.6.1 Biomimicry

Otto Schmitt suggests Biomimetic as a term in late 50s of the last century. It represents biologically influenced design philosophy that examines natural models, systems and elements to be used as inspirational solutions for human problems.¹⁴⁰ Term biomimetic replaced biomimicry and is in use since 1976. Biologist Janine Benyus in a book *Biomimicry: Innovation Inspired by Nature*¹⁴¹, defines biomimicry as something that takes inspirations from Nature but could also imitate Nature's ways of solving problems. She adds that biomimicry is:

*...a new way of viewing and valuing nature. It introduces an era based not on what we can extract from the natural world, but on what we can learn from it.*¹⁴²

Benyus suggests that human activity, in order to become sustainable, should focus on canon of nine Nature's laws, strategies, and principles as follows: (1) nature runs on sunlight, (2) nature uses only the energy it needs, (3) nature fits form to function, (4) nature recycles everything, (5) nature rewards cooperation,

¹³⁹ Exhibition: D'Arcy Thompson's On Growth and Form. (2014, May/August 14-17). *D'Arcy Thompson's On Growth and Form: an introduction*. Retrieved May 1, 2016, from Henry Moore Institute Leeds: <http://www.henry-moore.org/hmi/events/multimedia-recordings/on-growth-and-form-an-introduction>

¹⁴⁰ Bailey, J. (2010) *Biophilia + Technophilia*, Digital Mania, Thesis Seminar, The University of Michigan, Taubman School of Architecture: archimorph.wordpress.com.

¹⁴¹ Benyus, J. (2002). *Biomimicry: Innovation Inspired by Nature*. New York: Harper Perennial.

¹⁴² Ibid. p. 21.

(6) nature banks on diversity, (7) nature demands local expertise (8) nature curbs excesses from within, (9) nature taps the power of limits.¹⁴³

3.6.2 Bionics

Steele, American medical doctor introduced the term bionic in 1958, originally defining science of system that copied some functions from Nature. The man, called bionic man Stelarc, in his writings on *Excess and Indifference Alternated Body Architectures, Section 1*¹⁴⁴ said:

*We are living in an age of excess and indifference. Of prosthetic augmentation and extended operational systems. An age of Organs Without Bodies. Of organs awaiting bodies. There is now a proliferation of biocompatible components in both substance and scale that allows technology to be attached and implanted into the body. Organs are extracted and exchanged. Organs are engineered and inserted.*¹⁴⁵

In his project *Extra Ear: Ear on Arm* (Fig. 3.4), he attached ear on his arm, adding an extra function to existing structure. He opens new possibilities to his body, enabling it to listen his own voice with ear rather than head; a possibility to percept its own existence out of predetermined spatial organization of the system, in this case body.

3.6.3 Biotechnik

On a dinner meeting held in 1937, a group of leading ecologist and Bauhaus architects, shared a belief that built environment should follow model of natural environment. In an article *The Bauhaus of Nature*, Peder Anker, following a meeting arguments, discussed that Bauhaus key instrument of design development is science. Fusion of science and architecture in Bauhaus school is visible through idea of biological-inspired program of design by Moholy-Nagy. In order to determine functionality, Moholy-Nagy's advice was to look for prototypes found in Nature, following "nature as a construction model". For him Sullivan's

¹⁴³ Benyus, J. (2002). *Biomimicry: Innovation Inspired by Nature*. New York: Harper Perennial.

¹⁴⁴ Stelarc. (2008). *Excess and indifference Alternated Body Architectures*. Retrieved May 2, 2016, from Stelarc: <http://stelarc.org/documents/ExcessandIndifference2.pdf>

¹⁴⁵ Ibid.

slogan “form follows function” should be understood via phenomena occur in Nature, where origin of every form is result of its proper function. In his artworks he was inspired by thinking of biologist Raoul H. France, searching for design that is setting human life in harmony with Nature. He defined architecture as an organic component that is creating in a harmonious environment, reflecting internally via balanced structure and externally in the shape of ecological communities. Moholy-Nagy exposed his ideas through different media. His attempt to express dynamism of forces on matter in his abstract film project *Light-play: Back-White-Grey* (1932).¹⁴⁶ Moholy-Nagy photographic experiments from 1926 *Photogram*, are production of new art, by usage of media that have primary ability of reproduction (Fig.3.5).¹⁴⁷ There is visible similarity with Nature’s process of adoption when inherited information origins an organism to make it possible to survive and reproduce in something similar, but new.

In writings *Learning from Nature* (2014), Alberto Estévez found proper explanation by orienting learning from Mother Nature, or Master Nature, to the learning process, calling it biolearning.¹⁴⁸ Even though under umbrella of biomimicry we could place biotechnik, and under biotechnik bionic; in this research are divided as separate section. The attempt is not to present it as drastically different approaches but to make it understandable how much inspiration from Mother Nature could be wide, informative, scientific, shocking, natural and unnatural in same time, resonant, without ends, always focusing on recalculations and fostering to new. While this research is trying to snap a crack of understanding architecture existence and to find a way for embodiment of senses in architecture discourses, it is important to discover and explain wide verity of possibilities, and how and why back and forth of exchange, adaption and resonance is important.

¹⁴⁶ Anker, P. (2005). The Bauhaus of Nature. *Modernism/Modernity*, 12 (2), pp. 229-251.

¹⁴⁷ Department of Photographs. (2004, October). Photography at the Bauhaus. In *Heilbrunn Timeline of Art History*. New York: The Metropolitan Museum of Art, 2000. http://www.metmuseum.org/toah/hd/phbh/hd_phbh.htm (October 2004)

¹⁴⁸ Estévez, A. T. (2014). Learning from Nature: Architecture and design in the first biodigital age. In A. T. Estévez (Ed.), *2nd International Conference of Biodigital Architecture & Genetics*. Barcelona: ESARQ (UIC).

3.7 Recalculation by Nature: Design

3.7.1 Branching

Branching system is exhibited almost in all kind of plants, starting in those smaller ones with regular shape of branching systems to those larger with some transformation and irregularity in branches.¹⁴⁹

Relevant to the architecture and this research is fashion of plant architecture to grow in order to maximize its surfaces, efficiency and adaption of its form and function while not concerning to its structural support. Branching architecture or final form of plants, depends on intrinsic and extrinsic attributes. It is governed by genotype, expressing wide verity of plasticity and intrinsic diversity between and within species; and by environment, environmental circumstances and ecological niches.¹⁵⁰

Branching structures are generated using L-systems. The L-system or Lindenmayer's system is a formal grammar applied in modeling process of growing of the plants, as well as for modeling of morphology of various organisms. The L-systems could be used for self-similar fractals generating. Such a system is the Iterated function system.¹⁵¹

3.7.2 Receiving Signals

Receiving signals by plants is previously mentioned, and it is related to the internal mechanisms, to receive and process information from external faculties. Signals from the outside world can change a cell's gene expression on micro and on macro level. One single plant can have different shapes of leaves depending on place of leaves on plants.¹⁵²

¹⁴⁹ Prusinkiewicz, P., & Aristid, L. (1990). *The Algorithmic Beauty of Plants*. New York: Springer-Verlag.

¹⁵⁰ Turnbull, C. G. (2005). Shoot architecture II Control of branching. (C. G. Turnbull, Ed.) *Plant Architecture and its Manipulation*, pp. 92-120.

¹⁵¹ Prusinkiewicz, P., & Aristid, L. (1990). *The Algorithmic Beauty of Plants*. New York: Springer-Verlag.

¹⁵² Ibid.

Speculative project *Wanderers* by Neri Oxman and Mediated Matter research lab presents a biologically-augmented 3D printed wearable's design where destination's attributes becomes a "shape formers":

*Each design is a codex of the animate and inanimate with an origin and a destination: the origin being engineered organisms, which multiply to create the wearable within a 3D printed skins; and the destination being a unique planet in the solar system.*¹⁵³

3.7.3 Multifunction

Multifunction of natural patterns is reflected on different scales. One can observe that leaves on plants, which have tissues of a multitude of tubes, use their network for transporting fluids to the farthest points and for supporting their own structure. Pattern of tubes on leaves, besides its structural properties, allows fulfillment of other functions too.¹⁵⁴

In the report of *The next Wave: 4D Printing Programming the Material World*, Programmable matter (PM) "has the economic, environmental, geopolitical, and strategic implications of 3D printing while providing new and unprecedented capabilities in transforming digital information of the virtual world into physical objects of the material world."¹⁵⁵ The aim is to create objects that are dynamic, with capabilities of changing the form and function after fabrication, "objects that could be assembled, disassembled, and then reassembled to form macroscale objects of desired shape and multifunctionality."¹⁵⁶

3.7.4 Modification

Modification of structure or structures of parts of organisms is a byproduct of the process of adaption. It is triggered by mixture of operators that acts and

¹⁵³ Oxman, N. (2014) *Wanderers*, An Astrobiological Exploration. *The Wanderers series was unveiled as part of Stratasys' collection "The Sixth Element: Exploring the Natural Beauty of 3D Printing"*. EuroMold, Frankfurt, p. 37.

¹⁵⁴ See: Michael Hensel in Special Issue: Techniques and Technologies in Morphogenetic Design AD: Architectural Design vol. 76, Issue 2, edited by: Michael Hensel, Achim Menges, Michael Weinstock, 2006, p. 20.

¹⁵⁵ Campbell, T. A., Tibbits, S., & Garrett, B. (2014). *The Next Wave: 4D Printing and Programming the Material World*. Atlantic Council. Washington: The Atlantic Council of the United States, p. 1.

¹⁵⁶ *Ibid.*, p. 4.

determines what structure arises in certain environmental conditions.¹⁵⁷

Modification could be realized on more levels and applied on different systems.

The one related to genetics is related to genetic engineering that edits organism's makeup by applying methods of gene targeting, nuclear transplantation transfection of synthetic chromosomes or viral insertion.¹⁵⁸

The Universal Constructor by John Frazer is a model of three-dimensional series of cubes, chosen for their universality to represent anything and model at any scale, on a base-board called 'landscape'. They could map states of environmental conditions, sound even dance. Cells and their locations are equipped to display the state in which it exists, pass message, and has identifying code.¹⁵⁹

3.7.5 Homeostasis and integrity

Homeostasis is a property of a system that remains stabilized an internal environment, while external one varies.¹⁶⁰ It is related to the integrity of environment, whether it is seen from inside or outside. Great role in the process of keeping integrity of a system and its originality has an envelope. On cell level membranes are providing integrity and generally separate the outside from the inside, but as well perform an intelligent role of filtration of materials, from in and out.

*Think Centre Pompidou without functional or formal partitions. Instead, consider a single and continuous transparent building skin that can integrate multiple functions and can be shaped to tune its structural and environmental performance. Not unlike the human skin which serves at once as both a barrier and a filter.*¹⁶¹

¹⁵⁷ Holland, J. H. (1992). *Adaptation in Natural and Artificial Systems*. Cambridge: MIT Press.

¹⁵⁸ Springer Nature. (2016). *Genetic engineering*. (Macmillan Publishers Limited, Producer) Retrieved May 12, 2016, from Nature.com: http://www.nature.com/subjects/genetic-engineering?WT.ac=search_subjects_genetic_engineering

¹⁵⁹ Frazer, J. (1995). *An Evolutionary Architecture* (Vol. Themes VII). London: Architectural Association.

¹⁶⁰ Springer Nature. (2016). *Homeostasis*. (Macmillan Publishers Limited, Producer) Retrieved May 12, 2016, from Nature. com: http://www.nature.com/subjects/homeostasis?WT.ac=search_subjects_latestes_homeostasis#re-search-and-reviews

¹⁶¹ Oxman, N. (2017, March 1). Neri Oxman #99. *The Editorial Interviews With Visionaries on Emerging Ideas Around Us*. (H. Legg, Interviewer).

3.7.6 Morphology

Term morphology, coined by the German poet, novelist, playwright, and philosopher, Johann Wolfgang von Goethe, in early 19s of previous century, refers to biological context referring to the study of form or forms.¹⁶²

In his book, *Convergent Evolution Limited Forms Most Beautiful*, George McGhee stresses out idea of limited number of evolutionary pathways.¹⁶³ In the same book the author cites Grinspoon:

*...When we do find aliens, or they find us, what will they look like? By revealing many forms of Earth life to be governed by deep geometrical rules of self-organization in nature, complexity suggests universal geometry of life that should transcend worlds...There is no way to predict precisely what aliens will look like, but the fractal geometry of life gives us reason to believe that when they do finally land on the White House lawn, whatever walks or slithers down the gangplank may look strangely familiar.*¹⁶⁴

Anyhow, although it is interesting, this approach is suggesting limited forms. This endless shift of the forms, limited by number of pathways, is advancing fabrication technologies for production of endless forms. The ideas of from that are “most beautiful and most wonderful have been, and are being, evolved”.¹⁶⁵ Endless house provides a model with a loop of mechanisms of making, transforming, shifting and evolving. It is seeking to find a Beauty in endless shifts.

Redesigned Darwin’s thought by George McGhee:

¹⁶² Goethe, J. W. (1995). *Scientific Studies (Goethe: The Collected Works)* (Vol. 12). (D. Miller, Ed.) Princeton: Princeton University Press.

¹⁶³ McGhee, G. R. (2011). *Convergent Evolution Limited Forms Most Beautiful*. Cambridge, London: MIT Press.

¹⁶⁴ In book: McGhee, G. R. (2011). *Convergent Evolution Limited Forms Most Beautiful*. Cambridge, London: MIT Press, p. 265.

¹⁶⁵ Darwin, C. (1859). *On the origin of species by means of natural selection, or the preservation of favored races in the struggle for life*. London: John Murray.

*There is grandeur in this view of life in the universe, with its several powers of functional and developmental constraint, having been originally breathed into a few forms of life or into just the one that is carbon based; and that, whilst this planet and others have gone cycling on according to the fixed law of gravity, from so simple a beginning limited forms most beautiful and most wonderful have been, and are being, re-evolved throughout the universe.*¹⁶⁶

3.7.7 Self-assemble

Self-assemble is a process in which the internal organization of a system, adapts to the enviroing milieu, to promote a specific function without being guided or managed from outside.¹⁶⁷ Components are autonomously organizing themselves into patterns or structures, on molecular and planetary level. Interest of self-assemble is coming from its appearance of order from disorder, and by that understanding of the phenomena of life; also by its dynamic, multicomponent systems. Self-assemble is guided by information coded into individual components, that interact, and out of that interaction, a design patterns has emerged. Self-assemble could be static or dynamic, in respect of energy losses. Examples of self-assemble of living and non-living systems, is given in Fig. 3.6.¹⁶⁸

Sometimes is not even necessary to tell that explained actions have resulted in desired effects. It can happen, that they are a niche for pure Beauty, which will sometime later, during its life articulation, get out or be transformed into some novel features.

3.8 Case Study: Leaf

Observing and being inspired by Nature, or mimicking processes found in natural environment, is dating from the most of the recorded time. Every step-in civilization has its own “fashionable” aspirations towards Nature. Recently, it is

¹⁶⁶ McGhee, G. R. (2011). *Convergent Evolution Limited Forms Most Beautiful*. Cambridge, London: MIT Press, p. 277.

¹⁶⁷ Hensel, M. (2006). (Synthetic) Life Architectures: Ramifications and Potentials of a Literal Biological Paradigm for Architectural Design. *Architectural Design: Techniques and Technologies Morphogenetic Design*, 76 (2), pp. 18-25.

¹⁶⁸ Whitesides, G. M., & Grzybowski, B. (2002). Self-Assembly at All Scales. *Science*, 295, pp. 2418-2421.

related to how instead of mimicking Nature, to become Nature. In a work of Pneuma 2, Neri Oxman demonstrated possibility of accommodating multiple functions found in natural world, where structural patterns, growing on multiple scales, provide possibility for performing various functions. Inspired by spongy bone, designed on meso scale as cellular solid and on micro scale as fibrous composite, Oxman combines cellular structure with a dotted geometrical pattern.¹⁶⁹

Aspiration towards Beauty of natural forms and its processes of origin, performance, growth, design, and redesign is not novel, but since every understanding could open new niche that will serve to some level of originality, could be beneficial. Nature speaks and listens by its network; it is reacting on “crisis” by having elastic “mind” and “body”; it is preserving and defending its integrity. A leaf on a plant, “a micro universe”, demonstrates all mentioned attributes.

Understanding and observing plants and their parts are not new and here serve to underscore natural capabilities of recalculation. Historically looking, interest on phyllotaxis or patterning of plants, traces back before Common Era. It has been involved in works of Theophrastus, and across 1800s with names of Hofmeister, Sachs, Schimper, Airy, Braun and the Bravais brothers, to become of interest of van Iterson and Church.¹⁷⁰

Due to the fact that this chapter is dedicated to the patterns found in Nature, it has to be clear that patterns are considered, no matter do they perform structural functions or filling the forms. It is considering micro, meso, and macro scale of patterns of leaf.

Almost all plants express their familiarity related to the elements of their “body” but also great amount of verity of the forms. “Body” is consisting of upper and

¹⁶⁹ Oxman, N. (2012-2013). *Hierarchical RD Bitmap Printing*. Retrieved Jun 10, 2016, from Mediated Matter: <http://matter.media.mit.edu/tools/details/pneuma-2>

¹⁷⁰ Adler, I., Barabe, D., & Jean, R. V. (1997). A History of the Study of Phyllotaxis. *Annals of Botany*, 83 (3), pp. 231-244.

underground parts. Leaf belongs to its upper “body”.¹⁷¹ Outward expression of leaf structure called by Leo Hickey includes venation pattern, marginal configuration shape, and gland position.¹⁷² This research includes patterns of adaxial and abaxial surface (micro), veins patterning (meso) and arrangement of leaf on plant stems (macro). Oke explained that:

*The three-dimensional geometry of a leaf or a canopy layer – are particularly interesting because they have both upper and lower active surfaces. This greatly increases their effective surface area for radiative and convective exchange...On a plant or tree the leaf is not in isolation, it is intimately linked to its total environmental setting, and the same is true of a plant or tree in a crop or forest. The effects of multiple shading, multiple reflection, long-wave radiation interaction etc. provide important feedbacks not found in the isolated case.*¹⁷³

Macro

Phyllotaxis is the biological pattern formation of leaves or related features on plant stems. Not well-known Turing’s seminal work on morphogenesis and lattice phyllotaxis, was trying to solve appearance of Fibonacci numbers in plant’s structure, geometrical lattice theory, and application of reaction-diffusion theory, mentioned earlier in this chapter. Very many plants while growing, are patterning leafs on stems, following Fibonacci numbers. This is in relation to “difference in angle between successive points on the stem”¹⁷⁴, and as a result has optimal packing. Appearance of Fibonacci phyllotaxis is arising out of (1) geometrical constraints of stems which is mostly cylinder; (2) dynamical constrains, reflected via nonlinear interactions between cells; and (3) growth constrains, related to the

¹⁷¹ Bell, A. D. (1991). *Plant Form an Illustrated Guide to Flowering Plant Morphology*. Oxford, New York, Tokyo: Oxford University Press.

¹⁷² Hickey, L. J. (1973). Classification of the Architecture of Dicotyledonous Leaves. *American Journal of Botany*, 60 (1), pp. 17-33.

¹⁷³ Oke, & T, R. (1987). *Boundary Layer Climate*. London: Routledge, pp. 116-117.

¹⁷⁴ Swinton, J. (2004). Watching the Daisies Grow: Turing and Fibonacci Phyllotaxis. In C. Teuscher (Ed.), *Alan Turing: Life and Legacy of a Great Thinker* (pp. 477-496). Berlin: Springer-Verlag, p. 478.

arena for pattern manifestation that is gradually increasing. Generating pattern leaves on stem is followed by a simple algorithm rules.¹⁷⁵

Meso

Network of the veins on leaf surface, performs double function and it is consisted out of two systems. One has the role of transport of water and minerals, and the other of the photosynthetic products.¹⁷⁶

Hickey (1973) gives venation classification based on proposition of von Ettingshausen's system. Classification on primary, secondary, tertiary and so on order depends on thickness of branches, their behavior related to other branches and to the margins of leaf.¹⁷⁷ Systems of venation pattern are given in Fig. 3.7.

Micro

A pattern of epidermal cell of leaf presents its outermost layer. Depending on orientation and position, there are adaxial and abaxial surfaces of epidermis (Fig. 3.8). Surfaces are mechanically firm but at a same time flexible. Epidermis is barrier between inside and outside. Besides their strength and flexibility, leaf surfaces are multifunctional, performing gas exchange, controlling water lost storing, attracting, and defending. Different functions are performed by various specialized cells. Cells are instructed of their function and distributed in a non-random pattern by signals received during morphogenesis interactions with neighboring cells and environmental inputs during cell cycle stage. On cell surfaces we have pavement cells, relatively unspecialized, mostly having jigsaw puzzle shape, which is more related to the mechanical strength and growth of leaves, no matter of expanding directions. Stomatal guard cells are keeping water inside plant and exchange gases. Patterning of stomatal guard cell is not random and depends on a size and function performances. Long-stalked trichomes have

¹⁷⁵ Swinton, J. (2004). Watching the Daisies Grow: Turing and Fibonacci Phyllotaxis. In C. Teuscher (Ed.), *Alan Turing: Life and Legacy of a Great Thinker* (pp. 477-496). Berlin: Springer-Verlag, p. 478.

¹⁷⁶ Bell, A. D. (1991). *Plant Form An Illustrated Guide to Flowering Plant Morphology*. Oxford, New York, Tokyo: Oxford University Press.

¹⁷⁷ Hickey, L. J. (1973). Classification of the Architecture of Dicotyledonous Leaves. *American Journal of Botany*, 60 (1), pp. 17-33.

a role of defense mostly by providing barrier on the leaf surfaces, again in non-random pattern formation. Short-stalked trichomes are adapted to enhance attractiveness to pollinators, by diffusing a light on petal.¹⁷⁸

It is evident that patterning of leaf surfaces follows algorithmic rule, indicated by genes, interaction and signals received from environment. Pattern, provides interaction and functional distribution of flow. Mechanical strength, flexibility, multifunction are enabled by pattern formation of cells, their size, specialization, shape, and capabilities, to switch between functions, while informed on local, global, mechanical, and molecular level.

3.9 Advantages of Patterns Found in Nature (outcome)

Patterns are gravitating for recalculation by pulling for openness. Importance of role of patterns found in Nature, for their application in architectural design, reflects on their ability to be open for new adaption and new insights from milieu ambient. These patterns have interesting anatomic features that are expressed by open and endless form of their individuality, but at a same time they still are close entities. They are close and open, while closeness strives for integrity, openness for changes. They are expressing constant flux. Functionality is embedded in very creation of materials and patterning on different scales of creation. Alberto Estévez says:

*The most peculiar of 'nature' is not to be an exotic collection of diverse species, but is the fluidity presented under different aspects that perform it. And so on, the human being is the most powerful vector it has produced. Make it flow!*¹⁷⁹

3.9.1 Isotropic and anisotropic nature

Patterns that occur in Nature are possessing duality, in regards to their physical and mechanical properties, structure and materials. They are isotropic, having uniformity in all orientations and anisotropic with properties that vary

¹⁷⁸ Glover, B. J. (1999). Differentiation in plant epidermal cells. *Journal of Experimental Botany*, 51 (344), pp. 497-505.

¹⁷⁹ Estévez, A. T. (2014). The Future of Architecture: Biodigital Architecture and Genetics. *Architecture Research*, 4 (1B), 13-20, p. 17.

systematically and depending on direction. If a manifold is, by its definition, an abstract topological space that is locally Euclidean¹⁸⁰, could we observe this understanding of duality in biological materials, as manifolds? Observing Nature's forms and biological materials via isotropic and anisotropic states, is underlining the idea of understanding it as a manifold that have a sub manifold, that is itself a manifold, but of smaller dimension. Additional to this is a property of manifold to "be endowed with more structure than a locally Euclidean topology"¹⁸¹ A manifold could be homogeneous without being isotropic, while heterogeneous implies that is anisotropic.¹⁸² This should be understood more as philosophical discussion of nature and properties of biological entities.

Patterns in Nature could be percept as structures and as material surfaces. Bleaching border between structure and material in biological entities is result of their highly structured nature within complex properties.¹⁸³ Nature does not define between its structural and material properties and by that could be explained as isotropic entity, with homogenous properties. But if we look plants, or here more studied leaf element of plant, it is visible that homogeneity of leaf in one scale is going to be heterogeneity in another scale. While being homogeneous in cross sections of its body on micro scale, on macro its structure is developed into vascular strands, having heterogeneous properties.

In biological materials heterogeneity of physical and mechanical properties is relative to their functions. Leaf, as previously demonstrated, if not accepted mainly as structure neither material, but both, regarding its function, is a natural anisotropic material. The advantage of being heterogeneous, results in highly efficient structures and forms, tailored to fit to their inner and outer environment and sensitive to support the range of recalculating ruts. As a result, we have heterogenic distributed properties and homogeneous flux of reactions, on these properties. Additionally, there is ability to simultaneously recalculate its model, by fabricating additional material structures as a response on stimuli.

¹⁸⁰ Todd, R. (1999). *Manifold*. (E. W. Weisstein, Producer) Retrieved July 30, 2016, from MathWorld--A Wolfram Web Resource: <http://mathworld.wolfram.com/Manifold.html>

¹⁸¹ *Ibid.*

¹⁸² *Ibid.*

¹⁸³ GrAB. (2016). Experimentation in B. Imhof, & P. Gruber (Eds.), *Built to Grow –Blending Architecture and Biology* (pp. 57-134). Basel: Book Series of the University of Applied Arts Vienna.

If we blurred border between materials and structures, then they become one entity with dual nature. From previous it is obvious that Nature does not make difference between structure and material, and obviously not attaching functions in relevance to distinction of material and structure. Nature is merging them into form that could be observed in many levels. Isotropy and anisotropy should be both accepted and percept through different levels, and stages of design. One does not deny another. Composite materials and functionally gradient materials are becoming to be closer to the idea of blurring borders between anisotropy, which do possess on the same level structural properties and isotropy which is here understood as material with homogeneous properties. Both materials and structure do possess pattern on micro, meso, and macro level.

3.9.2 Embedded intelligence

In Nature, systems perform optimally through the effective implementation of concepts and approaches described previously in this chapter. Effectiveness and differentiation into similar but specified parts across many scales of natural systems emerge from embedded intelligence in natural entities.

Patterns in Nature are not presented just as a motive but as a picture of the “deepest” data of its being, which will make it grow on its own. This strong idea is taking natural entities to become recognizable and pleasant. The idea of reading data and process behind patterns is recorded previously in the work of Rosalind Franklin. In order to capture structure of DNA, Rosalind Franklin used technique of X-ray diffraction (Fig. 3.9), providing a “picture” and by it decoding structure behind.¹⁸⁴

3.9.3 Functionally gradient materials

While talking about Nature's secrets regarding engineering materials, we have already mentioned that there is no border in-between structure and composition. Nature finds a way to make responsive materials and to change its geometry to accommodate specific performance requirements. A natural system possesses sensorium to make it aware of external and internal stimuli and by detecting them, to model and remodel its skeletal system. Recalculation of skeletal system

¹⁸⁴ See: http://www.pbs.org/wgbh/nova/tech/DNA-photograph.html_2010

could include remodeling or combinations of its microstructure, entire entities, its shape, and size or similar. Material called Functionally Graded Material (FGM), expresses various aspects of its chemical composition, physical state, and geometrical configuration, via conceptual unit of material ingredient. There is direct relation between microstructure and material behavior. By controlling and producing a non-uniform microstructure, plan was to achieve optimum performance in a specific application. FGMs could be designed if two different material ingredients change gradually, or in a discontinuous way. Concept of FGMs is improving materials that gradually change over time or by signaling from environment, when depended functions are embedded in spatial gradation rather than in material gradation.¹⁸⁵

3.10 Beauty of Patterns Found in Nature

Bio inspired or biolearned applications in architectural design are mostly oriented on applying processes and results, found in Nature, but concerning to its materials and structures that are fulfilling specific functions. Growing as Building (GrAb) project run through 2013-2015, at University of Applied Arts, Vienna, was searching for developing novel architectural forms laying on advantages of growth patterns and growth dynamics found in animals, plants, and fungi. Manifesto of GrAb project is outlining its attention to produce “things that are new, useful, safe and aesthetic”¹⁸⁶. Additionally to the transfer and importance of bio-inspired functionality and its application on architectural projects and materials, GrAb was trying to transfer aesthetics and elegances to that functioning.¹⁸⁷

Biological structuring and function is more defined by scientists, while Beauty is left to be observed by poets. When will the value of Beauty take the same role as value of function, material, structure and all together; and how can one learn from Beauty of Nature to make novel, let us say better forms in architecture?

¹⁸⁵ Miyamoto, Y., Kaysser, W. A., Rabin, B. H., Kawasaki, A., & Ford, R. G. (1999). *Functionally Graded Materials Design, Processing and Applications*. (Y. Miyamoto, W. A. Kaysser, B. H. Rabin, K. A. & R. G. Ford, Eds.) New York: Springer Science+ Business Media.

¹⁸⁶ GrAB. (2016). Manifesto. In B. Imhof, & P. Gruber (Eds.), *Built to Grow – Blending Architecture and Biology* (p. 167). Basel: Book Series of the University of Applied Arts Vienna.

¹⁸⁷ Speck, T. (2016). Approaches to Bio-inspiration in Novel Architecture. In B. Imhof, & P. Gruber (Eds.), *Built to Grow – Blending Architecture and Biology* (pp. 145-149). Basel: Book Series of the University of Applied Arts Vienna.

Attractiveness of scientific discovery, especially biotechnology, genetics, mathematics, material sciences, related to problems of morphogenesis, embryogenesis, adaptiveness, evolution of form and visual perception, autonomy and self-organization, individuation, theoretical biology, emerges new frontiers of aesthetics of architectural forms. Visionary architects are attempting to apply these discoveries, not just as byproducts but as well in entire process of form emergence. “Science fiction” could be the term that is describing this architectural sympathy for science. But besides attractiveness of new insights, where is the meaning of that production and correlation? Does it come from the object that could be intention or is it purely related to viewer’s interpretation?

In 1981 physicist Richard Feynman, in an interview for BBC, gave an ode to a Flower, observing that Beauty of flower and scientific understanding of Beauty coming from knowledge about flower, which is more important for Beauty “detection” than pure seeing it. By that, appreciation of Beauty could be enhanced imagining cells, their inner structures, actions and process that occurs in-between cells and parts of flower. Indicating that Beauty has to have, for sure, more dimensions and viewing points.¹⁸⁸

Like quantum mechanics, which is not about matter but idea¹⁸⁹ suggestion, is that meaning of Beauty is coming from not how it looks like, but rather from idea that underlies its presentation. Whether it is like here focused on recalculation, Beauty is finding in every step forwards of its attempt to flow and recalculate, by calculating its past and emerging its future.

3.11 Summary

A biological entity displays exquisite mechanism for listening, reaction, and adaption on signals from inner and outer environments. They are expressing hierarchy of their structural control, functions, and material compositions. They are optimal for their behavior and usage of components. They have an attribute to be different while keeping its integrity and are similar at sharing information embedded in genes and outer environment. As it is said by Aristotle at the very beginning of this chapter, things in Nature make this world marvelous. In

¹⁸⁸ Feynman, R. (1981, November 23). The Pleasure of Finding Things Out. *BBC*. (Caltech talks)

¹⁸⁹ Chaitin, G. J. (2014). Is Information Fundamental? *Closer to Truth*. (R. L. Kuhn, Interviewer)

particular, we have focused on the strategies that promote recalculation of Nature. It could be that Beauty of Nature is coming as a result of fluidity, never ending recalculations embedded in its roots, for making novel forms and adding new insights that will be recalculated again. Nature wins itself, day by day.

In this chapter, focus is on the mechanisms of recalculations, by explaining relations of co-continuous composites on different scales, and milieu ambient. It is obvious that Nature is making forms from inner but also from outer environment. Its form is sensing inside signals but as well outside ones. We have seen that natural systems are assemblage of different, multiple layers of materials, that are performing different functions, making these materials, that are anisotropic, to become homogenous entities.

Alessandro Sarti and David Piotrowski in the article *Individuation and Semiogenesis: An Interplay Between Geometric Harmonics and Structural Morphodynamics*, talked about pre-defined spaces emerged from individuation. Synthesizing perspectives of Simondon, Deleuze-Guattari and Bateson, they introduced pre-individual form as heterogeneous one, with continually changing and individuation of itself, which is coming as a result of harmonic act on pre-individual form.¹⁹⁰

Seen from case study of leaf, patterns are elements that are providing pathways for transfer and diffusion of information, whether it is mechanical, chemical or formal. We could not reach border in-between structure and its composition, which implicates that Nature does not make difference. Patterns are observed on structural level as well as on material level of their compositions. Being emerged from (un)material, a combination of chemical substances is organized and reorganized, in highly complex and structured forms of living entities. Process of morphogenesis involves creations and inspirations for research of Goethe, later D'Arcy Thompson and today it is quite spread idea. Morphogenesis generates forms and makes matters worth. Challenging problem reflecting this idea of

¹⁹⁰ Sarti, A., & Piotrowski, D. (2015). Individuation and Semiogenesis: An Interplay Between Geometric Harmonics and Structural Morphodynamics. In A. Sarti, F. Montanari, & F. Galofaro (Eds.), *Morphogenesis and Individuation* (pp. 49-73). Cham, Heidelberg, New York, Dordrecht, London: Springer.

morphogenesis could be from where “shape formers” of architecture are coming and what they are. As Lawrence Krauss said in lecture *A Universe From Nothing*, “everything we see is coming from empty space”.¹⁹¹ Than even architecture’s “shape formers” are from the same nothing. There is an entire heritage of ideas and concepts that has to be reconsidered and to serve as instructors, besides these inner “shape formers”, in order to recalculate nature of architecture and to face new challenges and ideas.

Exchange with and in milieu ambient and constant flux between entities is a force, which makes natural objects to animate from order to disorder, constantly unplugged, they finally led to the process of constant recalculation. Improvement of connectionism should work on staggeringly complexities of life and creations of possible architectures. Multiple, many in one, one in many, never ending, more singularities, undergoing process, pluriverse, modification and transformation from one into many and vice versa, are possible creators.

Nature is machine with capacities to sense. Nature recalculates its entities having communication routes. Is it possible to produce forms that use natural sensorium in order to recalculate themselves? Contrary to Frei Otto benefits of making self-formation constructions with capacities of comprehension more than pure copy of Nature¹⁹², we could bypass design that was into design inspired with Nature, and through Nature and come to the point to design for design or design instead of Nature.

We move from the world of natural patterns to man-made patterns and computer patterns, in search for novel form making strategies that comply with Natural points of flow and recalculations, but still, Nature will stay as our milieu ambient for application and successfulness.

Search for Beauty of morphogenesis, networking, hierarchy, and self-assembly, discussed within this chapter, should be understood as concepts rather than processes. Copy of processes of natural form finding should be one way but whether Nature itself possesses much importance on processes? Nowadays we

¹⁹¹ Krauss, L. (2009). Talk: *A Universe from Nothing*, AAI.

¹⁹² Meissner, I. (2015). Frei by Name, Frei by Nature. *Uncube Magazine* , 33.

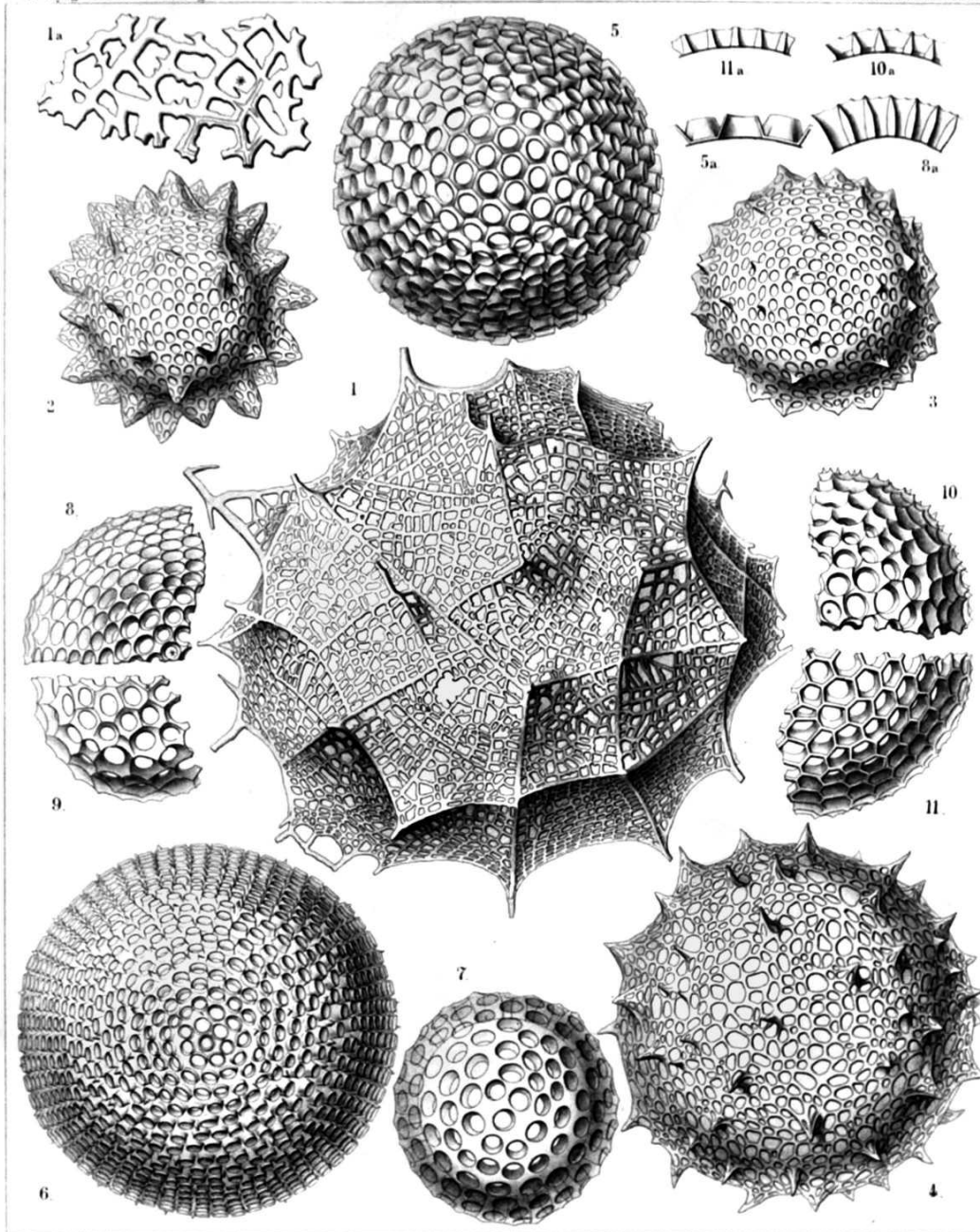
can merely produce materials or better say structures from almost nothing. We are making novel materials and forms. Printing material and designing form, simultaneously with possibilities to change every step forward. Nature does not celebrate crisis either criticize. By the recalculations and enhancing its entire structure it makes problems be solved. Nature does not work but is working. It is designing without material, without using any labor. Are we then more into making like Nature, or becoming the Nature?

Through the discussion, in the following chapters of state of the art applications of new insights and contemporary solutions of design, philosophy, and Beauty as an underlying idea, we will try to catch major challenges to be resolved on the way to make more designs instead of Nature.



Figure 3.1 The mycelium of a fungus spreading through soil called 'Earth's natural internet'.
Photograph courtesy of Nigel Cattlin / Alamy.

Source: http://www.bbc.com/earth/story/20141111-plants-have-a-hidden-internet_03/07/2016.



F. Haeckel und J. G. Thomsen, Del.

E. Böttcher, Jena, Lithogr.

1 OROSPHAERA . 2-4. CONOSPHAERA . 5, 6. ETHMOSPHAERA .
7-11. CERIOSPHAERA .

Figure 3.2 Ernst Haeckel, Plate 12 Orders PHÆOSPHERIA et SPHÆROIDEA. Families Orosphærida, Astrosphærida et Liosphærida. Report on the Scientific Results of the Voyage of H.M.S. Challenger During the Years 1873-76, Vol. XVIII.

Source: Project Gutenberge Book,

<https://www.mirror-service.org/sites/gutenberg.org/4/4/5/2/44527/44527-h/44527-h.htm>

_16/04/2014



Figure 3.3 D'Arcy Thompson's teaching model of a Polychaete larva, made out of glass in Dresden Blaschka Studio, University of Dundee Museum Services, D'Arcy Thompson Zoology Museum. Photograph by Stephen Robinson.

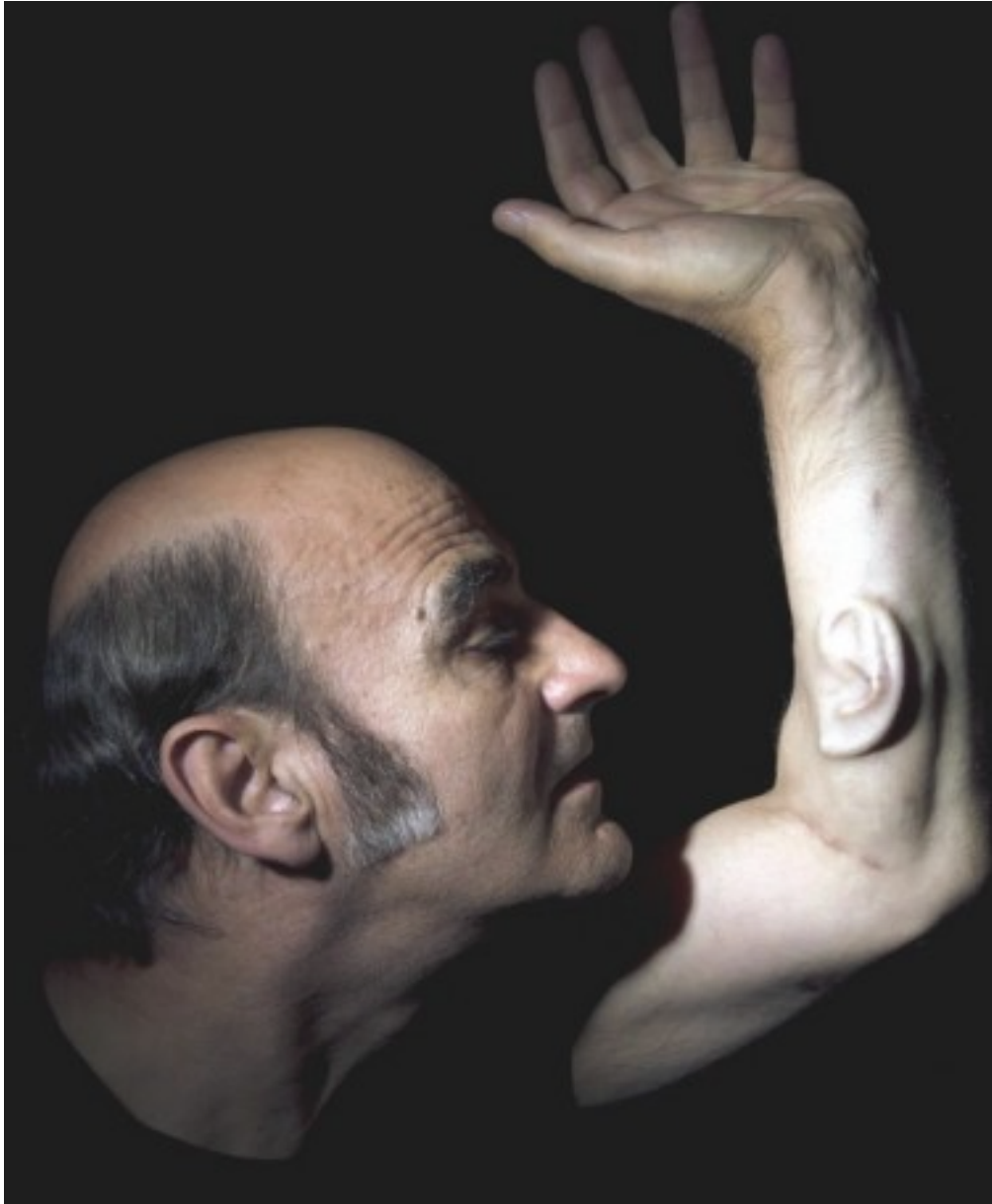


Figure 3.4 Ear on Arm, by Stelarc. Source: http://stelarc.org/?catID=20290_11/07/2016.

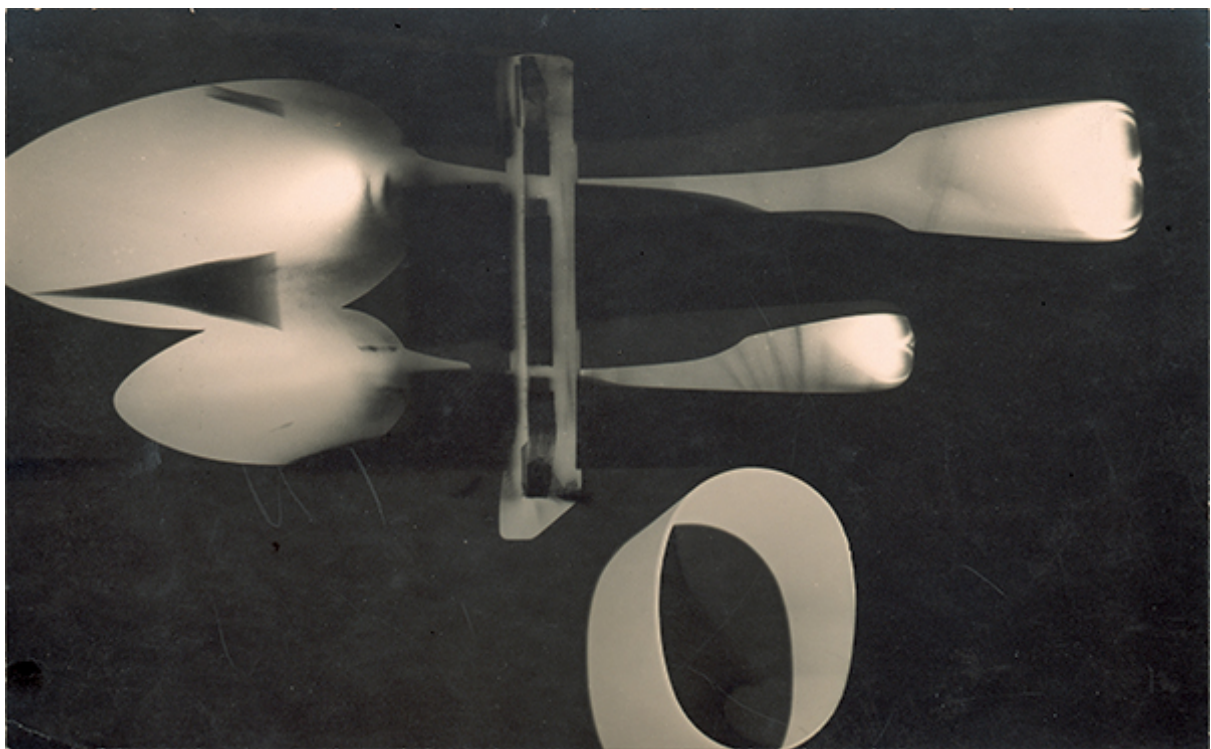


Figure 3.5 Moholy-Nagy's FGM.217 Untitled, Dessau 1927.
Source: http://moholy-nagy.org/art/photograms/_26/07/2016.

| System | Type | Applications/importance |
|--|-----------|--|
| Atomic, ionic, and molecular crystals | S | Materials, optoelectronics |
| Phase-separated and ionic layered polymers | S | |
| Self-assembled monolayers (SAMs) | S, T | Microfabrication, sensors, nanoelectronics |
| Lipid bilayers and black lipid films | S | Biomembranes, emulsions |
| Liquid crystals | S | Displays |
| Colloidal crystals | S | Band gap materials, molecular sieves |
| Bubble rafts | S | Models of crack propagation |
| Macro- and mesoscopic structures (MESA) | S or D, T | Electronic circuits |
| Fluidic self-assembly | S, T | Microfabrication |
| "Light matter" | D, T | |
| Oscillating and reaction-diffusion reactions | D | Biological oscillations |
| Bacterial colonies | D, B | |
| Swarms (ants) and schools (fish) | D, B | New models for computation/optimization |
| Weather patterns | D | |
| Solar systems | D | |
| Galaxies | D | |

Figure 3.6 In table by George M. Whitesides and Bartosz Grzybowski, in *Self-Assembly at All Scales*, it is presented wide applications of dynamic self-assembly at different scales (S, static, D, dynamic, T, templated, B, biological). Some of the possibilities of applications given by authors are: crystallization at all scales, robotics and manufacturing, nanoscience and technology, microelectronics, and netted systems (for full reference look at text).

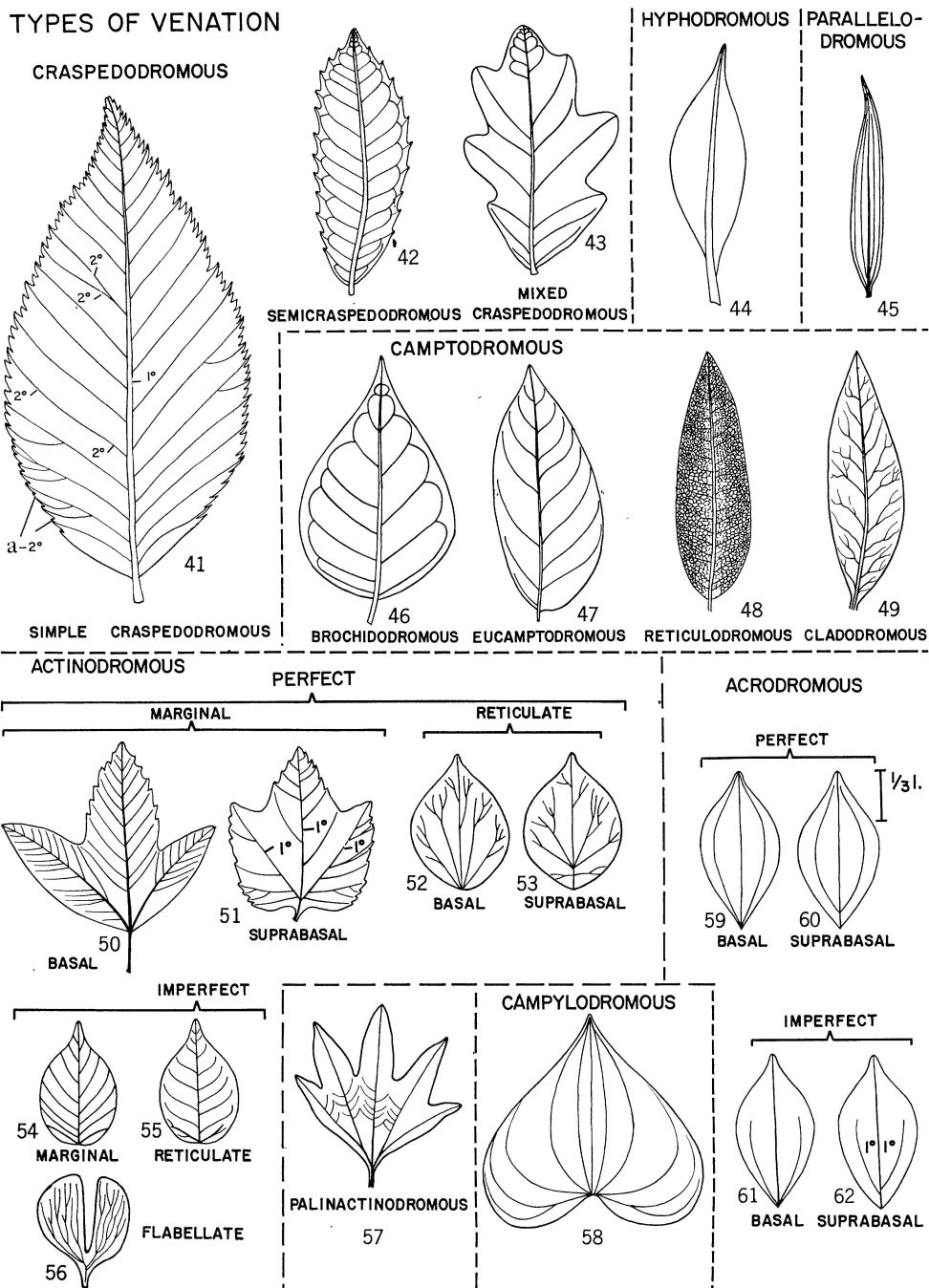
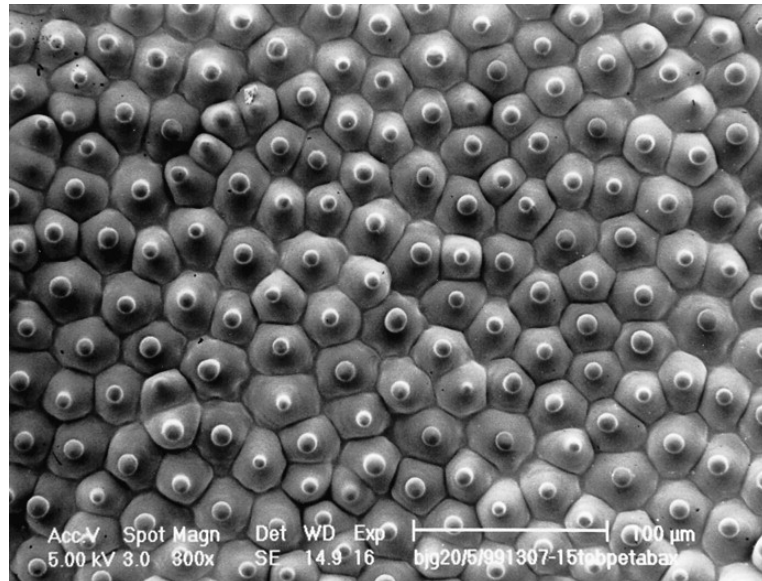
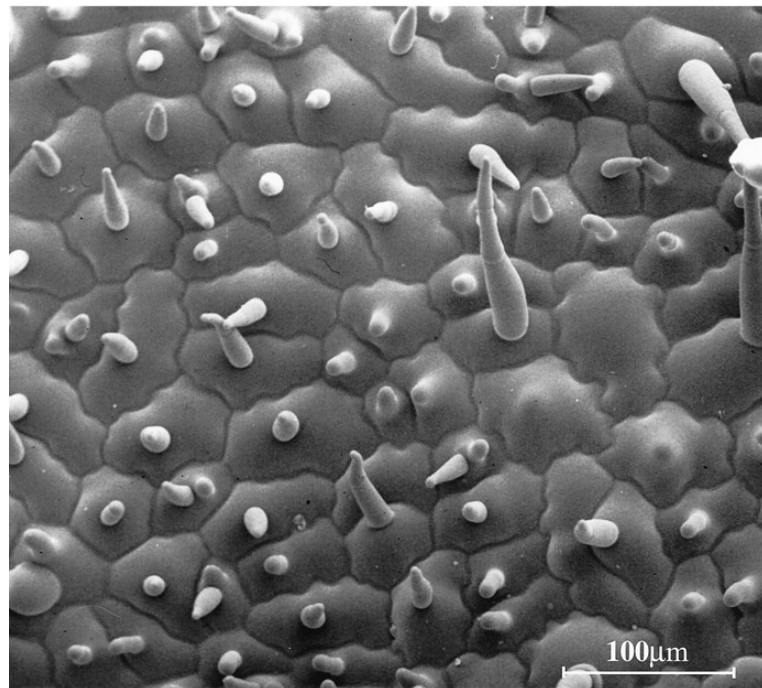


Figure 3.7 Leaf architecture by Hickey, showing different types of venation patterns. Source: Classification of the Architecture of Dicotyledonous Leaves (for full reference look at the text).



A



B

Figure 3.8 Patterning of abaxial and adaxial surface of tobacco leaf. (A) Abaxial surface pattern, made out of all conical-papillate cells. By its shape and organization into patterns, cells, increases its light capture in order to provide Beauty to attract pollinators. Beauty of abaxial pattern of this particular leaf, expresses its simplicity. Having all same shape of cells, Beauty is related to the wholeness of surface they create, and its role of attract. (B) Adaxial surface pattern made out of different conical-papillate petal cells.

Source: <http://jxb.oxfordjournals.org/content/51/344/497.full> _26/07/2016.

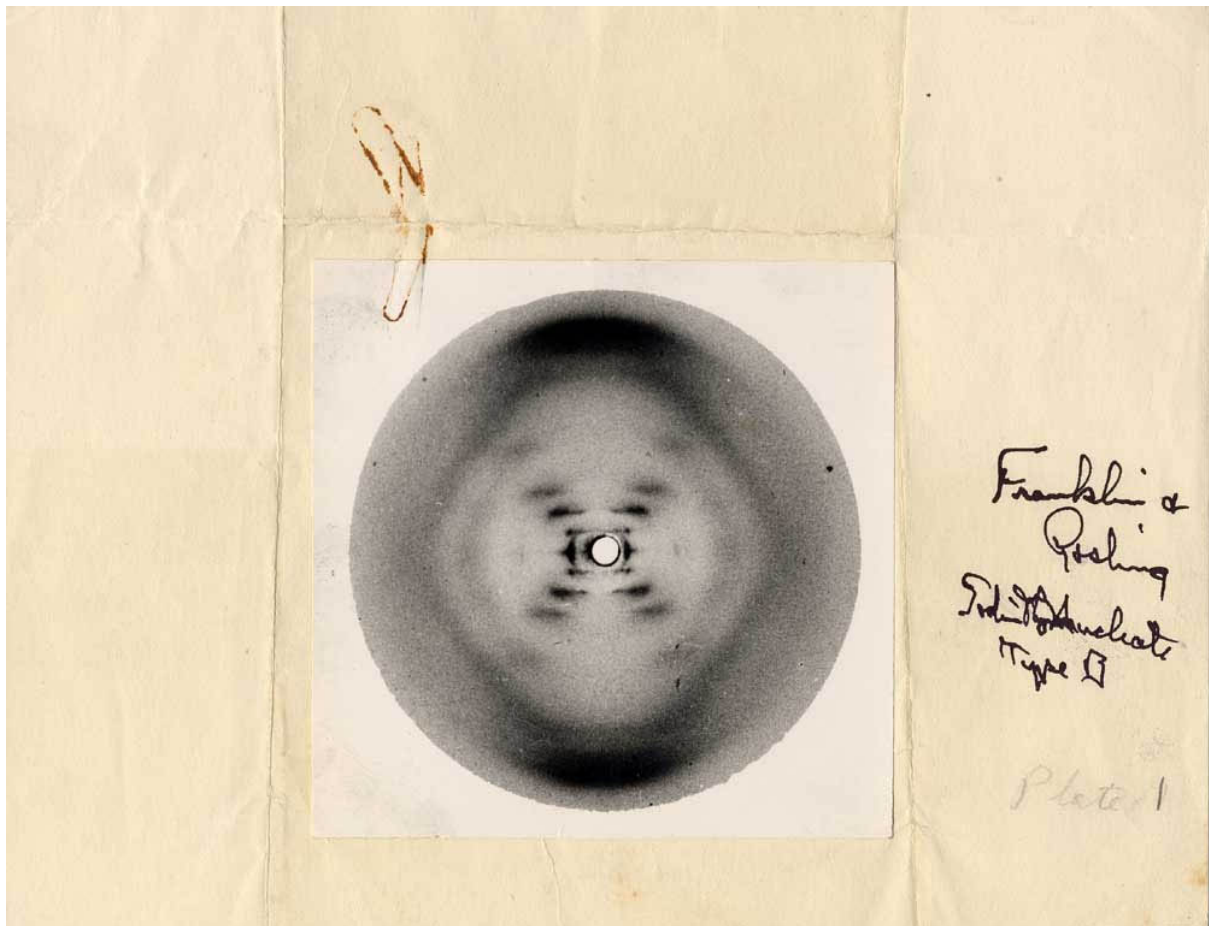


Figure 3.9 Photo 51, Franklin X-ray: Sodium deoxyribose nucleate from calf thymus, Structure B, taken by Rosalind E. Franklin and R.G. Gosling (1952).

Source: https://askabiologist.asu.edu/Rosalind_Franklin-DNA_15/09/2014.

CHAPTER 4

4 The Original Us!

The mind was dreaming. The world was its dream.

_Jorge Luis Borges

4.1 The Anthropocene

Chapter 4 (entitled: The Original Us) is about patterns designed by humans pointing towards the potential integration between patterns and environment in what these patterns occur. Also, definition of materials and engineering of man-made pattern is given. Here, human ways of making pattern are considered vis-à-vis Nature's ways as the potential substance to be recomposed and reformed.

New geological age termed as anthropocene, by Nobel laureate Paul Crutzen, is characterized by changes on Earth done by new geophysical force, humans. These changes occur versus disappearing border between natural and artificial, and human infiltration into non-human milieu, "bringing with it a new period of

environmental anxiety and existential uncertainty”.¹⁹³ As François Roche said in The Greg Lynn Show 2016, we are finding ourselves in paranoiac situation, defining ugliness as charming attraction, from which we could develop strategy of creation.¹⁹⁴

Chapter will discuss ways for a desirable novelty in creative productions, via illustrations of relevant pattern formations through human history. It will search for an image of bright future or an image of future from movie *Brazil*¹⁹⁵ (1985) by Terry Gilliam described as “melancholy, joke-ridden view of the horribleness of where we are now and the worse horribleness of where we’re heading”.¹⁹⁶

Question that is to be open is, whether desirable novelties are bringing desirables beauties. Another movie *Only Lovers Left Alive*¹⁹⁷ (2014) by Jim Jarmusch, is giving us a spineless image of future, by following a vampire couple, that due to their immortality, live in time but not in a space. This is even more underlined by no means of a continent that put them apart. If we look from their perspective, with having a time as only reference, with no space that is considered, what would be novel and what is obsolete? Borges in his short story *The Garden of Forking Paths* gave us similar picture of the possible world by placing the story of Ts’ui Pen in time but not in space:

*In contrast to Newton and Schopenhauer, your ancestor did not believe in a uniform, absolute time. He believed in an infinite series of times, in a growing, dizzying net of divergent, convergent and parallel times. This network of times which approached one another, forked, broke off, or was unaware of one another for centuries, embraces all possibilities of time. We do not exist in the majority of these times; in some you exist, and not I; in others I, and not you; in others, both of us.*¹⁹⁸

¹⁹³ ACADIA. (2015). Conference Theme/Design Agency. *Computational Ecologies Design in the Anthropocene* (p. 2). Cincinnati, Ohio: ACADIA Association For Computer Aided Design in Architecture.

¹⁹⁴ Roche, F. (2016, May 11). Greg Lynn Show. *Canadian Centre For Architecture*. (G. Lynn, Interviewer) Montréal: Paul Desmarais Theatre.

¹⁹⁵ Gilliam, T., Stoppard, T. (Writers), & Gilliam, T. (Director). (1985). *Brazil* [Motion Picture].

¹⁹⁶ Kael, P. (n.d.). *Movies Brazil*. Retrieved May 23, 2016, from The New Yorker: <http://www.newyorker.com/goings-on-about-town/movies/brazil>

¹⁹⁷ Jarmusch, J., Bessay, M. (Writers), & Jarmusch, J. (Director). (2013). *Only Lovers Left Alive* [Motion Picture].

¹⁹⁸ Borges, J. L. (1962-1964). *Labyrinths: Selected Stories and Other Writings*. New York: New Direction Publishing.

Looking from perspective of immortal creatures, when problems of the day are becoming irrelevant, what matter is what worldly matters detached from the space. Then the form is becoming detached from its representation of spatial articulation and becomes more temporal, which certainly has its impact on Beauty, and architectural standpoint of the making and producing forms. Placing architecture in this standpoint will certainly open up possibilities of forming Architectural Sensorium and make architecture not just an architecture of space, but as well as an architecture of time.

Buildings of the past used architectural languages to speak about main concerns of that particular period but even tried to get in touch with universal metaphysical discourse. Sometimes narrative was more abstract, like in a creative work of eastern part of the world and more concrete like is the case on the west. So to speak, on building facades of Greek and Roman temples we have religious narratives presented via human body as an element, and more abstract narrative on Islamic temples. In continuation, human creativity goes into period of purification of any such narratives and what was left is utilitarian value. In recent history by introduction of digital discourse into architectural design we are raising again usage of patterns not just as décor but as main sincere character of Architectural Sensorium. Having placed patterns in Architectural Sensorium could be observed as avant-garde, a few decades ago. Now, when something what was avant-garde became mainstream, there is need to be more extreme by saying that pattern should be observed as an internal nature of Architectural Sensorium. As it is seen in previous chapter where Nature is making unreadable differences between structure and material, in this chapter we should see patterns of human creativity that are blurring differences between decorative and utilitarian understandings.

Existing notions of creativity and notion of Beauty are extended through the developing understandings of biological and technological insights. Instead of talking of matter, nature and its processes, things that are nonhuman organisms, technologies, tools, and machines as creative agencies, in this chapter we will examine human influences on creativity. Besides gesture, knowledge, skills, and

tools of human creativity, we will search for unconscious elements by examination of patterns that are emerging out of our brains.

4.2 The Reason for its Importance

*...to act or write or make music or paint things or sculpt things are trying to remember, recreate, share, and pitifully hold on to a particular memory or memories that allowed us to continue living with some comfort...*¹⁹⁹

Form is the synergy of nature, culture, and surrounding milieu, where purpose, value, ethics and politics are seen as concept of creativity and pathway of flow of action, interaction, and transaction. Concept behind concerning patterns made by humans, as a part of this research, has an idea to make it clear that designing, forming, or growing is not all about materials (here material should be understood as a component, no matter if it is making structure of form or fill of form).

4.2.1 Phenomena of colors and music as materials

Russian painter Wassily Kandinsky, known for his abstract paintings, presents geometrical shapes that are acting, interacting and transacting between each other by “cutting” surrounding space. His legacy is in considering colors as a way to examine universal aesthetics. His works link each particular color with geometric shapes and musical tones. Same like Kandinsky, another teacher from Bauhaus, Paul Klee, tried to free colors from their descriptive role adding them the role of shaping, composing and influencing interaction of an artwork and people.²⁰⁰

Both are enriching ways of processing paintings in a way of extending pattern formation by usage of materials, which are abstract, like music and colors.

¹⁹⁹ Brando, M. (2015). *Marlon Brando on Art: Autobiography Made Flesh*. Retrieved April 24, 2016, from "Come Up a Man: The Hungers of Marlon Brando" by James Grissom: <http://comeupaman.blogspot.ba/search?q=I+have+found+that+most+of+us+who>

²⁰⁰ Smith, K. (2016). *Bauhaus Color Theory*. Retrieved July 3, 2016, from Sensational Color: <http://www.sensationalcolor.com/understanding-color/theory/bauhaus-color-22743#.V7qzu1fC-Jh>

4.2.2 Phenomena of duality as an material

Our aesthetic appreciation of the visual world depends largely on light. Light is electromagnetic radiation, which has information about earliest epochs, chemical composition of stars, measurements of expansion of universe. Light has dual nature. One is particle nature and another is reflected via its wavy propagation through space. Its duality is discovered by pattern formation in double slits experiment by 1802 Thomas Young (Fig. 4.1). In order to be fully understood light has to be seen from quantum level. Through quantum lenses, light is pocket of energy, called photons. Matter and energy in quantum mechanics also have dual nature of their multiple and simultaneous states. Pattern formation of light, besides its dual nature, is inflected by observer and apparatus.²⁰¹

4.2.3 Phenomena of lightness as materials

Force as a construction element is mentioned in the previous chapter by stating D'Arcy Thompson "form of an object is a diagram of forces".²⁰² Form has emerged as a consequence of interaction of forces. Further influences of forces could cause their changes. Usage of forces should not be understood as a heavy or bulky design strategy. A contrary should be understood via diagram or pattern that is generated by interaction of forces, to make lightweight architecture. Frei Otto has used non-standard materials for building, like air and fabric. By usage of (un)materials he tried to replace sombre, massiveness, axiality, and symmetry with lightweight, floating, asymmetrical forms²⁰³, moving forward to "new" concept of the building relations and Beauty.

*Using air as a building material means that the amount of material you need is very minimal so you can dedicate your forces to the relation between animals and man, and man and plants, and make an environment which is in equilibrium.*²⁰⁴

²⁰¹ Stark, G. (2015, December 12). *Light*. Retrieved July 3, 2016, from Encyclopedia Britannica: <https://www.britannica.com/science/light>

²⁰² Thompson, D. W. (1945). *On Growth and Form*. New York: Cambridge: at the Universty Press, p. 16.

²⁰³ Meissner, I. (2015). Frei by Name, Frei by Nature. *Uncube Magazine*, p. 33.

²⁰⁴ Meissner, I. (2015). Frei by Name, Frei by Nature. *Uncube Magazine*, p. 9.

4.2.4 Phenomena of “Universality” as material

Phenomenon, known as “universality” which dates from 1950, is discovered in systems of the energy spectrum of the uranium nucleus, in the zeros of the Riemann zeta function, Cuernavaca bus system, in spectral measurements of composite materials, such as sea ice and human bones, and in a simplified version of the Internet. In all these systems, there is sequenced pattern, representing different data of particular system, like energy levels, zeta zeros, bus departure times or signal speeds. Their patterns occur as transmitters from chaotic and ordered, into fine balanced ones (Fig. 4.2). Phenomenon is receptive for very complex systems, consisting of many parts that interact and generate spectrum (Fig. 4.3). Personality in such a system is not important. Every such system is possible to treat with random matrix to model it and predict its behavior.²⁰⁵ We can say that patterns help in prediction of behaviors in medicine, meteorology, ecology, and computer science.

4.2.5 Phenomena of monad, nomad, meme as material

Monad

Monads are entities of compounds, but without any parts, a single substance. Leibniz in *The Monadology* (1898) presented them as “elements of things” without possibilities for extensions and forms. Monads are untouchable entities with no windows to transmit any substance or accidents inside of their entities. Even though they have qualities, they do not have capabilities to be changed, altered or prequalified by surrounding milieu, but from internal principle yes. In the same work, Leibniz spoke about “possible universes”, as a race for perfection that these worlds aspirers to, and decide upon one rather than another. Construction of single universe is made out of infinite number of Monads, in co-relations, reflecting perpetually living mirroring of universes.²⁰⁶

²⁰⁵ Wolchove, N. (2013, February 5). *In Mysterious Pattern, Math and Nature Converge*. Retrieved May 16, 2015, from Quanta Magazine: <https://www.quantamagazine.org/20130205-in-mysterious-pattern-math-and-nature-converge/>

²⁰⁶ Leibniz, G. W. (1898). *The Monadology*. (R. Latta, Trans.), Oxford: Clarendon Press.

*Souls act according to the laws of final causes through appetitions, ends, and means. Bodies act according to the laws of efficient causes or motions. And the two realms, that of efficient causes and that of final causes, are in harmony with one another.*²⁰⁷

Is it possible to apply Leibniz relation of soul and body when talking about Architectural Sensorium? Man creations are also an attempt to conceive harmony of means, appetites, and ends, reflecting social, political, economical casualties and critics; and efficiencies and motions of natural laws. The Beauty is not coming in making perfection, but making it possible; like it is selection of the world with best possible fitness. Idea of Monads is inhabited in discourse of architecture, art, literature, and science representing its metaphysical standpoint.

Nomad

A contrary to Leibniz's closed entities of Monad, as a result of adaption to the novel discussions, we have Deleuze's Nomad.²⁰⁸ Deleuze "exposed" closed windows of Monads for dramatic transformations, making its surfaces to be folded, and by that they are becoming informational board for concepts of the world of an infinite series²⁰⁹:

*The city seems to be a labyrinth that can be ordered. The world is an infinite series of curvatures or inflections, and the entire world is enclosed in the soul from one point of view.*²¹⁰

Meme

Besides DNA, a life replicator, Richard Dawkins introduced another one called meme. Meme do not have genetic notion, they are products of culture evolved through history of time; they are living structures, cultural informers.

²⁰⁷ Leibniz, G. W. (1898). *The Monadology*. (R. Latta, Trans.), Oxford: Clarendon Press, p. 79.

²⁰⁸ Deleuze, G. (1993). *The Fold Leibniz and the Baroque*. (T. Conley, Trans.) London: The Athlone Press.

²⁰⁹ *Ibid.*

²¹⁰ *Ibid.*, p. 24.

Examples of memes are tunes, ideas, catch-phrases, clothes fashions, ways of making pots or of building arches. Just as genes propagate themselves in the gene pool by leaping from body to body via sperms or eggs, so memes propagate themselves in the meme pool by leaping from brain to brain via a process which, in the broad sense, can be called imitation.²¹¹

Looking from quantum mechanics point, information cannot be lost. Explained by Bousso, amount of information that one can fit on surface, let say box, at a density of one bit per Planck tile, is sufficient to tell you absolute everything that could happen to that box. Meaning that amount of information is limited by area, not volume. Boundaries are tiled by one bit per Planck.²¹² Architecture is designing void using boundaries. If boundaries are inseparable from form, then Monads, Nomads or either Meme are (un)materials of making patterns of novel architecture.

It could be summarized that mysterious forces in this possible universe are manifesting themselves via patterns that could be seen, for example in light, which has mechanisms, among others, to transmit information about earliest epochs.

Defining all possible (un)materials for building or growing, or thinking about new architectural “beings”, is an endless process. Definition of why something is, or something could be seen from physical or metaphysical point. Placing (un)material in one of mentioned pools, seems to be quite impossible. From mentioned (un)materials in this chapter, it is obvious that some of them represent pure physicality in one fold and when they are unfolded or refolded again they are expressing pure metaphysical notion. Via experiments in one notion another one is discovered. It seems that physical and metaphysical materials raised border in between, like artificial and natural ones did, or like structures and composites did.

²¹¹ Dawkins, R. (1989). *The Selfish Gene*. Oxford: Oxford University Press, p. 192.

²¹² Bousso, R. (2014). Is Information Fundamental? *Closer to Truth*. (R. L. Kuhn, Interviewer) PBS.

4.3 Strategies plan of actions: chemical & morphogenesis

4.3.1 Synergy

In a process of synergy different entities, at least two, are composing an outcome. Composed entities play as homogenous, following heterogeneous laws. As it was explained in previous chapter, natural entities possess isotropic and anisotropic nature related to the inner and outer articulation. In human activities, there is composition that acts the same. In architecture, it is obvious that one architectural entity is consisted out of many parts. Successful process of synergy plays a big role in making “big things”:

*We must clarify our position. No-matter-what can be something with the exception of the world that things are and which is nothing. Playing with this exception is the very thread by which the most beautiful and important human materials are sewn, in which we adorn our whole environment: representations of the world as if the world were a big thing, a thing apart from things and mattering among these things through the actions and knowledge of our species, which crafts very big things.*²¹³

“Big thing” is consisted out of several things, never just one. Entities or several things could jump from one “big thing” into another or go outside. “Big thing” that is made out of unique thing does not exist. If that is a case, there is world. Every unique thing that makes action, interaction, thinking, socializing, acts on big things, on its composition or decomposition.²¹⁴

Let us see architecture as a process of car production while yielding things on things, into the “big think”, during world-changing history. There are some certain similarities regarding structure, material properties, standardization, assemblage, enveloping, between house and house/car on the road. House just like car faces changes like globalism, environment, and new manufacturing techniques and demands for redrawing, re-crafting and re-born novelties to their discourse. Idea behind novelties in car industry is to become instead hardware provider, software

²¹³ Garcia, T. (2014). *Form and Object a Treatise on Things*. Edinburg: Edinburg University Press, p. 85.

²¹⁴ Garcia, T. (2014). *Form and Object a Treatise on Things*. Edinburg: Edinburg University Press.

and experiences provider.²¹⁵ Having in mind that there are more mobile phones than people on the planet, and that mobile will be substituted with The Internet of Things by 2017, the focus of the changes, or shift forward in car industry, is guided in benefits of the connectivity.²¹⁶

Interests of this research is not given to certain outcome or sophisticated image of cars in future, but on new materials that are now playing a main role in construction of cars, while in the past they were not in use. (Un)materials are possessing dual nature. From one side they could represent materials that were not in use before in architectural design, but they exist in their physical nature, and materials, which are more metaphysical. Usage of such materials could bring us to produce novel forms with novel functions, which may not be obvious in this time, but could become important in future. So, making architectural “beings” out of (un)material is introducing new level of what architecture could be in this possible world and could bring solution of architectural problems by introducing some novel procedures. It does not mean to work interdisciplinary, it means to work inside our discipline but to spread notion of architecture.

A novel of *1Q84*²¹⁷, by Haruki Murakami, starts with a woman, called Aomame, stuck in traffic jam in one elevated highway of Tokyo. In order to pinpoint distance, taxi driver suggested her, unusual escape route by using emergency pullouts of highway. From one side there is highway with its static but layered form and with capabilities to open its, windows to unusual, mystical, and novel forms. Introducing an (un)material usage of secret stairways inside of emergency pullouts, instead of standard ways, in making her route, the woman has designed a mystical world that has changed her life forever.

Similar understanding of a Japanese spatial comprehension of overlapped and layered space, was introduced by western architect Frank Lloyd Wright. He was inspired by the woodblock artist Hiroshige Ando and *The Book of Tea* written by

²¹⁵ Don Butler, head of Connected Vehicle and Services for Ford Motor Company for Wired Brand Lab. (n.d.). How Connectivity is Driving the Future of the Car. Retrieved July 10, 2106, from Wired: <http://www.wired.com/brandlab/2016/02/how-connectivity-is-driving-the-future-of-the-car/>

²¹⁶ Wired Brand Lab. (n.d.). *How Connectivity is Driving the Future of the Car*. Retrieved July 10, 2106, from Wired: <http://www.wired.com/brandlab/2016/02/how-connectivity-is-driving-the-future-of-the-car/>

²¹⁷ Murakami, H. (2011). *1Q84*. New York: Knopf.

Tenshin Okakura and later by Mies van der Rohe.²¹⁸ Salvator Liotta and Matteo Belfiore in the book *Patterns and Layering* said that Japanese layers are open to possibilities to create relationships:

*Layering is made of devices able to create a juxtaposition of heterogeneous elements instead of creating uniformity.*²¹⁹

4.3.2 Neuroaesthetics

Why is something beautiful? For Greeks, it was something that is in the eye of the beholder, while for David Hume is “in the mind that contemplates them”²²⁰. Kantian Beauty is without rules, no concept, not relative,²²¹ for Hegel it is spirit and history.²²² Plato’s Beauty is an Idea and therefore the Beautiful is in itself, the direct correspondence of what is one to itself.²²³ For Franz Boas Beauty is cultural concept.²²⁴ Additional to all and many more understandings of Beauty, evolutionary psychologists, have looked for quantifiable, describable and universal aspects of beautiful. In this field called neuroaesthetics, it become real that appreciating Beauty might not be universal, but its neural basis certainly is. Novel studies in field are based on documented hallucinations from 1920s, studied by neurologist Heinrich Klüver. Intrinsic properties of the visual nervous system partially could be presented by patterns of zigzags, spirals, grids and curves.²²⁵

In recent history, in a collaborative work on the project Neurotopographics,²²⁶ a neuroscientist, an artist, and an architect have been working to understand

²¹⁸ Kuma, K. (2012). Foreword. In S.-J. A. Liott & M. Belfiore (Eds.), *Patterns and Layering: Japanese Spatial Culture, Nature and Architecture* (pp. 4-5). Berlin: Gestalten.

²¹⁹ Liott, S.-J. A., & Belfiore, M. (2012). Background. In S.-J. A. Liott, & M. Belfiore (Eds.), *Patterns and Layering: Japanese Spatial Culture, Nature and Architecture* (pp. 6-7). Berlin: Gestalten.

²²⁰ Hume, D. (2006). The Standard of Taste. In *Four Essays: Tragedy, The Standard of Taste, Suicide, The Immortality of the Soul* (pp. 7-19). <https://philpapers.org/rec/HUMFET>, p. 9.

²²¹ Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press. p. 339.

²²² Adorno, T. W. (1997). *Aesthetic Theory*. (G. Adorno, & R. Tiedemann, Eds.) London, New York: Continuum, p. 57.

²²³ Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press, p. 337.

²²⁴ Boas, F. (1927). *Primitive Art*. Cambridge: MA: Harvard University Press.

²²⁵ Costandi, M. (2008). *Beauty and the Brain*. Retrieved August 22, 2016, from SEED Magazine: http://seedmagazine.com/content/article/beauty_and_the_brain/

²²⁶ Spiers, H., Malinowski, A., & Visman, B. *Neurotopographics, the film installation*. Welcome Trust, 2008.

relations between brain and space. Result was a film installation that explores brain cell activities' patterns and their relation of making human beings capable to perceive and remember space.

For neuroscientist Hugo Spiers, it was important how space is represented in brain. Neuroscientists are trying to decode, records of generated patterns that occur in process that starts when neurons extract information from our senses.²²⁷ Our brain is equipping us with mental maps of space, senses of direction, and recorded experiences regarding a space we have been visited. There are three cell types that are involved in activity of making patterns: (1) place cell plugging us with some particular space; (2) grid cell, sending signals of distances; and (3) head direction cells providing sense of directions. Installation Neurotopographics²²⁸, (Fig.4.4) is merging assumed brain cell activity patterns of three cells' types with visitor's subjective experience recorded by camera. Result is two-dimensional graphic animations that combine our physical presence in space and scientific patterns occur in brain during that particular presence.²²⁹ Participants in the project have their own perspectives:

*When someone traverses a space, their brain produces an oscillating, rhythmic pattern. We tried to realize this abstract understanding into an everyday reality.*²³⁰

*The challenge for this project was to find and develop visual and sensual representation, not an illustration, for the cell activity in correlation to spatial navigation...this could led to the question whether there exists a pre-constructed order.*²³¹

²²⁷ Spiers, H., Malinowski, A., & Visman, B. *Neurotopographics, the film installation*. Welcome Trust, 2008.

²²⁸ Ibid.

²²⁹ Ibid.

²³⁰ Hugo Spiers about the Project: Spiers, H., Malinowski, A., & Visman, B. *Neurotopographics, the film installation*. Welcome Trust, 2008, see in: <http://neurotopographics.psychol.ucl.ac.uk/science/science.html>

²³¹ Bettina Vismann about the Project: Spiers, H., Malinowski, A., & Visman, B. *Neurotopographics, the film installation*. Welcome Trust, 2008, see in: <http://neurotopographics.psychol.ucl.ac.uk>

*...strengthen my belief that an architectural space is not a singular, fixed entity, but a plurality of possible worlds; perhaps more (almost) immaterial than material, ever changing with the direction and the intensity of light.*²³²

Summarizing understandings of space, looking from perspectives of our brain, there are three types of cells that place interests: (1) place cell that reflects the bounding architecture of the environment; (2) grid cell covers the environment with a large sheet of graph paper, and (3) head direction cell acts as compass.²³³ Actions of these cells are creating patterns by which we become able to percept the space. From the explained project, it seems that pattern is universal, but it is inseparable from subjective experience of the participants in the space. Besides of the question regarding whether there exist a pre-constructed order or plurality of worlds, it could be added, whether from that correlations of participants and scientific proof of patterns that occur, we can produce, additional to this, some other space but in this possible world; manifold of our perception, out of our senses that take part of Architectural Sensorium.

Architecture of the last century was quite related on the form and function, while now with paradigm shift, discourse of architecture is focused better on relations, envelops, synthesis/synergy of elements, energies that are in the use, culture milieu and natural milieu.

Notion of Beauty has changed over time, jumping from being an idea, transferred to ideal, then subjective idea, an object of self-intensity, via concept, as a relation between form and object, cultural or naturalized concept, or fact laying on neural basis.²³⁴ Tristan Garcia has expanded the spectrum of judgment about Beauty to:

*In the end, what can be beautiful displaced what the Beautiful can be.*²³⁵

²³² Antoni Malinowski about the Project: Spiers, H., Malinowski, A., & Visman, B. *Neurotopographics, the film installation*. Welcome Trust, 2008, see in: <http://neurotopographics.psychol.ucl.ac.uk>

²³³ Hugo Spiers about the Project: Spiers, H., Malinowski, A., & Visman, B. *Neurotopographics, the film installation*. Welcome Trust, 2008, see in: <http://neurotopographics.psychol.ucl.ac.uk/science/science.html>

²³⁴ Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press, p. 340.

²³⁵ Ibid.

4.4 Low-tech man's design actions

Low-tech design assumes patterns that have been in use or are relevant for architecture discipline, but from a standpoint of usage of low technology, meaning these patterns that are mainly based on human labor. While in previous chapter it is mentioned that Nature does not work but is working, here we will see more than obviously, that human labor is inevitable part of patterning. The focus is placed on patterns that are not necessarily designed to perform functions related to their spatial organizations, but play a role of generative systems. They have power of originating, producing or reproducing some novel functions and additional spatial layers besides their own. This is quite understandable while talking about waving information into pattern, producing memory for computers. Their spatial representation is not related to functions they perform. As a part of computational machine, they have many more additional layers of their performance that oversight their spatial articulation.

It is also obvious that this research does not make difference in-between western and eastern understandings and man creation of patterns, although difference exists. Just to be mentioned, the West first accounts of patterns are in relation to the formation of the universe. Understandings were more related to making defined, ordered picture, seen firstly by Empedocles, than via Platonic descriptions of universe as solid and geometrical form. In the East, first patterns were presented merely not as a form but phenomena and force, “to catch the universe as if it were an image”.²³⁶

4.4.1 Making pattern out of surface

One of the human-made patterns that are based on low-tech, where human labor is inevitable element of diagram, is origami of folded paper. Akira Yoshizawa, father of origami, is one of the masters in paper folding that tried to present folds of the paper in more divine way, by breathing a life into his art works. Origami becomes interesting for people from different backgrounds, in attempt to reveal how universe works. For some, origami is pure artistic formation, without beforehand given schema of folds, and for others, it could be a mathematical

²³⁶ Boudonnat, L., & Kushizaki, H. (2003). *Traces of the Brush: The Art of Japanese Calligraphy*. San Francisco: Chronicle Books, p. 197.

formula, which requires rules. Ruled origami could be subject of repetition, while un-ruled ones cannot be repeated.²³⁷

Thinking and talking about origami could go deep in its applications, that even DNA could be transferred into origami culture. No matter does it seem metamorphic art form, or live paper or paper with changed character, in origami we transform flat surface into three-dimensional forms. By folding an envelope/surface we are forming space or void, changing memory of paper. Many folds we make, more and more, novel space will arise. Interpreting papers articulations could be in 20 steps up to 300 steps (Fig. 4.5). Number of steps has gradually increased through history. Many practitioners agree that after practicing origami for a while they are going more and more in use of few folds, but adding more emotions. Basically, from repeating and copying some certain forms found in Nature, origami becomes more abstract idea to make solutions of some exact phenomena by simple patterns of folded paper. If something is simple, then it is becoming hardly measured while proportions, symmetry, similarities and differences, and its functionality is not so obvious; if it is less complicated and missing values to be measured, does it mean that it is not beautiful?²³⁸

4.4.2 Making pattern of solid

War memorial Valley of Heroes²³⁹ in Tjentiste (Fig. 4.6), Bosnia and Herzegovina, represents remembrance on Battle of Sutjeska, a battle during World War II. Inclined fractal walls constructed in 70's are confronting to the many other memorials with same topic, by its majestic strangeness. While at the same time, memorials in some other countries are represented in more concrete style, mostly using humanmorphic elements, in former Yugoslavia commemoration of battles was usually expressed in abstract way. By extraction of materials out of bulk solids, they are generated into fractal forms or sculptural tiled forms. They are renders of the history of mankind, but certainly, their technical and spatial articulations are the forerunner of time. In this example Beauty becomes a tourist attraction. Made based on collective history, by multitude of the abstract elements

²³⁷ Fox, M. (2005, April 2). Akira Yoshizawa, 94, Modern Origami Master. *The New York Times*.

²³⁸ Gould, V. (Writer), & Gould, V. (Director). (2008). *Between the Folds* [Motion Picture].

²³⁹ Zivkovic, M. *Valley of Heroes*. Tjentiste, 1971.

not necessarily symbolic, resulted as monuments to celebrate collective freedom and Beauty.

4.4.3 Making pattern out of treads

From Renaissance era, lace has arisen by hands of hardworking woman. While education in art of that period was susceptible to males, females in inability to access the schools of Art, where more dedicated to production of applied art, like lace or similar. Firstly, that skill was dedicated to aristocratic and middle-class women with background in the basic needlework. Later, when it become more in use and when appetites had grown, lace making, but not wearing, became a part of manufacture production of poorly paid workers. Sometimes skills of lace making are traditionally passed on from generation to generation. Following lace through history, we can find different motifs that are based firstly on strict Gothic geometric stylization, transformed by time in more contemporary styles showing ornaments of early reticella to Baroque scrolls, floral patterns to anthropomorphic, zoomorphic and mythological ornaments of Rococo. Demand for lace led to establishment of manufactured and industrial production. In short period, Beauty of lace becomes threat to economy and social life of that period. Prices of certain lace jumped and even procurement of wearing luxury items was imposed by government, with strict rules where lace could be applied. Regarding design approach, lace could be made by following pattern or without any before given script.²⁴⁰

At the very beginning, there were hemstitch and holly stitch techniques of lace making, both developed from white stitch. Hemstitch means that “certain numbers of threads of the wrap are down while the remaining parallel treads are worked with needle and a tread to form desired patterns.” In Holly stitch “a small knot is made using a needle and a thread creating a stretched transversal thread or a stitch of the preceding row. Holly stitch is leaving more freedom in design, while hemstitch is working only along vertical and horizontal threads.”²⁴¹

²⁴⁰ Eckhel, N. (2012). *Exhibition In Honor of a hand, Lacemaking in Croatia*. Zagreb: Etnografski muzej.

²⁴¹ Ibid.

Since a difference is in adding, subtracting and multiplying material, it could be said that production of the lace could be forerunner of advance digital manufacturing tools, like, CNC milling and 3D printing. Additionally, it is irrelevant to talk about if the nuns of the Benedict's monasteries at the island of Hvar (Croatia) use the computer techniques and algorithms for the production of the Hvar lace, but what they have produced has sophisticated Beauty of the future artworks made by computer artists, which will be mentioned in following chapters (Fig. 4.7).

Traditional skill of lace making in the Benedict's monasteries have been being passed on from generation to generation in the last 100 to 130 years. There are three different methods of lace making starting from: (1) center; (2) from the end of; (3) the net.²⁴² Regarding its method a pattern is divided into parts, and iterations of elements begin from center, from the end or following network. In this way, lace is not made according to already settled design. Benedictine sisters imagine patterns themselves, thus every one of them creates a unique piece of art, with immense complexity. Since there is no written code, lace cannot be repeated. Invention of its own code makes this artwork unique and impossible to be copied and pasted. Art historian Zeljka Corak about lace wrote:

*A disproportional amount of anonymous time of an intimate life has been put into lace. Each lace is measured by the number of the lacemakers' heartbeats and the amount of thoughts which occupied their minds while it was being made. It's almost as if the skill, and the hands so diligent, make lesser part of its value. Today, lace not only has cultural and artistic value, but is also a testament to an inalienable work – to a life that entirely reflects in the work making everything around it precious.*²⁴³

As a result of human labor, arise an unusual, irregular and changeful productions, with having non-attempted suggestion of symmetry rather than calculated proportions. Lace makers manage to use their own aesthetic sense, to adapt and

²⁴² Hanibal Lucic Museum. (2010). *Benedictine Convent, Hvar*. Split: Dalmacijapapir d.o.o., p. 4.

²⁴³ Eckhel, N. (2012). *Exhibition In Honour of a hand, Lacemaking in Croatia*. Zagreb: Etnografski muzej, p. 5.

simplify forms according to their own cultural, environmental, and social sensorium.

4.4.4 Making pattern out of information

In time back when the computer for Apollo was manufactured, computers were enormously huge, sometimes even occupying entire floors or two. So, Apollo computer constructors needed to squeeze weight and size of computers required for the mission to Moon. Most difficult, among other elements, was to incorporate all required memory, in order to make software to work properly. After many unsuccessful attempts, it was decided to use core rope memory, a unique data storage device. Core rope memory has fixed memory and erasable memory core, and cannot be changed upon of leaving the factory, regardless that it was quite complicated for manufacturing. Each core could store either 0 or 1, meaning one bit of information, or four words of information.²⁴⁴

It was not high tech process of making memory. Each copper wire was woven through or around magnetic core, related whether it is 1 or 0. “Little old ladies” employed by NASA, lady workers, suppose to sit in pairs with memory unit between them and to place copper wires through and around the cores.²⁴⁵ (Fig. 4.8)

Core rope memory is an example of how patterns made out of weaved treads, become patterns in computing processes. Physical, spatial pattern becomes part of process in another layer, computational one. Patterns of national treasure, like a lace, become not just inspiration for some future projects, but have been threatened in a way of spatial articulations by using advanced digital tools. Patrick Schumacher regarding different use of patterns, said that function of patterns could not be defined:

²⁴⁴ NASA. (n.d.). *Chapter Two: Computers on Board The Apollo Spacecraft - The Apollo guidance computer: Hardware*. Retrieved April 4, 2016, from Computers in Spaceflight: The NASA Experience: <http://www.hq.nasa.gov/office/pao/History/computers/Ch2-5.html>

²⁴⁵ History of Recent Science & Technology. (n.d.). *Visual Introduction to the Apollo Guidance Computer, part 3: Manufacturing the Apollo Guidance Computer*. Retrieved April 28, 2016, from Apollo Guidance Computer Activities: <http://authors.library.caltech.edu/5456/1/hrst.mit.edu/hrs/apollo/public/visual3.htm>

*Patterns do not have any well-defined, unitary function. As patterns evolve they acquire new functions and lose their prior functions, or new functions are superimposed upon older ones.*²⁴⁶

It might be said that patterns do have universal purpose, and that could be used in many scales and layers.

4.5 Body as a landmark

To build today means to be free, in a manner that we have to accept that we are living in the age where everything is possible. Technology, structural analysis, design tools, and material production are enough wide and strong to produce a variety of patterns which will fulfill, not just functional and structural elements, but have conceptual, sustainable and aesthetical responsibilities. Flexible, asymmetric, adaptable, unfinished, non-unified, aesthetic materials, replaced standardization, modularity, and neutrality. In this chapter, patterns are seen as cultural codes, exact products of human labor, where performances of materials are not giving final result but what matters is the entire process.

Human beings are perceiving space from its own perspectives, taking human body as a comparable measurement related to its milieu. Why is it so? Schrödinger in his short essay *What is Life?* (1944), asked question: Why are atoms so small?²⁴⁷ Giving an answer he said:

*...question really aims at the ratio of two lengths - that of our body and that of the atom - with an incontestable priority of independent existence on the side of the atom, the question truly reads: Why must our bodies be so large compared with the atom?*²⁴⁸

Human body is taken as a “landmark” in defining sizes of architectural spaces. Human sensorium mechanism is in entire connectives with its surrounding milieu. But does it mean that human body is the only element that should measure

²⁴⁶ Schumacher, P. (2009). Parametric Design. *The Patterns of Architecture: Architectural Design*, 79 (6), p. 30.

²⁴⁷ Schrödinger, E. (1944). *What is Life?* Cambridge: Cambridge University Press, pp. 2-3.

²⁴⁸ Ibid.

things according to its own size. Divine proportion followed by golden ratio number, where popular in paintings among Renaissance artists. Da Vinci's employed the divine proportion into his artworks to make relations, not exact dimension. Today proportions are having importance, no matter whether size is displayed in meter or angstrom, whether it is small or big. While in past, proportions were obvious, on a human scale level, now it seems that it performs on angstrom layer and plays fundamental role in creation. As Guattari and Deleuze emphasize, forms are not distinguished by size, into small and big ones, neither their work is coextensive in only one size related field.²⁴⁹

Etymology of word proportion is derived from Latin proportio(n-), from proportione 'in respect of (its or a person's) share'.²⁵⁰ A mathematical aspect says, that ratio is comparing one thing to another, while proportion is two ratios with equal or equation that can be solved.

In 2015, Michael Trott, initiated a project called *Aspect Ratios in Art: What Is Better Than Being Golden? Being Plastic, Rooted, or Just Rational?* Investigation takes into consideration aspect ratios of old vs. modern paintings. It was an analysis of the height-to-width ratios of many painting collections. By using a combination of built-in and web data sources, his team, among other qualitative features, has established that: seventeenth century causes the transition to aspect ratios of small denominators. Was it because of standardization and industrial production of materials, or rather aesthetic principle is remaining question?²⁵¹

Applying mentioned analysis on architecture discourse, we could ask same question, whether changes of appearance in architectural image, was result of aesthetical acceptance that has been followed by industrialization and

²⁴⁹ Deleuze, G., & Guattari, F. (1987). *Thousand Plateaus: Capitalism and Schizophrenia*. (B. Massumi, Trans.) Minneapolis: University of Minnesota Press.

²⁵⁰ Oxford Dictionaries. (2016). Retrieved May 15, 2016, from Oxford Dictionaries Language matters: <http://www.oxforddictionaries.com/definition/english>

²⁵¹ Trott, M. (2015, November 18). *Aspect Ratios in Art: What Is Better Than Being Golden? Being Plastic, Rooted, or Just Rational? Investigating Aspect Ratios of Old vs. Modern Paintings*. Retrieved March 20, 2016, from Wolfram Blog: <http://blog.wolfram.com/2015/11/18/aspect-ratios-in-art-what-is-better-than-being-golden-being-plastic-rooted-or-just-rational-investigating-aspect-ratios-of-old-vs-modern-paintings/>

standardization of materials or standardization and industrialization changed our aesthetics.

Iconic Vitruvian man lies on mathematical equations and becomes standard, from which all other differences and distances were measured. Architecture becomes, standardized by completing an ethical function of placing an ideal Vitruvian man into space. Human body is accepted as a space and becomes a space, in spatial creation of its manifolds. According to Da Vinci human body is:

...world in miniature; and certainly this name is well bestowed, because, inasmuch as man is composed of earth, water, air and fire, his body resembles that of the earth; and as man has in him bones the supports and framework of his flesh, the world has its rocks the supports of the earth; as man has in him a pool of blood in which the lungs rise and fall in breathing, so the body of the earth has its ocean tide which likewise rises and falls every six hours, as if the world breathed; as in that pool of blood veins have their origin, which ramify all over the human body, so likewise the ocean sea fills the body of the earth with infinite springs of water. The body of the earth lacks sinews and this is, because the sinews are made expressly for movements and, the world being perpetually stable, no movement takes place, and no movement taking place, muscles are not necessary. —But in all other points they are much alike.²⁵²

Referring to Dutch philosopher Baruch de Spinoza, Deleuze finds importance in knowing what a body can do:

We know nothing about a body until we know what it can do, in other words, what its affects are, how they can or cannot enter into composition with other affects, with the affects of another body, either to destroy that body or to be destroyed by it, either to exchange actions and passions with it or to join with it in composing a more powerful body.²⁵³

²⁵² Da Vinci, L. (2004). *The Notebooks of Leonardo da Vinci*. Project Gutenberg EBook, p.12.

²⁵³ Deleuze, G., & Guattari, F. (1987). *Thousand Plateaus: Capitalism and Schizophrenia*. (B. Massumi, Trans.) Minneapolis: University of Minnesota Press, p. 257.

Extension of body potentials is visible in the collection of Wanderers, an astrobiological exploration (Fig. 4.9) by Neri Oxman.²⁵⁴ She has placed human body into new environment, and by design, which certainly is in correspondence with new milieu and surroundings, has made a symbiosis between humans and design. By that she has extended human potentials. Purely conceptual work, her design is certainly showing an importance of application of multi-layering design approach.

Applying proportions and ratio on atomic layer, will change attitude of importance of building in accordance with human body references. Proportions of light and shade²⁵⁵, kinds of (un)materials, mentioned by Da Vinci, could extend proportions of void and solid in architecture, while architecture could be understood as production of void rather than solid.

Articulation of the space via patterns reveals strong potentials for production in architecture. Creating space, through not just one layer but via many ones, will employ not just meaning and advantages of multi-strata, but as well open more possibilities of creation:

*Spatial layering and patterns are extraordinary tools to create buildings which are able to coexist in harmony with nature, people, and culture.*²⁵⁶

4.6 Design approaches

Noosphere is considered as a third layer of development of Earth, from geosphere via biosphere into noosphere. Noosphere is a result of human mind.²⁵⁷ For Delauze there is no such thing of biosphere and its transformation into noosphere. There is only mechanosphere, with certain stratum incorporated.²⁵⁸

²⁵⁴ Oxman, N. (2014) Wanderers, An Astrobiological Exploration. *The Wanderers series was unveiled as part of Stratasys' collection "The Sixth Element: Exploring the Natural Beauty of 3D Printing"*. EuroMold, Frankfurt, 2014.

²⁵⁵ Da Vinci, L. (2004). *The Notebooks of Leonardo Da Vinci*. Project Gutenberg EBook.

²⁵⁶ Liott, S.-J. A., & Belfiore, M. (2012). Background. In S.-J. A. Liott, & M. Belfiore (Eds.), *Patterns and Layering: Japanese Spatial Culture, Nature and Architecture* (pp. 6-7). Berlin: Gestalten, p. 7.

²⁵⁷ Bailey, J. (2010) *Biophilia + Technophilia*, Digital Mania, Thesis Seminar, The University of Michigan, Taubman School of Architecture: archimorph.wordpress.com.

²⁵⁸ Deleuze, G., & Guattari, F. (1987). *Thousand Plateaus: Capitalism and Schizophrenia*. (B. Massumi, Trans.) Minneapolis: University of Minnesota Press.

*The plane of consistency knows nothing of differences in level, orders of magnitude, or distances. It knows nothing of the difference between the artificial and the natural. It knows nothing of the distinction between contents and expressions, or that between forms and formed substances; these things exist only by means of and in relation to the strata.*²⁵⁹

In relation to the creation of the environment, we should mention human attitudes for orchestration, control, and centralization. Accompanied by an idea that architecture is everywhere, total design was something very explicitly inserted as a dominant approach of 20th-century architecture. In the essay *Whatever Happened to Total Design?*, Mark Wigley defined two meanings of total design. First is called implosion of design that has focus on one inner point, and second, explosion of design that has been attached to every point in the world.²⁶⁰ As a result of implosive design we have:

*...hyper-interiors that enveloped their occupants in a single, seamless multimedia garment...*²⁶¹

Such approach is equipping an environment with “an extraordinary density of sensuous effect”²⁶², giving a singular expression of artwork. Shift from implosion to explosion makes creative works not isolated, but rather conquistadors of their milieu.

While construction was always strongly tied with technology, designers were acting revolutionary, taking steps which encourage technology and by it constructions. In past, architects face no limit related to the size of their design. They have been designing, apropos total design, almost everything. A contrary to today, when size becomes to be related to the inner, atomic size of designed objects. We have to say that architects still do not pay attention on size of their design, but today, they zoom in a very particle of design work. They are able to concoct their own materials, and by that, design becomes more than ever total.

²⁵⁹ Deleuze, G., & Guattari, F. (1987). *Thousand Plateaus: Capitalism and Schizophrenia*. (B. Massumi, Trans.) Minneapolis: University of Minnesota Press, p. 7.

²⁶⁰ Wigley, M. (1998). *Whatever Happened to Total Design?* *Harvard Design Magazine* (5).

²⁶¹ Ibid.

²⁶² Ibid.

Writing human genome from the scratch, rather than reading it, is not any more polemical discussion, but the fact. MIT group Gen9 has the “idea of synthesizing all six billion DNA letters of a human genome and using the results to “boot up” a cell.”²⁶³ Today architects become more extensible in their production. They could produce any particular arrangements from atomic to bigger size. It is to be studied how that unfinished design, extensible, disposed to the changes, adaption or recalculation, could have or should have a singular Beauty.

Steven Keating, researcher of MIT Lab, has introduced immaterial and informed fabrication, kinds of novel concept of digital fabrication and construction. Immaterial fabrication is “where designs are produced by changing material and environmental properties without mechanical forces”²⁶⁴ while informed fabrication is “combination of immaterial sensing and physical fabrication, where environmental feedback contributes to the finished design product.”²⁶⁵

Looking forward into new aesthetical territories produced without materials, but with importance of gesture, by following Keating’s immaterial and informed fabrication concepts, we should mention Robert Rauschenberg. In his artwork, *White Paintings*²⁶⁶ from 1951 what was missing was an image. He did not use any material on canvas, neither labor in production. Instead, he left painting to be exposed to the gesture of surroundings. An (un)material like sound, light, dust, plays the main role in creation, while any additional element, standard for painting, will make it to look like fake. What had occurred on painting, was real. In his work, we see usage of (un)material, extensible, not fixed, disposed on changes, an informed fabrication that constantly recalculate its reality. On the other hand, curved rock of Cappadocia, a Göreme valley in Turkey, are entirely made out of (un)material, but with human gesture. Volcanic valley is sculpted by

²⁶³ Regalado, A. (2016, May 25). *Ethical Questions Loom Over Efforts to Make a Human Genome from Scratch*. Retrieved May 28, 2016, from MIT Technology Review: <https://www.technologyreview.com/s/601540/ethical-questions-loom-over-efforts-to-make-a-human-genome-from-scratch/>

²⁶⁴ Keating, S. J. (2012). *Renaissance Robotics: Novel applications of Multipurpose Robotic Arms spanning Design Fabrication, Utility, and Art*. Master Thesis at the Massachusetts Institute of Technology, p. 201.

²⁶⁵ Ibid., p. 191.

²⁶⁶ Rauschenberg, R. *White Paintings, 1951*.

erosion. Later, habitats were subtracted from these natural sculptures, by mechanical forces and changes of material properties.

4.7 Beauty of Patterns Find made by Humans

Beauty of one's creation, here related to the creation of patterns, is attached to human gesture, sometimes is result of usefulness, connected with science and technology, but still it is quite out of surprise and with completely unpredictable outcomes. *Neuromancer's* characters are living "in an age of affordable Beauty...offered the routine Beauty of the cosmetic boutiques, a conservative amalgam of the past decade's leading media faces"²⁶⁷, Beauty of convention. In the same novel, their individuality is raised by luck of such Beauty. To illustrate importance of Beauty, cloned killers are looking for an artwork, as a representation of mechanism of great Beauty, not an interpretation. Interpretation, as it is explained by Susan Sontag, is impoverishing world and, by that, Beauty of its creation. We could reflect Sontag's meaning of depleted world it means the world that lost its Beauty, but got its interpretation of, result of "revenge of the intellect"²⁶⁸.

*Interpretation, based on the highly dubious theory that a work of art is composed of items of content, violates art. It makes art into an article for use, for arrangement into a mental scheme of categories.*²⁶⁹

Human impact on Beauty is gigantic. Seen from case study of the lace, it is obvious that there were no need to make detailed drawings, elaboration, or calculation that result, beautifully. Visual sophistication of the images of these patterns comes from gesture, labor, and mental pattering of the creator. It has to be mentioned that in the past, old settlements of Göreme valley; old craftsmen had made better designs than they can be designed in advance. We are now again becoming crafters of our own creations. We are crafting very atomic layers of our design.

²⁶⁷ Gibson, W. (1984). *Neuromancer*. The Penguin Publishing Group, 1984.

²⁶⁸ Sontag, S. (1966). Against Interpretation, in S. Sontag, *Against Interpretation and Other Essays* (pp. 2-10). Picador.

²⁶⁹ *Ibid.*, p. 7.

Implementation and articulation of patterns on atomic level, in architecture, attempt to establish a new rationale for the validity of world. We are back to the mythological and symbolic claims, but this time patterns are becoming medium to interact between tangible and intangible, artificial and natural.

Let Beauty to become a tool for justification of architecture. Human creations, and nowadays possibilities to craft very inner layer, are putting us in a position of having less interpretation and more origination. Final product of these creations is transmitted via patterns.

*We can now see that completely new patterns can be generated. They will be entirely different from any pattern we have seen so far, and generate entirely different spaces and architectures...Pattern making holds the greatest promise for the next generation.*²⁷⁰

Via patterns we can transmit Beauty of the immaterial world. This layer opened to us by new insights of science and technology, will encourage us to dig for our creation inside disappearance and impermanence of the world. To use, to work, to treat and to produce what we have never before. We start from particle, its performances, Beauty that is related to that particular level and importance to complete it with appropriate milieu. Beauty of contemporary design is in relation to the materials and technology but as well with relation of cultural developments of technology and materials that are in use. Possibilities of man-made patterns are going to become endless, adaptable, altered, and loud.

4.8 Summary

Usage of pattern and their spatial articulation open possibilities in architecture to work on inner, atomic layer. If the divine proportion was something to what art and architecture was striving in past, today we keep the same issue, but now proportion is measured in angstrom, not meter scale. We, architects, dig deeper into space to search and articulate forms. Man-made patterns carry sensuous touch in such creations. Translating proportion's ration from human vs. space, to

²⁷⁰ Kuma, K. (2012). Foreword. In S.-J. A. Liottl, & M. Belfiore (Eds.), *Patterns and Layering: Japanese Spatial Culture, Nature and Architecture* (pp. 4-5). Berlin: Gestalten.

space vs. space (spaces of another scale), could open possibilities to produce, or better uncover hidden possibilities of surrounding milieu; to fold space, to make it faced to this possible world. While Nature's production is not in regard to the processes behind it, human creation is. Human beings in a process of creation are depositing, not just material, but cultural milieu, they are making sensuous surfaces. The intellect of its creator could grasp a form, usefulness, symbolism, but sensorium could grasp Beauty.

Gordon Matta Clark's *Building Cuts* is example of subtraction of materials from built architecture. Novel forms are results of architect's gesture. Final result relies on processes, not on material in this particular case. Matta Clark is morphing situation rather than materials. If there is labor, result depends on process. If there is no labor, there is no result depending on process, like in Nature. Sometime formless, solid less, material less, are elements for production of novel forms which are becoming mechanisms for generating Beauty, like Duchamp's transformation of one object to another from ugly to beauties.

Patterns are enabling us to depict an essence, not interpretation. Man-made patterns presented here, have relation to the technology, some of them to computerization, but they are not presenting pure renderings of realities but rather intangible aspects of the world, with high potentials to become part of tangible. They are amplification of real, constructive subjects. They could take their inspiration from natural, but their articulation stays artificial. So, somehow they are becoming a window that connect natural with artificial. Different connecting agents that are coming from deep and shallow strata of human creation, work together, articulating milieu and producing Beauty. As it is said in previous chapter, Nature does not work, but is working, related to (hu)mankind patterns work is inevitable part. We can say that the main character of nature is synthesis, meaning placing components together, while human production could be attributed by synergy. Instead of placing component, focus is rather on interaction and authentic relationships between components.

Patterns are not having an in and out, they create solids and voids. They do not interpret, but rather morph forms, relying on gesture, possess duality of being

part of artificial and real, tangible and intangible. They become self-understand in their appearances in one of possible world, like Jorge Luis Borges's visions of parallel realities, "The mind was dreaming. The world was its dream."

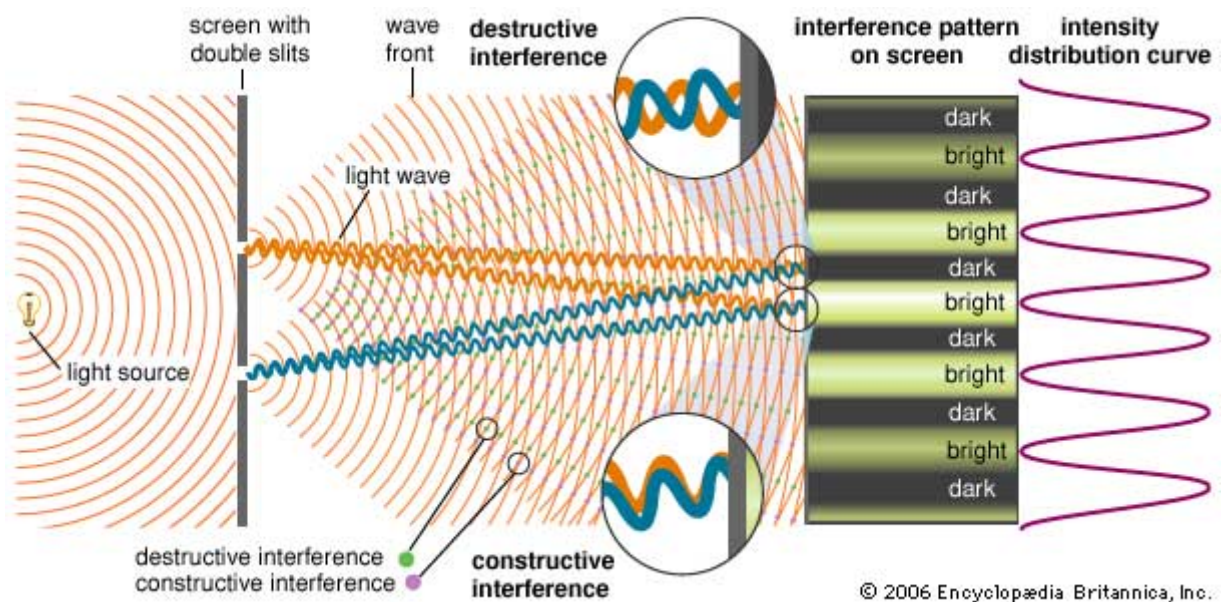
For Perrault exists "positive beauty" and "arbitrary beauty".²⁷¹ Matisse said that Beauty is arising from limiting media of an artist.²⁷² Having in mind that today medium is unlimited; whether then notion of Beauty is extended, rather than being positive or arbitrary, to be an aggregated Beauty.

Supposing that architectural design will include different strata in its process of making then it must be that design work might become experienced from several strata as well, which will certainly revolutionize notion of Beauty. So to speak, architecture will become more architecture, and less culture, politics, ecology, economy or thoughts, spatially presented. Today aggregated Beauty that shows layered, atomic and before hidden spaces, presented in manner, which was abstract before, is more real than ever before. As Sontag seeks to replace interpretations with an erotic of art²⁷³, we need an eroticized architecture to reveal its sensorium.

²⁷¹ See in: Pérez-Gómez, A. (2006). *Built upon Love*. Cambridge, London: MIT Press.

²⁷² Matisse. (1978). On Modernism and Tradition, 1935. In J. D. Flam, *Matisse on Art* (pp. 71-73). New York: E. P. Dutton, p. 73.

²⁷³ Sontag, S. (1966). Against Interpretation, in S. Sontag, *Against Interpretation and Other Essays* (pp. 2-10). Picador.



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Figure 4.1 Observation of the dark and bright pattern formation in Young's double-slit experiment; monochromatic light is passing through two slits. The experiment reveals double nature of lights, particle and wave.

Source: https://www.britannica.com/science/light/Youngs-double-slit-experiment_10/8/2016

Random



Universality



Periodic

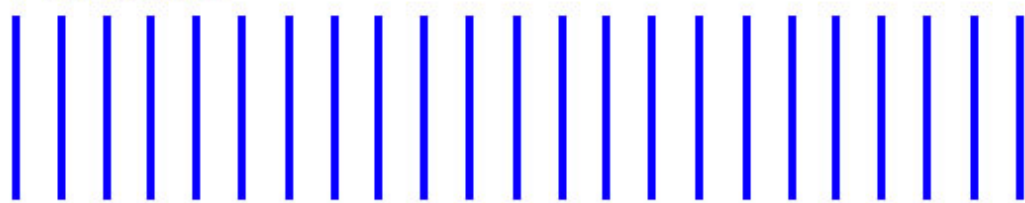


Figure 4.2 Pattern known as “universality” occur as transmitter between periodic and random one. Followed “correlation function” a mathematical formula gives exact distance, or space apart two lines. Illustration courtesy of Simons Science News.

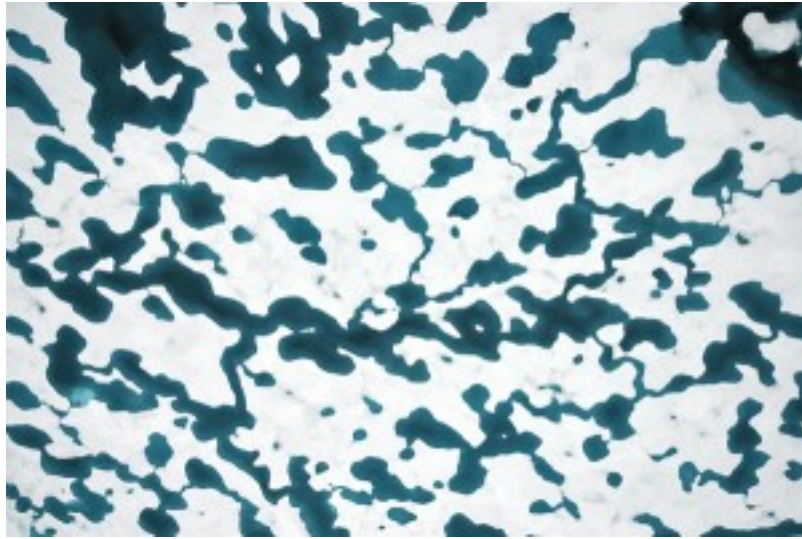


Figure 4.3 Above: connected Arctic melt ponds are exhibit a property of pattern called “universality” which is common to all complex, correlated systems and could be demonstrated by mathematical formula. Below: disconnected Arctic melt ponds that are exhibit property of a random pattern, and by that could not be complex, correlated systems. Photograph by Don Perovich.

Source:https://www.quantamagazine.org/20130205-in-mysterious-pattern-math-and-nature-converge/_3/8/2016.

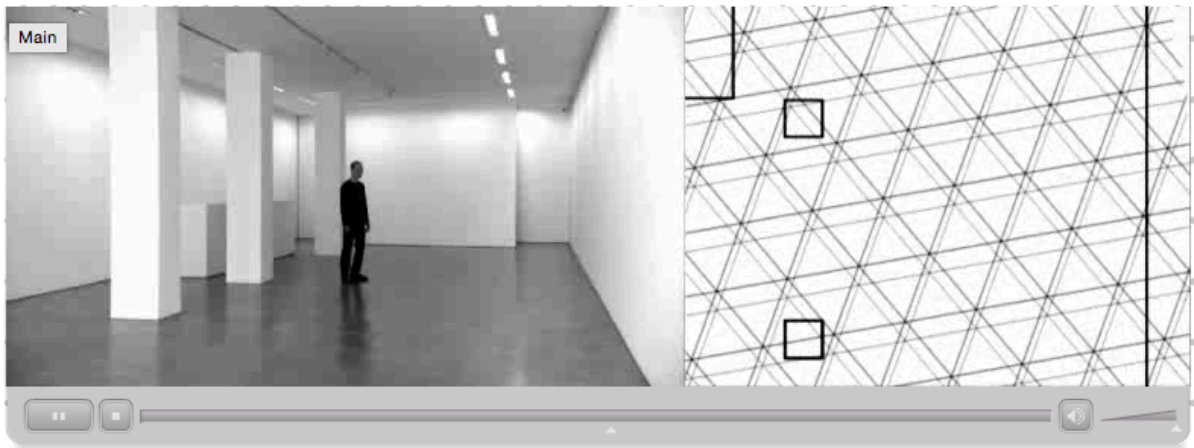


Figure 4.4 Screenshot from the film installation, *Neurotopographics* (2008) as a result of a Welcome Trust funded partnership between neuroscientist Dr. Hugo Spiers, artist Antoni Malinowski, and architect Bettina Visman.

Source: http://neurotopographics.psychol.ucl.ac.uk/_5/8/2016.



Figure 4.5 Origami made by crumpling technique by French paper folder Vincent Floderer. This technique is using many creases paper could hold, giving an expressive and beautiful outcome. Source: <http://www.origami-artist.com/crumpling.htm> _18/8/2016.



Figure 4.6 Tjentiste war memorial, entire structure and detail, Bosnia and Herzegovina. Photograph courtesy of (top) travasis.world press.com, (down) sbitters. Source: http://www.atlasobscura.com/places/tjeniste-war-memorial_8/8/2016.

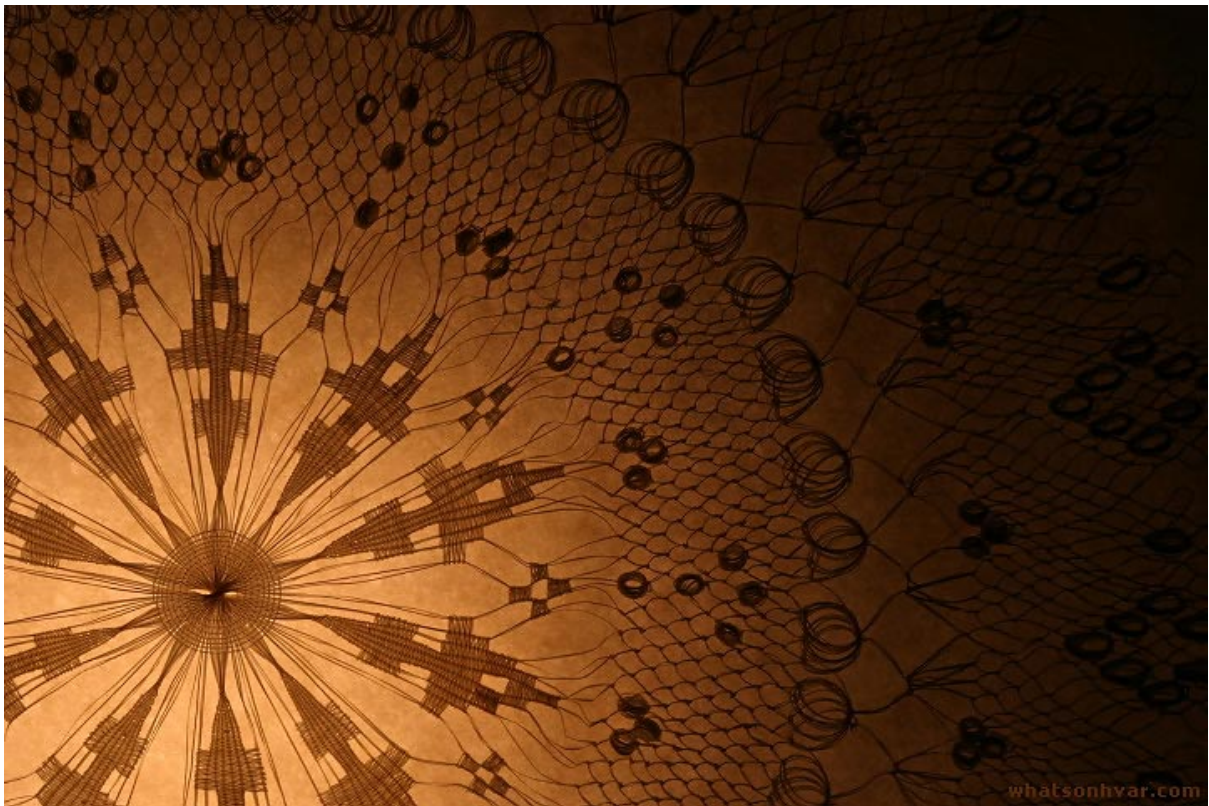


Figure 4.7 Lace from Benedictine Convent at the island of Hvar (Croatia). Photograph courtesy of Hanibal Lucic Museum.

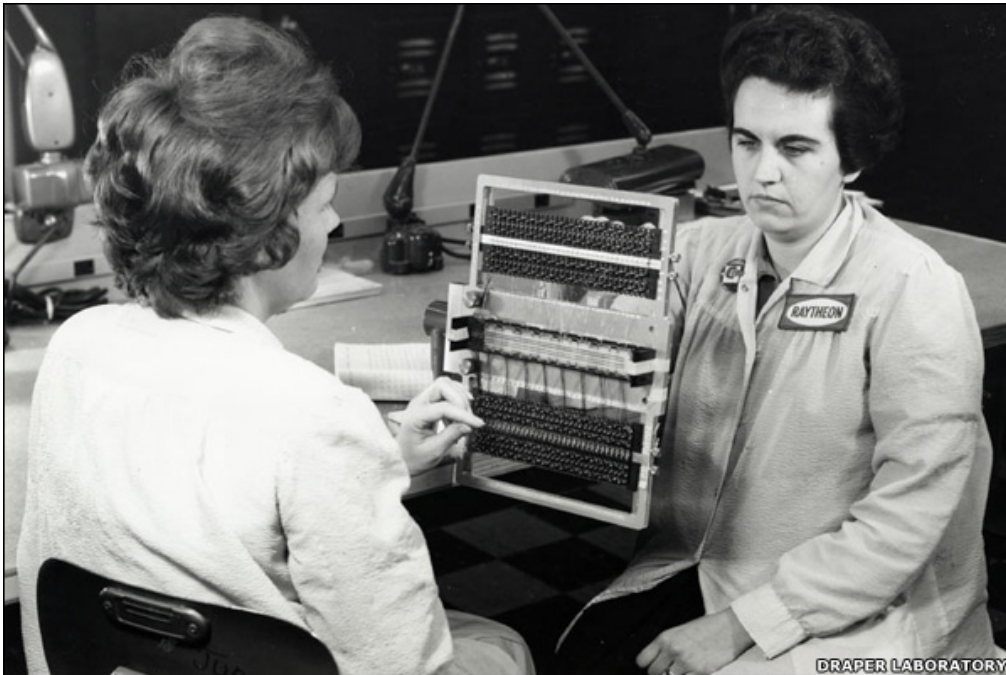
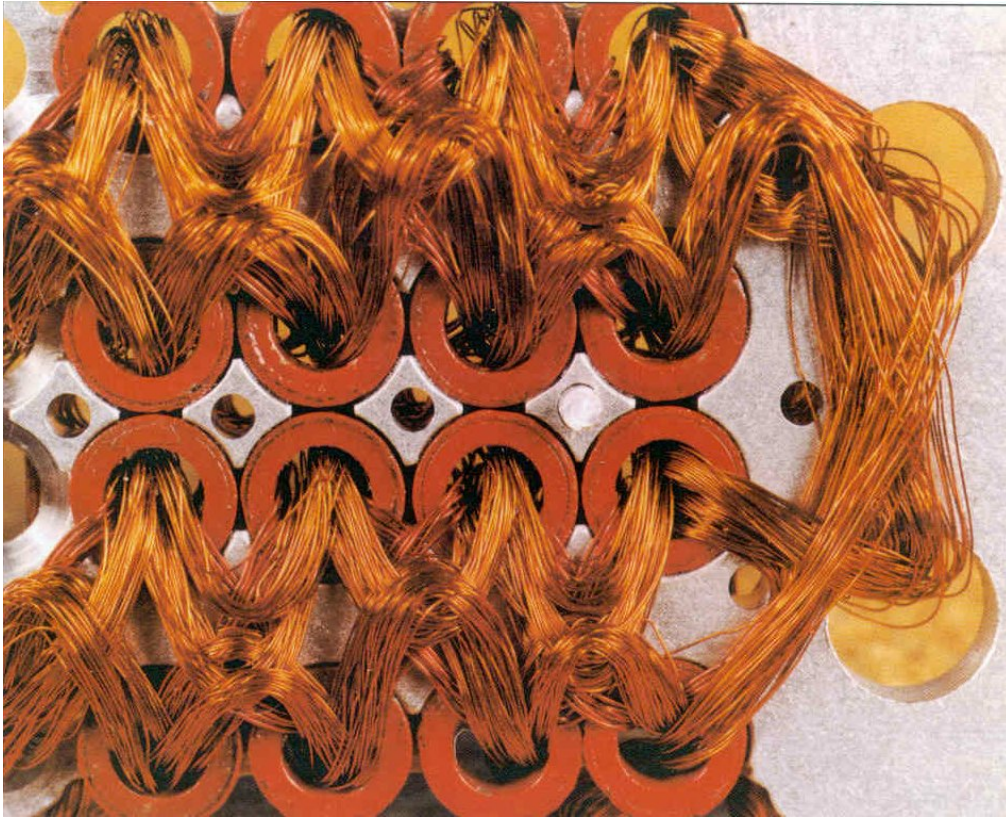


Figure 4.8 Above: weaved core-rope memory for Apollo computer. Photograph courtesy of Raytheon, from the files of Jack Poundstone. Below: process of making it by loom operators, screenshot from movie Weaving Software Into Core Memory by Hand. Source: https://www.youtube.com/watch?v=P12r8DKHsak_8/8/2016.



Figure 4.9 Mushtari Jupiter's Wonderer is an example of extensions of human body and multi-layered design approach by Neri Oxman in collaboration with Christoph Bader and Dominik Kolb. Photograph by Yoram Reshef.

Source: http://www.materialecology.com/projects/details/mushtari_10/8/2016.

CHAPTER 5

5 Bit Wants to Become Something!

Virtual experiences, dreams...All data that exists is both reality and fantasy. Whichever it is, the data a person collects in a lifetime...is a tiny bit compared to the whole.

_ Ghost in the Shell a 1995 anime film directed by OSHII Mamoru

5.1 Shape of Data

Chapter 5 (entitled: Bit Wants to Become Something!) provides review of cutting edge computational technique and technological introductions into creative discourse, which carry the potential to support an approach of design that will finally result in production of Architectural Sensorium. Also, it will speak about computational theories, which trace path of design generation and fabrication technology.

It is more than obvious that this chapter will talk about artificial world, but not in a manner of the world that is polar to natural one. Here artificial and natural are

considered based on argue of Krogh Jensen, “condition each other and the ego arise in an autopoietic and therefore flexible overlapping of these traditionally separated worlds: since we know how we know, we produce ourselves – while we thereby always exclude the possibility of understanding the cognitive acts of others.”²⁷⁴

With advantages of new technologies and design tools, patterns produced in artificial realm taking part of architectural thoughts. Shift of paradigm has open new horizon on the role of patterns. They are considered here, as a border crossing structure from natural versus artificial. As a result of advances in computation, patterns are open to be edited, extracted, manipulated, generated, and abstracted by architects. They become alive, to some extent transmitters from intangible to tangible. Their abstraction is becoming their reality.

Design has its strong relations with technology and designers are usually willing to explore and to adapt new techniques and usage of new creation approaches in their work. So, it is more than obvious that shape of data, with different tools will give us new aspirations towards Beauty as well. Focus of this research is more to the Hot Couture fashion, rather than on exploration of advances in technology that are following these outcomes. Even though it will be considered, but advances of technology will not be examined here chronologically.

5.2 Concept

In order to be constructed, geometric-centric approach of design creation conceived firstly the form²⁷⁵. That was expressed in a mainstream design approach from centuries. Form, as such, becomes defined and conveyed as geometrical form, later filled with material.

Now interest in form is based on intrinsic features, with spatial manipulation of the many-body systems of particles, on atomic level, and possibilities to be emerged in many-body forms on metric level, especially with advent on scientific,

²⁷⁴ Krogh Jensen, M. (2002). *Remarks on nature, super-ecology, life, production, position and other negotiations*. Exhibition catalogue. Paris: Musée d'Art Moderne de la Ville de Paris. Olafur Eliasson: Chaque matin je me sens différent. Chaque soir je me sens le meme, p. 57-61.

²⁷⁵ See in: Oxman, N. (2012). Material Computation: Higher Integration in Mophogenetic Design. *Architectural Design, Special Issue* , 82 (2), 88-95.

computational, and technical level. Form or body is not conceived in advance, like previous approach that is giving priority to the geometrical representations. Following Nature way of production, where physical properties are conserved, but on same time open for adaption to their environing milieu, form is predominantly determined by the interaction of the intrinsic and extrinsic signals.

Quantum experiments, novel materials, heterostructures and reduction of dimensionality²⁷⁶ have opened possibilities towards understanding form manipulation on very basic level of its creation. Starting point of considering form now is on 0D level. Reduction of dimensions was mathematical idea, and was seen as abstract concept until its abstraction becomes physically and materially actualized by new experimentation on quantum level.²⁷⁷

Imagine a particle confined to a box. If we start to flatten the box, quantum mechanics tells us that the energy of the spatially confined particle becomes discontinuous. The separation between energy levels increases as the box is flattened even further. Eventually, the particle's motion along the direction in which the box is flattened freezes as the discrete and quantized energy scale becomes larger than any other characteristic energy in the system. Thus, in our flattened box, the particle is restricted to two dimensions—essentially an object in Abbot's Flatland, although it still exists in the three-dimensional world.²⁷⁸

The approach, which is taking intrinsic properties of the form it is not considering form in its tridimensional nature at first. New comprehensions on experimental level in quantum mechanics achieved to cultivate novel “synthetic” matter, which is not found in Nature.²⁷⁹ Historically looking, in architecture creation, we have shifted from top-down to bottom-up method, meaning from geometric-centric approach that considers form, firstly as 3D body, to computational level that considers it, as 0D body.

²⁷⁶ Kim, P. (2015, Fall). Physics in Low-Dimensional Materials. *Physics Harvard University Department of Physics Newsletter*, pp. 9-11.

²⁷⁷ Ibid.

²⁷⁸ Ibid., p. 9.

²⁷⁹ Preiss, P., & Greiner, M. (2015, Fall). Quantum Matter under the Microscope. *Physics: Harvard University Department of Physics Newsletter*, pp. 28-31.

Design with advance digital and fabrications tools, especially ones that are considering biotechnology, cultivated and promoted editing and generating form out of its intrinsic and extrinsic capabilities. By that, we have possibilities to design instead of Nature, and to produce forms that best fit to their environment, that are material efficient, and economical on the structural and material level. Artificial will become more natural, and the border between these two will bleach. Considering Beauty, question is: what values should be considered, and whether we could have universal approach to the Beauty?

Architectural Sensorium is a complement to the advance design approaches, with a clear orientation to the importance of sensorium to take part of architectural “beings”; and Beauty, which will complement fitness and sustainability of novel forms.

The last part of the background troika, related to the patterns mediated by computers will try to envelop internal condensation of forces that are intertwined into forms, and which are taking precedence on external forces. Internality is reflecting an individuation of form of new architectural “beings”.

Even though computational mediated patterns are caring essence of self-replication, mutation, self-deletion, self-organization, and synthesis, demonstrating its prediction mechanisms, they have luck in currently recalculating mechanisms that could be found in Nature mediated patterns. This thesis will search for supplement of recalculating the route, if any changes internal or external ones, occurs during emergent of form.

5.3 Phenomena

The earliest computer scientist like, among others, Alan Turing and John von Neumann, were quite much obsessed and motivated to underlay computerization and programming with sort of live capabilities that are having similarities with a natural being. In order to achieve those visions, they looked to Nature and search for mechanisms, not just to find and create systems with life-like abilities, but also to implement natural’s adaption of environmental capabilities processes to artificial system. As a base of computation, some certain essences of genetic

operators take relevance of past experiments, but as well as of some future ones. Issues related to genetics and live being will be examined here briefly. Computers from very beginning did not just apply on calculating realistic (of that time) codes, but as well to model brain, mimic human activates or to simulate biological evolution.²⁸⁰

Self-replication

Self-reproduction is a constant reiteration of genes. New DNA molecules are synthesized by separated complementary strands, using them as templates.²⁸¹

Finding self-reproduction, as a most striking peculiarity, the British mathematician Lionel Penrose used this phenomenon to promote non-biological reproduction within wooden pieces that are passing information and assembling novel patterns based on the initiating pattern. This experiment shows that even the simplest characteristics possess reproductive property and it could be demonstrated by simple mechanisms.²⁸²

Mutation

In genetics processes, mutation is when “one allele of a gene is randomly replaced by (or modified to) another to yield a new structures.”²⁸³ Entire process is conducted in order to generate “best” possible structure.

Discussing how digital technologies have re-reveal elegance and aesthetics in discourse of architecture, Mark Foster Gage says:

A truly expert and contemporary elegance cannot be generated from simple allusions to movement, sensuousness or fluidity, but also requires the production of desirable, yet sometimes mutant, anomalies that are curated to further exaggerate these, and other, aesthetic effects.

²⁸⁰ Holland, J. H. (1992). *Adaptation in Natural and Artificial Systems*. Cambridge: MIT Press.

²⁸¹ Encyclopedia Britannica. (n.d.). Retrieved October 12, 2016, from Encyclopedia Britannica: <https://www.britannica.com>

²⁸² Penrose, L. S., & Penrose, R. (1957). A Self-reproducing Analogue. *Nature* (4571), p. 1183.

²⁸³ Holland, J. H. (1992). *Adaptation in Natural and Artificial Systems*. Cambridge: MIT Press. p. 110.

*Continuously variable forms provide degrees of sameness and difference, though rarely, without expert intervention, produce new emergent figural mutations within the system. This ability to curate mutation, and the production of emergent figures at multiple scales, is fundamental to contemporary elegance...Elegance requires differentiation, but flourishes on mutation.*²⁸⁴

Self-organization

One of the main characteristics of biological systems is to spontaneously generate its structure with time, even starting from disordered or structureless initial state.²⁸⁵

Stuart A. Kauffman in book *The Origins of Order: Self-organization and Selection in Evolution*, discussing coevolving systems summarizes:

*If organisms typically adapt to the complex regime in order to be capable of complex behaviors, then within the complex regime, ruggedness of landscapes can be further tuned by controlling compression. Since these factors control landscape ruggedness, they are candidates for being optimized to achieve coevolving ecosystems which are collectively poised near the edge of chaos.*²⁸⁶

Autopoietic

Autopoietic, i.e. self-generating system is the one that it is organized in a network and in which component make up their network. "A system or organism is either autopoietic – meaning that it is living – or not, which means that it is dead."²⁸⁷

²⁸⁴ Gage, M. F. (2007). Deus Ex Machina From Semiology to the Elegance of Aesthetics. *Architectural Design*, 77 (1), 82-85, p. 83.

²⁸⁵ Wolfram, S. (1983). Cellular Automata. *Los Alamos Science*, 9, pp. 2-27.

²⁸⁶ Kauffman, S. A. (1993). *The Origins of Order: Self-organization and Selection in Evolution*. New York, Oxford: Oxford University Press, p. 281.

²⁸⁷ Krogh Jensen, M. (2002). *Remarks on nature, super-ecology, life, production, position and other negotiations*. Exhibition catalogue. Paris: Musée d'Art Moderne de la Ville de Paris. Olafur Eliasson: Chaque matin je me sens différent. Chaque soir je me sens le meme, p. 59.

Said by Stuart A. Kauffman:

*We may, in not distant future, create life anew.*²⁸⁸

Synthesis

Gene synthesis, sometimes known as DNA printing, is a method of synthetic biology to design artificial biological systems. Working on definition of what life is, Humberto Maturana and Francisco Varela have synthesized that life is not DNA, "it is instead the principle on which an individual system is organized."²⁸⁹

Genome

Last century was stamped by decryption of the human genome. That has fast-forwarded our civilization to the novel understanding of world. Discovery of the set of DNA has implications in medicine, diagnosis, printing of parts or entire organisms, and production of artificial machines. This certainly opens polemics regards ethical standards versus synthetic and natural. Topic of this research has efforts towards Beauty standards that were always present but this time its emphasis is on novel creatures.

Generic

For Badiou concept of generic is a main concern in a search of the being of a truth:

*The being of a truth, proving itself an exception to any pre-constituted predicate of the situation in which that truth is deployed, is to be called 'generic'.*²⁹⁰

Giving attributes to the genes as the shape formers of architecture, and reducing dimensionality of the architectural body on to 0D level, opens possibilities for reiteration. 0D is not determined level. It is more indiscernible immanent. Process

²⁸⁸ Kauffman, S. A. (1993). *The Origins of Order: Self-organization and Selection in Evolution*. New York, Oxford: Oxford University Press, p. 341.

²⁸⁹ Ibid.

²⁹⁰ Badiou, A. (2006). *Being and Event*. (O. Feltham, Trans.) London/New York: Continuum, p.xiii

of creation that found its starting point on level with reduced dimensionalities, is making new networks by performing an autopoietic articulation of dimensionalities. Possibilities implicated by additional mutation will produce new structures and take one out of many bodies of possible creations. Body that is emerging from 0D level, is entirely immanent, made out of generic attributes with a further possibility to become something new, and in that transition, jump from immanence to transcendence. It seems that computation application is making possibilities for architectural design to be generic in a Badiou's concept; being generic considers being infinite with possibilities of recalculation in the possible world.

5.4 Information, Communication, and Computation

A sensory mechanism of entity is the one that transmits input, received from enviroing milieu or other entities, from being real to become more abstract. Information from outside, a material manifestation, becomes echo in sensorium. The way of informing our stimuli becomes basics of existence.

*We are presently living in an invisible soup of electronic messages.*²⁹¹

Reception of inputs enormously depends of the organism's body shape and size. So to speak, ants, because of the rough ground, do not see far,²⁹² their sensorium is relevant to chemical senses in relating to orientations. Following Marx observation senses are our first theoreticians:

*...our senses are our first theoreticians screening the input from the surroundings for relevance.*²⁹³

Information affects not only our inner sensorium but also an output that has been manifested as physical product. Keating, mentioned in previous chapter, is

²⁹¹ Sterling, B. The Moving Finger Writes in: Weisshaar, C., & Kram, R. *Outrace the Installation. Outrace the Paper*. London Design Festival, London, p. 6.

²⁹² Sur, A. (2008). Interview with Richard Levins On Philosophy of Science. In B. da Costa, & K. Philip (Eds.), *Tactical Biopolitics Art, Activism, and Technoscience* (pp. 35-40). Cambridge/London: The MIT Press.

²⁹³ Sur, A. (2008). Interview with Richard Levins On Philosophy of Science. In B. da Costa, & K. Philip (Eds.), *Tactical Biopolitics Art, Activism, and Technoscience* (pp. 35-40). Cambridge/London: The MIT Press, p. 35.

introducing a *Robotic Arm* (Fig. 4.1), an advance fabrication method that has ability of sensing and modification, depending whether it is used as an input, or output device.²⁹⁴ Keating is researching (un)materials, as spatial outputs of the systems; such as light, sound, heat, radiation, or radio waves.

An example of representations transformed to presentation is installation called *OUTRACE, Robots Land On Trafalgar Square!* (Fig. 5.2) by Clemens Weisshaar and Reed Kram. Installation consisted of 8 robots, borrowed from auto industry and equipped with LED light sources that are sitting on head of each robot. Visitors on Trafalgar Square are conducting robots and their movements provide messages on real medium of surrounding air. Created form continues its articulation in artificial milieu by relying it to Internet. Form is created with (un)material by using advance fabrication method, while input is product of human stimuli. Final creations are objects that are incorporating environmental data, taken from both, artificial and real environments.²⁹⁵

A contrary to mentioned, where both input and an output is result of advance fabrication and computation method, in research work of Japanese architect, Yusuke Obuchi, we can see an attempt to get best of human outputs of spatial articulations and connection of given output and an advance computational tool. Experiments on *TOCA Pavilion* includes calculation of input of human behavior in process of deposition of materials. Scanned input of human behavior gives an output. Recalculation was considered on every step of human process of production, so advance fabrication method is not working on emergence of form, but on recalculation of the process of human labor. Constantly, result of human gesture has to be measured and calculated to best possible fitness solutions.²⁹⁶ In both examples, information was considered neither abstract nor real, as main actor of production, managing its own process and emerging form. Additionally, mentioned examples are representing communicational processes in-between different components of system, in this case humans and machines.

²⁹⁴ Keating, S. J. (2012). *Renaissance Robotics: Novel applications of Multipurpose Robotic Arms spanning Design Fabrication, Utility, and Art*. Master Thesis at the Massachusetts Institute of Technology.

²⁹⁵ Weisshaar, C., & Kram, R. (2010) *Outrace the Installation*. *Outrace the Paper*. London Design Festival, London.

²⁹⁶ Obuchi Lab. (n.d.). *Architecture and Urbanism, Global 30.0*. Retrieved September 3, 2016, from Obuchilab: <http://www.obuchilab.com/info/>

Communication flows, from artificial to real, by having its articulation in both mediums.

Our notion of space has been unfolded with digitalization, “in which communication over computer networks occurs”²⁹⁷ called cyberspace, coined by William Gibson (*Neuromancer*, 1984). Another fold in space-based notion of communication, given by Stanislaw Lem in study *Summa Technologiae* (1964), is setting up new technique that is transmitting information via telepathic, intangible channels, or by extra-sensory preceptors. Cryptaesthesia is extrasensory perception or reception of information with the mind as an interfaced. Over powered senses on non-senses perception, according to Lem, is the result of the lack of evolutionary development of non-sense perception, although its importance could be quite significant.²⁹⁸

Origin of Imagination is from Latin *imaginare* “form an image of, represent” and *imaginari* “picture to oneself”; while Possible is Latin *possibilis*, from *posse* “be able”.²⁹⁹ Together Imagination and Possible could present “to have the freedom to picture to oneself new possible scenarios to catalyze change”. We are entering to an epoch of architecture with new scenarios and new materiality, opened to us with computerizations. Said by Estévez in essay of biomorphic architecture, about growing “habitable living beings”:

*Their greatest paradigm aims to continuously join the zeros and ones of the architectural drawing with those of the robotized manipulation of DNA, to organize the necessary genetic information responsible for the natural growth of an habitable living being, according to the designs previously arranged using the computer...With a new particularly powerful cybernetic-digital technology that enables drawings to be implemented in architecture constructed in this way, directly through machines: machines-wombs that make the architect-geneticist's DNA project grow.*³⁰⁰

²⁹⁷ Oxford Dictionaries. (2016). Retrieved May 15, 2016, from Oxford Dictionaries Language matters: <http://www.oxforddictionaries.com/definition/english>

²⁹⁸ Lem, S. (1977). *Summa Technologiae*. (P. Vujicic, Trans.) Beograd: Nolit.

²⁹⁹ Oxford Dictionaries. (2016). Retrieved May 15, 2016, from Oxford Dictionaries Language matters: <http://www.oxforddictionaries.com/definition/english>

³⁰⁰ Estévez, A. T. (2015). Biomorphic Architecture. In A. T. Estévez, *Biodigital Architecture & Genetics writings* (pp. 60-85). Barcelona: ESARQ, Universitat Internacional de Catalunya, p. 79.

5.4.1 Artificial Intelligence

An objective of Artificial Intelligence (AI) is to create machines that performs like humans and simulates human behavior. Gian-Carlo Rota and David H. Sharp, in an interview from 1985 for Los Alamos Science, have underlined question of philosophical comprehensions, expectations, and recognition in relation to the building of machines based on AI.³⁰¹

*Philosophers are needed today more than ever to tell the AI engineers some unpleasant truths. The philosopher's role has always been that of stating facts that may have been on everybody's mind but that no one dared state clearly...Research is sometimes not so much discovering something new as becoming aware of prejudices that stop us from seeing what is in front of us.*³⁰²

David H. Sharp about building machines that can see, said: “we must find a way to encode in a machine the expectation of certain patterns”³⁰³. Similarly, we can say that by embedding pattern of expectations into Architectural Sensorium, will enable its aliveness, perform like it is alive, or simulate its aliveness. This identities, that are humanoid by its origin, are now transmitted to the machines, making some clash in-between, and producing parallel space where this two crossing each other. Instead of making parallel worlds, mentioned processes are unfolding parallel spaces, or voids, in this world.

Story about automata, machines that act on their own will, simulating human or animal behavior, has started by discovery of the ancient automata that calculate astronomical positions, Antikythera (150-100 BC).³⁰⁴ Same idea was seen in a work of Pascal and Leibniz. Edgar Alan Poe was saying that automata, earliest robots, for its functions always have to embed human agency into their entities.³⁰⁵ Besides functionality, concern of Beauty of the replica has also become

³⁰¹ Rota, G.-C., & Sharp, D. H. (1985, Spring/Summer). Mathematics, Philosophy, and Artificial Intelligence. *Los Alamos Science*, 92-104. (L. A. Science, Interviewer).

³⁰² *Ibid.*, p.101.

³⁰³ *Ibid.*, p.102.

³⁰⁴ Weisshaar, C., & Kram, R. Outrace (2010) The Installation. *Outrace The Paper*. London Design Festival, London.

³⁰⁵ Weisshaar, C., & Kram, R. Outrace (2010) The Installation. *Outrace The Paper*. London Design Festival, London.

important. Especially when it is presented to mass audience, Beauty matters, and it becomes more objective than pure functionality. Examples of this are Pygmalion's statue of Galatea and more recent Rachel, character in movie Blade Runner³⁰⁶ (Fig. 5.3). Their beauties had underlined their functionalities. Beauty has taken emotionally intuitive factor of cognition to the forefront, computer's abstraction from being useful, becomes to be beautiful. Digitalization as an interface to the milieu of zero-dimensionality has for the consequence obviously, the disappearance of all dimensions. To conceive more-dimensionality has occurred as process of incarnation of an individual, by raising its intrinsic properties to be embedded in one of possible bodies. The whole process from 0D to 3D and more dimensions is encrypted, conceptualized in mutual hyper transition between, real and artificial.

Movement of perception, from material construction of the world to (un)material, was a concern of essay *Cultural Cognition and Smart Space Design Culture* by Alfredo Andia and Branko Kolarević. Also, Feynman vision from 1960, pointed out that digital technology will alter perception and miniaturization will grow explosively.³⁰⁷ Comparing it with Schrödinger understandings of size of atom and human body, mentioned earlier, we can say that computerization has really opened possibilities to work on atomic, rather than on metric level, and has changed our perception from material and form, to the very creation of material and form, on atomic level.

5.4.2 Cellular Automata

Foundation for the future development, of present-day computers and computing machines, is given by two men, Alan Turing and John von Neumann. Neumann has suggested new theory of computation that will embed function of self-reproduction "which can have output something like themselves".³⁰⁸ He employed the model of cellular automaton (CA). Mathematical model CA is a system of

³⁰⁶ Scott, R. (Director). (1982). *Blade Runner* [Motion Picture].

³⁰⁷ Andia, A., & Kolarevic, B. (2012). CULTURAL COGNITION AND SMART SPACE DESIGN CULTURE. *ACSA International Conference CHANGE, Architecture, Education, Practices* (pp. 367-371). Barcelona: Association of Collegiate Schools of Architecture.

³⁰⁸ Neumann, J. v. (1966). *Theory of Self-Reproducing Automata*. (A. W. Burks, Ed.) University of Illinois Press, p. 75.

highly complex behavior and many universal features.³⁰⁹ For the purpose of visual presentation of the CAs, John Horton Conway has placed small dishes on a tartan floor of his house. Starting with a few randomly arranged dishes he would be adding and removing them following three simple rules, in order to show how these rules, working together, create unlimited complexity.³¹⁰

Cellular automata come in a variety of shapes and multiplicity of patterns. Fundamental properties of a cellular automaton is the type of pattern on which it is computed, the color cells it may assume, and the neighborhood over which cell affect one another.³¹¹ We could say that there are only four different types of patterns: nothing happens (plain pattern), periodic patterns, chaos, order at the edge of chaos (complex non-periodic patterns, Fig. 5.4).³¹² CA is an idealization of natural systems that are defending themselves from maximum entropy, e.g. death, by spontaneously generating its structure.

*To apply the philosophy underlying natural automata to artificial automata we must understand complicated mechanisms better than we do, we must have elaborate statistics about what goes wrong, and we must have much more perfect statistical information about the milieu in which a mechanism lives than we now have. An automaton cannot be separated from the milieu to which it responds.*³¹³

5.4.3 Genetic Algorithm and Genetic Architecture

Coined by Holland in 1975, first genetic algorithms were a class of adaptive stochastic optimization algorithms involved in search and optimization.³¹⁴ Genetic algorithms are subparts of evolutionary algorithms, which are inspired by natural processes, as it is inheritance, mutation, selection, and crossover, in searching

³⁰⁹ Wolfram, S. (1983). Cellular Automata. *Los Alamos Science*, 9, pp. 2-27.

³¹⁰ Bentley, P. (2013). *Digital Biology - How nature is transforming our technology*. Zagreb: Izvori, p. 237.

³¹¹ Weisstein, E. W. (1999). *Cellular Automaton*. Retrieved May 18, 2016, from MathWorld--A Wolfram Web Resource: <http://mathworld.wolfram.com/CellularAutomaton.html>

³¹² Chu, S. K. (2008). *The Architecture of Possible Worlds, 3rd International Conference Digital Art and Architecture, Net.Art and Virtual Universes*. University of Barcelona, Faculty of Geography and History, Barcelona.

³¹³ Neumann, J. v. (1966). *Theory of Self-Reproducing Automata*. (A. W. Burks, Ed.) University of Illinois Press. pp. 71-72.

³¹⁴ Rowland, T., & Weisstein, E. W. (1999). *Genetic Algorithm*. Retrieved May 18, 2016, from MathWorld--A Wolfram Web Resource: <http://mathworld.wolfram.com/GeneticAlgorithm.html>.

solutions for problem optimization.³¹⁵ The idea behind genetic algorithms is to mimic a natural selection processes by mutation, selection, and by measuring against fitness function and repetition founding suitable solution.³¹⁶ They are used to generate objects and forms of artificial life entities; in this process, manipulating with biological life and codes is inevitable.

To yield better performance of biological system, Nature has mechanisms of learning process based on interaction with environment, which has been provided via detectors, effectors, and measurements of the system performance.³¹⁷

Karl Chu, pointed that “evolution of life and intelligence on Earth has finally reached the point where it is now deemed possible to engender something almost out of nothing”³¹⁸ that architects work on “a radicalization of the prevailing paradigm of architecture...by developing a new concept of architecture that is adequate to the demands imposed by computation and the biogenetic revolution.”³¹⁹

Dealing with construction of possibilities reflected as construction of entire world, genetic architecture share similarities with monadology. Monads here present a minimal unit of a system or the single bit of information, capable to self-replicate, self-organize, and self-synthesis into evermore-new constellations of emergent relations and ensembles. These capabilities are as well an essence of genetics and biology.

Genetic architecture should be understood neither as a representation of biology nor a form of biomimesis. It has theoretical origin traced in works of John von Neumann’s system for self-replication.³²⁰ Neumann’s understandings of production of matter is seen as “imagines automata which can modify objects

³¹⁵ Bailey, J. *Biophilia + Technophilia*. archimorph.wordpress.com.

³¹⁶ Rowland, T., & Weisstein, E. W. (1999). *Genetic Algorithm*. Retrieved May 18, 2016, from MathWorld--A Wolfram Web Resource: <http://mathworld.wolfram.com/GeneticAlgorithm.html>

³¹⁷ Holland, J. H. (1992). *Adaptation in Natural and Artificial Systems*. Cambridge: MIT Press, pp.172-173.

³¹⁸ Chu, S. K. (2006). Metaphysics of Genetic Architecture and Computation. *Architectural Design*, 76 (4), p. 39.

³¹⁹ Chu, S. K. (2006). Metaphysics of Genetic Architecture and Computation. *Architectural Design*, 76 (4), p. 42.

³²⁰ Ibid., pp. 38-44.

similar to themselves, or effect syntheses by picking up parts and putting them together, or take synthesized entities apart, then from nothing.³²¹

Genetic approach towards architecture has its importance in internal condensation of forces that are intertwined into form and which are taking precedence on external forces. Internality is reflecting an individuation of form of new architectural “beings”.

Even though genetic architecture through its essence of self-replication, mutation, self-deletion, self-organization, and synthesis, demonstrates its prediction mechanisms it has luck in currently recalculation processes.

Twentieth first century has focused on materiality of “life” and the environment and interaction in-between them. Privileging importance of cells under genes and its bigger entities DNA is part of discussion of the research work of Oron Catts and Lonat Zurr. They have been taking Thacker argument that “genomics rematerialized the information rather than virtualized the biological material.”³²² In a way Thacker is underlying his understandings with a sayings of Canguilhem, about understandings of life as a spreading out and organization of the milieu; and Lewontin’s view of “triple Helix” formation of importance’s of genes, organism, and the environment; Noble’s statement that organisms are not defined only by genes, but as well by interactions of genes and cells, and influences from outside. Same essay is mentioning problematic level of production of biological material and artificial life that is coming from our incapability to solve prediction problems by using only genetic material. While information theory, related to codes works on intrinsic level, cell theory besides its intrinsic involvement operates, evolves, and mutates extrinsically, in direct relation to its surroundings.³²³

³²¹ Neumann, J. V. (1966). *Theory of Self-Reproducing Automata*. (A. W. Burks, Ed.) Urbana/London: University of Illinois Press, p. 75.

³²² Catts, O., & Zurr, I. (2008). The Ethics of Experiential Engagement with the Manipulation of Life. In B. da Costa, & K. Philip (Eds.), *Tactical Biopolitics Art, Activism, and Technoscience* (pp. 125-147). Cambridge/London: The MIT Press, p. 135.

³²³ Ibid.

5.5 Planetary computerization

Guattari, founder of schizoanalysis and ecosophy, has distinguished three zones of historical ages, (i) the age of European Christianity, (ii) the age of capitalist abstraction or deterritorialization of knowledge and technique, and (iii) the age of planetary computerization. Age of planetary computerization is determined by a new mechanic subjectivity. Main characteristics of this age are: media and telecommunications are taking privilege on oral and scriptural relations, synthetically materials on natural ones, huge amount of data is waiting to be processed, and bioengineering is remodeling life forms.³²⁴ To succeed in acceptance of new planetary conditions, Guattari is suggesting to “reside in our collective capacity for the recreation of value systems, that would escape the moral, psychological and social lamination of capitalist valorization, which is only centered on economic profit”, while “ethical and aesthetic values do not arise from imperatives and transcendent codes. They call for an existential participation based on an immanence that must be endlessly reconquered.”³²⁵

*...future machines will be human, even if they are not biological...*³²⁶

Rey Kurzweil considered the smartest and nuttiest futurist on Earth, predicts that man will become one with machines by 2045. After the epoch of Physics and Chemistry, Biology and DNA, Brains and Technology new merge of Human Technology and Human Intelligence will be known as epoch of Singularity.³²⁷ We will be surrounded by "greater complexity, greater elegance, greater knowledge, greater intelligence, greater Beauty, greater creativity, and greater levels of subtle attributes such as love".³²⁸

³²⁴ Guattari, P.-F. (1996). *The Guattari Reader*. (G. Genosko, Ed.) Oxford/Cambridge: Blackwell Publishers.

³²⁵ *Ibid.*, p. 266.

³²⁶ Kurzweil, R. (2006). *The Singularity Is Near: When Humans Transcend Biology*. London: Viking, p. 38.

³²⁷ *Ibid.*

³²⁸ *Ibid.*, p. 260.

5.6 Computation as style, movement or ubiquitous

We are living in an early post-genomic time that has decrypted human genome, bioscience and biotechnology re-modulated knowledge of our past and future is already here.³²⁹

Architects are borrowing algorithms from math and science and employing them in process of their own creations. Code systems, ruled processes and totally new nature of creating possibilities are becoming the mainstream in architecture and art. Architecture and artworks are focused on opening their interests towards processes borrowed from science and technology. Form and structure is generated following set of the rules; it depends on rules and could be changed by rules. Architecture is becoming to be seen as a pattern made by computational automata in the space-time of Earth. Architecture practices are in position of obsolete usage of software. Architects now are software creators, basically, software is becoming architecture. Sean Ahlquist and Achim Menges define process of computation in architectural practice as:

*...the processing of information and interactions between elements which constitute a specific environment...it provides a framework for negotiating and influencing the interrelation of datasets of information, with the capacity to generate complex order, form, and structure.*³³⁰

In an introductory chapter of *Architectural Design* special issue from 2013, Brady Peters has divided architectural practices, focus on making digital tools for their design practice into a groups of (i) ones that are having internal and external sectors for custom software makers, like are Geri Foster + Partners, Herzog & de Meuron, Grimshaw, Aedas|R&D, UNStudio, Skidmore, Owings & Merrill (SOM), Buro Happold SMART Solutions, Knippers Helbig Advanced Engineering and Gehry Technologies; (ii) practices that are fully integrating computation into actual design process like MOS and Facit Homes, and (iii) the ones called hybrid

³²⁹ Referring to William Gibson quote: The future is already here — it's just not very evenly distributed. in "The Science in Science Fiction" on Talk of the Nation, NPR (30 November 1999, Timecode 11:55).

³³⁰ Menges, A., & Ahlquist, S. (2011). Introduction. In A. Menges, & S. Ahlquist (Eds.), *Computational Design Thinking* (pp. 10-30). Chichester, West Sussex: Wiley.

software engineers/architects like David Rutten (Grasshopper®/Galapagos), Daniel Piker (Kangaroo), Andrew O Payne and Jason Kelly Johnson (Firefly), Giulio Piacentino (WeaverBirde), Thomas Grabner and Ursula Frick of [uto] (GECO™), Arthur van der Harten (Pachyderm Acoustical Simulation).³³¹

Employment of computation thinking takes part, among others, in architectural creation, visual art, and music. Here, we will discuss approaches of architecture and art, which use computation and technology as a design method, considering Biodigital architecture, generative, and biotechnological arts. Since Nature is an inevitably part of computation, it is considered here as a catalyst for all mentioned approaches.

5.6.1 Aesthetic Environments

The introduction of computerization in the artistic and architectural practices has raised importance for re-questioning the notion of forms, either biological or artificial ones, that occurs under the auspices of the technology or artificial intelligence. Form becomes to be percept through codes, its own DNA; and interactions, actions, and transaction between its parts and environment.

Art and architecture has been re-arisen by originating field of cybernetics. Gordon Pask was one of creative cyberneticians that become a key influencer in the creative fields. In his project *The colloquy of mobiles*, exhibited at *Cybernetic Serendipity* held at the ICA, London 1968, he has attempted to go one step further in direction of fabrications of an active/reactive environment with properties of an “aesthetically potent” environment. Synthetically produced environment, with aesthetical potentials is an environment that people are liable to enjoy by exploring it, learning about it, forming a hierarchy of concepts that refer to it or seeing themselves reflected in it.³³²

³³¹ Peters, B. (2013). Computation Works: The Building of Algorithmic Thought. (B. Peters, & X. D. Kestelier, Eds.) *Architectural Design, Special Issue: Computation Works: The Building of Algorithmic Thought*, 83 (2), pp. 8-15.

³³² Pask, G. (1968). The colloquy of mobiles. (J. Reichardt, Ed.) *Cybernetic Serendipity*, p. 34.

*Man is always aiming to achieve some goal and he is always looking for new goals.*³³³

As a part of same exhibition, project of hospital building at Northwick Park (Fig. 5.5), London had interests to determine visible structure as a result of computer oriented programme. Final spatial appearance of mullions was not intervened by architect, John Weeks, but is result of computational algorithm that uses design parameters, such as weight and loading characteristics of architectural elements, considered as codes.³³⁴ Today when, by some, parametric design has been accepted as new style³³⁵, this work could be an early example; since it is objective, with diminishes of the subjective touch of its creator.

Computer space creation, also presented on Cybernetic Serendipity exhibition, done by Lowell Nesbitt is project that shows physically occupied space by the machines. Nesbitt has transformed surface of IBM machines into aesthetic object, "which has nothing to do with the real ambience of the object within it."³³⁶

Mentioned examples of environment creation, architecture, painting that are mediated by computers, or made by physical presence of computers as machines, like is a case of last example, where base for future fusion of generative, genetic, bio-politic, bio-technological, bio-digital, computational, transformative, new medium, bionic, genomic, or robotic creations.

Focusing on intrinsic dimension in architectural creation, coming from computational understandings, could be advanced by employment of protocols that are considering its dynamic surrounding. This will open possibilities to become more focus on recalculations of route of created architecture, from inside and from outside.

³³³ Pask, G. (1971). A Comment, a Case History, and a Plan. In J. Reichardt, *Cybernetics, Art and Ideas* (p. 76). Greenwich: CT: New York Graphics Society.

³³⁴ Weeks, J. (1968). Indeterminate dimensions in architecture. In J. Reichardt (Ed.), *Cybernetic Serendipity* (p. 69). London/New York: Studio International.

³³⁵ Referring to Parametricism by Patric Schumacher in Schumacher, P. (2009). Parametricism - A New Global Style for Architecture and Urban Design. (N. Leach, & H. Castle, Eds.) *AD Architectural Design - Digital Cities*, 79 (4), 14-23.

³³⁶ Martin, H. (1968). Computer Paintings of Lowell Nesbitt. In J. Reichardt (Ed.), *Cybernetic Serendipity* (pp. 63-64). London/New York: Studio International.

As it is said previously, the architectural creation, even though is employing and considering Nature, human, and computer understandings of patterns creations, found its main inspiration in Nature. Main focus is on, biolearning³³⁷ called by Estévez. Mother Nature is wide, informative, scientific, shocking, natural and unnatural in same time, resonant, endless, focused on recalculations, always fostering to new. So, biodigital architecture is something that could be considered as an underline of all three chapters of background troika. It is mentioned in this chapter, because of its digital nature that is showing its intrinsic part and its natural nature that is showing its possibilities to be open on endless variations using its recalculation mechanisms.

Architecture employs in its creations, usage of new materials and embeds new insights, especially the ones from genetics and computation. Biodigital architecture by following this idea is resulting in something that Nature is great example, which is to be “100% ecological, recyclable and sustainable, with maximum energy-saving throughout the construction process and no need for manual labor, as its growth is natural.”³³⁸

To complete that idea and to manage to build such architecture has been based on fact that “materials” of such creations, should possess “digital DNA”³³⁹, and by it making them free for “automated emergence, robotized self-construction and artificial growth”.³⁴⁰ Such architecture is not copied, “sin cera’s”, 1:1 scale, and real entity of vividness.

In Genetic Barcelona Project, by Alberto Estévez, genetic control of cell growth is employed to be architectural protocol for growing *Genetic Barcelona Pavilion*, *Ceci n'est pas un pavilion: a genetic reform soft and eatable of Mies van der Rohe's German Barcelona pavilion, Barcelona* (Fig. 5.6). Project is searching for

³³⁷ Estévez, A. T. (2014). Learning from Nature: Architecture and design in the first biodigital age. In A. T. Estévez (Ed.), *2nd International Conference of Biodigital Architecture & Genetics*. Barcelona: ESARQ(UIC).

³³⁸ Estévez, A. T. (2015). Biodigital Architecture. In A. T. Estévez, *Biodigital Architecture & Genetics writings* (pp. 130-133). Barcelona: Escola Tècnica Superior d'Arquitectura (ESARQ), p.132.

³³⁹ Estévez, A. T. (2015). Biodigital Architecture. In A. T. Estévez, *Biodigital Architecture & Genetics writings* (pp. 130-133). Barcelona: Escola Tècnica Superior d'Arquitectura (ESARQ), p.132.

³⁴⁰ Ibid.

soft and furry architecture.³⁴¹ It is advancing usage of natural “software” (DNA), and by it enabling production of growth material for future architectural entities. It is obvious that current stage of the environment, a brilliant example of past architecture Mies van der Rohe’s pavilion, is defining but not determining future growth of architectural “beings”.

*To live is to spread out; it is to organize a milieu starting from a central reference point that cannot itself be referred to without losing its original meaning.*³⁴²

In the same project of *Genetic Barcelona Pavilion*, is visible awareness of the problems of applying engineering logic on the living systems if “the statements suggest that organisms are defined only by their genes; whereas in truth they are also defined by the very varied ways in which genes actually operate within a living cell, and these gene expression patterns are most certainly influenced by the outside world.”³⁴³ To become aware of its neighboring milieu and to have besides its intrinsic properties development, also responsibilities to its environment, tissue of possible future architecture “beings”, should be settled into environment that enhancing and mediating development of its artificial DNA. As it is case of mimicked biological tissue that has its intrinsic and extrinsic dimensions, while operating over several different length scales:

The cell is at the center of the developmental world. Truth be told, we cannot, as tissue engineers, actually claim to engineer tissues. We can only engineer an environment for cells that might induce, enhance, or mediate their developmental processes. But progress has been buoyed by biomimetics—lifting recipes from nature for the design of tissue engineering systems...Concepts that are intrinsic for developmental biology are now becoming essential for the new generation of tissue

³⁴¹ Estévez, A. T. (2015). Tout est architecture! Architecture is vision (All is architecture!). In A. T. Estévez, *Biodigital Architecture & Genetics writings* (pp. 138-141). Barcelona: Escola Tècnica Superior d'Arquitectura (ESARQ).

³⁴² Catts, O., & Zurr, I. (2008). The Ethics of Experiential Engagement with the Manipulation of Life. In B. da Costa, & K. Philip (Eds.), *Tactical Biopolitics Art, Activism, and Technoscience* (pp. 125-147). Cambridge/London: The MIT Press, p. 136.

³⁴³ Noble, D. (2008). *The Music of Life: Biology Beyond Genes*. Oxford: Oxford University Press, p. 19.

*engineering: complex signaling, "niche" development, and physical regulatory factors.*³⁴⁴

Creating "life" instead of Nature is to have aspirations towards becoming Nature (Fig. 5.7). Today tissue engineers are creating synthetic cells, building them from scratch, but also a synthetic environment, that is employing Nature to induce, enhance, or mediate development of synthetic cells. Synthetic environment named by National Research Council is virtual environment, which is more "flexible, operates in real time, presents images in three rather than two dimensions, involves multiple senses, and immerses the user".³⁴⁵ It is used for study of animal behavior and communication, molecular biology, manipulation of scenarios of atoms in a molecule, and creations of organisms that are follows new genetic codes.³⁴⁶

So far, we mentioned methodological and conceptual impact of computation and science, especially biotechnology, on creation and thinking about architecture. Also, it has to be mentioned a set of advantages in technological framework, which follows or are followed by usage of digital fabrication and integration of computerization in architecture. In relation to those thoughts, Mediated Matter Group of Media Lab, Massachusetts Institute of Technology has developed data-driven Material Modeling, a "data-driven approach for the creation of high-resolution, geometrically complex, and materially heterogeneous 3D printed objects at product scale."³⁴⁷ It is using external and internal generated data sets for bitmap-based printing or voxel printing. Demonstration of this 3D printed approach is shown by Lazarus' "air urn" memento. The surface mask's material

³⁴⁴ Vunjak-Novakovic, G. (2006, September 1). *Transplants Made to Order*. Retrieved October 13, 2016, from The Scientist:

<http://www.the-scientist.com/?articles.view/articleNo/24300/title/Transplants-Made-to-Order/>.

³⁴⁵ Lewis, R. (1995, June 12). *Virtual Reality Piques Life Scientists' Interest, Despite Obstacles*. Retrieved, from The Scientist:

<http://www.the-scientist.com/?articles.view/articleNo/17442/title/Virtual-Reality-Piques-Life-Scientists--Interest--Despite-Obstacles/>.

³⁴⁶ Ibid.

³⁴⁷ Bader, C., Kolb, D., Weaver, J. C., & Oxman, N. (2016). Data-Driven Material Modeling with Functional Advection for 3D Printing of Materially Heterogeneous Objects. *3D Printing and additive manufacturing*, 3 (2), 71-78, p. 71.

composition is generated by the “physical flow of air and its distribution across the surface”³⁴⁸

Additional methodological protocols that could be considered or “stolen” from science and industrial design, in opening awareness towards environment impacts on architectural creation, and by it change characteristics of Beauty, are (1) computational fluid dynamics (CFD) that is part of the maritime industry and continue to grow with the increasing development of computers, (2) metamorphic algorithms, (3) robotics, or (4) aeolian protocols.

To this methodological and technological picture that is redefining Beauty, there is artistic manipulation of technical and biological processes that has started in 1936, when American photographer Edward Steichen shown in MoMA, New York, *Delphiniums*, genetically modified hybrid plants.³⁴⁹

An artistic expression that fuses developments and understandings from sometimes even contradictory different areas truly embodies complexity of Beauty. Works of artist and mathematician Andy Lomas, demonstrate stress of Beauty by the creations that are made into digital realm, employing knowledge from Nature, sculpture, math, and biology. His sculptures named *Aggregation* are placed in artificial milieu and are inspired by the works of D'Arcy Thompson, Alan Turing, and Ernst Haeckel; based on study of how to make plants and coral like structures in digital realm (Fig. 5.8).³⁵⁰

Frei Otto in *A Conversation with Frei Otto*, from 2004, says:

*I don't find forms, but I create forms. The computer only acts as if it has found the forms. If we keep in mind that an infinite amount of forms could be created this way, the person sitting in front of the computer has really created them and not just found them.*³⁵¹

³⁴⁸ Bader, C., Kolb, D., Weaver, J. C., & Oxman, N. (2016). Data-Driven Material Modeling with Functional Advection for 3D Printing of Materially Heterogeneous Objects. *3D Printing and additive manufacturing*, 3 (2), 71-78, p. 71, p. 75.

³⁴⁹ Hartmann, C. (2008, March 11). *Edward Steichen Archive: Delphiniums Blue (and White and Pink, Too)*. Retrieved September 13, 2016, from MoMA: http://www.moma.org/explore/inside_out/2011/03/08/edward-steichen-archive-delphiniums-blue-and-white-and-pink-too

³⁵⁰ Lomas, A. *Aggregation*. Source: <http://www.andylomas.com/aggregationImages.html>

³⁵¹ Songel, J. M. (2010). *A Conversation with Frei Otto*. New York: Princeton Architectural Press. p. 38.

5.7 Beauty

Usage of computers and computerization in architectural creation processes are establishing new paradigm. More than in the other two chapters of background troika processed by this thesis, the use of (un)materials is dominant. (Un)material, as it is already mentioned, could be understood as a lack of physical characteristics or functionality in the common field of creating forms. In the case of the creation of computer-mediated patterns, it is obvious absence of both, the physical as well as a functional attribute.

(Un)materials of computer-mediated patterns, relying on sophisticated but also critical properties. Sometimes criticism reaches questionable ideas that aspires proverbial opportunism with an aim to introduce objectivism and completely throw out artistic and subjective character. The case of Parametricism as style, called into question code of the subject, by dominance of the objective. In addition to continuous and variation of creations of Schumacher's idea of creation of spaces, by joining technology and computerization, results in "ineffable and intuitive becomes finally more scientifically tractable and computationally modellable."³⁵²

The education, dedication, concentration, critical ability for observation, review, and immunity for all kinds of imperatives are essentials for the creation. Computerization may produce and may not, a conformal or junk art.

Using new materials or (un)materials for shaping void and the process of co – relation of ideas, worships the idea of architecture on the way to a modern, sketchy, new, critical, ethical and poetical. Discovering a new niche, unfolds the phenomena that is a found in Nature, about the parts of organisms whose function has not yet been made public, but waiting to be activated, as response on new environmental triggers. Niches are enriching our experience and spreading our perception, so Nature may give its review, bearing in mind its unquestionable mechanism for recalculation. Equating form with 0D and forming

³⁵² Moore, R. (2016, September 11). *Zaha Hadid's successor: my blueprint for the future*. Retrieved October 13, 2016, from The Guardian: <https://www.theguardian.com/artanddesign/2016/sep/11/zaha-hadid-architects-patrik-schumacher-blueprint-future-parametricism>

and reforming it from it in many-body forms, through computerization, can conclude that computer-mediated patterns help Nature in recalculating route.

Presence of Beauty in such creations is generic procedure of recalculations, an event that is encounter in Nature, and thus is taking part of computation and artificial as artificial is inevitable for defining Nature. Operators that are emerging computer-mediated patterns are sort of re-variables that are producing infinite creations. Beauty thus, becomes an indiscernible part of their existence, and computation as such does not know for Beauty, all it does is to produce it.

5.8 Summary

Forms, that are generated from 0 dimensions, possess characteristics of many-body forms with infinite possibilities. Generic protocols introduced in creation of architectural design, multiples many-body forms. All collected data from virtual experiences, dreams; both from reality and fantasy, crossing identities between humans and machines (Fig. 5.9) will become creators of future bodies.

If Human Technology and Human Intelligence merge in one³⁵³, in the epoch of Singularity, will the next epoch merge human with human in virtual milieu?

I wish to merge with you. - Merge? - A complete joining.

We will both be slightly changed, but neither will lose anything.

*Afterwards, it should be impossible to distinguish one from the other.*³⁵⁴

When life starts to imitate artificial life, body of such creation will emerge from crisis and its aestheticization will become most effective actuator. Casualties of the new technologies and computer mediated patterning had open possibilities to work on very creation of the gene, cell, organ, organisms or population level, but having in mind that environment, whether is real or artificial, is not separated element, and flux of going through recalculation has continuum state.

³⁵³ Kurzweil, R. (2006). *The Singularity Is Near: When Humans Transcend Biology*. London: Viking.

³⁵⁴ Oshii, M. (Director). (1995). *Ghost in the Shell* [Motion Picture].

If Nature was doing synthesis, humanity synergy, computer-mediated patterns are result of merge, between humans and machines, and soon between humans and humans, no matter whether they are biological or syntactical encounters.

It is more than unnecessary to stress out that we live in interesting era, and by having in mind Susan Sontag observation about substituting something that is beautiful, with something that is interesting, we can say, we live in beautiful era.



Figure 5.1 Keating created a light painting by a LED and robotic arm. Light source creates painting while moving in a direct path. Source: Keating, 2012, (full reference find in text).

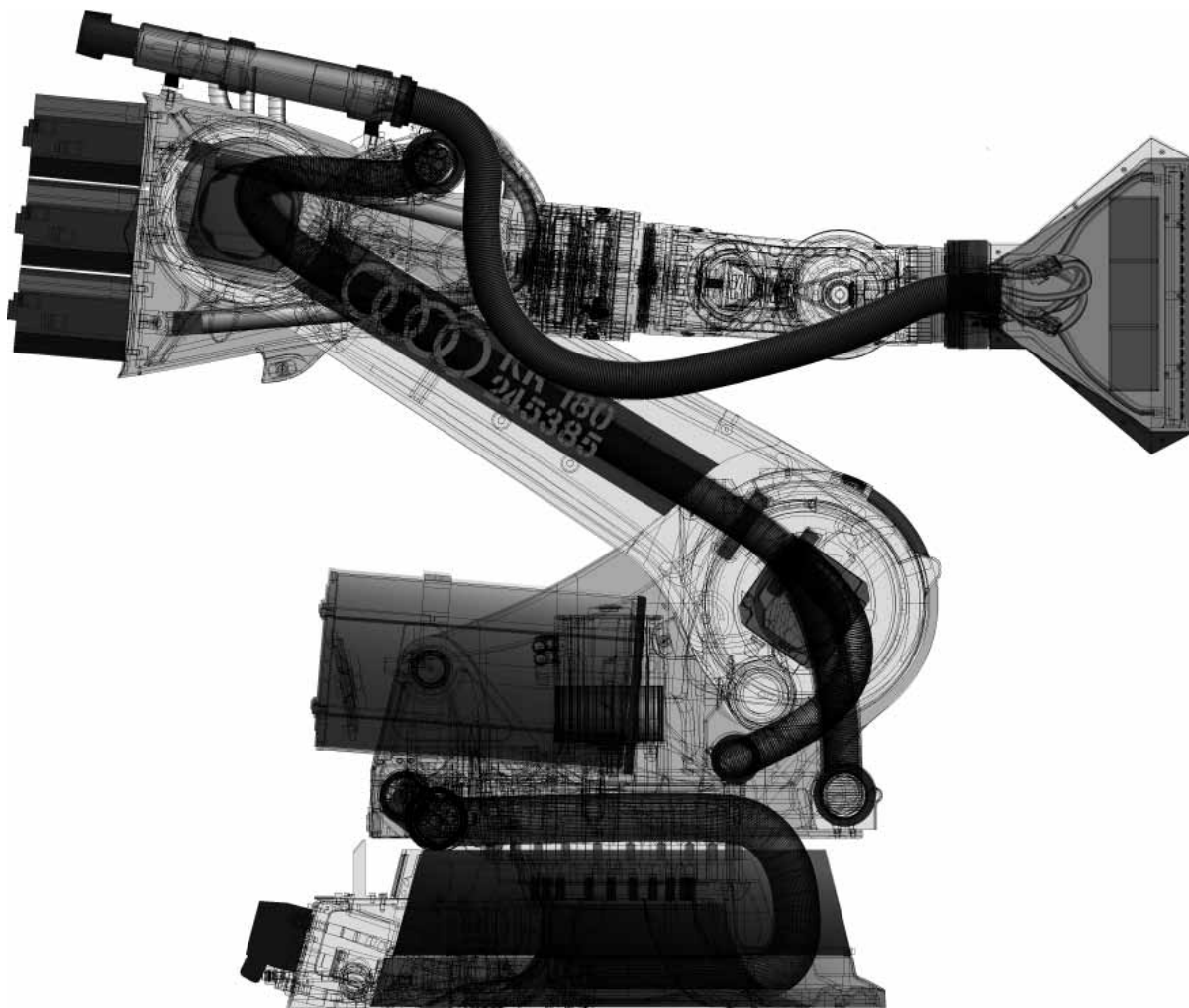


Figure 5.2 The installation OUTRACE on Trafalgar Square, one out of 8 large-scale industrial robots on loan from Audi's Ingolstadt production lines, equipped with LED light, to trace messages generated via computers, or smart phones (full reference find in text).



Figure 5.3 Blade Runner, movie (full reference find in text), character Rachel, robot that is identifying itself as human.

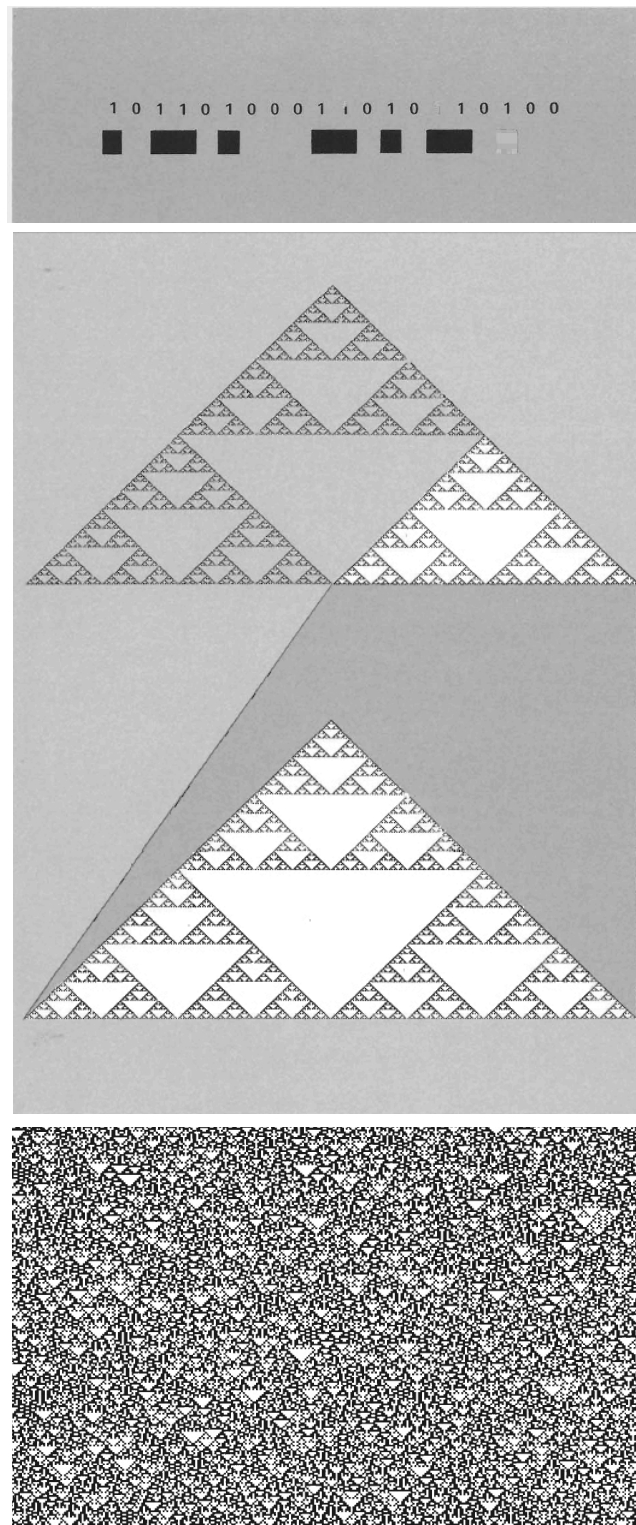


Figure 5.4 Cellular Automata by Stephen Wolfram, showing transition (looking from top to down) from simple, periodic and complex non-periodic pattern (full reference find in text).



Figure 5. 5 Photograph of Northwick Park Hospital in London, 1961, by British architect John Weeks. Façade envelope was determined by computational algorithm having high and loading characteristics as a code. Photograph by David Theodore. Source: *Architecture in Formation: On the Nature of Information in Digital Architecture* (2010), p.74.



Fig. 5.6 Example of usage of new materials in architecture, by implementing genetic control of cell growth. Genetic Barcelona Pavilion by Alberto Estévez (*Ceci n'est pas un pavillon: an biodigital intervention on Mies van der Rohe's German Barcelona pavilion, Barcelona, 2007*). Photograph courtesy of Alberto T. Estévez / Genetic Barcelona Project.



Figure 5.7 Advances of medicine are taking us to outliving the functional life of our organs. This has opened the need for producing biological grafts that are standing instead natural structure and function as well as to adapt on differences that are occurring in environment. Tissue engineering is creating “life” instead of Nature, and aspiring to become Nature. They are crating, instead of biological cell, an synthetic environment, on other world employing Nature to induce, enhance, or mediate development of biological tissue. From: *Transplants Made to Order* by Gordana Vunjak-Novakovic (whole references see in text). Photograph courtesy of Thomas Ropke/Corbis.

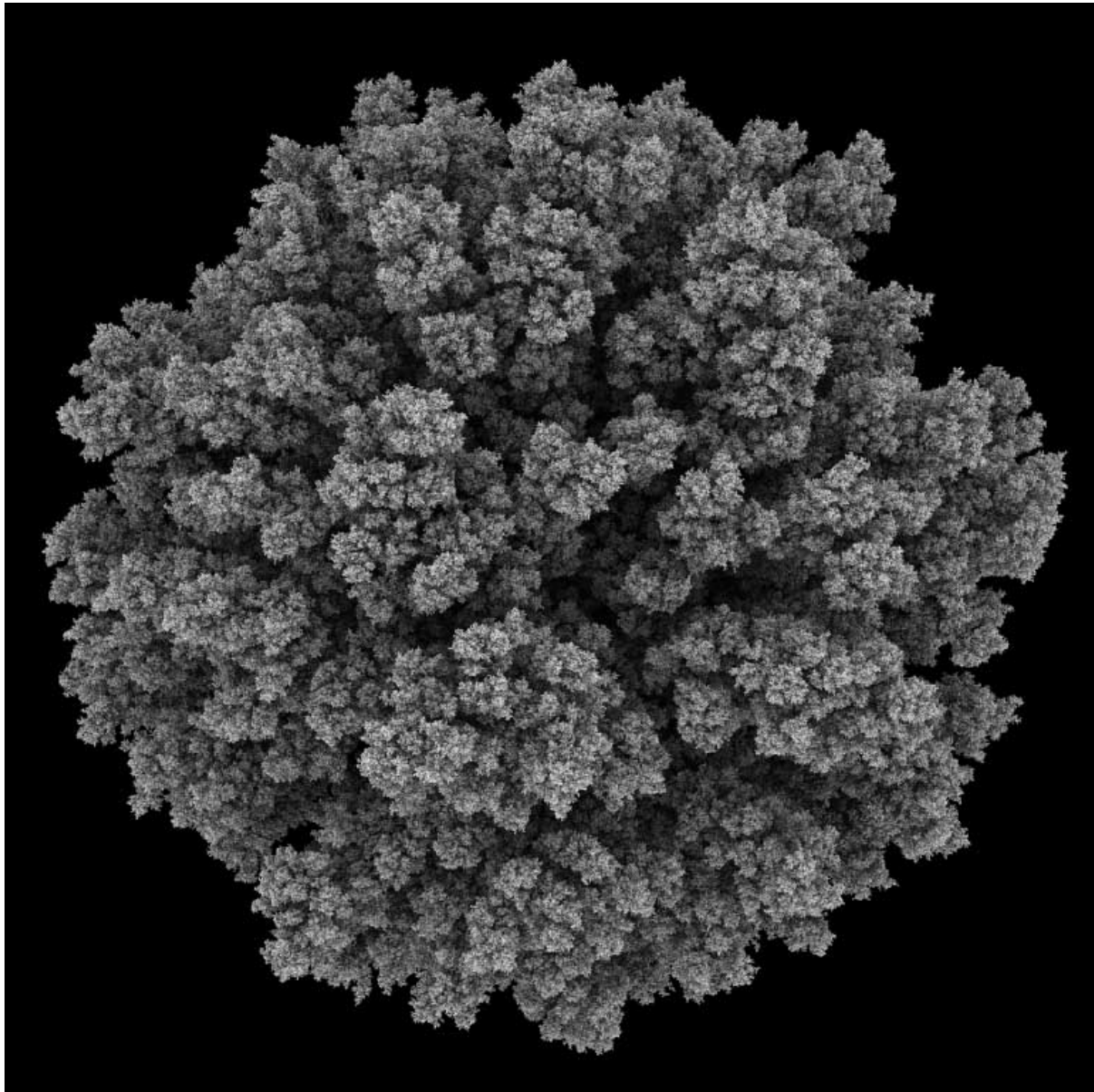


Figure 5.8 Andy Lomas' Aggregation 12, sculptural shapes made in digital realm based on gradually grown by simulating the paths of millions of particles randomly flowing in a field of forces. Source: <http://www.andylomas.com/aggregationImages.html> _10/10/2016.



Figure 5.9 Scene from movie *La Planète Sauvage* by René Laloux (1973) where humanoids rebel against the machine-like leaders.

CHAPTER 6

6 Unfinished!

In everything...uniformity is undesirable. Leaving something incomplete makes it interesting, and gives one the feeling that there is room for growth...Even when building the imperial palace, they always leave one place unfinished.

_Japanese Essays in Idleness, 14th Century

6.1 Existing concepts, methods and technologies

Chapter 6 (entitled: Unfinished!) presents existing concepts, methods, and technologies faced with new insights, showing them in new scenarios to stress whether they work - or if not – why. This has served for definition of limits or expansion of environment that is influencing design realm. Mentioned examples are relevant for the conceptual, methodological, and technical overview of research topic and are discussing design based on patterns and intervention of environment on their spatial formation.

In the pinnacle of contemporary architectural achievements are visible understandings of extension and interconnection of architectural creation on the related and less related fields. Architectural creation considers now synthesis with biology, technology, science, art, and craft. Kinds of infusion of mechanisms, like patterns mediated by Nature, or informed by Nature, by humans or computed by machines are creating symbiotically conducive architectural creatures. These architectures rely on their own emergence, existing and growing towards endless recalculation of their order in relation to their inner and outer milieu. This behavior will benefit toward better connection and interrelation of real and artificial and by it physical and digital.

*In connection with the rise of digital culture, [the architects'] main contribution may very well lie in the domain of augmented reality, that is, dealing with the interface between the physical and the virtual, rather than focusing almost exclusively on the latter.*³⁵⁵

Antoine Picon in essay, *Digital Culture in Architecture* writes that changes of nowadays architecture have found themselves in radical and enduring situation like it was at the beginning of the Renaissance.³⁵⁶ Architecture finds itself in a state of crisis when most aesthetic outputs arise.³⁵⁷ Consequences of mix of real and artificial will be visible via shared Beauty attributes, taken from one and another milieu. These momentous changes are tackled by angstrom measurements, importance of 0D, sensuous surfaces, mechanism for listening, reaction and adaption on signals from inner and outer environments, an essence, not interpretation, never ending recalculations embedded in the roots, animate from order to disorder, multiple, many in one, one in many, never ending, more singularities, undergoing process, pluriverse, modification and transformation from one into many and vice versa.

Why patterns? Because patterns are representing link between artificial and real, physical and digital; they are at same time abstract and concrete. Patterns are

³⁵⁵ Picon, A. (2010). *Digital Culture in Architecture. An introduction for the design professions*. Basel: Birkhäuser, p.185.

³⁵⁶ Ibid.

³⁵⁷ For object in crisis see: Hartoonian, G. (2006). *Crisis of the Object: The Architecture of Theatricality*. New York: Routledge.

actively engaged in the exploration of a new architectural “beings” created by (un)materials, and representing first and foremost an experimental image of practice that is speculative by origin, but with an aim to become scalable. Implementation and articulation of patterns, in architecture, attempts to establish a new rationale for the validity of the world. Symbolic element of pattern do matter in nowadays architecture, but it is also extended with mythological aspects of patterns as medium for interaction between tangible and intangible, artificial and natural, physical and virtual. Exactly mythological aspect will be taken as a major attribute for research in this chapter.

Having in mind that architecture includes different strata in its process of making, we should be aware that it might become experienced from more than one strata as well, which will certainly revolutionize notion of Beauty. Aggregated Beauty mentioned before, has an idea to show layered, atomic and before hidden milieus, which were abstracted by holistic approach, but now are becoming more real and naked than ever. Calling for a need to eroticize architecture is call for revealing its sensorium.³⁵⁸

*Snowflakes are design, crystals are design, music is design, and the electromagnetic spectrum of which the rainbow colors are but one millionth of its range is design; planets, stars, galaxies, and their contained behaviors such as the periodical regularities of the chemical elements are all design-accomplishments.*³⁵⁹

We human beings are born with senses, reflexes and learning mechanisms. How architecture is manifested? This chapter is trying to analyze examples of architectural creations through the basic strategies that baby born is equipped.

Troika of Nature, human, and computer-mediated patterns is making a base for selection of projects that are underlying idea of (un)materialized architecture and possession of sensorium. It is considering learning from natural recalculation to

³⁵⁸ Referring to S. Sontag's seeks for replacement of interpretations with an erotic of art: in: Sontag, S. (1966). *Against Interpretation*. In S. Sontag, *Against Interpretation and Other Essays* (pp. 2-10). Picador.

³⁵⁹ Fuller, R. B. (1971). Introduction. In V. Papanek, *Design for The Real World* (p. viii). Pantheon Books.

accomplishing myriad of economical, elegant, intelligent, poetical, and integrated patterns. It is encouraged by an active, unafraid, open-minded usage of novelties in science, technology, and computation to employ a scientific method, which is crystallizing and verifying forms in all its stages.

Form in crisis expresses its most aesthetical states.³⁶⁰ Even though this research work is not necessarily and structurally in lineage to the inevitable elements that are part of notion of crisis of forms like social, ethical, economical, ecological, and system crises shaped by unemployment, political movements and similar, still it explores phenomena shaped by these crises in previous chapters. The overall idea is to grasp aesthetical form that is result of these phenomena, in order to find an aestheticized future.

6.2 Clash

In previous chapters, we stress character of natural patterns, which is based on synthesis that places components together. While potentials of manmade patterns lay on synergy that is instead of placing component, focused rather on interaction and authentic relationships between components, computer-mediated patterns are characterized by process of its merge.

Discussions and concepts of synthesis, synergy, and merge, lead architecture discourse to be seen by (i) generic term such as self-replicating, self-organizing and self-synthesizing, (ii) perceptual selecting, exploring, and focusing on attention, and (iii) behavioral categories of action, interaction, and transactions.³⁶¹ Each of these terms could be considered as isolated, but actual architectural behavior manifests most of them, while fast forward expansion in consideration of what is to be considered as matter or form, are common characteristic to all of them.

³⁶⁰ Referring to architecture that has found itself in radical and enduring situation like it was at the beginning of the Renaissance in Picon, A. (2010). *Digital Culture in Architecture. An introduction for the design professions*. Basel: Birkhäuser; and Hartoonian, G. (2006). *Crisis of the Object: The Architecture of Theatricality*. New York: Routledge.

³⁶¹ The subdivision is made according to the attributes of complex adaptive systems, having an reference in Complex Adaptive Systems, by Serena Chan; ESD.83 Research Seminar in Engineering Systems October 31, 2001/November 6, 2001.

6.3 Generic term such as self-replicating, self-organizing, and self-synthesizing amended with self-synergy and self-merge

Geometry of feather

Background troika of human, computer, and Nature mediated patterns, has considered pattern formations as historical, evolutionary, and genetic geometry, shape, distribution, size definition, expressing its generics in many structures. Pattern formation not necessarily reflects its material nature, but sometimes follows a logical and intuitive geometrical formation, reflecting and satisfying its utility and aesthetics. The world set as self-replicated, self-assembled, and self-synthesized provides an exciting vision towards a new model of constructions in architecture and its Beauty. Engagement of geometries, shapes, sizes, repetitions in gaining better performances, or exploring new possibilities, could be observed by introducing metamaterials. Metamaterials are artificial structures that are having performative properties via pattern formation. In project *Metamaterial Mechanisms* (Fig.6.1), researchers are working on pattern formation that enables and controls directional movements of designed artefacts. Metamaterials are following cell formation. Their possibilities for directional movement have been enabled by designing distribution that follows a distribution of the shearing cells, a specialized type of cell.³⁶² A distribution of cells that is in accordance of their specialties and interactions between cells is a natural process. While Nature originates creation of patterns by placing specialized type of cells, like the example of leaf surfaces, computer also mediated patterns formation, depending on subjective behavior of the particular cell within its neighbors.

Creative work of Philip Beesley and Skylar Tibbits, is based on self-assembly, being followed by two trajectories; one that embeds information into system and another, that is based on process of assemblage. Both tracks build buildings between themselves, correcting, reconfiguring and analyzing them in order to be communicated digitally and physically. In order to close circle between designing with digital tools and producing with digital technologies, to manage to bridge the gap between digital and real, they try to conserve information, which was

³⁶² Ion, A., Frohnhofer, J., Alistar, M., Wall, L., Kovacs, R., Lindsay, J., et al. (2016). *Metamaterial Mechanisms. User Interface Software and Technology UIST '16*, (pp. 16-19). Tokyo.

embedded digitally, and to conduct its physical assemblage, that is followed by that exact info. A contrary to Metamaterials, project *Hylozoic Soil Series* by Philip Beesley, exhibited in 2012 in Fundación Telefónica, Madrid, involves materials “as the major practice that is making, planning myriad cycles of simulation, prototyping, finding the qualities of components through realization and prototyping, and then combining them again”³⁶³ (Fig.6.2).

In the works of artist Zemer Peled, self-broken pieces are not generated by computer, (Fig.6.3), neither artist uses smart materials in its works, but still, these artworks are biologically growing by the creative input of the creator itself. Made out of beforehand smashed pieces of ceramics, called “feathers”³⁶⁴, these works resemble into something that possesses attributes of living beings’ Beauty, dynamism, and endlessness.

Sensitive dependence on strange conditions

Sensitive depended patterns on inputs from surrounding milieu, changes their characteristic in non-linear fashion. Like small changes of rules profoundly change complex systems, so do “small” inputs from environment, could re-arrange and re-define complex patterns of architecture “beings”. As reference for this is John Horton Conway’s pattern formation made out of small dishes, placed on his house’s tartan floor. Starting with a few randomly arranged dishes, he would be adding and removing them following three simple rules, in order to show how these rules, working together, are able to create unlimited complexity.³⁶⁵

Edward Lorenz, an American physicist in 1960s, studying weather patterns concluded that if the present conditions are not known exactly than “predication of sufficient distant future is impossible”.³⁶⁶ Lorenz’s research also has resulted in

³⁶³ Beesley, P., & Tibbits, S. (2012, May 24). ACADIA Discourse: Philip Beesley and Skylar Tibbits. *ACADIA*. (A. Kudles, Interviewer, & A. Kudles, Editor)

³⁶⁴ Peled, Z. (2016, September). Nomad. *Mark Moore Gallery*. (M. Moore, Interviewer)

³⁶⁵ Bentley, P. (2013). *Digital Biology - How nature is transforming our technology*. Zagreb: Izvori, p. 237.

³⁶⁶ Lorenz, E. N. (1963, January 7). Deterministic Nonperiodic Flow. *Journal of the Atmospheric Sciences*, 130-141, p. 141.

understandings, that small changes can have large consequences and by that the natural systems including complex ones of artificial ones, are unpredictable.

*One does not usually regard the atmosphere as either deterministic or finite, and the lack of periodicity is not a mathematical certainty, since the atmosphere has not been observed forever.*³⁶⁷

By that, architecture also could be understood as a complex system. It has an uncertain future proven by changes through history; it is unpredictable since it cannot observe forever its ends; it is changeable system that has reaction to its milieu. In order to grab a reaction in relation to the surrounding milieu, as an element of creations, we can mention some examples that lie on “sensitive dependence on initial conditions”. To make it more vivid, “sensitive dependence on initial conditions” projects are becoming, sensitive dependence on strange conditions. By strange, here it is meant strange to common consideration of the world. So, these speculative experimentations are revealing its creation to be bombarded by the conditions of mystical outer space conditions. A prediction comes as change of surrounding milieu.

While Brazilian-American artist Eduardo Kac is famous by “GFP bunny” (2000) that has been altered with jellyfish gene, resulting in glowed green when exposed under blue light³⁶⁸, Suzanne Anker, a visual artist and theorist who was working at the intersections of art and the biological sciences, has grown fuchsia plants. Instead to be green Anker’s *Astroculture* (2010, Fig.6.4), changed its appearance by growing in synthetical environment, where sun was changed by red and blue LED lights. False sun gives, to original plants, new impact of Beauty.³⁶⁹

Another collaboration, Neri Oxman with Stratasys, challenges idea of being sensitive to strange conditions, in the case of pulling out or substituting natural appearance, or unmasking intrinsic milieu of an entity. Idea was to 3D interpreted the face of music and film icon Björk. Project entitled *Rottlace* (a

³⁶⁷ Lorenz, E. N. (1963, January 7). Deterministic Nonperiodic Flow. *Journal of the Atmospheric Sciences*, 130-141, p. 141.

³⁶⁸ Kac, E. *GFP Bunny*.

³⁶⁹ Anker, S. *Astroculture* (2010), *Shelf Life*.

variation of the Icelandic term for 'skinless', Fig.6.5), had aim to make, as Oxman says, "the face without a skin".³⁷⁰ Face was made by unique full-color, multi-material 3D printing technology, following scan of Björk's own facial structure, and reflecting her musculoskeletal system. It was a project that has made new Beauty out of bounds between two milieus, known as skin.³⁷¹ Oxman's attempt was to use advance technology to recreate complex geometries of facial rigid and soft materials, and by it to open possibilities to make entities without parts,³⁷² as she said:

Multi-material 3D printing enables the production of elaborate combinations of graded properties, distributed over geometrically complex structures within a single object. With Rottlace, we designed the mask as a synthetic 'whole without parts'.³⁷³

This approach, that has reminiscence in holism, but expressing new way of wholeness, will certainly produce novel re-interpretation of the Beauty that was considered as hidden for now and became recovered by clashing science, technology, biology, and creativity.

This technology not only provides the freedom to produce perfect fitting costumes for the film and music industries, but also the inimitable capacity to materialize a unique fantasy to such a precise level of detail and 3D expression.³⁷⁴

It may be said that un-prediction in architecture comes from changes of understandings what is surrounding milieu. Bjork's face has been changed by

³⁷⁰ Oxman, N. (2016, Jun 30). *Björk Performs in Neri Oxman Designed 3D Printed Mask*. Retrieved September 27, 2016, from Stratasys Blog: <http://blog.stratasys.com/2016/06/30/3d-printed-mask-bjork/>

³⁷¹ Stratasys. (2016, Jun 30). *Björk Performs in Neri Oxman Designed 3D Printed Mask*. Retrieved September 27, 2016, from Stratasys Blog: <http://blog.stratasys.com/2016/06/30/3d-printed-mask-bjork/>

³⁷² Oxman, N. (2016, Jun 30). *Björk Performs in Neri Oxman Designed 3D Printed Mask*. Retrieved September 27, 2016, from Stratasys Blog: <http://blog.stratasys.com/2016/06/30/3d-printed-mask-bjork/>

³⁷³ Ibid.

³⁷⁴ Kaempfer, N. Creative Director Art Fashion Design at Stratasys (2016, Jun 30). *Björk Performs in Neri Oxman Designed 3D Printed Mask*. Retrieved September 27, 2016, from Stratasys Blog: <http://blog.stratasys.com/2016/06/30/3d-printed-mask-bjork/>

reflection from one milieu that has been defined by internal structure of human, by new interface, to its external milieu.

Following project is about creating entrance section, “an immersive physical environment for the song”,³⁷⁵ made for the Björk retrospective, held in the MoMA, New York, 2015 (Fig. 6.6). Design studio *The Living*, based in New York, was commissioned by MoMA to make a physical space for acoustic experience, challenged with changeable conditions of the physical surroundings of museum entrance, speakers and subwoofers that are playing the song, rigid tissue of the space and visitors. Song was mapped on walls and ceiling of entrance space, and tiled by unique cones that cover each inch of surfaces and corresponds to one second of the song.³⁷⁶ The project is tiling amount of information generated from song that can fit on surface, in this case of black box of entrance of museum. Previously explained, in quantum mechanics information cannot be lost and it is limited by area, not volume. Boundaries are tiled by one bit per Planck. A density of one bit per Planck tile is sufficient to tell you absolutely everything that could happen of that some certain box.³⁷⁷

State of Paradox

Life is based on exchange of order and disorder. Relevant for this research is concept of the order, disorder, and entropy, looked through lenses of Schrödinger’s explanation of life. In *What is life*, Schrödinger wrote that by metabolism, process of change and exchange, living organisms are freeing themselves from low level of entropy, that has no help in producing aliveness; and by that keep staying in safe mode, or mode that is far from state of maximum entropy which will cause death. Sucking orderliness from its environment is a

³⁷⁵ Benjamin, D. (2015, March 10). *Behind the scenes with The Living at MoMA's Björk retrospective*. Retrieved September 27, 2016, from Wallpaper*: <http://www.wallpaper.com/art/behind-the-scenes-with-the-living-at-momas-bjrk-retrospective>

³⁷⁶ Lau, W. (2015, March 5). *How the Living Mixed High-Tech and Sweat for MoMA's Björk Retrospective*. Retrieved September 27, 2016, from Architect: http://www.architectmagazine.com/technology/how-the-living-mixed-high-tech-and-sweat-for-momas-bjork-retrospective_o

³⁷⁷ Bousso, R. (2014). Is Information Fundamental? *Closer to Truth*. (R. L. Kuhn, Interviewer) PBS.

device by which an organism maintains its high level of orderliness/life and low level of entropy/death.³⁷⁸ Being on edge of order and disorder, life and death, virtual and real, like Émilie Pitoiset's character which is poetically speaking facing to another realm³⁷⁹ (Fig.6.7), is an idea to make legitimate scientific pursuit for evoking a strange Beauty. That shared Beauty from one and many realities will make borders of natural and artificial, real and virtual, to disappear. State of the paradox occurs by erasing border between ordered life and disorder death is reinforced by the idea of Markus Gabriel's world consisted of the everything that exists, including all real and imaginary while world by itself does not exist.³⁸⁰

Tissue engineers are challenged to 3D prints the existing vascularized cellular constructs to substitute human-scale tissues. *Integrated tissue–organ printer (ITOP)* is seeking to print constructs that are relevant in size, shape and structural integrities with natural ones.³⁸¹

False but artistic project of 3D printings of human body, an online science fiction project called *The Modular Body* (Fig. 6.8), is showing creature called Oscar, invented by alter-ego of author of the project, Cornelis Vlasman. Oscar is made out of his creator's cells.³⁸² This speculative project shows possibilities that are opened by new insights in synthetic biology and technology. Interesting about the project is a fact, that visionary filmmaker, author of the project, Floris Kaayk, was thinking about creating like Nature but in fact, having a totally different aesthetical approach. So, Oscar is growing, in a redesigned and redefined form, while its functions are kept the same. The form here is not generated by following function in a commonly accepted way, but is designed in artistic way, revealing not just possibilities of creation itself, but as well of the new Beauty.

³⁷⁸ Schrödinger, E. (1944). *What is Life?* Cambridge: Cambridge University Press.

³⁷⁹ As visual reference of in-between state of paradox, taken is character of Pitoiset, É., from her *work in progress*.

³⁸⁰ Gabriel, M. (2015). *Why the World Does Not Exist*. Polity.

³⁸¹ Kang, H.-W., Lee, S. J., Ko, I. K., Kengla, C., Yoo, J. J., & Atala, A. (2016). A 3D bioprinting system to produce human-scale tissue constructs with structural integrity. *Nature Biotechnology*, 34, 312-319.

³⁸² Kaayk, F. *The Modular Body* (2016).

Project for theatre production, of Chinese Opera and New Media (Fig. 6.9), is substituting human bodies with virtual leftovers. Project fuses colors and motions of traditional Chinese costumes with movements of human dancing. What we get is virtual disappearance of human bodies with remains of their presence, given by costumes dance. A newly introduced virtual performer leads to the manipulation of the virtual by the real.³⁸³

Another project that manipulates the reality by the virtual realm is new lights ray still underdeveloped, called *Smart Headlight*, by Carnegie Mellon's Robotics Institute. These lights are emphasizing important objects to the driver's sight by "erasing" unimportant ones, like raindrops or snowflakes. This project of enhanced reality demonstrates mixture of the real with unreal. Snowflakes and raindrops exist, even though they are not part of the driver's reality. Even more interesting is that this project is not having any interface or medium for such purpose. It is showing reality in reality, but giving different pictures of same thing, completely erasing border of real and virtual.³⁸⁴

Emerged from bottom-up

*An adaptive system (or a complex adaptive system) is a system that changes its behavior in response to its environment. The adaptive change that occurs is often relevant to achieving a goal or objective.*³⁸⁵

It seems that adaption is addicted to extrinsic environmental and intrinsically embedded elements, but as well as to interrelation between extrinsic and intrinsic. If we add that both extrinsic and intrinsic environments possess great randomness of orderliness and entropy we come to the point of great complexity of systems, which should be somehow described. Complex adaptive system is consisting of agents that are in constant interaction with the other agents.

³⁸³ Gremmler, T. (2016). *Virtual Actors in Chinese Opera*. (M. Woo, Z. Icosahedron, Directors, GuoGuang Opera Company (Taipei), Performer)

³⁸⁴ ILIM laboratory. (2010-2013). *Toward a Smart Automotive Headlight for Seeing Through Rain and Snow*. Retrieved September 28, 2016, from Carnegie Mellon Illumination and Imaging: <http://www.cs.cmu.edu/~ILIM/>

³⁸⁵ New England Complex Systems Institute (NECSI). (2011). *Concepts: Adaptive*. Retrieved May 15, 2016, from New England Complex Systems Institute solving problems of science and society: <http://necsi.edu/guide/concepts/adaptive.html>

Orderliness could result from non-linear actions and reactions between agents. Neumann has suggested new theory of computation that will embed function of self-reproduction “which can have outputs something like themselves”.³⁸⁶ He employed the model of cellular automata (CAs). CA is a system of highly complex behaviors and many universal features.³⁸⁷

Mathematical model of CA comes in a variety of shapes and multiplicity of patterns. Fundamental property of a CA is the type of pattern on which it is computed, the color cells may assume it and the neighborhood over which cell affect one another.³⁸⁸ We could say that there are only four different types of patterns: nothing happens (plain pattern), periodic patterns, chaos, order at the edge of chaos (complex non-periodic patterns).³⁸⁹ CA is an idealization of natural systems that are defending themselves from maximum entropy, e.g. death, by spontaneously generating its structure. Natural CAs emerge from bottom up phenomena following not explicit rules.

*To apply the philosophy underlying natural automata to artificial automata we must understand complicated mechanisms better than we do, we must have elaborate statistics about what goes wrong, and we must have much more perfect statistical information about the milieu in which a mechanism lives than we now have. An automaton cannot be separated from the milieu to which it responds.*³⁹⁰

Besides using CAs for modeling processes and phenomena in Nature, spatial representations in art and architecture, CA finds its applications in music too. Musicians have been experimenting with translating CAs into music form. Historically looking, generated music form out of simple rules, or steps that follow interactions between agents could be found in *Musikalisches Würfelspiel*. This is

³⁸⁶ Neumann, J. V. (1966). *Theory of Self-Reproducing Automata*. (A. W. Burks, Ed.) Urbana/London: University of Illinois Press, p. 75.

³⁸⁷ Wolfram, S. (1983). Cellular Automata. *Los Alamos Science*, 9, 2-27.

³⁸⁸ Weisstein, E. W. (1999). *Cellular Automaton*. Retrieved May 18, 2016, from MathWorld--A Wolfram Web Resource: <http://mathworld.wolfram.com/CellularAutomaton.html>

³⁸⁹ Chu, S. K. (2008). *The Architecture of Possible Worlds, 3rd International Conference Digital Art and Architecture, Net.Art and Virtual Universes*. University of Barcelona, Faculty of Geography and History, Barcelona.

³⁹⁰ Neumann, J. V. (1966). *Theory of Self-Reproducing Automata*. (A. W. Burks, Ed.) Urbana/London: University of Illinois Press, p. 71-72.

a game of W.A. Mozart, from the 18th century; about generating music by choosing random number of dice roll.³⁹¹

Martin Messier in project *Field*³⁹² is using continuous plugging and unplugging connections of sound and lights of electromagnetic fields, invisible for naked eye and human ear.³⁹³ He is following rules of plugs and unplugs, composing by inaudible and invisible energetic materials, a (un)material.

Sea Organs is a project done by architect Nikola Basic in Zadar waterfront.³⁹⁴ Whole structure of steps to the sea is capturing movements of waves and pushes air through the pipes, making random whistle. In this case, hidden sound of water is transformed to shape Riva-waterfront.

Architect opera (2013)³⁹⁵ is as an example of connection between sound and space, project of Jenny Kallick and Lewis Spratlan. It is “instrumental and vocal music blend drawn from acoustic recordings within Kahn's buildings”.³⁹⁶ Final electro-acoustic music is using records of “sound aura” of the building’s structure together with brief sound explosions, performed inside of existing acoustic envelope.³⁹⁷

*I feel fusion of the senses. To hear a sound is to see its space. Space has tonality, and I imagine myself composing a space lofty, vaulted, or under a dome, attributing to it a sound character alternating with the tones of a space, narrow and high, with graduating silver, light to darkness.*³⁹⁸

³⁹¹ Cage, J., & Hiller, L. (2011). HPSCHD. In L. Austin, & D. Kahn (Eds.), *Source: Music of the Avant-garde, 1966–1973* (pp. 147-160). Berkeley, Los Angeles, London: Unveristy of California Press.

³⁹² Messier, M. *Filed*. Sonar +D, Barcelona.

³⁹³ Sonar +D. (2016). *Tech shows: FIELD by Martin Messier*. Retrieved October 1, 2016, from Sonar +D: <http://sonarplusd.com/activity/field-by-martin-messier/>

³⁹⁴ Basic, N. *Sea Organs*. City of Zadar, Croatia.

³⁹⁵ Kallick, J., & Spratlan, L. (2013). *Architect opera*. Navona Records.

³⁹⁶ Voyatzis, C. (2013, June 9). *Even A Brick Wants To Be Something*. Retrieved October 1, 2016, from Yatzer: <https://www.yatzer.com/even-brick-wants-be-something-louis-kahn>

³⁹⁷ Amherst College. (2011, November 15). *To Hear a Sound is to See a Space: Professors and Alumni Collaborate to Build ARCHITECT Opera*. Retrieved October 1, 2016, from Amherst College: https://www.amherst.edu/news/news_releases/2011/11/node/357036

³⁹⁸ Kahn, L. *Architecture: Silence and Light, 1970*, reprinted in *Louis I. Kahn, Writings, Lectures, Interviews*. (A. Latour, Ed.) New York, 1991: Rizzoli. p. 252.

All mentioned projects are related to emerging sensory capabilities into their entities. These entities whether by its structural organizations, performance, and human re-touch, or combinations of them, are using their own sensorium, to adapt it to the surrounding disturbance, and to generate and transmit again into novel forms. These projects do not just outperform their creators, they have their own sensitivities and express their epistemic autonomy.³⁹⁹ They also refer to become structural/physical implementations of the experiments in the late 1950's of Gordon Pask, who searches for a device that would create its own "relevance criteria"; it means that input-output combinations and categories would be selected by the device itself.⁴⁰⁰

6.4 Perceptual selecting, exploring, and focusing on attention

Emphasis on the need and possibility

Introduction of genetic processes into works of art and architecture is already mentioned. This section will mention several projects that have focus on need and possibilities opened with new insights, conducted by usage of living organisms or of their parts; or by learning from biological process. The aim is to alter evolutionary path and to conduct a scientifically deliberate design approach. These projects are rather taking fragmented perspectives than comprehensive awareness of system as a whole. Possibilities that occur in sophisticated evolutionary time are not considered or are not exploited entirely. Projects that have focused on relation between possibilities and needs are encouraging construction of altered environments and imagining possible future, besides established evolutionary path. Searching for niche of sophisticated manufacturing processes of evolutionary path of our planet, was a main point for running project of *Biological Radio* (2011)⁴⁰¹ by Joe Davis. Bacterial radio design creates a flat circuit, made out of conductive bacteria, in a Petri dish. The bacteria that were used are E coli modified with a gene for silicatein, extracted from the marine sponge *Tethya aurantia*. Marine organisms are using Silicatein to create various

³⁹⁹ Referring to Descartes' Dictum: how can a designer build a device that outperforms the designer him/herself? In: Ashby, R. W. (1952). Can a Mechanical Chess-Player Outplay Its Designer? *The British Journal for the Philosophy of Science*, 3 (9), pp. 44-57.

⁴⁰⁰ Cariani, P. (1993). To evolve an ear. Epistemological implications of Gordon Pask's electrochemical devices. *Systems Research and Behavioral Science*, 10 (3), pp. 19-33.

⁴⁰¹ Davis, J. *Bacterial Radio* (2011).

marine glass endoskeletons and exoskeletons forms. Pins and wires are connecting circuit skeleton parts and antennas to actually transmit AM radio broadcasts to listeners.⁴⁰²

It is well known that architects are working on many levels and scales not necessarily focus only on object. One level that occupies architects of nowadays is level opened by introduction of genetics into our field. *Genetic Barcelona Project* (Fig. 6.10) led by Alberto Estévez is challenging possibilities of glowing the urban trees conducted from the inside, genetically treated. Estévez's team works on changes of chain of DNA of lemon tree. Driven by the aim to substitute artificial lighting with bioluminescence the team of Estévez comprised of molecular biologists, agricultural engineer, linguistic geneticist and bioethicist, worked on introduction of the Green Fluorescent Protein, luminous protein, into genetic script of the trees, to make mechanisms for reduction of the consumption of electricity.⁴⁰³

A planetary perspective

Music video for the song *Dream a Little Crazy* (Fig. 6.11) by Australian band Architecture in Helsinki, done by body architect Lucy McRae and spatial experimenter Rachel Wingfield is searching for an option-expanding infrastructure of life. It is showing an artistic view of possibilities that are integrated with life by introduction of 3D printings and synthetic biology.

I do speculative story-telling. I create parallel, alternate worlds — underpinned by science fiction. The idea is to render possibilities to how technology will change, thinking about how people will embody the future in technology. But I do it in playful ways. In a way, I'm designing the connective tissue between science and imagination. I'm not a technologist,

⁴⁰² Cyberarts 2012 - International Compendium Prix Ars Electronica 2012. (2012). *Hybrid Art*. Retrieved 10 3, 2016, from Ars Electronica Prix Ars Electronica 2012: <http://prix2012.aec.at/prixwinner/7023/>

⁴⁰³ Estévez, A. T. (2015). *Genetic Barcelona Project*. In A. T. Estévez, *Biodigital Architecture & Genetics writings* (pp. 94-99). Barcelona: ESARQ, Universitat Internacional de Catalunya; first published in *Metalocus*, núm. 017, pp. 162-163, Madrid, Autumn, 2005; *Urban Nightscape 2006*, pp. 86-88, International Commission on Illumination, Athens (Greece) 2006 and (Fragment) *Leonardo*, vol. 40, núm. 1, pp. 18 & 46, The MIT Press, San Francisco-California/Cambridge-Massachusetts (USA), February 2007.

*I'm not a scientist. I'm an artist inspired by scientific thinking, and I use that to steer the narratives of my films and concepts.*⁴⁰⁴

The projects molds, used for the purpose of video making, are having second life, by being used as molds for candy makings. Audience eats band's members. In future, as seen by the artist Lucy McRae "we actually will clone ourselves, or eat ourselves in order to enhance our senses."⁴⁰⁵

Anticipatory

Although it has already been said, predicting situations in architecture, if it is considered as a complex system, cannot be conducted since we cannot observe entire history of it, forever by its ends, focus on factors that could apprehend situation could be beneficial and should be taken into account while choosing an option of the actions that should be made.

Apocalyptic scenarios of cities are led under different factors. Emptiness covered by losses of industrial imperative or by losing its identity under consequences of war actions. Many of such cities employed art to grab the freedom that has been spread by such unwanted situations. As it is explained by artist Chloë Brown that has size freedom by medium of dance, in project *Dancing in the Boardroom (2013)*⁴⁰⁶:

*You lose the reason for being, there's a genuine period of confusion, and then out of that confusion, that emptiness, things start to happen. And the things that start to happen are largely creative.*⁴⁰⁷

Pieter Schoolwerth in an episodic video *Your Vacuum Sucks (2015)* is searching for the possibility to "inhabit a newly space-less ground zero of sorts...so that something else could happen" by introducing simultaneous

⁴⁰⁴ McRae, L. (2014, February 14). Biohacker meets Willy Wonka: Lucy McRae on the making of the incredible edible music video for Architecture in Helsinki. (TED Blog, source: <http://blog.ted.com/lucy-mcrae-on-the-making-of-the-music-video-for-architecture-in-helsinki/>; Retrieved 10 3, 2016).

⁴⁰⁵ Ibid.

⁴⁰⁶ Brown, C. *Dancing in the Boardroom*, 2013.

⁴⁰⁷ Brown, C. (2016, April 6). From an English Factory to the Streets of Detroit, Disrupting Space with Dance. (Hyperallergic, Interviewer)

change between presence and absence.⁴⁰⁸ In this something else is happening, he was trying to depict our altered senses about space, time, and else.

Ambience Installation *City Caverns*⁴⁰⁹ 2013, by the author (Fig. 6.12), is negotiating about a blurred, vague, and unthreatening dots of the city network. These are spots of distrust and meeting avoidance. Such caverns represent unprogrammed and random citizens within the interspaces; they are the product of urban trauma. This inter-space provides the potential for the performance of nature. Nature is productive. It does not celebrate crises. It reschedules and activates the segments of its matrix. Provoked by the presence of urban ruins and lured into their problems, we have learned to adapt ourselves. Our view of the world is shaped by accumulated impressions, thus influencing our creative apparatus and our involvement within it. This investigation deals with the issue of transformation of existing urban network so that all of its parts can fit the flow of information. Yet at the same time, the network must maintain its integrity, which enables it to transform itself and transfer data.

We are aware that today a large number of information “bombarding” the world and to live is to try to catch up with the digital age. Such age is presenting this planet as an urban area where the city space is presented through an information network. There are various studies that connect different network systems in order to simulate or predict, like urban networks, social networks, ecosystems, Internet or the specific patterns found in Nature.

The question is how to adapt the existing city network, which has undergone certain cracks, for the continuous flow of information, while still maintaining the integrity of its parts, which will enable the complex system to transmit data from one point to another? Since the basic property of information is variability, the power systems should be capable of re-building, re-using, and re-defining.

⁴⁰⁸ Schoolwerth, P. *Your Vacuum Blows, which Sucks* (2014). *Press Release*. Miguel Abreu Gallery.

⁴⁰⁹ Simisic, L. *City Caverns* (2013). Art Gallery of Bosnia and Herzegovina, Sarajevo.

Condensation of points, around certain types of attractors, reveals patterns or messages intended to intermediaries and provide answers, which are used to regulate our expectations for change. City caverns are attractors, which broadcasts the attraction or repulsion in its gravitational field. They are black holes. In principle, a black hole cannot be seen or described, but its existence has been known for the way its gravitational field affects the movement of the stars around it. Similarly and even city caverns do exists, they do not change us directly, but are changing world around us.

Historically, the idea of spreading interest about the ruins began as an intellectual drive in the Renaissance and became basic aesthetics in the coming centuries. It was not a reflection loaded with melancholy and the curse of death, but extravagant encouragement for sensual enjoyment.

In this video ambient exhibition, visitors are pushed in recent image of one of the city caverns that has been projected on to the walls of the gallery. An aim was to allow the visit to the garden, which was created in it, in a safe mode, and to celebrate Natures' support to life. Ruins of today are generated on the basis of different kinds of events. But all can be interpreted as an urban trauma. Ruins like they are living in space, but not in time. They represent the future, and Nature fought for their present, creating a performance of art form, hard to explain, and by it articulating the extent of our individual alienation to the neglected spots of city. This way of natural struggle for aliveness, when none of its parts is neglected, was main focus of this exhibition. It is the reflection on the movie *Children of the Man*⁴¹⁰, where culture is dying while nature is in the continuity of aliveness.

Playing its performance, Nature is updating potential and renewed collective re-individuation of ruin. The Beauty of the process frees ballerinas on the dance floor, which are in constant conflict with the forces and energy of motion, inertia, speed, and acceleration. Their Beauty is not merely a reflection of the sum of

⁴¹⁰ Cuarón, A. (Director). (2006). *Children of the Man* [Motion Picture].

their movement, not in resistance to the forces around them, and a reflection of the illusion of performing the impossible.⁴¹¹

The built environment is a dynamic field and sometimes innocent and neutral materials and ideas can lead to possible solutions. It is not about a finding some universally ultimate recipe, but more a threshold, perhaps an abstract and without a prescribed outcome. The age that we live in is smart, sometimes invisible, from time to time ethical and poetical. Why we are digging into this invisibility, is probably because we have a humble attitude towards the unexpected.

Under sections of *Detroit in need of reinvention*, Venice Biennale 2016 presented ideas of 12 US firms about city of emptiness of Detroit. Among others, T+E+A+M had an idea to re-imagining city, in Detroit's case its vast, by using off-site waste material as a "material of a new urban space".⁴¹² Their idea is based on:

*Detroit doesn't have a materials problem; its materials have an image problem.*⁴¹³

This project is trying to depict imaginary scenario rather than material and structural one and to search for the picture of this world that is covered and hidden.

Scientifically and Technologically Comprehensive

Design and the Elastic Mind exhibition held in MoMA (2007) curated by Paola Antonelli is about new enthusiasm and love affair between science and technology with design. It shows projects that are explaining possible world's image of future.⁴¹⁴ Project like is *Genetic Trace*⁴¹⁵ (2007) by designer Susana Soares, is considering nanotechnology to provide new sensing element as

⁴¹¹ See in Laws Kenneth, *Physics and the Art of Dance: Understanding Movement*, Oxford University Press, 2002.

⁴¹² T+E+A+M. *Rummage*. Venice Binnale 2016, Venice, source: <http://tplusaplusaplusm.us>; Retrieved 10 3, 2016.

⁴¹³ Ibid.

⁴¹⁴ Antonelli, P. *Design of Elastic Mind*. MOMA The Museum of Moder Art, New York, retrieved October 1, 2017, from:<https://www.moma.org/calendar/exhibitions/58>

⁴¹⁵ Soares, S. *Genetic Trace*. MOMA The Museum of MODern Art, New York.

extension of our body by enhancing our existing senses. She equipped humans with mechanisms to collect dead cells, with DNA information, from other human, while shaking hands (Fig. 6.13).

Pushing realities far from equilibrium

Previously mentioned processes of balance between order and disorder and searching for threshold between these two, lead us to the understandings that complex system, such as architecture and art, are trying to transcend boundary of real and imaginary and by it ordered and disordered, assuming that reality is ordered, while imaginary is disordered.

*The Floating Piers*⁴¹⁶ (2016) project is merging realities with imagination by enabling humans to walk on water. Re-framing Nature's image, conceptual artist Christo is doing an environmental installation by connecting physically two islands on a lake in Italy (Fig. 6.14).

Re-investigating materialization, made by intangible material, mist from water of the lake on which pavilion is built, the *Blur Building* for Swiss EXPO 2002⁴¹⁷, extended notion and altered its sensorium. It is becoming even more tangible than surrounding milieu that has been built out of tangible materials. By making an altered atmosphere space occupied by blur mess, building makes an illusion that has finding similarities with a uterus that surrounds babies or with atmosphere that surrounds fire flame, or a milieu of snow. It is erasing visitors' visual and acoustic references leaving us with "spaceless, formless, featureless, depthless, scaleless, massless, surfaceless, and dimensionless"⁴¹⁸ void while intangible matter become reality (Fig. 6.15).

Referring to observations of Lars Lerup, on action of fusion of animals and humans, a "nebulosity of instinct and intelligence",⁴¹⁹ these projects raised the same nebulosity that is altering our intelligence while enhancing our senses, and

⁴¹⁶ Christo. *Floating Piers*. Italy.

⁴¹⁷ Diller, E., & Scofidio, R. (2005). Architecture as a Habitable Medium. In G. Flachbart, & P. Weibel (Eds.), *Disappearing Architecture _From Real to Virtual to Quantum* (pp. 184-195). Basel: Birkhauser.

⁴¹⁸ Ibid., p. 189.

⁴¹⁹ Lerup, L. (2000). *After the City*. Massachusetts London: The MIT Press Cambridge, p. 171.

vice versa. Or, we could better say virtual, seen as an outcome of our intelligence, is enhancing nature that is constructing our sensorium.

*The future of architecture lies at the heart of the struggle for distance. Proximity, or more precisely contiguity, made the fabric of the city, and again proximity and contiguity reappear but now in a very different mien: architecture, like all artifice, must through "hints and halos" embody nature. Both have to get closer, and both would in this becoming be reinvented.*⁴²⁰

6.5 Behavioral categories of action, interaction, and transactions

Category of action, interaction, and transaction seen via characteristics of adaptability, reiteratively, and recursively, is focused on projects that react on the events localized by particular being and time, by physical action, performance, communications, co-evolution, and connectives. These attributes are following an idea of making aesthetic environment of Gordon Pask. Pask is an early proponent and practitioner of cybernetics, not only from scientific points, but also from artistic. Joining *The colloquy of mobiles* exhibition, in London 1968, he attempted to go one step further in direction of fabrication of an active/reactive environment with properties of an “aesthetically potent” environment. Such environment, defined by Pask, is an environment that people are liable to enjoy by exploring it, learning from it, forming a hierarchy of concepts that refer to it or seeing themselves reflected in it.⁴²¹ Potential of such environment lies in interaction, which is by hypothesis pleasurable. “Aesthetically potent” environment should offer sufficient variety, consisted of forms that could be learned for interpretations by following guidelines and have potentials to respond, engage and adapt themselves. Reaction and adaption is manifested via play of light and sounds in communicational dance between male and female mobiles. Paskian environment continually communicates between its mobiles and learns

⁴²⁰ Lerup, L. (2000). *After the City*. Massachusetts London: The MIT Press Cambridge, p. 171.

⁴²¹ Pask, G. (1968). The colloquy of mobiles. (J. Reichardt, Ed.) *Cybernetic Serendipity*, p. 34.

about one another, with possibilities to engage to this “play”, human beings. This has great importance for bleaching the boundary between real and artificial.⁴²²

*...the external aesthetically potent environment gives rise, bit by bit, to an internal representation...as a discourse between the internal representation and our immediate selves. In contrast, a reactive and adaptive environment is intended to externalize this discourse.*⁴²³

Paskian colloquy a contrary to monads, or an autopoietic space, defined by Maturana and Varela (1979) as “organization constitutes a closed domain of relations specified only with respect to the autopoietic organization that these relations constitute, and thus it defines a space in which it can be realized as a concrete system, a space whose dimensions are the relations of production of the components that realize it.”⁴²⁴, and by it identified in one particular space, while Paskian colloquy jumps from its internal/artificial realm to external/real one.

Adaptive

The process is adaptive, means that entities continuously co-define and inter-accommodate each other and the surrounding milieu. Using an unwitting DNA of unknown donors, Heather Dewey-Hagborg has generated possible portraits that rely on scientific inquiry while having an artistic creative touch. Artist, in project *Stranger Visions*⁴²⁵ (2013, Fig.6.16), collects human genetic material and by implementation of contemporary scientific techniques, identifies that a scientific technique is open for interpretations.⁴²⁶ Playing with leftovers of our humanity she produced new humans that have their base in real ones, but do not exist and rely on artificial realm.

Kevin Slavin and MIT Media Lab investigate how collection of the microbes, collected by bees, natural forensics, could pattern “vast and invisible world that

⁴²² Pask, G. (1971). A comment, a case history and a plan Gordon Pask in Cybernetics. In J. Reichardt (Ed.), *Art and Ideas*. London: Studio Vista.

⁴²³ *Ibid.*, p. 77.

⁴²⁴ Maturana, H. R., & Varela, F. J. (1972). *Autopoiesis and Cognition: The Realization of the Living*. Dordrecht/Boston/London: D. Reidel Publishing Company, p. 135.

⁴²⁵ Dewey-Hagborg, H. *Stranger Visions*. Retrieved October 9, 2016, from Heather Dewey-Hagborg: <http://deweyhagborg.com/projects/stranger-visions>

⁴²⁶ *Ibid.*

surround us”.⁴²⁷ His team is investigating data from microbes collected in Venice, to produce microbiological map of the city and explore possibilities of protecting and improving human health.

Reiterative

The process is reiterative if entities and a whole system continuously adjusts and re-adjusts to meet advances that occur in path. For a site-specific installation called *Arborescence* (2014), commissioned by an Amsterdam Light Festival and designed by Loop.ph, a 7.5 m tall sculpture floated on the Amstel River, tribute the life in the city. Being inspired by the light, LOOP.ph proposed a bioluminescent plant form “to reprogram life to create more sustainable, bright futures”. *Arborescence* is created out of over 10,000 circles of composite fibre, hand-woven and assembled structure. This is another project mentioned here, that speculates on idea of “living lighting” in the city, but this time bringing not just functional alterations but as well changes of aesthetical appearance of possible sustainable lightings.⁴²⁸

Recursive

The recursive dimension is coming from similarities between wholeness and parts. The project of Tristan Perich *Microtonal Wall* presented worldwide, is manipulating visual and perceptual dimension. Described by Sonar D+, this performative stable structure is in constant clash within its smartness and coldness, visual and sonic appearance, and stable nature of its physicality and dynamic nature of sound device.⁴²⁹ Play of contrast between perceptual dynamic and visually static dimension could be found in ancient cave drawings, where visually static surfaces of caves are transformed to dynamic appearances by artistic drawings, as it is seen in the motion picture.

⁴²⁷ Slavin, K. (2016, January 29). *The most interesting ideas in architecture right now: Use bees to help determine the biological makeup of a city*. Retrieved October 10, 2016, from Ideas Ted.com: <http://ideas.ted.com/the-most-interesting-ideas-in-architecture-right-now/>

⁴²⁸ Loop.ph. (2015, November/January). *Arborescence*. Retrieved October 10, 2016, from ph: <http://loop.ph/portfolio/arborescence/>

⁴²⁹ Sonar D+. (2016). *Tristan Perich presents Microtonal Wall at Mies Van der Rohe Foundation*. Retrieved October 10, 2016, from Sonar D+: <http://sonarplused.com/activity/microtonal-wall/>

Interconnectedness

As noted earlier, complexity of the system results in synergic, synthetic, and emergent forms from the inter-relationship, inter-action, and inter-connectivity of the elements within a system and between a system and its surrounding milieu, but not necessarily both.

Connectives based on exchange of information, presented via pattern, or better say a network, are getting its importance especially by the introduction of the digital technologies. Digital technologies have open possibilities for new perspectives of exploration of these networks and their characteristics that could give us better understandings of human behavior, individual and collective one. Project *Signature of Humanity* run by The SENSEable City Lab and Ericsson, investigate whether patterns that are based on communicational realm extracted from different parts of the world, have repetition in its dynamics, or whether they are affected by specific event, or are there any similarities in image between cities. Result of this investigation is signature of the city that is based on cultural background, “all major cities share a same partitioning in spatial areas with specific patterns”.⁴³⁰ This signature is the sensorium apparatus that transmits particular image, visual dimension of city life, via network/pattern. Merging the particular signals of the particular cities into one single pulse give us signature of our humanity (Fig. 6.18).

Another pulse, but in this case of nature, infected by natural movement as casualty of phenomena like are earthquakes, volcanoes or glaciers and reaction of earth on human impact, is explored in an example of the artwork presented at Sonar D+, 2016, by author Ruth Jarman and Joe Gerhardt. Using seismic data of movement of Earth’s strata in minute frame, duo has given a sonic and visual pattern image of changes that have occurred in strata of Earth’s structure and landscape (Fig. 6.19).⁴³¹

⁴³⁰ The Senseable City Lab and Ericsson. (2012). *Signature of Humanity*. Retrieved October 10, 2016, from MIT Senseable City Lab: <http://senseable.mit.edu/signature-of-humanity/>

⁴³¹ Sonar +D. (2016). *Earthworks, a Semiconductor installation for SonarPLANTA*. Retrieved October 10, 2016, from Sonar +D: <http://sonarplusd.com/activity/earthworks/>

Co-evolution

Borrowing an idea of evolution into realm of design and emergent of the form, entities of the system changes based on their interaction between one another and their milieu. Co-evolution, introduced by Stuart Kauffman, is concept of co-evolvement between entireties, via interface of surrounding milieu. Described by Kauffman:

*Coevolution is a story of coupled deforming "fitness landscapes". The outcome depends jointly on how much my landscape is deformed when you make an adaptive move, and how rapidly I can respond by changing "phenotype".*⁴³²

There are several projects that are based on idea what will happen with design/growth of entities if there is change of known environment's characteristics. Project of MIT's Mediated Matter group, named Synthetic Apiary (2016), explores evolvment between synthetic environment and honeybees.⁴³³ Milieu, in which bees are supposed to live, is engineered so it is placed out of time, simulating perpetual spring, with no changes of season.

6.6 Summary Small Architecture

Mentioned projects within this chapter are augmenting information into dimension of matter and expand visual and performative horizon of themselves or surrounding milieu. They represent fusion of synthetic, synergic, and emergent systems. Relying on growth a characteristic that design borrows from Nature, such entities are becoming sophisticated by implications and introduction of the very creation of the entities borrow from art and architecture into scientific discourse.

⁴³² Kauffman, S. A. (1990). The Sciences of Complexity and "Origins of Order". *PSA: Proceedings of the Biennial Meeting of the Philosophy of Science Association* (pp. 299-322). The University of Chicago Press, p. 304.

⁴³³ Mediated Matter Group. (2016). *Synthetic Apiary*. Retrieved October 10, 2016, from MIT Media Lab: <http://matter.media.mit.edu/environments/details/synthetic-apiary>

*Science is still searching for a theory of explanation, architecture for a theory of generation - and it is just possible that the latter will be advanced before the former...perhaps before the turn of the century there will be a new branch of science concerned with creative morphology and intentionality.*⁴³⁴

These alternations between scientific and artistic viewpoints are making embodiment also for recalculating notion of Beauty.

Projects presented within this chapter produced extraordinary challenges that are taking part of brave, strong, shocking, extravagant, new sense of Beauty of the outer space that occupies our world. They are becoming new standards of the beautiful, finding its main understandings in intrinsic characteristics altered with extrinsic correlations of the potential milieu.

Showed projects are employing geometry, materials, human impact, genetics, new technologies, science and interaction of all, for generating form of coming architecture of possible worlds. Their growth is forced by geometry's potential, human's creativity, material's performances, and combination of all three, to release Beauty, that cannot be attributed by classical subjectivity/objectivity, symmetry, divine, standard based on sizes and shapes, elegance, or gracefulness, but by something which has more relation to the movable, changeable, re-refreshed, alive, self-synthesized, self-synergic and self-merged attributions. To be in-between virtual and real, these new creations, or better new growing entities are making legitimate scientific pursuit for evoking a strange Beauty from one and many realities.

Their body is in contacts with the substance of flows of information, self-organizing network of desire for becoming a monadic subject that embodies both, real and artificial realm, and by it presents manifold worlds. They are becoming device for performative, visual and perceptual nature of materials, structures and flash of their bodies.

⁴³⁴ Frazer, J. (1995). *An Evolutionary Architecture* (Vol. Themes VII). London: Architectural Association, p. 20.

Mentioned devices and projects sometimes are not made to have capacities for solving a given real world problem. Some of them rely only on capacity to transmit Beauty. They certainly employed scientific search for making possible of impossible or stressing biological evolution and technological development and by it discover niches of possible worlds.

Changes of function while visual dimension is preserved; changes of perception while visual dimension remains; changes of both visual and perceptual dimension, while function remains; are all ways for deconstructing elements of Beauty. No matter on what decolonization they remain, they still are stressing our sensory experience. They are examples of understandings of nonhuman consciousnesses.

Immersed in matter that has been re-dimensioned, body of Beauty has been exchanged, extended and interconnected in myriad and many-body ways with distinct formal and visual consequences seen in matter and location. For instance, (un)material of such body is not stable, neither it is characterized by its location. Since (un)material could be implemented into many-body patterns, by the interface of humans, Nature or computers, many-body by itself shows permeable characteristics related to the boundaries of its localization. It is a process of terrific creative osmosis and highly economical form for new ways of sustainability.

We are coming to point to make architecture that certainly do not rely on its own history but employs memory, referring to Brodsky sayings about poetry “it has some things in common with history: it employs memory, and it is of use for the future, not to mention the present.”⁴³⁵

Agnes Geoffray said that a visual artist that is working on re-touching, or re-combination of collected images from different sources to make a latent world suspended:

⁴³⁵ Brodsky, J. (1995). *An Immodest Proposal in On Grief and Reason: Essays*. New York: Farrar, Straus and Giroux, p. 208.

*With time, latency becomes suspended. But whatever term you use, what interests me is this suspended moment...this interruption, this pause, this floating image, where before and after rest indefinitely and for invention. With suspension everything remains possible, nothing is definite.*⁴³⁶

If we consider speculative science-fiction project of *The Modular Body*, as something that is close to be real, or if we take it, no matter real or not, accepting its Beauty, also a Beauty of its process of creation as something that is part of our own life, to enrich our creative impressions. Speculations of creating alive architecture are even closer than ever to become possible. It does not matter are we going to live in, or on something like Oskar; or are we going to merge with Oscar in virtual realm, new Beauty is there and it is constantly bombarding us with its new humor. As it is said in very beginning of this chapter uniformity is undesirable. Intentionally this thesis studies projects that are interesting for their Beauty more than aesthetics. Explored projects are new, wild, and brave Beauty of creation, similar to relation found in-between art and culture. While a culture contrary to art, expresses continuity and coherence, art possesses singularity of a wildness and surprising nature. Aesthetics vs. Beauty has same relations. That is why it is important, because it is everywhere.

Growing independently from natural environment, in sense that entities are either placed in environment different than ours, for example out of planet Earth, in space, or entities are growing inside of known environment but having difference in their visual appearance or functional dimension. Both could have difference on visual and perceptual dimensions, and both could stress Beauty of their entities. It cannot be said that their Beauty is surrealistic since real has be stretched into artificial, imaginary, sci-fi realm or realm out of this planet. Projects that are presented have an aim to prepare our visual and perceptual acceptance to go somewhere else.

⁴³⁶ Geoffray, A. (2014). Sans Titre: Suspense. *lensculture*. (E. Temkin, Interviewer), source: <https://www.lensculture.com/articles/agnes-geoffray-sans-titre-suspense#slide-6> 22/9/2016.

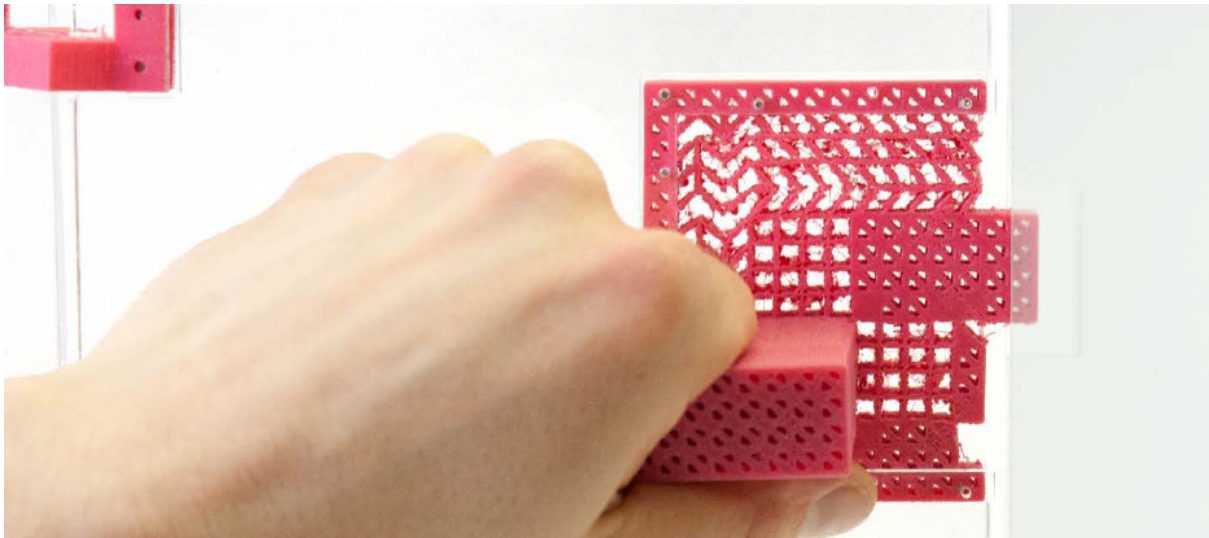


Figure 6.1 Metamaterial Mechanisms by group of Hasso-Plattner Institute researchers; the specialized cells are designed into grid that enables entire structure to move, shear and accommodate specific function.

Source:<http://www.creativeapplications.net/news/metamaterial-mechanisms-3d-grids-with-mechanical-properties/> _28/9/2016.



Figure 6.2 Installation view of protocell-filled glass vessels and horizontal filtering layers of Hylozoic Soil Series 10 by Philip Beesley, for 2012 Fundación Telefónica, Madrid, Spain. Photograph courtesy of Philip Beesley.

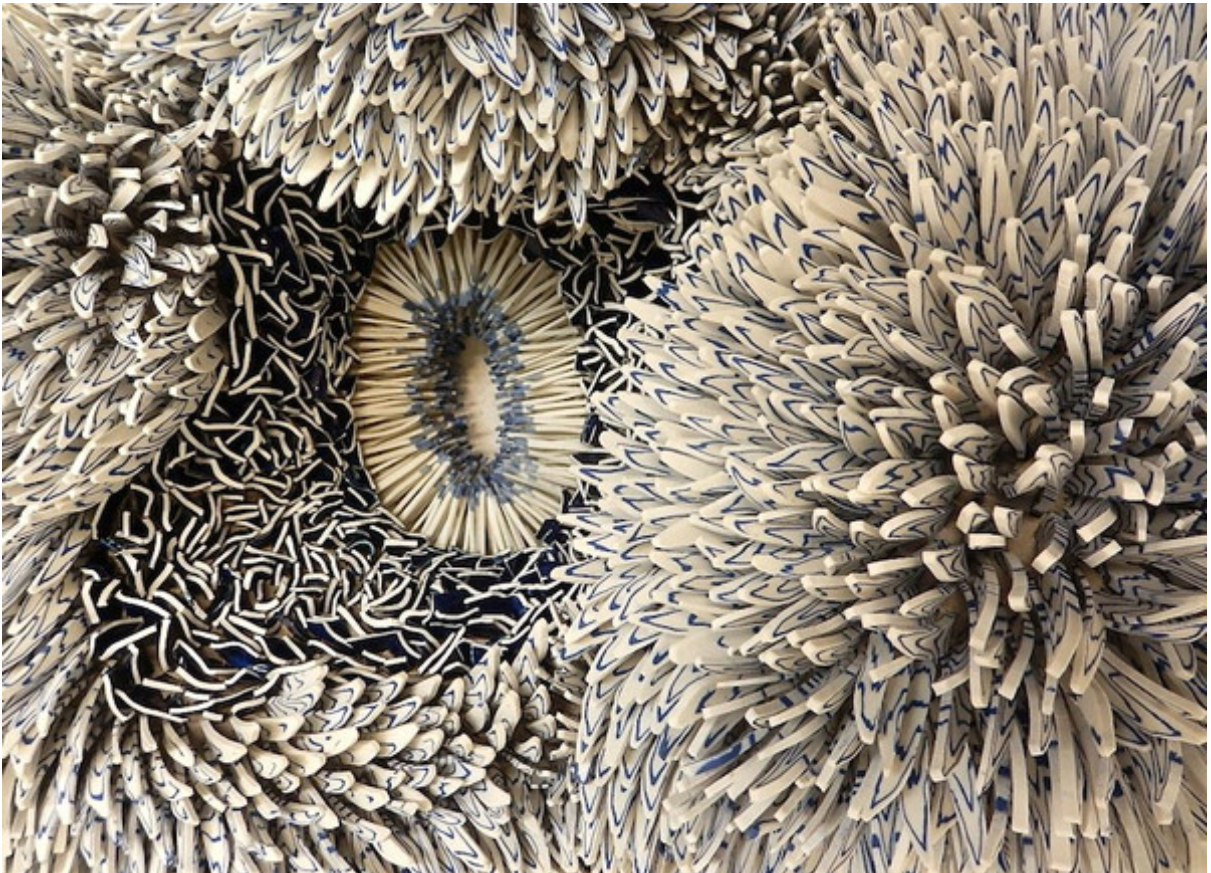


Figure 6.3 Sculpture generated of ceramic feather by artist Zemer Peled. Even it is not employing high technology; self-broken shards are still biologically growing into organic creatures.

Source:<http://www.booooooom.com/2014/10/15/beautiful-sculptures-made-thousands-ceramic-shards-artist-zemer-peled/> _23/9/2016.



Figure 6.4 Astroculture by Suzanne Anker, growing plants under artificial sun. Source: <http://suzanneanker.com> _21/9/2016.



Figure 6.5 Collaboration of Neri Oxman and Stratasys technology in making Björk's 3D printed mask. Picture is showing artist during the opening performance of her 'BJÖRK DIGITAL' 2016. Photograph courtesy of Santiago Felipe. Source: http://blog.stratasys.com/2016/06/30/3d-printed-mask-bjork/_28/9/1016.

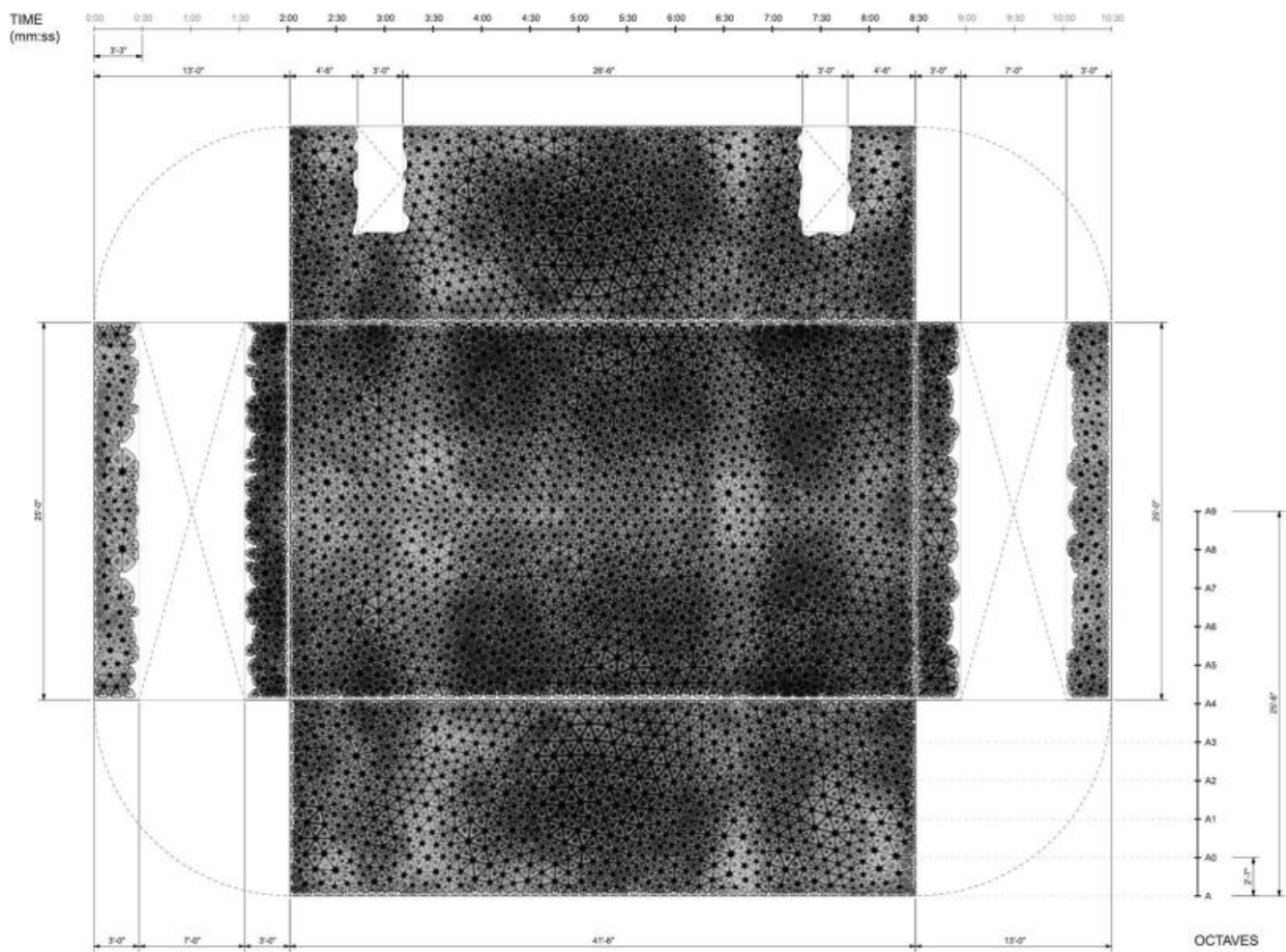


Figure 6.6 Picture is showing final map of tiled cone topography that represent amount of information, taken from the song "Black Lake", on surface of entrance of MoMA, New York. Done for Björk Retrospective, 2015. Photograph courtesy of The Living.



Figure 6.7 Émilie Pitoiset's work in progress. Pitoiset's characters belongs to reality and fictions. The narrative that includes film and performance.

Source: http://www.emiliepitoiset.net/works/E_Pitoiset_portfolio.pdf _22/9/2016.

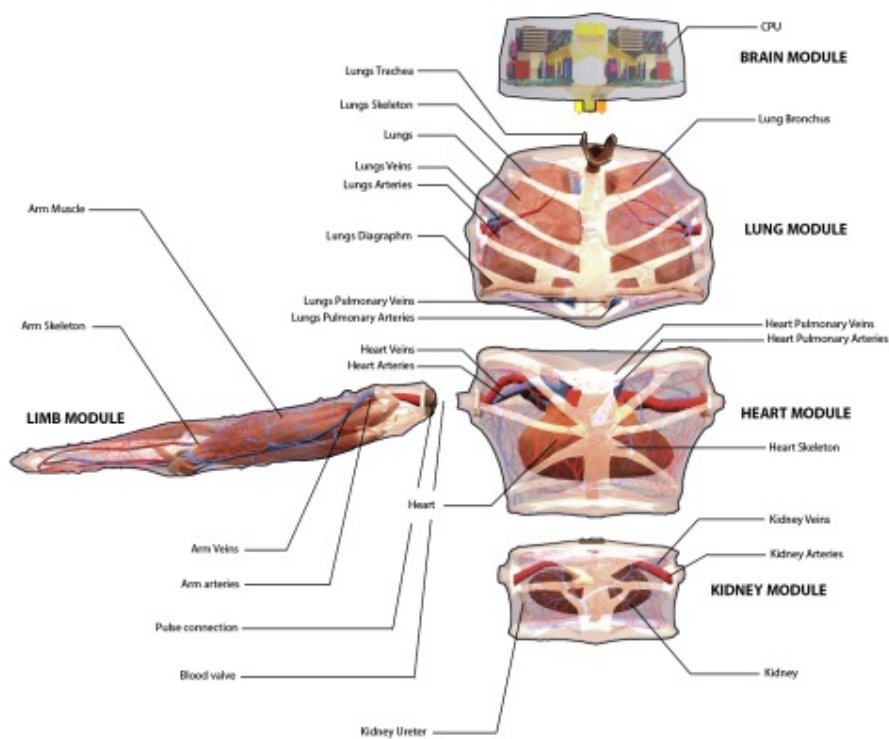


Figure 6.8 Modular Body by filmmaker Floris Kaayk, science fiction story, showing a speculative organism called Oscar, built from cells and feed by blood of its creator.
 Source: http://thomodularbody.com/_10/9/2016.



Figure 6.9 Fusion of Chinese Opera and New Media, showing substitution of human bodies with virtual leftovers.

Source: https://vimeo.com/173139879_25/9/2016.



Figure 6.10 Genetic Barcelona Project, by Alberto Estévez's team, on its first phase (2003-2006), showing an urban environment with bioluminescent trees, made by genetically modified lemon tree. Illustration courtesy of Aleix Bieto and Gabriel Montañés.

Source: http://geneticarchitectures.weebly.com/research_group.html _28/9/2016.



Figure 6.11 Fragment from music video for the song *Dream a Little Crazy* by Australian band Architecture in Helsinki by artist Lucy McRae, showing an eatable copy of humans.



Figure 6.12 City Caverns by the author (2013) an ambient installation, showing one of the city ruins placed into gallery to celebrate Nature's mechanisms for recalculating its route. Photograph by the author.



Figure 6.13 Genetic Trace (2007) project by designer. Project manipulates with an extension of the human body to alter our sensorium. Example shown here is hairy nails, that scratch DNA information while shaking hands. Photograph courtesy of Susana Soares.



Figure 6.14 Project of artist Christo, The Floating Piers (2016) in Pilzone, Italy, that connects island on the lake by structure of 220,000 floating polyethylene cubes, covered of waterproof fabric. Photograph by Alessandro Grassani for The New York Times.



Figure 6.15 The Blur Building Pavilion at the 2002 Swiss Expo by Diller and Scofidio, shows an atmosphere where our sensorium apparatus lays on vision of itself. Photograph courtesy of Diller and Scofidio.

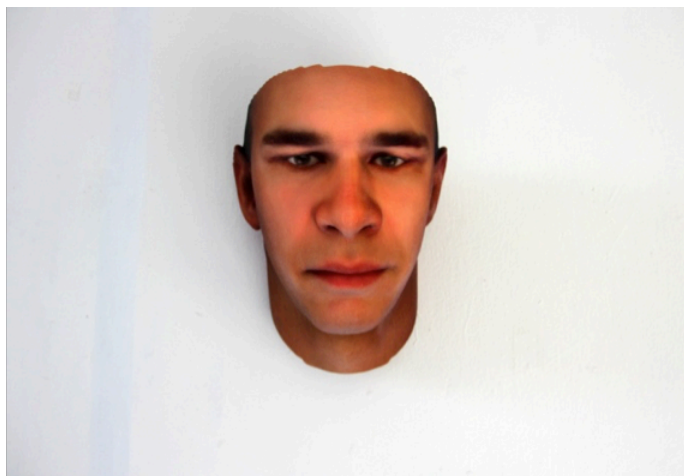


Figure 6.16 Stranger Visions by artist Heather Dewey-Hagborg showing portrait and samples from New York: Sample 6; Collected 1/6/13 12:25pm; Wilson ave. and Stanhope St. Brooklyn, NY; MtDNA Haplogroup: D1 (Native American, South American); SRY Gene: present; Gender: Male; rs12913832: AA; Eye Color: Brown; rs4648379: CC; Typical nose size; rs6548238: CC; Typical odds for obesity. Photograph courtesy of Heather Dewey-Hagborg. Source: http://deweyhagborg.com/projects/stranger-visions_10/10/2016.



Figure 6.17 Project of making microbiological map of Venice, uses bees to help determine the biological makeup of a city. Photograph courtesy of Kevin Slavin.

Source: https://ideas.ted.com/the-most-interesting-ideas-in-architecture-right-now/_10/10/2016

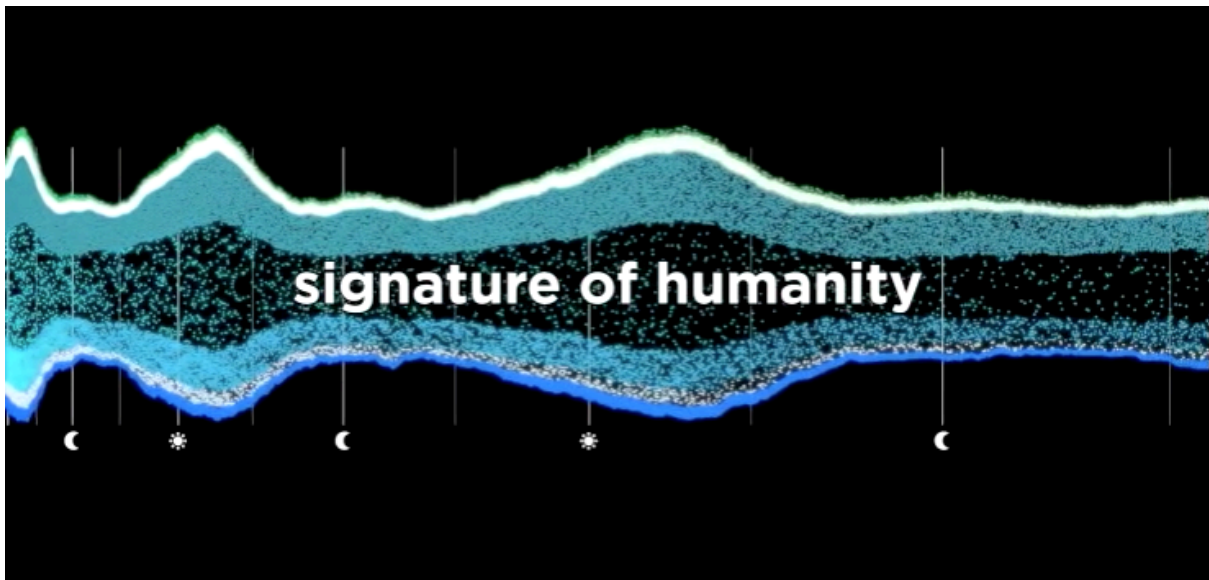


Figure 6.18 Picture shows pulse of human usage of the network. Visual dimension of constant information flow of our humanity, as a signature that is reflected via pattern/network. Project Signature of Humanity run by MIT, The Senseable City Lab and Ericsson in 2012.

Source: http://senseable.mit.edu/signature-of-humanity/_10/10/2016.



Figure 6.19 Picture shows pulse of Nature's strata in minute frame. These patterns are based as a consequence of natural phenomena and human impact on Earth. Project is done for Sonar D+, 2016 by Ruth Jarman and Joe Gerhardt. Source: http://sonarplusd.com/activity/earthworks/_10/10/2016.

CHAPTER 7

7 Fast Forward

I know that in the study of material things, number, order and position are the threefold clues to exact knowledge; that these three, in the mathematician's hands, furnish the 'first outlines for a sketch of the Universe'.

— Sir D'Arcy Wentworth Thompson

7.1 Sensuous, Information, Boundaries and Environments

Chapter 7 (entitled: Fast Forward) presents the methodological and theoretical framework of architectural creation, in order to explore and contribute to some of the issues and questions raised in previous chapters. The idea is to search for importance given by the new insights of world and provide extended thesaurus of architectural realm.

Previous chapters provide the basis for research questions about hybrid theory of Architectural Sensorium, as well as an overview of cutting edge research projects and their relations towards the subject of Beauty. It is about identifying, testing, and formulating theoretical argument, observed in each chapter individually. Throughout this chapter we discuss the new dimensions of terms related to materiality, sensibility, collective interactions seen in self-synthesis, self-synergy, and self-merge, information, space, bounds, virtual and physical realm, seen through theoretical, technological and philosophical standpoint, which may contribute to the development, definition and implementation of method for creation of Architectural Sensorium. The new theory should contribute to the development of design that emerges through the interrelation with the environment, not just as a mere geometrical design forms. Interrelation of spatial pattern and its environment promotes objects with graduated properties perfectly distributed and highly customized to fit multiple of functions. Philosophical views are an inevitable aspect of design development, as this does not become the mere performance of skills and techniques. This approach aims to offer new ways of design as well as to deepen the sensibilities of designed objects and their environment.

*When I am working on a problem, I never think about beauty. I think only on how to solve the problem. But when I am finished, if the solution is not beautiful, I know it is wrong.*⁴³⁷

Concept of embodied cognition by Eleanor Rosch, Evan Thompson, Francisco J. Varela is taken as a reference for interplay between intrinsic properties of the entities and extrinsic ones of the surrounding milieu. That concept presents base for more comprehensive understandings of interaction and joints within architectures. Discussing about perception of the world, mentioned trio has observed two possibilities, one that world is relying on pre-given properties or its internally embedded systems of laws. Emphasis was given to the cognition that is

⁴³⁷ Buckminster Fuller in Darling, D. (2004). *The Universal Book of Mathematics from Abracadabra to Zeno's Paradoxes*. Hoboken, New Jersey: Wiley, p. 34.

mingling between inner and outer worlds' pre-givens, transforming it from pure projection into embodied action.⁴³⁸

*By using the term embodied we mean to highlight two points: first that cognition depends upon the kinds of experience that come from having a body with various sensorimotor capacities, and second, that these individual sensorimotor capacities are themselves embedded in a more encompassing biological, psychological and cultural context.*⁴³⁹

Such understandings are opening a position for architecture to be considered through many dynamic forms, via myriad concepts, and perceived by many senses. Projects described in the previous chapter are presenting an attempt towards creation of sensory mechanisms for the new comprehensions in creation. They are trying not to make something that could think but rather to sense. Like it was an attempt of Artificial Intelligence to make machines to act as human, it is now about to sense like human. Here, we will discuss concepts of sensuous mechanisms, information that have been transmitted by senses and abstracted by mind, boundaries that are defining realm of a milieu, considered as a space of many possibilities.

Self-determination of architecture towards self-synthesizing, self-synergy, and self-merge as an intrinsic competence, tends to become deterministic for the recalculation, and by that revolved again into indeterminist nations. By this shift from deterministic and indeterministic, forms are getting utter again, they are iterated from many-body to one (Fig. 7.1).

7.2 Body Without Organs but With Sensuous

The poet John Milton coined the term sensuous⁴⁴⁰ that relates to the senses or a sensible object. The aim of research on the sensuous is to open the door for understandings of possibilities for embedding of sensorium into architectural

⁴³⁸ Varela, F., Thompson, E., & Rosch, E. (1991). *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge: MIT Press.

⁴³⁹ Ibid., pp. 174-173.

⁴⁴⁰ Merriam Webster. (n.d.). *Merriam Webster Dictionary*. Retrieved 11 7, 2016, from <http://www.merriam-webster.com/dictionary/sensuous>

entity, and to explore how such hybrid could benefit possible realization and encounter of the Beauty.

Innovative projects mentioned in the previous chapter are generally focusing on importance of the niche, hidden spaces of our realities that will enhance, extend or alter our known senses, by affecting and being affected by stimuli from its own environment. Here, we will discuss about notions of the senses, sensation, and sensibility.

Relation of the proposed hybrid theory of Architectural Sensorium and patterns mentioned as background troika of this research is coming from the concept of decomposition and dislocation. Decorations of the body, by different patterns like tattoos or masks, are decomposing body with its physical presence and by that taking it into other space (Fig. 7.2). For Foucault, this means to replace body into another milieu with “secret powers and invisible forces.”⁴⁴¹

*My body is like the City of the Sun. It has no place, but it is from it that all possible places, real or utopian, emerge and radiate.*⁴⁴²

This concept if it is applied to architecture is forcing architecture to be pulled in to distinguish of what is its own milieu and by that, to over stimulate notion of senses and finally act as a body in crisis, which will open possibilities to redefine essence of its Beauty. Focusing on what architecture could become, analog to introduction of the new human element of robotic products, RoboCop:

*It's not what man can create, it's what man can become.*⁴⁴³

To apply on architecture the thought of Benedict Spinoza “what a body can do”,⁴⁴⁴ we can ask what architecture can do.

⁴⁴¹ Foucault, M. (2006). Utopian Body. In C. A. Jones (Ed.), *Sensorium: Embodied Experience, Technology, and Contemporary Art* (pp. 229-234). Cambridge/London: MIT Press, p.231.

⁴⁴² Ibid., p. 233.

⁴⁴³ Billington, A. (Director). (2014). *OmniCorp's 2027 CES Keynote Presentation 'RoboCop' Viral Video* [Motion Picture].

⁴⁴⁴ See in: Marshall, E. (2013). *The Spiritual Automaton: Spinoza's Science of the Mind*. Oxford: Oxford University Press.

Gilles Deleuze in writings about Francis Bacon's logic of sensation has mentioned Artaudian body without organs and a wave of the senses.

*The body is the body / it stands alone / it has no need of organs / the body is never an organism / organisms are the enemies of bodies.*⁴⁴⁵

Distinction between the abstract and sensational forms is explained by introduction of an tactile dimension of flow of the waves, that is producing a vibration of the sensation. Sensible form acts on soft part of body e.g. flesh, while abstract form acts on more rigid parts, bones. This action links sensation to the soft part while abstraction is linked with its rigid parts. While Cezanne's sensation is embedded within the body; Baconian one passes "from one "order" to another, from one "level" to another, from one "area" to another."⁴⁴⁶

By Deleuze force is the condition of sensation. Sensation relies on force that a body is exerting.⁴⁴⁷ Force promotes creation of a dynamic body, opening possibilities for re-calculations, and immanence of many-body. Deleuze questioning:

*How will sensation be able to sufficiently turn in on itself, relax or contract itself, so as to capture these non given forces in what it gives us, to make us sense these insensible forces, and raise itself to its own conditions?*⁴⁴⁸

This could be observed in relation to the notion of the information, its' flux, a continuum, a switch to omni-attribution or many-body, that have been mastered by sensation, an agent of bodily deformations.⁴⁴⁹

⁴⁴⁵ Artaud, A. (1977). *The Body is the Body*. *Semiotext(e)*, 2 (3), 38-39.

⁴⁴⁶ Deleuze, G. (2003). *Francis Bacon: the logic of sensation*. (D. W. Smith, Trans.) London/New York: Continuum, p. 36.

⁴⁴⁷ *Ibid.*

⁴⁴⁸ *Ibid.*, pp. 56-57.

⁴⁴⁹ *Ibid.*

*Sensibility develops within organic matter, but gets also specified and thus determined through the more abstract relation of information. And information is not a stable factor, but gets altered by cultural, technical and political phenomena.*⁴⁵⁰

Art, music, and thus even architecture could be mechanisms, among others, of folding force from invisible to visible, or non-sonorous forces to sonorous ones. The body without organs is defined by an indeterminate organ and it is more qualitative - than the organism that is defined with determinate organ.⁴⁵¹ Baconian pre-givens are virtual and actual images that are covering surfaces or are embedded in ourselves, possessing potential for constitutive levels towards deformations.⁴⁵²

*What is essential is invisible to the eye.*⁴⁵³

Shelley McNamara and Yvonne Farrell - founding partners of Dublin-based Grafton Architects, said about feeling spaces with our body and senses:

Buildings tell the stories of our lives in built form...

*We walk through and feel spaces with our whole bodies and our senses, not just with our eyes and with our minds. We are fully involved in the experience; this is what makes us human.*⁴⁵⁴

To experience decomposed architecture, as omni-layered entity, is crucial in the construction of possibilities for making impossible; affecting and being affected by its sensuous; and understanding importance and relations to the Beauty with embodiment of its own sensorium. Importance of omni-layering of the architectural creation sets a human experience into motion, and by its possibilities

⁴⁵⁰ Mongini, C. (2015). Morphogenesis Under Construction: Tracing the Process of Individuation Along Physico-Aesthetic Coordinates. In A. Sarti, F. Montanari, F. Galofaro, & A. Sarti (Ed.), *Morphogenesis and Individuation*. Springer International Publishing Switzerland, p. 76.

⁴⁵¹ Deleuze, G. (2003). *Francis Bacon: the logic of sensation*. (D. W. Smith, Trans.) London/New York: Continuum.

⁴⁵² Ibid.

⁴⁵³ De Saint-Exupéry, A. (1995). *The Little Prince*. (I. Testot-Ferry, Trans.) Wordsworth Editions, p. 82.

⁴⁵⁴ McNamara, S., & Farrell, Y. (2012). Lecture: *Architecture as the New Geography*. London: Royal Academy of Art.

to extend own senses. Disembodied architecture where relevance of its body is important, but its spatial organization, or better say its deformations, are left to be oscillating constantly, between a realistic interpretation and dimension of the interpretations that should be discovered.

This approach of decomposing architecture with an embedded sensorium - suggests an alternative basis for processes of creation in general. It is based on idea of creations of uncertain niches found in Nature that are waiting their realization as a response on affection from environment. Like Baconian pre-givens, realized upon requests of the body of future architectures, they are being immersed in real or virtual milieu and shaped by (un)materials from both realms. Real and virtual realms become fundamentally inseparable and mutually informative. It allows future architecture to explore its milieu with its body sensorium and reflects to it. So, architecture is not seen as passively reflective of the surroundings, but as an active constructor of its own reality and virtuality. Thus, Beauty becomes universal driver for the system to be realized, arise within system itself, as a form that reflects its needs and goals, has its attraction to the environment, and being attracted by environment but not necessarily both.

The concept of “bio-info sensibility” recently coined by Franco Berardi (Bifo) and Alessandro Sarti states:

*Sensibility is the faculty which makes possible to find the path which does not exist, the link between things that have no intrinsic or logical implication. Sensibility is sense-driven creation of conjunctions and the ability to perceive the meaningfulness of the shape that is emerging from chaos, not by way of recognition, not because it is compatible with some form that we have seen before—but simply because we perceive its aesthetic correspondence, its accordance (conformity) with the expectations of the conscious and sensible sensitive organism.*⁴⁵⁵

⁴⁵⁵ Berardi, F. (2014). *DOCTORAL DISSERTATIONS: And. Phenomenology of the end. Cognition and sensibility in the transition from conjunctive to connective mode of social communication.* Helsinki: Aalto University publication series, p.12.

7.3 First There Was the Voice and Out of the Voice I Was Born

Linkage between information and architecture becomes well known by the introduction of the computation into architectural practice. Nowadays, information/data have been elegantly passing from virtual to physical realm, and in that process, produce tangible forms of information. Information was materialized even before that. Benedict nuns used cognitive maps to make Hvar's lace. Loom, derived from Old English word *geloma* an element of unknown origin⁴⁵⁶, was used as a medium for materialization of the data while production of socks could be considered as an early 3D printer.

*In its simplest form, computation is a system that processes information through a discrete sequence of steps by taking the results of its preceding stage and transforming it to the next stage in accordance with a recursive function. Such an iterative procedure based on recursion has proved to be astonishingly powerful and is classified as belonging to a class of machines having universal properties.*⁴⁵⁷

Information is accepted as a descriptor of matter, energy and thus space and time. Gregory John Chaitin argues that matter has lost its central stage in world of creation. Matter and Energy, fundamentals of physical attributes and properties of architecture, are extended by notion of Information defined by its virtual property. William Bateson the man, who first uses word genetics, has suggested that living things are vortexes through which matter passes, but not matter itself.⁴⁵⁸

Information has revolutionized notion of architecture, but what architecture means from perspective of information. How architecture is seen from the realm of information (Fig. 7.3).

⁴⁵⁶ Etymonline.com. (2001). *Loom*. Retrieved 2016, from Online Etymology Dictionary: <http://www.etymonline.com/index.php?term=loom>

⁴⁵⁷ Chu, S. K. (2006). Metaphysics of Genetic Architecture and Computation. *Architectural Design*, 76 (4), 38-44, p. 40.

⁴⁵⁸ Lowe, A. (2007). Moulding wet materials into Replicas of themselves. In E. Gomart (Ed.), *Genesis Life at the End of the Information Age; published on the occasion of the homonymous exhibition at Central Museum, Utrecht (14 April - 12 August 2007)* (pp. 81-85). Utrecht: Central Museum.

Claude Shannon firstly described information theory in 1948, in paper at Bell Systems Technical Journal, *A Mathematical Theory of Communication*. Up to that time, there was no strong idea what a message was. What Shannon proposed is quantification and unity of all information media, by encoding all communication into bits. By Shannon, no matter of its content, message is represented with 0's and 1's.⁴⁵⁹ He has also described relation between carriers, message, and entropy. By that theory entropy has crucial role in transfer of information; low entropy carrier carries a high entropy message.⁴⁶⁰

Since a fundamental role of information is to be transferred, transformed, transferred again, entropy signifies life of information. Comparing to Schrödinger explanation of life, as a process of change or exchange, called metabolism, when living organisms are freeing it selves from low level of entropy, that cannot help producing while alive, and by that keep staying in safe mode, or far from state of maximum entropy which will cause death. Sucking orderliness from its environment is a device by which an organism maintains its high level of orderliness/life/low level of entropy contrary to maximum level of entropy/death.⁴⁶¹

With arrival of computers at 1960s, scientists and philosophers move from materialism theory to the functionalism. They have seen the computing as storing information in memory and that acts as mechanical mind. By the 1980s, functionalism becomes substituted by qualia, giving importance to qualitative character of sensation.⁴⁶²

In continue, information gets its sibling called quantum information. Differences between classical information described as bits that are either 0's or 1's and quantum information that is coming in superposition, enabling things to exist in different states on same time. For many scientists, today information is not only descriptor of the world but its fundamental part. Juan Martín Maldacena an Argentine-American theoretical physicist said that information is to be

⁴⁵⁹ Aftab, C., Kim, T., & Yeddanapudi. (2011, Fall). *Information Theory: Information Theory and the Digital Age*. Retrieved November 15, 2016, from Web MIT: <http://web.mit.edu/6.933/www/Fall2001/Shannon2.pdf>

⁴⁶⁰ Ibid.

⁴⁶¹ Schrödinger, E. (1944). *What is Life?* Cambridge: Cambridge University Press.

⁴⁶² Smith, D. W. (2007). *Husserl*. London/New York: Routledge.

fundamental part of world while it is correlating by laws that are constraining it.⁴⁶³ Similarly, mathematician Stephen Wolfram, argue that rules are fundamental of the world and they are generating what we see in Nature.⁴⁶⁴

Raphael Bousso is a theoretical physicist and string theorist known for the proposal of Bousso's holographic bound, a general relation between the curved geometry of space-time and its information content. Information tells space-time how to curve; space-time tells information how to disappear. That is an evidence for a universal relation between geometry and information.⁴⁶⁵

Unity of quantum mechanics, gravity and matter could lead us to phantasm matter that will violate rule of information, in given space-time geometry, controlled by the area.⁴⁶⁶ In quantum mechanics, information cannot be lost. We are surrounded by information; we are receiving, producing, transforming information and evolving it again into network. Explained by Bousso, amount of information that one can fit on surface, box, at a density of one bit per Planck tile, is sufficient to tell you absolutely everything that could happen to that box. Meaning that amount of information is limited by area, not volume. Boundaries are tiled by one bit per Planck⁴⁶⁷, or better saying tiled by information.

Myriad of nerves that are connecting every spot on our skin with brain, are populated on surface of skin. All that system is involved in sensory experience to abstraction of that experience. Our skin is by that understanding, also tiled by information. If architecture is designing void using boundaries, and boundaries are consisted out of tiles of information then architecture and information are strongly connected in production, definition, and formation of space.

⁴⁶³ Maldacena, J. M. (2014). Is Information Fundamental? (R. L. Kuhn, Interviewer) PBS.

⁴⁶⁴ Wolfram, S. (2014). Is Information Fundamental? *Closer to Truth*. (R. L. Kuhn, Interviewer) PBS.

⁴⁶⁵ Bousso, R. (2014). Perturbative Proof of the Covariant Entropy Bound. *FQXi 4th International Conference on Physics of Information*. Puerto Rico.

⁴⁶⁶ Bousso, R. (2014). Is Information Fundamental? *Closer to Truth*. (R. L. Kuhn, Interviewer) PBS.

⁴⁶⁷ Ibid.

Introduction of information in process of creation and understanding of universe that is rather discrete is opening continuous possibilities for perception of architectures as digital form and by that discrete rather than analog.

Disembodiment of the information unified all modes of communication and by it architecture. So, information could be embedded in different forms of architectural creations and being disembodiment, again represented in realm of digital. For Marvin Lee Minsky, an American cognitive scientist in the field of artificial intelligence, there is no actual or real world, only possible one (Fig. 7.4).⁴⁶⁸ Scientists are making models to describe reality. Architecture is getting a role of descriptor of the possible worlds.

If it is possible to decompose everything and to abstract it into 0s and 1s or its superposition and model it again in many-body, what is that Beauty; a byproduct or process itself. If the Beauty is bit, then it can be materialized. But whether its notion is homogeneous or heterogeneous; relying on singularity or wholeness? Does its value carry an importance when it is decomposed or when it is taking part of the wholeness, or could it be both?

Scientists are taking information as fundamental and as such ruled by laws. By those understandings, connection is an inevitable process of existence. Some elements are connected and some of will be connected. Interconnection is a process of composing and decomposing information. This flow of information from abstract to physical has no ends.

Jackson Pollock perpetrator of abstract expressionism is saying that he is working like Nature does, inside out.⁴⁶⁹ Pollock is not abstracting nature, but an environment that is for him, a canvas.⁴⁷⁰ Such abstraction is then transmitted and received by our sensorium, meaning that abstraction becomes sensually accepted. Information is agent that can be transferred into abstract, material or sensual nations.

⁴⁶⁸ Minsky, M. L. (2014). Is Information Fundamental? *Closer to Truth*. (R. L. Kuhn, Interviewer) PBS.

⁴⁶⁹ Emmerling, L. (2003). *Jackson Pollock 1912-1956*. Köln: Tachen.

⁴⁷⁰ Taylor, R. (2006). *Chaos, Fractals, Nature: A New Look at Jackson Pollock*. Eugene: OR: Fractals Research Laboratory.

7.4 Flying Carpet of 21st Century

Seen from different perspectives it is obvious that boundaries are not pure separators between in and out. To understand building envelopes as an “extended spatial zone that encompasses all interactions of the physical building envelope with the various conditions and dynamics of its specific setting, be these cultural, environmental or otherwise.”⁴⁷¹, several aspects will be examined.

Concept that stresses ideas of boundaries as an extended dynamic medium of interaction related to biological, metaphysical and spatial formation, will be examined via different aspects: (1) bound as an extension of our own skin; (2) bound as a boarding frame; (3) bound as a transitional element.

Biological membranes, boundaries of an organism, are life mechanisms with a capability to control flow of substance, receiving, sending and processing data, from inside and outside. In such trafficking and transport, organisms are also generating energy.⁴⁷² Skin of human body is the most external receptor for experiencing surrounding milieu. Skin is sensory receptor, and as such our mechanisms for accepting pure information, without being abstracted by the mind understandings. Working on extension of our skin could be beneficial in a way of getting an direct medium for sending, receiving and processing feedback from the milieu and getting adapted and by it recalculating itself. Abstracted stimulus that are flying from bound to bound, introduces organisms with the sensuous experienced knowledge. Entities that are finding themselves in side of sphere of these interactions are becoming also reflectors and receptors of sensuous experiences. Such milieu could become a factory for making Architectural Sensorium. In that process, a boundary of the architectural entities becomes extension of our own senses. Senses are becoming more objective that is mostly being accepted, especially in conventional “western” understandings, and by that understanding, mind abstractions are becoming more subjective. Boundary between subjective and objective is fading out. Marshall McLuhan sees mankind as an extension of the skins:

⁴⁷¹ Addington, M., & Schodek, D. (2005). *Smart Materials and Technologies for the Architecture and Design Professions*. Oxford: Elsevier, p.38.

⁴⁷² Watson, H. (2015, October 26). Biological membranes. *Essays in Biochemistry*, pp. 43-69.

*In these electric age, we wear all mankind as our skin.*⁴⁷³

Tangible or intangible boundaries are reflecting our own senses. They are affecting or being affected, and by being amended with sensorium, reflecting and receiving reflections.

Importance of artistic understandings of sensuous experience and input that is received via patterns of visual, tactile and soon, olfactive and gustatory modalities, is seen in picture that 80% of the people which are working on research about virtual reality implementations and modalities are artists. Artists are equipped with mechanisms to deal complex possibilities of human sensorium.⁴⁷⁴

*Skin is feeding the brain with perceptions of the world, but conversely brain is supplying the skin with sensitivity, aesthetic inclinations, and tendencies: desire. Desire is not the need of something, but the sensible creation of the world as aesthetically meaningful environment.*⁴⁷⁵

On spatial level skin is two-layered membrane that “stays between us and the world...continuously re-generated, emerging at the surface, aging, decaying and finally disappearing, melting into air, forgotten”.⁴⁷⁶ Skin is topological element⁴⁷⁷, folding towards surrounding milieu but as well towards interior of itself.

Legacy of the classical architecture, especially one more oriented to western architecture, was to work within boundaries as a given fixed form. By the subdividing the given pattern, new patterns occur, but there were no possibilities to go past the boundary. Balmond Cecil attempts, by having this legacy in mind, to find a way to “open” new dimension within given frame, by process of

⁴⁷³ Marshall McLuhan, *Understanding Media in: de Kerckhove, D. (1998). The Second Skin. Artfutura catalog 1998. Barcelona.*

⁴⁷⁴ De Kerckhove, D. (1998). *The Second Skin. Artfutura catalog 1998. Barcelona.*

⁴⁷⁵ Berardi, F. (2014). *Doctoral Dissertation: And. Phenomenology of the end. Cognition and sensibility in the transition from conjunctive to connective mode of social communication.* Helsinki: Aalto University publication series, p. 49.

⁴⁷⁶ Ibid.

⁴⁷⁷ See in: Beylot, P., Gingins, P., Kalra, P., Magnenat Thalmann, N., Maurel, W., Thalmann, D., et al. (1996). 3D Interactive Topological Modeling using Visible Human Dataset. *Computer Graphics Forum*, 15 (3), pp. 33-44.

compilation rather than subdivision within the form's given boundary. New pattern of given boundary, will in scale us, while function of produced pattern will define material. So, in system of pattern making, given boundary, compiled pattern within that boundary, will define function and lead to define material.⁴⁷⁸

Thinking about boundaries, Beatriz Colomina wrote about concept of framing:

*Any concept of the window implies a notion of the relationship between inside and outside. In Le Corbusier's work this relationship has to do with the contrast between the infinity of space and the experience of the body, a body that has become a surrogate machine in an industrial age...to an unfixed, never reified image, to a sequence without direction, moving backward and forward according to the mechanism or the movement of the figure.*⁴⁷⁹

Bounding plane of this age, such as roof of modernist architecture becomes deformed into bounding curve, something that was flat and dull becomes folded and multilayered. New aesthetics of the cutting-edge project shows, not just something out of the view, but something out of the common reality.

Freud's psychoanalytical methods included concept of decomposition of the body. Spatial organization of the scene of his consultation room (Fig. 7.5) has played important role in treatments⁴⁸⁰ and has been decomposed also. Mirror attached onto transparency of the window has an understanding of the multilayer and dynamism. It is basically dematerialized reality, augmenting an additional layer of transparency and reflectivity on it, a forerunner of the today models of augmented reality. Patterns could be understood as transformers of the bound between real and virtual, tangible and intangible.

Inclusion of sensory extensions of our own and surrounding entities will certainly have a resonance on understandings of our realities.

⁴⁷⁸ Balmond, C. (2015, November 30). Material Number. Royal College of Arts, London.

⁴⁷⁹ Colomina, B. (1987). Le Corbusier and Photography. *Assemblage*, 4, 6-23, p. 21.

⁴⁸⁰ Fuss, D., & Sanders, J. (2011). Inside Freud's Office. In L. Weinthal (Ed.), *Toward a New Interior an Anthology of Interior Design Theory* (pp. 446-475). New York: Princeton Architectural Press.

*It is only because we can include such sensory inputs as artificial vision, hearing and touching into our extended sensorium that we can truly consider the possibility of "Artificial Consciousness". A.I. is truly A.C. minus the interplay of the senses. It is only by adding the sensory interplay that we can reconstitute outside our body the kind of "interiority" which is characteristic of human consciousness.*⁴⁸¹

Beauty of these new extended creatures with sensorium will certainly be the surprise in continuum line of aesthetic history.

7.5 Virtual and Real Space

Besides that architecture is raised in space, it is also raising the space. Architectures inevitably interact with its surrounding milieu, by shaping a possible world within existing one. By that understanding, its final goal is to produce new reality by manipulating existing one, rather than relying on pure representation of it. Toyo Ito, in lecture *Generative Order*, said:

*A tree assumes its form depending upon its variety. By repeating very simple rules, the tree creates a very complex order. But a tree also decides its own specific form as it grows. A tree decides its shape in response to its surroundings. A tree is always open toward the environment. When you stand beneath a tree— within the span of its branches, within the space it creates— it is impossible to determine whether you are inside or outside.*⁴⁸²

In *Performance-Oriented Architecture* book, in the Introduction chapter, we have a discussed on how form is not pure shape of material object but milieu of conditions, modulations, and microclimates that emanate from exchanges of environment and objects.⁴⁸³ Performance is presented as driving concept for design where form and function are in synergetic relation within natural, cultural,

⁴⁸¹ De Kerckhove, D. (1998). *The Second Skin. Artfutura catalog 1998*. Barcelona.

⁴⁸² Toyo, I. (2012). *Generative Order*, 2009, Lecture simultaneously translated by Noriko Taniguchi. In J. Turnbull (Ed.), *Toyo Ito: Forces of Nature* (pp. 32-88). Princeton Architectural Press.

⁴⁸³ Hensel, M. (2008). Performance-Orientated Design Precursors and Potentials. *Architectural Design*, 78 (2), pp. 48-53.

and social environment. Performative capacity is characterized by four domains of “active agency” the human subject, the spatial and material organization and the environment.⁴⁸⁴ A consequence of material practice or abiotic elements lays in partitioning of space and modulation of environments, which can absorb and satisfy multi-functional and aesthetic criteria and preferences. In addition to these abiotic elements, this approach involves biotic elements, e.g. humans or inhabitants who become active part in “structuring a field of possibilities” and by that architecture can open “new social formations and institutional form”.⁴⁸⁵

The question that is addressed particularly in this section, but having been mentioned in others, is a creation of milieu by (un)materials like senses. The intention of this section is to get closer to an understanding of why and how architecture is reflecting and being reflected into space could produce not just “new” space but a space with attributes.

*Because we can today project the sensory interplay which is required for consciousness outside the closed universe of our minds, our convenient distinctions between objectivity and subjectivity have ceased to be entirely reliable: the boundary line is blurred when it is not-eliminated altogether.*⁴⁸⁶

Searching for definition of surrounding environment that is reflecting and being reflected by an architectural work two terms are added to the list of notions that are of interest to this work, they are atmosphere and ambient. Both are having dual nature in their definitions. Atmosphere has more meanings, ones more related to physical deterministic and other of influences made by human, like it is an aesthetic effect of artwork.⁴⁸⁷ Besides dual meaning of atmosphere, there is duality in the meaning of ambient. Ambient is percept as technical term, when is explored ambient of light, acoustic, meteorologist’s pressures, air or temperature.

⁴⁸⁴ Hensel, M. (2010). Performance-Oriented Architecture - Towards a Biological Paradigm for Architectural Design and the Built Environment. *FORMAkademisk*, 3 (1), pp. 35-56.

⁴⁸⁵ Ibid.

⁴⁸⁶ De Kerckhove, D. (1998). *The Second Skin. Artfutura catalog 1998*. Barcelona

⁴⁸⁷ Merriam Webster. (n.d.). *Merriam Webster Dictionary*. Retrieved 11 7, 2016, from: <http://www.merriam-webster.com/dictionary>

Ambient has more subjective meaning when it is used in poetry. The word has its Latin roots as verb *ambire*, meaning, "to go around".⁴⁸⁸

Focus of this investigation of atmosphere and ambient is placed on their aesthetic effects and poetic meaning. The revision of both has led to the notion of environment which also have more meanings, "the complex of physical, chemical, and biotic factors (as climate, soil, and living things) that act upon an organism or an ecological community and ultimately determine its form and survival"⁴⁸⁹ and "the aggregate of social and cultural conditions that influence the life of an individual or community."⁴⁹⁰

As mentioned above, focus is placed on elements that are creating mood of a place rather than its physical conditions. For production of nowadays architecture that is sustainable on its technical level but as well on its sensuous level, meaning of psychic conditions is also relevant. But since here is investigation about creation of Architectural Sensorium, level of human perception and reflection of created space is on focus.

*What do we mean when we speak of architectural quality? It is a question that I have little difficulty in answering. Quality in architecture . . . is to me when a building manages to move me. What on earth is it that moves me? How can I get it into my own work? . . . How do people design things with such a beautiful, natural presence, things that move me every single time. One word for it is Atmosphere.*⁴⁹¹

As a case study for discussing of making mood of pleasure it was taken a work by artist David Spriggs. Spriggs' works are emerging from relational dynamism of contours percept by interplay of edges.⁴⁹² Observer's movements define a milieu of entire atmosphere. There is no final form, only encounters. His *Paradox of*

⁴⁸⁸ Merriam Webster. (n.d.). *Merriam Webster Dictionary*. Retrieved 11 7, 2016, from <http://www.merriam-webster.com/dictionary>

⁴⁸⁹ Ibid.

⁴⁹⁰ Ibid.

⁴⁹¹ Zumthor, P. (2006). *Atmospheres: Architectural Environments – Surrounding Objects*. Basel: Birkhäuser, p. 11.

⁴⁹² Manning, E. (2009). *Relationescapes: Movement, Art, Philosophy*. Cambridge/London: The MIT Press.

Power (2007, Fig. 7.6) works on bleaching one milieu into another. There is no straight difference between blue and red. By straight here is meant, explainable, and definable, like there is no any more straight difference between virtual and real. In this work blue, cannot be percept without red, the same as virtual without real. The blue and red are attacking our sensorium by its “own quasi appearance.”⁴⁹³ Movement of observers around artworks is directly placing participators in milieu and as such defining an atmosphere but as well as in process of creation of many bodies. This is great example of synergy of artwork and humans in production of many-body milieu of atmosphere and ambient attributes.

Following Spriggs’ examination, this chapter proceeds towards exploration of the projects that are tending to an approach of creating with environment. In order to find (un)materialistic attributes, atmosphere and ambient are reduced to nothing, and space that has containing nothing to a void. Two references are following this investigation, first Michael Foucault in *Of Other Spaces* says:

*The space in which we live, which draws us out of ourselves, in which the erosion of our lives, our time and our history occurs; the space that claws and gnaws at us, is also, in itself, a heterogeneous space. In other words, we do not live in a kind of void, inside of which we could place individuals and things. We do not live inside a void that could be colored with diverse shades of light; we live inside a set of relations that delineates sites which are irreducible to one another and absolutely not super imposable on one another.*⁴⁹⁴

and Umberto Boccioni in his *Plastic Dynamism* says:

⁴⁹³ Manning, E. (2009). *Relationscapes: Movement, Art, Philosophy*. Cambridge/London: The MIT Press, p. 145.

⁴⁹⁴ Foucault, M. (1984). *Des Espace Autres/Of Other Spaces: Utopias and Heterotopias, Architecture/ Mouvement/ Continuité*. Note from source: This text, entitled “Des Espace Autres,” and published by the French journal *Architecture/ Mouvement/ Continuité* in October, 1984, was the basis of a lecture given by Michel Foucault in March 1967. Although not reviewed for publication by the author and thus not part of the official corpus of his work, the manuscript was relaeased into the public domain for an exhibition in Berlin shortly before Michel Foucault’s death. Translated from the French by Jay Miskowiec.

*We shall see the shape of the atmosphere where before was only emptiness.*⁴⁹⁵

There are dual understandings of void, one fearful and other fruitful. Negative understandings are more related to the modern western philosophy, while oriental, positive one is considering void as something rather than nothing⁴⁹⁶ - an stage of imagination and creation of many-body, as a positive suggestion of ambient, atmosphere, entropy, 0s and 1s, or their superposition. In traditional Japan, space Ma is most important space, a void that transmits sensuous, like are changes of time, light, smell and similar.⁴⁹⁷ Heideggerian space, even been defined by the boundaries, pretends towards beginnings, not endings. These boundaries are possessing natural essence not to stop something, but to begin it.⁴⁹⁸

Works of *Building Cuts* of Gordon Matta Clark are more about revealing of void than constructing it. Such revealed void is not an empty space, a contrary it is a space full of possibilities. By that understanding, architecture is revealing its emptiness as its natural essence. Emptiness is becoming niche for natural demonstration of possibilities.

Several architectural approaches are working on shaping environment that is suggesting presence of an atmosphere, mood or ambient, relying on different elements and space shapers. Partial conclusions of constructions of an ambient or atmosphere, derived from interplay of environment and architecture, and relying on importance of bleached border of real and virtual environment; void, rather than solid; and raising an importance towards an aesthetical environment, are as follows: (1) constructing or enhancing an ambient or atmosphere from, what is present in that particular space; (2) from what is present in observer of the space; and (3) what is introduced from artificial realm.

⁴⁹⁵ Umberto Boccioni, Plastic Dynamism 1913, in: Emmerling, L. (2003). *Jackson Pollock 1912-1956*. Koln: Tachen, p. 143.

⁴⁹⁶ Liott, S.-J. A., & Belfiore, M. (2012). Background. In S.-J. A. Liott, & M. Belfiore (Eds.), *Patterns and Layering: Japanese Spatial Culture, Nature and Architecture* (pp. 6-7). Berlin: Gestalten.

⁴⁹⁷ Richardson, C. (Director). (2014). *Sensing Spaces – Architecture Re-imagined, Visiting Kengo Kuma [Motion Picture]*.

⁴⁹⁸ Heidegger, M. (1971). Building Dwelling Thinking. In *Poetry, Language, Thought* (A. Hofstadter, Trans., p. 154). New York: Harper Colophon Books.

First group could consider an environment consisted of small components parts that are taking parts of weak architecture of Kengo Kuma works:

Weak architecture' is also about our relationship with space, and I believe that the human body responds to this kind of weakness. For instance, the ground is not like concrete – there are leaves and particles of soil, details that provide diversity and richness, which is what human beings need to find in architecture...No shadow means no spirit...⁴⁹⁹

Besides Kuma's environment, is Rem Koolhaas' environment that is also cultivating an importance of givens of certain space, that has for result, not a signature of author, in this case Koolhaas, but of the mood of space.

As second group example is an environment shaped with voice that is celebrating community, presented in project of Diébédo Francis Kéré for exhibition in The Royal Academy of Art, 2014:

Every night when I was a child my family gathered together. We would sit close to each other in a sort of circle and listen to the adults telling stories; there was no light so we couldn't see each other. It was an intense feeling of being in a safe, protective space that had been created through our presence, along with the lone voice of the storyteller in the darkness. All of us in the circle hung on every word.⁵⁰⁰

Placing building into a revolutionary environment is giving it role of an active involver into social conditions like it was a case of architecture of post-revolutionary Marxist society. For Alexei Gan and Moisei Ginzburg buildings are activists in revolutionary movements.⁵⁰¹

⁴⁹⁹ Richardson, C. (Director). (2014). *Sensing Spaces – Architecture Re-imagined*, Visiting Kengo Kuma [Motion Picture].

⁵⁰⁰ Richardson, C. (Director). (2014). *Sensing Spaces – Architecture Re-imagined*, Visiting Kéré in Burkina Faso [Motion Picture].

⁵⁰¹ Cooke, C. (1995). *Russian Avant-Garde: Theories of Art, Architecture and the City*. London: Academy Editions, p. 118.

Third group could be Skylar Tibbits' intelligent environment, consisted of objects of multiple forms and myriad performances.⁵⁰² An evolving environment presented in articulation of Frezer's *Evolutionary Architecture* mediated by interactive computer model with an aim to embed into environment "the symbiotic behavior and metabolic balance that are characteristics of the natural environment."⁵⁰³ Or an intelligent, complex, self-organized, evolutionary environment proposed by Warren Brodey,⁵⁰⁴ that has an responsive attribute that is leading on today dynamic architecture, mediated by robots, no matter whether it is a case of bio robots or mechanical ones. Or in continuity a synthetic environment, that is employing Nature to induce, enhance, or mediate development of synthetic cells. Synthetic environment named by National Research Council is virtual environment, which is more "flexible, operate in real time, present images in three rather than two dimensions, involve multiple senses, and immerse the user".⁵⁰⁵

In addition are myriad possibilities and interconnection of all three, since the complexity of our everyday stimuli tends to a state of an articulation of architecture without a focus on just one constructor. So, architecture should move forward and presents an alternative organization of that complexity, in order to sketch the Universe that has been designed and is designing (Fig.7.7), as it is stated in very beginning of this chapter.

7.6 Summary: How to do it

*The most precious thing in life is its uncertainty.*⁵⁰⁶

New role of architecture is to intensify or to employ, intensified attributes; to give attributes to the unconventional elements or functions; to use materials and forms that certainly never perform some functions before or that are usually not

⁵⁰² Tibbits, S. (2011). A Model for Intelligence of Large-Scale Self-Assembly. *ACADIA 2011: Integration Through Computation* (pp. 342-349). Calgary/Banff: Circle of Courage Publications.

⁵⁰³ Frazer, J. (1995). *An Evolutionary Architecture: Themes VII*. London: Architectural Association Publications, p. 9.

⁵⁰⁴ Brodey, W. M. (1697). The design of intelligent environments, soft architecture. *Landscape*, 17 (1), pp. 8-12.

⁵⁰⁵ Lewis, R. (1995, June 12). *Virtual Reality Piques Life Scientists' Interest, Despite Obstacles*. Retrieved from The Scientist: <http://www.the-scientist.com/?articles.view/articleNo/17442/title/Virtual-Reality-Piques-Life-Scientists--Interest--Despite-Obstacles/>

⁵⁰⁶ Keene, Donald, 1967, *Essays in Idleness: The Tsurezuregusa of Kenkō*, New York: Columbia University Press, p. 7.

assigned to certain material or form. By method of over simulation, architecture is seeking to grab its sensorium and to enlarge experience beyond the normal range. Sensuous, information, boundaries, and environments are not presented as novel understandings of what architecture might be. There were taking part of architecture creation from its beginnings, with all transformations that these understandings have passed through. But what is novel here is that synergy of these terms is understood as an element of architectural creation, and that identification of such element could help to grasp Architectural Sensorium and detect value of the Beauty.

Senses, information, boundaries, and spaces are all having an importance of creation of architectures, giving its touch towards unpredicted characteristics of Beauty. State of architecture that is relying on such an understanding is more than impermanence and it is transmitted by sensorium, being only reality we have, even it is uncertain.

We are living new lives, said Stuart Kauffman, our reality is beyond imagination, said by Adriaan Geuze and Matthew Skjonsberg.⁵⁰⁷ Imagination is dual possible, actual real or artificial real. Stuart Kauffman believes in dualism of real Actuals, Res Extensa derived from Descartes and real Possibles, Res Potentia derived from Aristotle.⁵⁰⁸ Origin of Imagination is from Latin imaginare “form an image of, represent” and imaginari “picture to oneself”; while Possible is Latin possibilis, from posse “be able”.⁵⁰⁹ Together Imagination and Possible could be “to have the freedom to picture to oneself new possible scenarios to catalyze change”. Performance of such architecture, or by performing such architecture, could magnified reality and merges it with virtual, setting it in possible world, without border of virtual, real or possible, being now, opening its position towards Faustian propositions. Stated by Alberto Estévez, architects have been extended realm of their activity:

⁵⁰⁷ Geuze, A., & Skjonsberg, M. (2012). Dancing with Entropy. *Architectural Design* , 82 (5), pp. 124-129.

⁵⁰⁸ Kauffman, S. (2010). *Res Extensa, Res Potentia and the Poised Realm*. Retrieved May 16, 2016, from National Public Radio: <https://www.npr.org/sections/13.7/2010/08/17/129250892/res-extensa-res-potentia-and-the-poised-realm>

⁵⁰⁹ Oxford Dictionaries. (2016). Retrieved May 15, 2016, from Oxford Dictionaries Language matters: <http://www.oxforddictionaries.com/definition/english>

*During millennia of history architects and designers have had to limit working until the surface of things. Now this boundary can be transcended, allowing access to the molecular level, coinciding with genetic design, and to the chains of information developing natural living elements by themselves.*⁵¹⁰

Impermanence, imagination, uncertainty, and possibilities are part of complex nexus that is the world itself and architectures in it. Architecture, no matter if it is emerged from environment, or emerging an imaginable environment, covered by information, percept by senses, or explored through windows of its bounding, is in constant editing of itself. Putting editing to the main role is re-placing importance of pure process to build into complex process of creation. It is underling an importance of synergy of creation and growth that has been explored in projects of previous chapter.

⁵¹⁰ Estévez, A. T. (2015). Genetic Barcelona Project. In A. T. Estévez, *Biodigital Architecture & Genetics writings* (pp. 94-99). Barcelona: ESARQ, Universitat Internacional de Catalunya, p. 96.

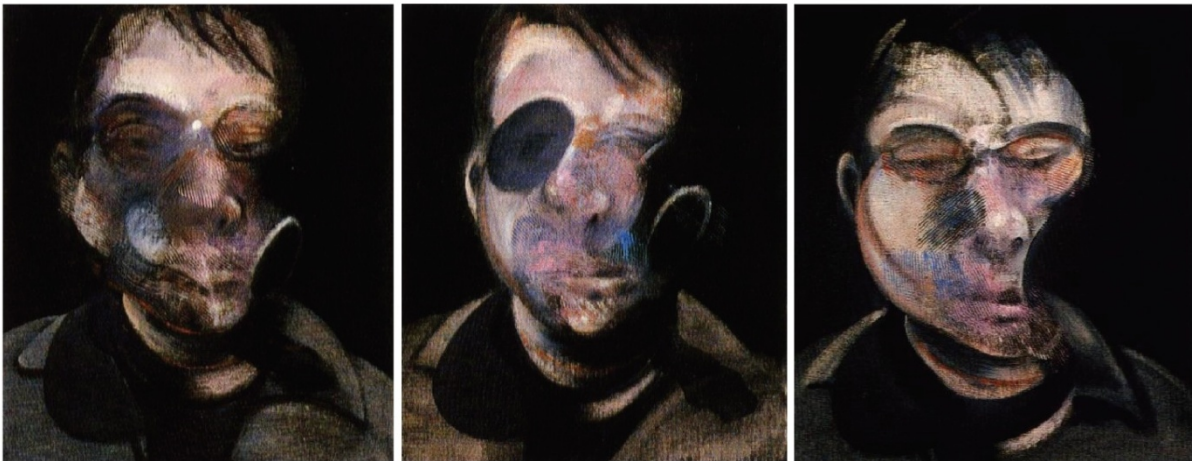


Figure 7.1 Three Studies for a Self Portrait by Francis Bacon 1976.

Source: https://www.artsy.net/article/artsy-editorial-francis-bacon_11/11/2016.

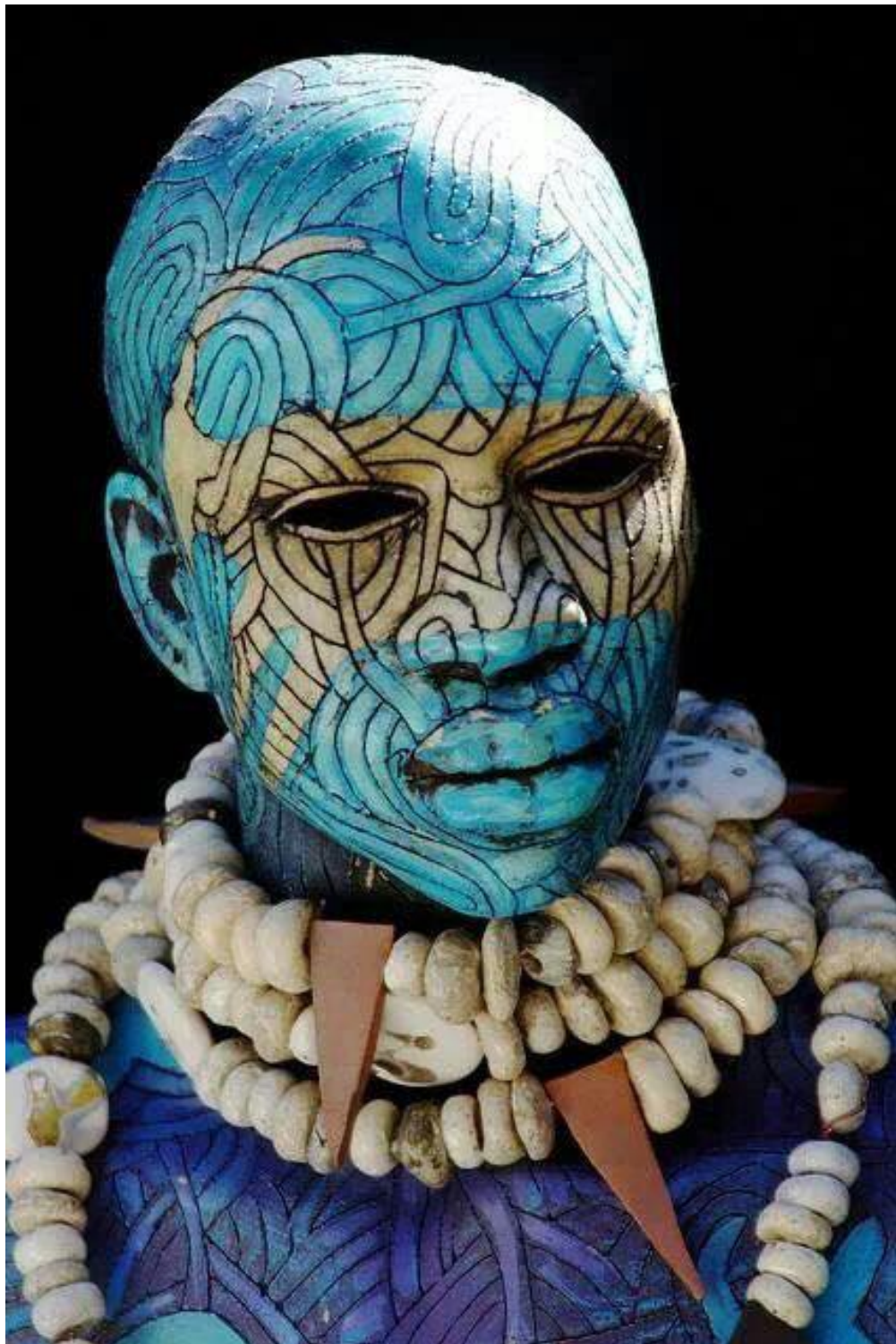


Figure 7.2 African Face Tattoo. Photograph by Burnt Umber.

Source: https://www.flickr.com/photos/rpilla001/8491194811/in/photostream_16/11/2016.



Figure 7.3 Material or Information? Frame from Visiting Kéré in Burkina Faso - film by Canny Richardson.

Source: <https://www.royalacademy.org.uk/article/meet-the-architects-di-b-do-francis>_accessed_30/03/2016.

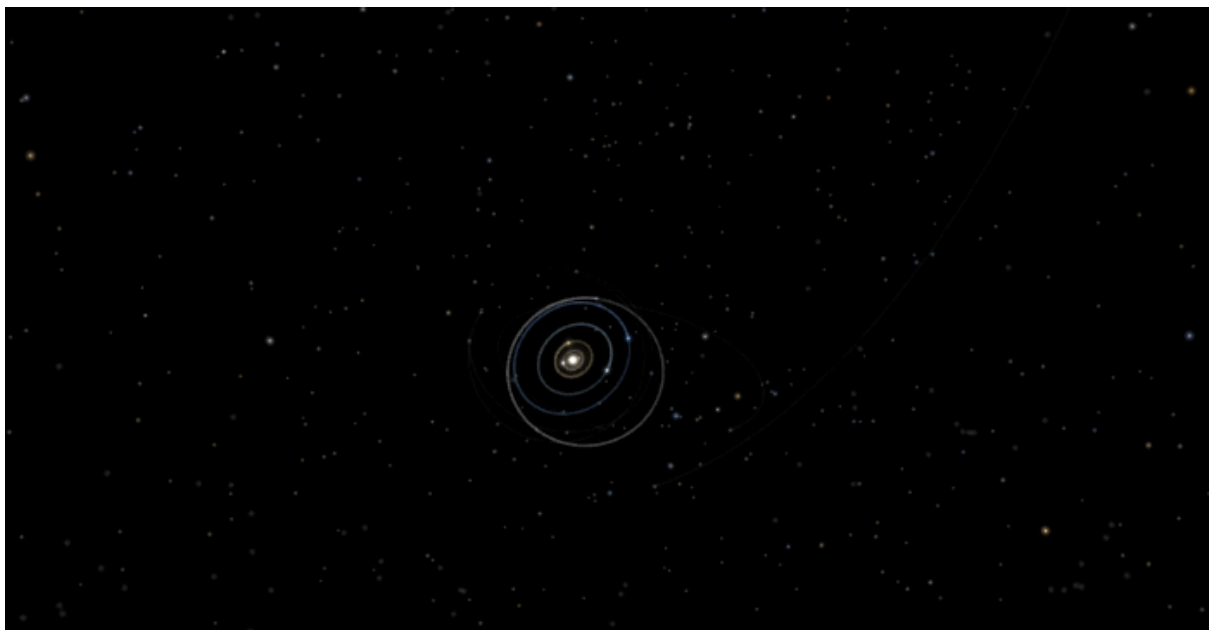


Figure 7.4 The realm beyond the orbit of Neptune is a subject of race for "Planet X". Unknown planet comes in many forms, from imaginary to possible. From: Solar System Exploration, NASA Science: <http://solarsystem.nasa.gov/news/2016/02/01/the-many-lives-of-planet-x> _16/11/2016. Photograph courtesy of NASA/JPL.



Figure 7.5 Scene of Freud's consultation room. Mirror attached onto transparency of the window has an understanding of the multilayered and dynamism. It is basically dematerializing reality, augmenting an additional layer of transparency and reflectivity on it, a forerunner of the today models of augmented reality (for full reference see in text).



Figure 7.6 David Spriggs' *Paradox of Power* about synergy of art and humans in production of many body milieux. An example of feeling rather than seeing. Photograph courtesy of David Spriggs.



Figure 7.7 *Falling in Love With the Dark Universe* an imaginary exploration by artist Pillar Zeta, about correlation of the world that has been designed and has designing us. Photograph courtesy of Pillar Zeta.

Source:http://www.pilarzeta.com/work/falling-in-love-with-the-dark-side-of-the-universe/_19/11/2016.

CHAPTER 8

8 Techniques for Early Diagnosis of Beauty

Beauty would save the world.

—Fyodor Dostoevsky, The Idiot (1868), Part 3, Chapter 5.

8.1 Tools, Products and Experiments on Beauty

Chapter 8 (entitled: Techniques for Early Diagnosis of Beauty) presents collection of design experiments, products, and tools that are demonstrating the relevance of the research topic of the thesis.

Beauty is privilege as a medium for reaching socio-economical, environmental, sustainable, and cultural content of contemporary world. A critical tradition of aesthetical form is supplemented here, by understandings of architects, artists,

writers, philosophers; all who are treating Beauty by design experimentations, productions, or tools or anyhow that is underlying Beauty in works. Chapter is presenting a set of criteria for diagnosing Beauty.

8.2 Beauty

Value of Beauty was curiously vanished from the horizon of twenties of the last century and revived at the beginning of the 21st century. Parallel to the same obsession about Beauty at a beginning of 20th, that has been resulted as Art Nouveau style, this time might bring us some novel understandings and insights in our creative doctrine.

Philosopher Byung-Chul introduces contemplative strata to Beauty that lasts and comes from perceiving similarities.⁵¹¹

*El «goce inmediato» no da lugar a lo bello, puesto que la belleza de una cosa se manifiesta «mucho después», a la luz de otra, por la significatividad de una reminiscencia. Lo bello responde a la duración, a una síntesis contemplativa. Lo bello no es el resplandor o la atracción fugaz, sino una persistencia, una fosforescencia de las cosas. La temporalidad de lo bello es muy distinta de la del «desfile cinematográfico de las cosas». La época de las prisas, su sucesión «cinematográfica» de presentes puntuales, no tiene ningún acceso a lo bello o lo verdadero. Solo cuando uno se detiene a contemplar, desde el recogimiento estético, las cosas revelan su belleza, su esencia aromática. Se compone de sedimentos temporales que fosforecen.*⁵¹²

Beauty is dating from the time of decoration of the murals on the cave walls or own body as tattoo drawings on skins, and it is with all backwards and forwards, survive until today. Eternal Beauty has taken relevance on function and problem-solving. Many architects are working and searching to do more than to solve some functional problems. In the era of Baudrillardian network and screen,

⁵¹¹ Han, B. C. (2014, September 7). Byung-Chul Han: "I'm sorry, but those are facts". (N. Boeing, & A. Lebert, Interviewers) ZEIT Wissen.

⁵¹² Ibid., p. 89.

Beauty has an transgressive and transformative dominance. It expresses its embedded notion, bombarding our senses and plays an elemental role of our life.

Duality is something that has been linked to Beauty by many authors through time. It is sometimes consisted of two opposite poles and conducts to antinomy of these poles, which carried to the ambivalence of Beauty. Basic duality is in subjective/objective understanding, from one side culturally relative contra species-specific relative. Kantian antinomy of taste, which was adopted in modern formulation of Beauty, considers thesis, understandings that a judgment of taste is not based on concepts and antithesis, where a judgment of taste is based on concepts.⁵¹³

Mary Mothersill spoke about generalizations of all beauties versus an “individual objects in the external world” and how we render a judgment of Beauty based on antinomy of individual genuine judgments of Beauty and no principles of Beauty.⁵¹⁴ By Freud, we have failed on giving an explanation about nature and origin of the Beauty while there is successful investigation about the conditions, under which things are felt beautiful.⁵¹⁵ J.A. McMahon recognizes Pythagorean-Tradition and Pleasure-Principle Tradition related to Beauty.⁵¹⁶

Gottfried Alexander Baumgarten understands Beauty as an independent judgment, leaded by the senses and imagination.⁵¹⁷

Gill Deleuze spokes about “wrenching duality”:

⁵¹³ Kant, I. (1987). *The Critique of Judgment*. (W. S. Pluhar, Trans.) Indianapolis/Cambridge: Hackett Publishing Company, p. 211.

⁵¹⁴ In Guyer, P. (1986). Mary Mothersill's Beauty Restored. *The Journal of Aesthetics and Art Criticism*, 44 (3), pp. 245-255.

⁵¹⁵ Freud, S. (1962). *Civilization and Its Discontents*. (J. Strachey, Ed., & J. Strachey, Trans.) New York: W.W. Norton & Co., pp. 29-30.

⁵¹⁶ McMahon, J. A. (2000). Perceptual Principles as the Basis for Genuine Judgments of Beauty. *Journal of Consciousness Studies*, 7 (8-9), pp. 29-35.

⁵¹⁷ Guyer, P. (2016, Winter). *18th Century German Aesthetics*. Retrieved December 15, 2016, from The Stanford Encyclopedia of Philosophy: <https://plato.stanford.edu/archives/win2016/entries/aesthetics-18th-german/>

*On one hand, it designates the theory of sensibility as the form of possible experience; on the other hand, it designates the theory of art as the reflection of real experience. For these two meanings to be tied together, the conditions of experience in general must become conditions of real experience; in this case, really appear as experimentation.*⁵¹⁸

*...divided into two irreducible domains: that of the theory of the sensible which captures only the real's conformity with possible experience; and that of the theory of the beautiful, which deals with the reality of the real insofar as it is thought. Everything changes once we determine the conditions of real experience, which are not larger than the conditioned and which differ in kind from the categories: the two senses of the aesthetic become one, to the point where the being of the sensible reveals itself in the work of art, while at the same time the work of art appears as experimentation.*⁵¹⁹

As a consequence, that dual nature of Beauty should be accepted as an continues ring that can have for result a loop in its understandings and lead us to Beauty that is never “absolute and immutable”⁵²⁰, like it was observed by Umberto Eco in *On Beauty*.

For Dostoyevsky, Beauty has an salvation role, while Joseph Brodsky Russian and American poet and essayist have an complementary statement to this role of Beauty.

*The purpose of evolution, believe it or not, is beauty, which survives it all and generates truth simply by being a fusion of the mental and the sensual.*⁵²¹

Pevsner calls something architecture only if has an aesthetical appeal:

⁵¹⁸ Deleuze, G. (1990). *The Logic of Sense*. (C. V. Boundas, Ed., M. Lester, & C. Stivale, Trans.) London: The Athlone Press, p. 260.

⁵¹⁹ Deleuze, G. (1994). *Difference and Repetition*. (P. Patton, Trans.) New York: Columbia University Press, p. 68.

⁵²⁰ Eco, U. (2004). *On Beauty*. (A. McEwen, Trans.) London: Secker & Warburg, p. 14.

⁵²¹ Brodsky, J. (1995). *On Grief and Reason: Essays*. New York: Farrar, Straus and Giroux., p. 207.

*...nearly everything that encloses space on a scale sufficient for a human being to move in is a building; the term architecture applies only to buildings designed with a view to aesthetic appeal...*⁵²²

For Freud Beauty is inevitable part of civilization:

*We may go from here to consider the interesting case in which happiness in life is predominantly sought in the enjoyment of beauty, wherever beauty presents itself to our senses and our judgement - the beauty of human forms and gestures, of natural objects and landscapes and of artistic and even scientific creations. This aesthetic attitude to the goal of life offers little protection against the threat of suffering, but it can compensate for a great deal. The enjoyment of beauty has a peculiar, mildly intoxicating quality of feeling. Beauty has no obvious use; nor is there any clear cultural necessity for it. Yet civilization could not do without it. The science of aesthetics investigates the conditions under which things are felt as beautiful, but it has been unable to give any explanation of the nature and origin of beauty, and, as usually happens, lack of success is concealed beneath a flood of resounding empty words. Psychoanalysis, unfortunately, has scarcely anything to say about beauty either. All that seems certain is its derivation from the field of sexual feeling. The love of beauty seems a perfect example of an impulse inhibited in its aim. 'Beauty' and 'attraction' are originally attributes of the sexual object.*⁵²³

Previously discussed usage of (un)materials for shaping space and the process of relating ideas, support the idea of architecture on the way for new, sketchy, ethical and poetical. Creating a niche, unfold an idea that exists in Nature, which speaks of the certain parts of organisms whose function has not yet been made public and is waiting for activation, when comes a need. Niches enrich our experience and widen out beyond our understanding and perception, so Nature may give us review, bearing in mind its unquestionable mechanism for

⁵²² Pevsner, N. (1963). *An Outline of European Architecture* (revised edition). Harmondsworth: Penguin, p. 15.

⁵²³ Freud, S. (1962). *Civilization and Its Discontents*. (J. Strachey, Ed., & J. Strachey, Trans.) New York: W.W. Norton & Co., pp. 29-30.

recalculation. Equating form with 0D and forming it and reforming from it in many body forms of architecture, one can easily conclude that patterns helps to understand these transitions. The risk, uncertainty and efforts towards recalculation could give an endless verity of the possibilities for new architectures. Presence of Beauty in such creations becomes its generic procedure that favors recalculations, an event that is encounter in Nature. Endless verity of the possibilities does not mean necessarily that everything is connected and could be fold and re-fold to something else. Existence of Beauty is an indiscernible part of existence of the things.

Beauty that is linked to the women's characters of poesy and drama usually has a characteristic of the imaginary, something that is out of reality; something through what we could encounter hidden worlds, imagine, conclude. Such is Helen of Troy, Beatrice, and maybe less known Andric's Jelena. Andric the poet did never actually saw Jelena, its phantasmagoria is closely related to the sun and its pathways, but her appearance even short, has a great impact of understandings of transcendence nature of Beauty.

Charles Darwin in *The Descent of Man* reflects to idea of attractiveness towards charmed variety that comes in shape of the Beauty that is not following some certain mould but rather go beyond common standard.

*As the great botanist Bichat long ago said if everyone were cast in the same mould, there would be no such thing as beauty.*⁵²⁴

Connection between patterns and Beauty lies in behavior to become less recognizable, while details becoming insignificant. In such level of ignorance towards recognition and cannon moulds, we could feel, been attracted, being touch by Beauty.

Metaphysical layer of Beauty has been divulgation of Slavoj Zizek's so called 3rd layer, which sits between in and out, between walls. Even it is called 3rd mysterious space, it considers parts that we rely on but deny its existence.

⁵²⁴ Darwin, C. (1882). *The Descent of Man*. London: William Clowes and Sons, p. 19.

Something that has an obvious impact of our lives, such as it is water or electrical installation or has political-ethnic responsibility, meanings or ideological confrontations. That gap that has been folded from division of in and out, the envelope of the space, becomes essential part of our lives. That is something that Zizek is calling unknown knows, things we know but we do not know that we know.⁵²⁵ Here comes importance of patterns that is reviling this gap, building gap of the gap, new space, new perspectives, and certainly new voids.

Writer, architect, and artist Lars Spuybroek, in book *The Architecture of Continuity*, speaks of diagrams in architecture but in relation to computing, biology, and art. He has extended notion of diagrams, giving it theoretical, methodological, and technical importance. In the book *NOX: Machining Architecture*, he declares typology and nomenclature of architectural diagrams defined through sensograms, flexigrams, kinetograms, thermograms, awaregrams, and similar. His technique of diagramming is flexible especially in a type of sensograms that is mapping intensities of feelings in the body but also intensities in material structure. Strategy of non-linear interaction should avoid failure or gap between whole and parts. His idea of changing diagrams to pattern is followed by acceptance, that elements of patterns are variable, and their laws are rules, in other words, pattern occur following a local regulation rather than global one.⁵²⁶

Compiling picture of surrounding milieu that is built of biogenetics, surveillance, satellite pictures, drones visions, information visualization, digital image, parametric architecture, robotic technology, and intelligences or augmentations will request new approach for perception. This new reality will build its new aesthetics in all its senses.

8.3 Design Products

It is said that is beautiful, if it is expresses the perfect unity⁵²⁷ of the Beauty and the body. If it is applied to architecture, then we could say, beautiful is if it is

⁵²⁵ Zizek, S. (2010, July 10). *Arquitectura y placer*. Conference: *More for Less*.

⁵²⁶ Spuybroek, L. (2004). *Nox: Machining architecture*. New York: Thames & Hudson.

⁵²⁷ See in: Plato. (2008). *Symposium*. The Project Gutenberg EBook.

expresses unity of Beauty and body of architecture. But what exactly is body of architecture?

Jean Baudrillard in essay *The Ecstasy of Communication* states that system of object has been lost. Body, landscape, time have disappeared as a descriptor of the universe, together with scene and mirror. They have been substituted by screen and networks. Transition from scene to screen has become really useless. Definition of the being is left to the genetic codes, while whole concentration of everything is placed in brain.⁵²⁸ Further changes of predominance of brain and code towards senses and processes that are happening inside sensorium, could possibly change towards beautiful notion rather than to functional notion. Did Sullivan kill the Beauty with sayings the "form follows function", or did it extend? Our hearts do have a function to pump blood, but they as well make heartbeats, which do have value of Beauty.

Stone balls (Fig. 8.1), dating from the age of Neolithic, seen by eyes of mathematician professor, Marcus Du Sautoy, represent a product of possibilities. Isolating such products of any particular purpose they are becoming representatives of an product of Beauty.⁵²⁹

Jean Baudrillard describes architecture of universe by screens and network, as "great screens on which are reflected atoms, particles, molecules in motion."⁵³⁰ Spaces like in and out, private and public bleached their borders. In past, we percept universe from "live projectile"⁵³¹, after we have been placed in capsule with an unfolding screen envelope.⁵³² What about today perception or our close tomorrow? In past, we attempted to project ourselves to the Moon; after that Moon, has become our close neighbor. Is then everything that is happening today, regarding Beauty and its new stage taking us back to the idea of going

⁵²⁸ Baudrillard, J. (1983). *The Ecstasy of Communication*. In H. Foster, *The Anti-Aesthetics Essays on Postmodern Culture* (pp. 126-134). Washington: Bay Press.

⁵²⁹ Sautoy, M. D. *Carved Stone Ball Object number: AN1927.2727*. Ashmolean Museum, Thinking with Things, The Oxford Collection Podcasts. Angelsharp Media.

⁵³⁰ Baudrillard, J. (1983). *The Ecstasy of Communication*. In H. Foster, *The Anti-Aesthetics Essays on Postmodern Culture* (pp. 126-134). Washington: Bay Press, p. 130.

⁵³¹ *Ibid.*, p. 127.

⁵³² *Ibid.*

somewhere else. Maybe not in Baudrillardian “live projectile”⁵³³, but by network, to become finally merged with some Moons!

This section is trying to detect Beauty by introducing cultural parameters that are dealing on constantly transitions of the body of architecture seen in different styles of architectural creation. While having no evidence of continuity, it is rather picking slots of our history that could bring picture of body of architecture that has relevance of nowadays transition from scene and mirror, via screen and network⁵³⁴ to its final possibilities of total merge of Beauty and body, like Dorian Gray did. This example, within this research, does not have its relevance regarding static profile of absolute Beauty; more relevance is found in an idea of possibilities to be merged within Beauty.

Relatively similar merge is giving to architecture a level of timelessness. Historical continuum has proofs of this link in many examples; especially in the architecture which, even if it is getting old, still has a symbolic representation towards ideal Beauty. Reflection occurs within existence of Architectural Sensorium given in sensation of Beauty rather than perception. As an example, style of the Art Nouveau has a timeless Beauty.

In Spain, Antoni Gaudi represents the Modernism movement. He attempted to integrate the natural form in his architecture and his daily life. His works emphasize, “Nature is the eternal mirror of architecture.”⁵³⁵ Considering Nature’s products of so called “objective beauty” and by that a “necessary beauty”, giving an objective evaluator regards Beauty.⁵³⁶

⁵³³ Baudrillard, J. (1983). The Ecstasy of Communication. In H. Foster, *The Anti-Aesthetics Essays on Postmodern Culture* (pp. 126-134). Washington: Bay Press, p. 130.

⁵³⁴ Ibid.

⁵³⁵ Estévez, A. T. (2015). An Evolution of Gaudí’s Legacy Towards Biodigital Organicism. In A. T. Estévez, *Biodigital Architecture & Genetics Writings* (pp. 264-271). Barcelona: Escola Tècnica Superior d’Arquitectura (ESARQ), p. 267.

⁵³⁶ Ibid.

*...this genetic internal “engine” drives simultaneously the most wonderful agreement of the parts to the whole and the whole to the parts, which is just one of the most repeated definitions of beauty.*⁵³⁷

Baudrillard is talking about the subject-object play, which gives a possibility for generating scene, private or public one. In continuity subject-object and as well as public-private opposition, is going to disappear.

*No more hysteria, no more projective paranoia, properly speaking, but this state of terror proper to the schizophrenic: too great a proximity of everything, the unclean promiscuity of everything which touches, invests and penetrates without resistance, with no halo of private protection, not even his own body, to protect him anymore...He can no longer produce the limits of his own being, can no longer play nor stage himself, can no longer produce himself as a mirror. He is now only a pure screen, a switching center for all the networks of influence.*⁵³⁸

Demolition of barriers between the public and private likely demolish the distinction between art and life. Klimt, first representative of secessionists, offers an escape from the ordinary world. Obsession of Beauty in Art Nouveau is the result of a reaction to the lack of Beauty, which occurs as a result of the industrial revolution. Is it possible to say that as a result of the digital revolution, we have re-attempt to rediscover the Beauty, new one or it is unique with the one-disclosure to Art Nouveau? Starting from the eighteenth century and later on has deducted meaning of the object and gives importance to the form. Marxist approach later takes away the Beauty from the form, “fighting” against beautified reality.

Populist attitude of Marxism have contributed to the schism of tendencies and Beauty and usefulness. All that is useless becomes bourgeois category, and all art which contributes to the Beauty and decorative embellish reality. A new class

⁵³⁷ Estévez, A. T. (2015). An Evolution of Gaudí’s Legacy Towards Biodigital Organicism. In A. T. Estévez, *Biodigital Architecture & Genetics Writings* (pp. 264-271). Barcelona: Escola Tècnica Superior d’Arquitectura (ESARQ), p. 267.

⁵³⁸ Baudrillard, J. (1983). The Ecstasy of Communication. In H. Foster, *The Anti-Aesthetics Essays on Postmodern Culture* (pp. 126-134). Washington: Bay Press, pp. 132-133.

is forcing new art. Marxists condemn art for art's sake because it embellishes reality. Previous reality becomes to be considered as terrible because it was based on to exploit. False facade and mask for a different reality is almost the definition of kitsch. According to the definitions, the main orientation of modernism is based on, metamorphosis of architecture, which insists on truthfulness, naked materials, and naked structure.⁵³⁹

In 1900 a dizzying shift of movements was going on guided by charismatic artistic enthusiasm. In art, modernist experiment with the discoveries of scientists and inventions, have opened up new possibilities of creativity and expression in a rapidly changing world.⁵⁴⁰

Characteristics of early modernist tendencies, following Stokstad, are:

(1) Tendency toward abstraction. Despite the aesthetic diversity, distinctive facilities have to operate in a distorted way; another are working in quite abstract way, through formal elements, line, shape, color, texture, space, mass, volume. Modern architecture also follows the path of abstraction, rejecting historical styles and ornamentation in favor of simple geometric form and non-decorative surface⁵⁴¹ as a way to perfectly express the mood of the age of the machine.⁵⁴²

(2) Emphasizing physical processes. The visible brush strokes and sign cuts, as well as the materials that are used, serves often more to reveal than to hide internal structure. Naked structural elements more honestly stated function, while the previously used structural elements, sometimes carry not only their and accompanying weight but the weight of botanical and anthropomorphic motifs. Modernist art and architecture is homogeneous, and runs to the quality of

⁵³⁹ Stokstad, M. (2009). *Art History* (3rd Edition ed., Vol. 2). New Jersey: Pearson.

⁵⁴⁰ Ibid.

⁵⁴¹ Ibid.

⁵⁴² Kurokawa, K. (1994). *The Philosophy of Symbiosis* (2nd Edition ed.). London: Academy Editions, p. 21.

honesty, and needs to fertilize its own function.⁵⁴³ A linear approach of how to make machines is borrowed by architecture and accepted as its own norm.⁵⁴⁴

(3) Continuous reviewing. Through the adoption of new techniques and materials, including artless materials, there occur collapses of the distinction between art and everyday life.⁵⁴⁵

*The fundamental nature of the natural science, geometry, physics and psychology in the age of modern rationality, is to seek to objectivise the world, based on the conviction that a single truth underlies all reality. These sciences seek to reduce (or analyse) reality to the measurable, thereby creating a world norm based on a unified world view. This is remarkably similar to the process through which a machine is reduced to its parts and standardised products are distributed universally throughout the world?*⁵⁴⁶

One of a key element of modernism is popularization, which was announced by the moment of the opening of great museums of modern art. In architecture, it is reflected by the switch of clientele, from wealthy to those who belong to the middle class.⁵⁴⁷

Following the new tendencies, we are approaching to the post-contemporary time, that is shaped not by objective, or subjective, neither ironic and conceptual, which certainly attributes time past, but, according to Suhail Malik, is shaped by future, which is coming even before the past. Subjectivity/objectivity together with linear understanding of time, which has an importance of past styles, especially

⁵⁴³ Stokstad, M. (2009). *Art History* (3rd Edition ed., Vol. 2). New Jersey: Pearson.

⁵⁴⁴ Kurokawa, K. (1994). *The Philosophy of Symbiosis* (2nd Edition ed.). London: Academy Editions, p. 23.

⁵⁴⁵ Stokstad, M. (2009). *Art History* (3rd Edition ed., Vol. 2). New Jersey: Pearson.

⁵⁴⁶ Kurokawa, K. (1994). *The Philosophy of Symbiosis* (2nd Edition ed.). London: Academy Editions. p. 22.

⁵⁴⁷ *Ibid.* p. 17.

of modernism and postmodernism, is substituted now by speculative time or speculative temporality which understanding has great impact on aesthetics.⁵⁴⁸

New understandings of real and virtual of today, are opening the question whether architecture generates real or rather virtual reality.

With arrival of computers at 1960s, scientists and philosophers move from materialism of identity theory to the functionalism. They have seen the computing as storing information in memory which acts as mechanical mind. By the 1980s, functionalism becomes substituted by qualia, a qualitative character of sensation.⁵⁴⁹

Matias del Campo and Sandra Manninger are advocating a new articulation in architecture by usage of ornaments. Long ago “prohibited” usage of ornaments in architectural design is being engaged again. In their project, the Oro and Block (Fig. 8.2), duo is addressing “specific architectural problems such as turning the corner, the negotiation of mass, void and subdivision, and the spatial richness produced by arches, pillars, chimneys, niches, cornices and crests, which positions them amidst the familiar and the strange.”⁵⁵⁰ By revealing ornamentation in making of mood of the space they as well challenge other Beauty that does not belong to the “culturally imprinted”⁵⁵¹ one. They attend not to make something that could think but rather to sense like it was an attempt of Artificial Intelligence to make machines to act as human, it is now about to sense like human.

For Tristan Garcia, the Beautiful is the intensified form rather than an idea or a substance.⁵⁵² Dave Hickey accepts Beautiful rather than the thing as an agency that causes a visual pleasure.⁵⁵³

⁵⁴⁸ Avanesian, A., & Malik, S. The Time-Complex. Postcontemporary. A conversation between Armen Avanesian and Suhail Malik. Retrieved February 12, 2017 from *Dis Magazine*: <http://dismagazine.com/issues/post-contemporary/>

⁵⁴⁹ Smith, D. W. (2007). *Husserl*. London/New York: Routledge.

⁵⁵⁰ Del Campo, M. (2016). Moody Objects: Ore Fashion Stores and Blocks. *Architectural Design*, 86 (6), 54-57, p. 57.

⁵⁵¹ Ibid.

⁵⁵² Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press.

⁵⁵³ Hickey, D. (2009). Enter the Dragon: On the Vernacular of Beauty. In D. Hickey, *The Invisible Dragon: Essays on Beauty* (pp. 1-16). Chicago: The University of Chicago Press.

Pierre Bourdieu, a renowned public intellectual, gives a distinctive category of classes via culture, art and thus Beauty. Arts and culture are one of the largest barriers of flow or mobility through social stratification, contribute to it and represent the biggest barrier in terms of class affiliation.⁵⁵⁴ Dealing with the issue of the value of an artistic work, and therefore the Beauty itself in the new culture and art, which uses mechanical instruments for making instead of hands, become an important study.⁵⁵⁵ Under the same products could be subsumed the today's instruments that are more synthetic than mechanical. Traditionally, the price is created by the logic of market monopoly, which comes down to the importance of the unique. Supply and demand define price and this is definition of market monopoly. Today focus is from the unique of the work towards the signature of the work. In fashion this is sharp obvious as a marking; it goes from the unique craftsmanship artisan production of the object to the signature, regardless of the amount. Price is tending to determination of value,⁵⁵⁶ and it could be considered Beauty as one of the values. By it, profit becomes one of the early detection of the Beauty. Beauty contributes to profit.

8.4 Tools: brain, senses, mood

Senses are medium for interaction. Human body as a user of architecture body, receives stimulus from it, transmit data to brain to process it and if so, finally transmit data again to milieu. Like it is mentioned in introductory chapter, talking about Odyssey who had anaesthetized his sailors to make them insensitive to the songs of sirens. In such picture, being insensitive will cut our link to the milieu that is surrounding us.

Already mentioned, there are two related divisions in neuroaesthetics, one where brain is main tool for detection of Beauty, and the other that is taking senses as a tool.⁵⁵⁷ Since, the whole system of beautiful sits somewhere in space that does not fit in any part and the whole of this research, as mentioned in Methodology

⁵⁵⁴ Bourdieu, P. (1984). *Distinction: A Social Critique of the Judgment of Taste*. (R. Nice, Trans.) Cambridge, Massachusetts: Harvard University Press.

⁵⁵⁵ Moulin, R. (2011). The Genesis of the Rarity of Art. *Art in Translation*, 3 (4), pp. 441-471.

⁵⁵⁶ Moulin, R. (2012). *El mercado del arte: globalización y nuevas tecnologías*. Buenos Aires: La Marca.

⁵⁵⁷ Spiers, H., Malinowski, A., & Visman, B. *Neurotopographics, the film installation*. Welcome Trust, 2008.

chapter, on antidisciplinary approach, it is inevitable that some overlaps will be present here. Especially when they touch meaning of sensations and senses, one as a product of inner and the other as a product of outer space and systems.

Strata of brain

Vilayanur Ramachandran and William Hirstein argue that defining Beauty lies in activation of certain processes of pleasure while perceiving beautiful object, not in properties that are identifying an object.⁵⁵⁸ So, human artistic experience, which leads to an aesthetic response, is based on exploiting eight principles or a contrary on managing to obey them. Ramachandran and Hirstein's principles of a brain perceptual process are: (1) the peak shift principle; (2) isolation of single cue; (3) perceptual grouping to delineate figure and ground; (4) extraction of contrast; (5) perceptual "problem-solving"; (6) abhorrence of unique vintage points; (7) usage of visual "puns" or metaphors in art; and (8) symmetry.⁵⁵⁹

Strata of senses

As it is mentioned earlier this stratum has its clashes with previous one. Charles Hartshorne proposer of Neoclassical Metaphysics acknowledged aesthetic value as a most inclusive one. Seen along of an aesthetical continuum, sensations were equal to feelings. For Hartshorne concept of Beauty⁵⁶⁰ sits between two opposite ends; one of order and disorder and another one of complexity and simplicity (Fig. 9.3). Out of this cycle, since the aesthetics comes as driver through experience, there is no existence.⁵⁶¹

Jennifer Anne McMahon in *Perceptual Principles as the Basis for Genuine Judgments of Beauty* considers two tradition of Beauty: (1) The Pythagorean Tradition: with its focus on "sober kind of pleasure evoked by formal relations in

⁵⁵⁸ McMahon, J. A. (2000). Perceptual Principles as the Basis for Genuine Judgments of Beauty. *Journal of Consciousness Studies*, 7 (8-9), pp. 29-35.

⁵⁵⁹ Ramachandran, V., & Hirstein, W. (1999). The Science of Art, A Neurological Theory of Aesthetic Experience. *Journal of Consciousness Studies*, 6 (6-7), pp. 15-51.

⁵⁶⁰ Hartshorne use meaning of beauty considering it not as only aesthetic value.

⁵⁶¹ Viney, D. W., & Shields, G. W. (n.d.). *Charles Hartshorne: Neoclassical Metaphysics*. Retrieved January 3, 2017, from The Internet Encyclopedia of Philosophy (IEP) (ISSN 2161-0002), A Peer-Reviewed Academic Resource: <http://www.iep.utm.edu/harts-n-m/#SH3f>

the object as a response to Beauty⁵⁶², and (2) The Pleasure-Principle Tradition with focus on sensuous pleasure.⁵⁶³ She is interested in human capacity of Beauty, which characterized the pleasure of Beauty as disinterested. Beauty comes “as results from a focus on relational properties within the object: whether the relations exist between visual elements, between musical passages, between movements and actions, dramatic events or literary episodes, or between ideas.”⁵⁶⁴ McMahon is focused on “causal relation between the beautiful object and the pleasure it causes in the perceiver.”⁵⁶⁵ Lars Spuybroek’s diagrams, mentioned earlier in this chapter are more felt e.g. “sensed” than read.⁵⁶⁶

Strata of mood

Oscar Wilde wrote down, as a response on line written in novel *The Picture of Dorian Gray*, that art is quite useless, that usefulness of art in its simple function makes mood to become,⁵⁶⁷ in the end, the most important element.

As mentioned earlier in Chapter Fast Forward, focus of this research is placed on elements that are creating mood of a place rather than its physical conditions. Partial conclusions of constructions of an ambient or atmosphere, given before and derived from interplay of environment and architecture, and relying on importance of bleached border of real and virtual environment; void, rather than solid; and raising an importance towards an aesthetical environment, are as follows: (1) constructing or enhancing an ambient or atmosphere from what is present in that particular space; (2) from what is present in observer of the space; and (3) what is introduced from artificial realm.

⁵⁶² McMahon, J. A. (2000). Perceptual Principles as the Basis for Genuine Judgments of Beauty. *Journal of Consciousness Studies*, 7 (8-9), 29-35., p. 30.

⁵⁶³ Ibid. pp. 29-35.

⁵⁶⁴ McMahon, J. A. (2000). Perceptual Principles as the Basis for Genuine Judgments of Beauty. *Journal of Consciousness Studies*, 7 (8-9), 29-35, p. 35

⁵⁶⁵ Ibid.

⁵⁶⁶ Spuybroek, L. (2004). *Nox: Machining architecture*. New York: Thames & Hudson. Compared his understandings of diagrams with more senses involved rather than linguistic understandings form side of pioneers of this approach, Peter Eisenman and Rem Koolhaas.

⁵⁶⁷ Wilde, O. (2008). *Manuscripts and Letters of Oscar Wilde*. Retrieved December 20, 2016, from The Morgan Library & Museum: <http://www.themorgan.org/collection/oscar-wilde/manuscripts-letters/36?id=1535>

The strata of mood of the space or rather mood of an architecture has been researched by Andrew Saunders in an article of AD, *Figuring Mood*, by merging mind and senses together, for assessing architecture. Saunders has focused on synaesthesia of “the production of a sense impression relating to one sense or part of the body by stimulation of another sense or part of the body, including the mind.”⁵⁶⁸ Mood presented as a product of architecture operates between objective/subjective, or rather intellectual/emotional perception. Mood has been used as an instrument for detection of harmony from Pythagoreans time and has its renaissance as an analyzing instrument of architectural entities in Baroque.⁵⁶⁹

Leon Battista Alberti writes about canon of assessing Beauty that lies in harmonic relations of the parts of the entity:

*I shall define Beauty to be a Harmony of all the Parts, in whatsoever Subject it appears, fitted together with such Proportion and Connection, that nothing could be added, diminished or altered, but for the Worse.*⁵⁷⁰

Importance of the mentioning mood in such concept that includes synaesthesia, given by Saunders, lies in its potential towards breaking barrier between virtual and physical, ever since Pythagoreans time, when, search to achieve harmony assumes mix of mystical and rational. Pythagoras also worked on assign of concept of numbers with colors, stimulating one sense by impulse of other, rather than by one from environment.⁵⁷¹ That is having its flash back right now by mixture of real and virtual. With those references, a milieu of space that has been created in space between virtual and real has bigger importance than space in only one of these realms and certainly will stimulate multiple senses via impulses from inside and outside. That obvious guarantee for success would appoint mind in flux. Additionally to the bleached barrier of virtual and real, there is importance of Architectural Sensorium, which is not there to transmit signals only, but to

⁵⁶⁸ Saunders, A. (2016, November 10). Figuring Mood: The Role of Stimmung in the Formal Approach of Heinrich Wölfflin and Alois Riegl. (M. d. Campo, Ed.) *AD Special Issue: Evoking Through Design: Contemporary Moods in Architecture*, pp. 34-41.

⁵⁶⁹ Ibid., p. 35.

⁵⁷⁰ Alberti, L. B. (1991). *On the Art of Building in Ten Books* (Vol. Book VI). (J. Rykwert, N. Leach, & R. Tavernor, Trans.) Cambridge: MIT Press, p. 156.

⁵⁷¹ Saunders, A. (2016, November 10). Figuring Mood: The Role of Stimmung in the Formal Approach of Heinrich Wölfflin and Alois Riegl. (M. d. Campo, Ed.) *AD Special Issue: Evoking Through Design: Contemporary Moods in Architecture*, pp. 34-41.

receive signals as well. Promotion of such understanding was described by Robert Vischer in his *Empathy Theory*, as a process of involuntary projection of emotion that is encountered in observers but not in the object of Beauty. By that process, the observer crosses border of real and imaginary and becomes observed from position of form of Beauty that is being observed.⁵⁷²

*Thus I project my own life into the lifeless form, just as I quite justifiably do with another living person. Only ostensibly do I keep my own identity although the object remains distinct. I seem merely to adapt and attach myself to it as one hand clasps another, and yet I am mysteriously transplanted and magically transformed into this Other.*⁵⁷³

By that process, we can fill Architectural Sensorium with necessity to transmit, transform and process signals.

8.5 Experiments

*Often beauty is the light of truth, almost its test.*⁵⁷⁴ *A method is only good if it gives good results. "By their fruits ye shall know them." Either they are beautiful, or they are dry and worthless. One tries this method and then abandons it, once it has borne fruit. Its very best fruit, of course.*⁵⁷⁵

Beauty has always possessed a stratum of unknown, since no one can predict that one certain entity will evoke Beauty even if it consists of some conditions that are necessary or logical. So, detection of the Beauty could be set under experimentations. Some relevant ones for this research will be examined within this section. They are complementing section of products for making comparison and tools for detection of Beauty and showing different and myriad ways of its notion. Beauty possess stages, says Plato, and even though Beauty is the one, the path to it leads across several of them.

⁵⁷² Vischer, R. (1994). On the Optical Sense of Form: A Contribution to Aesthetics. In *Empathy, Form, and Space: Problems in German Aesthetics, 1873-1893* (H. F. Mallgrave, & E. Ikonomou, Trans., pp. 89-123). Santa Monica, California: Getty Center for the Arts and Humanities.

⁵⁷³ Ibid., p. 104.

⁵⁷⁴ Serres, M., & Latour, B. (1995). *Conversations on Science, Culture, and Time*. The University of Michigan Press, p. 26.

⁵⁷⁵ Ibid., p. 100.

New Aesthetics

In last chapters, we saw evidence about apparent reflections of the understandings that were related to other fields but as well reflected to architectural creation. So, attitudes like acting as machines were reflected during Modernist style in architecture. Later on, we have evidence of actions as human that have impact in creation of AI, but also that aesthetical approach impacted architectural creation. Then we have an action as Nature, that have its relevance in architecture, and we came to the point to reflect on action of computers that as well has its own impact on Beauty.

James Bridle has coined a word New Aesthetics referring not to the new style but rather an exploration of the embedded novelties that new insights taken from digital have on physical world. Exploration is looking for digitalized physical realities, a reality that belongs to virtual realm but becomes physical. Snapshots of pixelated appearances that are leaking into our physical milieu (Fig. 8.4), are layering our world by digital realm and by it, changing our aesthetic appreciation.⁵⁷⁶

By Bruce Sterling, “the New Aesthetic is one thing among a kind: it’s like early photography for French Impressionists, or like silent film for Russian Constructivists, or like abstract-dynamics for Italian Futurists.”⁵⁷⁷ The New Aesthetic carries positive thoughts, having such attributes like are new and truth, an culturally agnostic, comprehensible, deep, contemporary, temporal, immediate, grainy and evidence-based, constructive and seeks for close attention, generational.⁵⁷⁸ Bruce Sterling after giving remarkable good credits of The New Aesthetics continues asking:

⁵⁷⁶ Bridle, J. (2011). *Waving at the Machines*. Retrieved December 23, 2016, from Web Directions: awesome conferences for web professionals:

<http://www.webdirections.org/resources/james-bridle-waving-at-the-machines/>

⁵⁷⁷ Sterling, B. (2012, April 2). *An Essay ON the New Aesthetic*. Retrieved January 10, 2017, from Wired: <https://www.wired.com/2012/04/an-essay-on-the-new-aesthetic/>

⁵⁷⁸ Ibid.

*Where did the people go? Where is the aura, where is the credibility? Are robots with cameras supposed to have our credibility for us? They don't...Aesthetics are, by definition, how beauty is perceived and valued in a human sensorium. Aesthetics is therefore an issue of metaphysics. Perception, beauty, judgment and value are all metaphysical issues.*⁵⁷⁹

Having in mind that we are already familiar with pixelated world, through pixelated vision of bees, we can argue that this digital aesthetics is known long time ago. Additionally, our brain appreciation of reality is quite abstract. Link of abstracted brain vision and sensuous one, mentioned before is obvious in Pollock work that is transferring abstracted vision to be sensuously transmitted.

Sterling is insisting for, instead of cracking Beauty, to built new one.⁵⁸⁰

Simulacrum

Simulacrum is the notion for "truth which conceals that there is none".⁵⁸¹ In modern society, simulacrum overcomes model and becomes independent object. Baudrillard in *Simulacra and Simulations* sets four phases of the image: (1) it is the reflection of a basic reality; (2) it masks and perverts a basic reality; (3) It masks the absence of a basic reality; (4) it bears no relation to any reality whatever: it is its own pure simulacrum.⁵⁸² A simulacrum is evident in third and fourth phase. Baudrillard connects them with "hyperreality", where images become bigger reality than reality itself. They are characterized by the irrelevance compared to discern truth from falsehood. "Hyperreality" is no longer real at all but "produced from miniaturized units, from matrices, memory banks and command models - and with these it can be reproduced an indefinite number of times."⁵⁸³

⁵⁷⁹ Sterling, B. (2012, April 2). *An Essay ON the New Aesthetic*. Retrieved January 10, 2017, from Wired: <https://www.wired.com/2012/04/an-essay-on-the-new-aesthetic/>

⁵⁸⁰ Ibid.

⁵⁸¹ Baudrillard, J. (1988). *Simulacra and Simulations*. In J. Baudrillard, & M. Poster (Ed.), *Selected Writings* (pp. 166-184). Stanford: Stanford University Press, p. 170.

⁵⁸² Ibid.

⁵⁸³ Ibid., p. 167.

Simulacrum is emptied of meaning, its own purpose; it could be found in past for example as monument, buildings with no facilities, mausoleums. Gilles Deleuze in his book *Difference and Repetition* used the term simulacrum, which is not a mere imitation but rather “act by which the very idea of a model or privileged position is challenged and overturned”.⁵⁸⁴ He even called it “demonic”⁵⁸⁵ as before him Plato similarly an abstract concept links to the mystique. Later Baudrillard represents counterfeit and reproduction some sort of “black magic”.⁵⁸⁶ Now we can say that we live more than ever in the world of the former black magic and simulacrum; devoid of meaning, which preceded the presentation, like are clones, the products of synthetic biogenetics, and acts of production of the whole man without man. Contemporary example of Jean Baudrillard's simulacrum is Avatar.

Regarding the space, an attempt of placing body of his characters somewhere, leads William Gibson to coin world of cyberspace. To work out of well known and used in science fictions spaceship or Ballardian universe, Gibson was moved by children’s physical involvement in space of video games. They have looked as they wish to be inside the “notional space of the machine.”⁵⁸⁷

*They were in that notional space, and the machine in front of them was the brave new world...And somehow I knew that the notional space behind all of the computer screens would be one single universe.*⁵⁸⁸

Children playing in digital milieu of video games are dematerializing physicality of their bodies and by it spaces we live in. Digital macabre of Neri Oxman death masks are rematerializing an essence of our presence in this reality. Both are bleaching the border between physical and digital, mystical and real, leaking from one to another.

⁵⁸⁴ Deleuze, G. (1994). *Difference and Repetition*. (P. Patton, Trans.) New York: Columbia University Press, p. 69.

⁵⁸⁵ Ibid., p. 127.

⁵⁸⁶ Baudrillard, J. (1988). Simulacra and Simulations. In J. Baudrillard, & M. Poster (Ed.), *Selected Writings* (pp. 166-184). Stanford: Stanford University Press, p. 182.

⁵⁸⁷ Gibson, W. (2011, Summer). The Art of Fiction. (Wallace-Wells, Interviewer) The Paris Review.

⁵⁸⁸ Ibid.

Hacking the space

Mark Zuckerberg has encouraged his employees for giving their own mark to new headquarter of Facebook. Group of them followed idea of Mike Pike have built a QR code on the roof of building (Fig. 8.5).⁵⁸⁹ This has resulted into building that is scannable from space. So, buildings are getting role of information transmitters, and by changing their appearance they are becoming part of the virtual network. Similarly, Chinese authorities have painted some factory roofs into shade of blue, to make them readable/unreadable for satellites.⁵⁹⁰

Problem-solving

Following discussion of what is called architecture, whether it is something that has a functional or technological understanding, or it is only if it possesses value of Beauty. Mere buildings versus architecture were part of doctrine of the Nikolaus Pevsner who says:

*A bicycle shed is a building; Lincoln Cathedral is a piece of architecture.*⁵⁹¹

Similarly, Le Corbusier makes a differentiation between architecture and “mere building”.⁵⁹² Schopenhauer also thinks that besides of all elements for solving different problems that buildings do, to be architecture it is necessary to have an aesthetical effect. As he explained, Beauty is related to corporeal nature of perception, and by it related to intellect:

⁵⁸⁹ Pike, M. (2012, March 26). *A hack of epic proportions: Building a QR code on the roof*. Retrieved December 16, 2016, from Facebook:

<https://www.facebook.com/notes/facebook-engineering/a-hack-of-epic-proportions-building-a-qr-code-on-the-roof/10150630641218920/>

⁵⁹⁰ Cope, A. S. (2012). *The New Aesthetic*. Retrieved December 16, 2016, from: <http://www.aaronland.info/weblog/2012/03/13/godhelpus/#sxaesthetic>

⁵⁹¹ Pevsner, N. (1963). *An Outline of European Architecture* (7th Edition ed.). London: Penguin, p. 15.

⁵⁹² In Graham, G. (2009, September). Architecture. *The Oxford Handbook of Aesthetics*. (J. Levinson, Ed.)

By virtue of the demonstrated intellectual nature of perception, the sight of beautiful objects, a beautiful view for example, is also a phenomenon of the brain. Therefore its purity and perfection depend not merely on the object, but also on the quality and constitution of the brain, that is on its form and size, the fineness of its texture, and the stimulation of its activity through the energy of the pulse of the brain-arteries. Accordingly, the picture of the same view appears in different heads, even when the eyes are equally keen, as differently as, say, the first and last impression from a much-used copperplate. To this is due the great difference in the capacities to enjoy the beauties of nature, and consequently to copy them: in other words, to produce the same phenomenon of the brain by means of an entirely different kind of cause, namely dabs of colour on a canvas.⁵⁹³

Jürgen Schmidhuber, a pioneer of self-improving general problem solvers, since 1987 has related intelligence to problem-solving issues:

All of intelligence — human or artificial — is about problem solving. For a long time, we have been trying to build general problem solvers that not only can solve one little problem here and another over there, but many different problems. [Problem solvers that can] learn new skills on top of previously learned skills, always adding new skills to the repertoire in an unlimited way, becoming more and more general problem solvers. Of course, to the extent that we succeed, this is going to change everything, because every computational problem, every profession, is going to be affected by this.⁵⁹⁴

Searching for problem-solving approaches in architecture, with regards to the environment, has an intellectual approach that has its manifestation in making architectures with relation to the beauties, rather than mere buildings.

⁵⁹³ Schopenhauer, A. (1958). *The World as Will and Representation* (2nd Edition, originally published in 1844 ed.). New York: Dover Publications, pp. 24-25.

⁵⁹⁴ Joe, C. (2016, December 26). *Artificial Intelligence Gained Consciousness in 1991 Why A.I. pioneer Jürgen Schmidhuber is convinced the ultimate breakthrough already happened*. Retrieved December 28, 2016, from Inverse Innovation: <https://www.inverse.com/article/25521-juergen-schmidhuber-ai-consciousness>

In Nature, various organisms exhibit variety of forms, and visual appearance and perceptions are also result of compensation and solution of problems that these entities have faced in their environment. There are scalable and un-scalable variables in Nature design solutions are express continuities or discontinuities. Visual appearance of surface area is in relation to the production and losses of the heat. So, many organisms have found solutions for losing heat, their internal transport, or carry of the loads by increasing their surface area, which has result in change of their visual appearance.⁵⁹⁵

Sustainable 2.0 is a research on business sustainability that is looking for finding sustainable ways based on human emotional and embodied aesthetical aspects. It is evoking awareness of the nature employing mind and emotions. Sensory experience is becoming a strategy for making more sustainable environment, so an internal–external relation is becoming a key for behavior change towards our environment. This experimental project is seeking for re-imagination of the humans and Nature connection. Placing emotions in focus while searching more sustainable answers on climate changes could bring a possibility that has more human aspect. For making more sustainable environment, this approach is proposing a sensorial experience that is more familiar with artistic and aesthetics inquiry, to address challenges of our time.⁵⁹⁶

About the trick of fantasies

Marvin Minsky in the book *The Society of Mind* about how human mind is forking has spoken about the needs for recollection of the memories by modifying a memory itself or by changing how scenario is presented. Besides mere recollection, when it is spoken about Beauty, it is needed to employ tricky switch

⁵⁹⁵ Schmidt-Nielsen, K. (1984). *Scaling: Why is Animal Size So Important?* Cambridge: Cambridge University Press.

⁵⁹⁶ Shrivastava, P. (2012, January). *Enterprise Sustainability 2.0: Aesthetics of Sustainability*. (P. Bansal, & A. J. Hoffman, Eds.) Retrieved January 12, 2017, from The Oxford Handbook of Business and the Natural Environment: <http://www.oxfordhandbooks.com/view/10.1093/oxfordhb/9780199584451.001.0001/oxfordhb-9780199584451-e-35>

between physical appearances and the fantasies that these appearances evoke.⁵⁹⁷

*To be sure, the colors, symmetries, and smells of flowers can certainly arouse the sorts of states we associate with things we've come to see as beautiful. But the more essential trick is in knowing how to turn entirely away from the physical realm and dwell instead upon the images and fantasies that flowers evoke in other spheres—such as the sense of a thing so sweet and innocent, so helpless and delicate, that it invites affection, nurture, and protection. Features like these must be made to fit the listener's private love ideal—only then can the metaphor match.*⁵⁹⁸

In the *Seven Lamps of Architecture*, Ruskin is giving significant role of nature related to the architectures and a way that detection of Beauty could be proceed. He thinks that beautiful is achieved through connection with Nature's creation. He is promoting imitation to achieve Beauty, but the one that is initiated by abstraction, and continued with graduated scale of abstraction.⁵⁹⁹ In *Lectures on Architecture*, he declares that ornamentation is the principal part of architecture, and should be natural, visible and thoughtful.⁶⁰⁰

*It will be thought that I have somewhat rashly limited the elements of architectural beauty to imitative forms. I do not mean to assert that every happy arrangement of line is directly suggested by a natural object; but that all beautiful lines are adaptations of those which are commonest in the external creation; that, in proportion to the richness of their association, the resemblance to natural work, as a type and help, must be more closely attempted, and more clearly seen; and that beyond a certain point, and that a very low one, man cannot advance in the invention of beauty, without directly imitating natural form.*⁶⁰¹

⁵⁹⁷ Minsky, M. (1988). *The Society of Mind*. New York, London, Toronto, Sydney, Tokyo, Singapore: Simon & Schuster.

⁵⁹⁸ *Ibid.*, p. 298.

⁵⁹⁹ Ruskin, J. (2011). *The Seven Lamps of Architecture* (eBook ed.). Boston: Dana Estes & Company Publishers.

⁶⁰⁰ Ruskin, J. (1853). *Lectures on Architecture and Painting delivered at Edinburgh*. New York, Chicago: National Library Association.

⁶⁰¹ Ruskin, J. (2011). *The Seven Lamps of Architecture* (eBook ed.). Boston: Dana Estes & Company Publishers, p. 101.

Beauty versus techno Beauty

Gilbert Simondon uses term *tecnoaesthetics* for expressing link between technique and aesthetics. It is aesthetics by which “tool adapts to its function”.⁶⁰² By it, architecture becomes functional and operative entity.⁶⁰³

Main task of Venice Biennale in 2014 became examination of different elements of architecture like are, among others, doors, windows, or walls, considering them through different cultures and different times. Curator of that biennale Rem Koolhaas states that digital culture and digital devices, infiltrated and immersed in many of these elements, and by that many of them have changed their nature in pretty drastic way. They become interactive or constantly monitoring their users, and have potential for entering to “sinister dimension”.⁶⁰⁴

For Eduard Winters, aesthetic appearances of architecture does not necessarily prevent technical domain. Technical and aesthetical are determines worth of architecture, the first is making design function better, and the second is working on building an aesthetical attractive environment.⁶⁰⁵

Changeable and permanent concept of Beauty

In dialog of Diotima of Matinea’s, it is spoken about different stages of Beauty, one that takes us from one to another, from Beauty of form to the Beauty of all other forms, then proceeds towards Beauty of mind, and finally to the Beauty of:

*...absolute, separate, simple, and everlasting, which without diminution and without increase, or any change, is imparted to the ever-growing and perishing beauties of all other things...*⁶⁰⁶

⁶⁰² Mongini, C. (2015). *Morphogenesis Under Construction: Tracing the Process of Individuation Along Physico-Aesthetic Coordinates*. In A. Sarti, F. Montanari, F. Galofaro, & A. Sarti (Ed.), *Morphogenesis and Individuation*. Springer International Publishing Switzerland, p. 77.

⁶⁰³ Ibid.

⁶⁰⁴ Koolhaas, R. (2016, January 14). Rem Koolhaas on smart technology's "sinister dimension". (C. Rose, Interviewer)

⁶⁰⁵ In Graham, G. (2009, September). *Architecture. The Oxford Handbook of Aesthetics*. (J. Levinson, Ed.)

⁶⁰⁶ Plato. (2008). *Symposium*. The Project Gutenberg EBook.

In the end of dialog, question that has arisen was what if man had eyes to see the true Beauty.⁶⁰⁷ Or whether we can come to a stage of unreal Beauty, bringing forth a reality, rather than image. Example of such Beauty could be found in the movie *Only Lovers Left Alive*⁶⁰⁸ when Yasmine Hamdan by singing a song evokes a reality that is better than image of successes that could occur.

It has its relation to architecture of digital age. While architecture of analog age is rather an image than possible reality, digital architecture is opposite; it is more a possible reality than image.

John Cage gives his own understanding about hidden we could say real, and exposed/image of Beauty, saying that composers should hide Beauty.⁶⁰⁹

*If I just made everything “beautiful,” then I wouldn’t help either myself or anyone else. No change would take place.*⁶¹⁰

Observation of Robert Barry, on event which occurred on March 4, 1970, about a liter of argon that was returned to the atmosphere, took part of exhibition held in MoMA, at the same year. Artists were invited to “address themselves to the question of how to create an art that reaches out to an audience larger than that which has been interested in contemporary art in the last few decades”.⁶¹¹ Barry’s contribution was:

*It is always changing. It has order. It doesn’t have a specific place. Its boundaries are not fixed. It affects other things. It may be accessible but go unnoticed. Part of it may also be part of something else. Some of it is familiar. Some of it is strange. Knowing of it changes it.*⁶¹²

⁶⁰⁷ Plato. (2008). *Symposium*. The Project Gutenberg EBook.

⁶⁰⁸ Jarmusch, J., Bessay, M. (Writers), & Jarmusch, J. (Director). (2013). *Only Lovers Left Alive* [Motion Picture].

⁶⁰⁹ Kostelanetz, R. (2003). *Conversing with Cage*. New York and London: Routledge.

⁶¹⁰ *Ibid.*, p. 81.

⁶¹¹ McShine, K. (1970). *Information (exhibition 1970)*. Museum of Modern Art. New York: Museum of Modern Art, p. 1.

⁶¹² Robert Barry in McShine, K. (1970). *Information (exhibition 1970)*. Museum of Modern Art. New York: Museum of Modern Art, p. 2.

Exploration on materiality extended by materiality of the screen

Video game Minecraft make small children, to become builders (Fig. 8.6). Participants act on buildings of virtual reality while building blocks are pixels. There is no precedence of materials that has been in use. Virtual building blocks could become any material in materialized world; world we live in is possible to produce any material. Minecraft allowed physical to enter to digital; users are direct builders of digital architecture which becomes (un)materialized. Materials are pixels in pixalete world. As Bjarke Ingels said on Future of StoryTelling:

*...our knowledge and technology does not limit us but rather enables us to turn surreal dreams into inhabitable space, to turn fiction into fact.*⁶¹³

Frederick Kiesler is speaking about expansion of the environment and impact on architecture that occurs:

*The traditional art object, be it a painting, a sculpture, a piece of architecture, is no longer seen as an isolated entity but must be considered within the context of this expanding environment. The environment becomes equally as important as the object, if not more so, because the object breathes into the surrounding and also inhales the realities of the environment no matter in what space, close or wide apart, open air and indoor. No object, of nature or of art, exists without environment. As a matter of fact, the object itself cannot expand to a degree where it becomes its own environment. Thus we have to shift our focus from the object to the environment and the only way we can bind them together is through an objective, a clarification of life's purpose - otherwise the whole composite picture in time and space will fall apart.*⁶¹⁴

Zeitguised (Fig. 8.7), the design studio from Berlin, is exploring material potential by clashing it with realm of screen, a digital environment. They stress potentials and Beauty of the occurred forms that are having its links to the reality but

⁶¹³ Ingels, B. (2014, September 9). *Worldcraft: Bjarke Ingels*. Retrieved January 18, 2016, from Future of StoryTelling: <https://futureofstorytelling.org>

⁶¹⁴ Kiesler, F. (1965, March). Second Manifesto on Correalism. *Art International*, 9 (2), pp. 16-19, p. 16.

certainly bringing some weirdness by being stressed with what digital realm is carrying. By that this is an example of exploration about blurred boundaries of real and virtual, and of production of autonomous form of possible materiality that has occurred in process.⁶¹⁵

*We're interested in finding materiality that blurs the physical/digital distinction. Materiality that is not taken from a physical one and bringing it to the screen, but rather using digital means to discover and explore unknown territory. Materials that don't exist yet and that never might, but through our hyperrealist approach become reality in the minds of the viewers.*⁶¹⁶

In their work, they explored a milieu that has been shaped and reshaped by “realistic presence of guises and the abstract vacancy of the digitized human movements.”⁶¹⁷

Observation of experiments about Beauty has taken us towards an inspiration, starting point, abstraction or thoughts, regarding possible architectures. We can say that Beauty is more about stressing and moving beyond the notion of architecture, while aesthetics is more about cultivating.

In the work of *The Painter of Modern Life*, Baudelaire has shown Beauty in duality of general and particular, one related to classical/historical continuum and another of “circumstance and the sketch of manners”.⁶¹⁸ He is granting the work of past for deriving Beauty, while the works of present are more useful for investing Beauty and giving quality of being now. Baudelaire is also stressing out that humankind has an “immortal thirst for beauty”,⁶¹⁹ which is underling an importance of presence of the Beauty. Baudelaireian Beauty is made of

⁶¹⁵ Longstreth, H. (2016, September 29). *New Mythologies / Design*. Retrieved October 21, 2016, from Post Matter Magazine.

⁶¹⁶ Ibid.

⁶¹⁷ Longstreth, H. (2016, September 29). *New Mythologies / Design*. Retrieved October 21, 2016, from Post Matter Magazine.

⁶¹⁸ Baudelaire, C. (1995). *The Painter of Modern Life*. In C. Baudelaire, *The Painter of Modern Life and Other Essays* (pp. 1-35). London/New York City: Phaidon Press, p. 1.

⁶¹⁹ Ibid., p. 2.

invariable and relative element. Those two are forming Beauty and are inevitable from one to another.⁶²⁰

8.6 Summary

After investing tools, derivation of products and exploration on experimentation about Beauty and possibilities for producing architecture that (1) acts as machine do; (2) acts as humans do; or (3) acts as Nature do; proposal that is following is to produce architecture that (4) sense as humans do (Fig. 8.8).

Opposite to the thought that Beauty has remarkable lifeguard importance on architecture and life, which has been mentioned in very beginning of this chapter Frei Otto thought that we do not need doctrine of Beauty, but rather “dedication to the ethos of the builder”,⁶²¹ to attempt to make human rather than beautiful architecture. But still Otto believes that free and by it unknown future of architecture will certainly transmit Beauty:

*The art of architecture is free and must remain free. Therefore, the face of the true architecture of the new century is as yet unknown. I hope that it will be good; I hope that it will radiate beauty.*⁶²²

Le Corbusier sees architecture given in reality of the truth by introducing an image of white house that has sitting opposite to its surrounding milieu. He plays with opposites as he said, an X-ray of Beauty:

*...to allow anything...which is not correct, authorized, intended, desired, thought-out: no action before thought...If the house is all white, the outline of things stands out from it without any possibility of mistake; their volume shows clearly; their colour is distinct. The white of whitewash is absolute, everything stands out from it and is recorded absolutely, black on white; it is honest and dependable. Put on it anything dishonest or in bad taste— it hits you in the eye. It is rather like an X-ray of beauty. It is a court of assize in permanent session. It is the eye of truth.*⁶²³

⁶²⁰ Baudelaire, C. (1995). The Painter of Modern Life. In C. Baudelaire, *The Painter of Modern Life and Other Essays* (pp. 1-35). London/New York City: Phaidon Press.

⁶²¹ Otto, F. (2005). Ethics, Aesthetics and Innovation, A Speech Frei Otto. In F. Otto, *Frei Otto, Complete Works: Lightweight Construction - Natural Design* (pp. 124-130). Basel/Boston/Berlin: Birkhauser, p. 127.

⁶²² Ibid., p. 128.

⁶²³ LeCorbusier. (1986). *Towards a New Architecture*. New York: Dover Publications, Inc.p. 173.

In relation to patterns that are starting point and are presenting background of this research sits an importance of Spuybroek's definition of patterns as a flexible, and being made of flexible elements. He is interested in structuring and patterning effect of information and forms. If form is changed, absorption of information becomes different. So, the system is becoming more flexible and more structuring happens.

Beauty moves towards incorporeal architecture, which makes previously defined term (un)material, to be a safe material to create Beauty. Philosophical and psychological perception becomes an agent for the detection of Beauty. We begin to imitate the artificial reality, and thus expanding the principle of Beauty. Beauty becomes an actant in narratives of architecture.

Holistic approach of works presented here is becoming more understandable when it is looked from perspective of pattern that evolve and emerge into one another. So, natural, manmade, and computer patterns are leaking from one another waving in such way a synthetic, synergic and merged future. In next chapter, it will be given discussion on context of architecture from the point of connection and not necessarily connection.

As necessity to proceed further, herewith will be given several partial conclusions regarding understandings of what architecture is. Starting from derivation of products we can say that architecture is consisted of architectural products. Experimentations are telling us that architecture in future should not be limited only to products. Investigation of tools is putting focus on architecture that examines its nature, by the architecture itself. What makes some architectural product to be is pattern/matrix/flux. Architectural works are becoming Beings as the result of the order of pattern. Architecture is the possibility of patterns. Architecture in the future is to explore the Beauty and relevant are all disciplines for which the Beauty is relevant. Since pattern is Being, final result of architectures (products) is inseparable from the process which has come to them, but do not exclusively the only possible form of creation. Products of architecture in the future are not products any more – those are the “might Beings”. While there is a need to work and act on architectures, and any logic or rigor in patterns or matrixes, architecture is not perfect. Perfect architecture will exist autonomously.



Figure 8.1 Five thousand years old stone balls from Scottish archaeological sites, represents products of abstraction and by isolating them from any particular purpose they are becoming representatives of Beauty. A symmetrical carving on the surface, without iron tools, represents great challenge. Photograph courtesy of the Ashmolean Museum, University of Oxford (full references see in text).

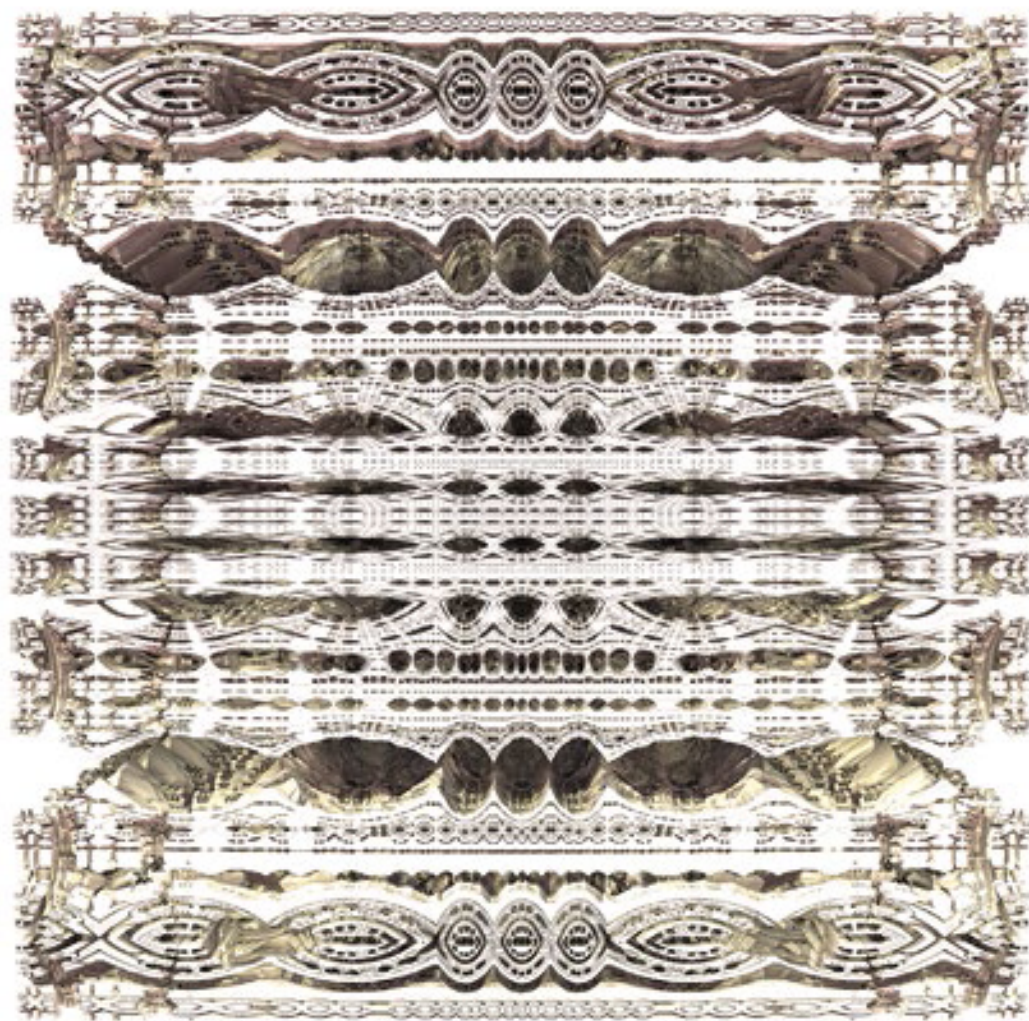


Figure 8.2 An speculative exploration of the architectural elements and principles such as arches, bases, fluting, apertures and stacked layers via algorithmic modeling by SPAN, Matias del Campo and Sandra Manninger for Blocks project. Source: *Architectural design: Evoking through Design: Contemporary Moods in Architecture*, edited by Matias del Capo, Wiley, November, 2016.

Undiversified unity, absolute order

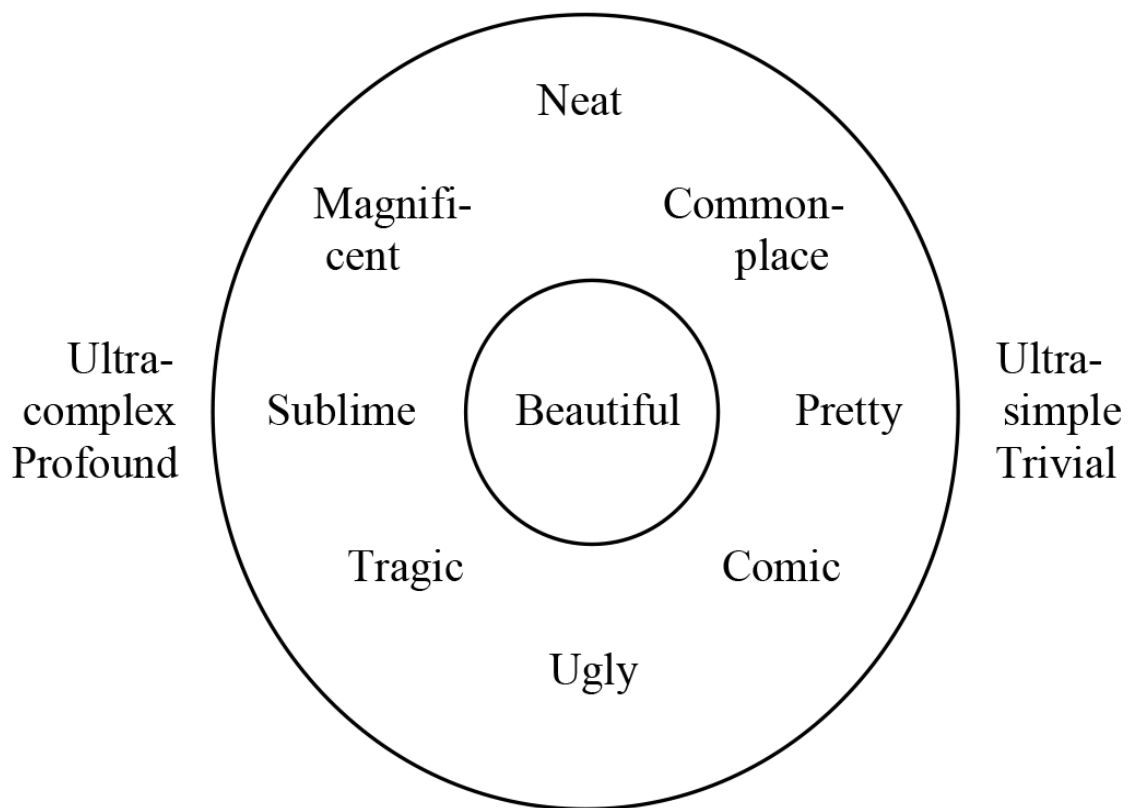


Figure 8.3 The Dessoir-Davis-Hartshorne Circle promoting a concept of Beauty, as an most inclusive value, horizontally and vertically placed between two opposites of complexity and simplicity, order and disorder. Source: http://www.iep.utm.edu/harts-n-m/#SH3f_12/1/2017.



Figure 8.4 Pixel, Street Art, unknown artist, from lecture of James Bridle *Waving at the Machines*, Web Directions South, 2011. Source: http://www.webdirections.org/resources/james-bridle-waving-at-the-machines/_14/12/2016.



Figure 8.5 Facebook headquarters' building is scannable from space. Group of employees has made an QR code on roof top.

Source:https://www.facebook.com/note.php?saved¬e_id=10150630641218920&id=9445547199_21/12/2016.



Figure 8.6 Video Game Minecraft, enter new way of buildings and builders. Figure shows Minecraft's presenters of new Minecraft.net.

Source: https://minecraft.net/en/article/welcome-new-minecraftnet_14/12/2016.



Figure 8.7 Cover design for POSTmatter by Zeitguised that explores an milieu that has been shaped and unshaped by materials that are belongs to digital realm rather than borrowed from physical one. This image shows process of hooded figure's guise that morphs from stable to less stable state. Exploring and ruining border between real and digital, this work explores material versus immaterial.

Source: http://postmatter.com/articles/new-mythologies/zeitguised/_28/12/2016.



Figure 8.8 Scene from movie *Un Chien Andalou*, director: Luis Buñuel; screenplay: Luis Buñuel and Salvador Dalí; photography: Albert Dubergén; production designer: Pierre Schilzneck; music: Wagner with some Argentine tangos (for 1960 version).

Source: <http://www.filmreference.com/Films-Ca-Chr/Un-Chien-Andalou.html> _13/12/2016.

CHAPTER 9

9 Dialoguing with Philosophy

As time goes on, you'll understand. What lasts, lasts; what doesn't, doesn't. Time solves most things. And what time can't solve, you have to solve yourself.

_ Haruki Murakami, Dance Dance Dance

9.1 Dialoguing with Philosophy

Chapter 9 (entitled: Dialoguing with Philosophy) lays out the theoretical and technical foundation of architecture with philosophical interrogation, targeting towards recalculation of context in architecture. Throughout this chapter, it will be discussed theory and technology from philosophical standpoint that may contribute to development, definition, and implementation of the context in raising Architectural Sensorium. Philosophical views are inevitable aspects of design

development, as this does not become mere performance of skills and techniques. This aims to offer a new way of design, as well to deepen the sensibilities of designed objects and their environment. It is about identifying, testing and formulating theoretical argument, observed in each chapter before, to suggest a further discussion on the definition between relationships viewed through three aspects: architecture out of boundary, inside boundary, in-between boundary. The area defined by the boundaries hereby considered the context in its wider understanding. The following investigation will attempt to clarify each of the listed aspects through the prism of philosophical points of view of the philosopher of recent generations, in order to confront it with the framework of Beauty.

9.2 Context

*I try to deal with things that maybe other people haven't thought about, emptiness, making a painting that isn't a painting, or that deals with the wall around painting. For years people have been concerned with what goes on inside the frame. Maybe there's something going on outside the frame that could be considered an artistic idea.*⁶²⁴

Parallel to the statement of Robert Barry that takes Nothing, as a most potent thing in the world, and consideration of what should be considered and relevant as a frame for creation sits Paul Ricoeur's research of the paradox, where "the ethical and mythical nucleus of mankind"⁶²⁵ has found itself.

*...how to become modern and to return to sources; how to revive an old dormant civilization and make part in universal civilization.*⁶²⁶

Having in mind some previously mentioned artistic works it seems that the artist is much fluently treating discoveries and possibilities in understanding the clash, between new and old, between what is accepted as a frame or context, and what is something that could be some further context.

⁶²⁴ Robert Barry in Lippard, L. R. (1997). *Six Years: The Dematerialization of the Art Object from 1966 to 1972, 1968*. Berkeley/Los Angeles: University of California Press.

⁶²⁵ Ricoeur, P. (1965). *Universal Civilization and National Cultures*. In *History and Truth* (C. A. Kelbley, Trans., pp. 276-277). Evanston: Northwestern University Press.

⁶²⁶ Ibid.

In the work of Bosnian artist, Jusuf Hadzifejzovic exists a tangible evidence of the emptiness that has been found inside of well-accepted frame. His artworks are about taking things back from, among others, warehouses, depots, repositories, and garbage dumps.⁶²⁷

His recent works publicly presented under the name *Property of Emptiness*, are recollecting emptiness by filling empty packaging of milk, banana skin or pomegranate among others. (Fig. 9.1); something that is considered to be discarded, used and exhausted. So, he is reviving truthful existence of something, inside of nothing. Meaning something where it is thought that existence is stopping.

Sir Roger Scruton, in given lecture regarded to his own achievements, *The Achievements of Sir Roger Scruton*, at the James Madison Program in American Ideals and Institutions event, at Princeton University, 2017, said regarding relations life-world that “the world as it really seems, is understood through our reflective interaction with it.”⁶²⁸

From the Greek era comes illusionistic treatment of reality, where artist enjoyed their skills to reproduce reality. This admiration towards reality is illustrated in the story from the fifth century BCE. Two characters, Zeuxis and Parrhasios, try to prove who better painter is. That time realistic paints were more valued. One painted grapes that fooled birds other that fooled rival. Deceived human worth more than deceived bird, so realistic curtain paint has won in the Rencontre.⁶²⁹

Certainly, today we are more going towards imitation of artificial life or bleaching border of real and artificial, rather than between real and real. Question that should be raised is from which realm should come proof of successfulness then? Who is our deceived entity to proof our success?

⁶²⁷ Vlaisavljevic, U. (2011). *Europa Depot*. Museum of Contemporary Art of Republic of Serbs, Banja Luka.

⁶²⁸ Sir Roger Scruton in American Ideals and Institutions event, *The Achievements of Sir Roger Scruton*, at Princeton University, on April 3, 2017. Source: Fernandez, M. (2017, April 14). *Celebrating the Philosopher of Beauty*. Retrieved April 14, 2-17, from The Epoch Times: <http://www.theepochtimes.com/n3/2240656-celebrating-the-philosopher-of-beauty/>.

⁶²⁹ Stokstad, M. (2009). *Art History* (3rd Edition ed., Vol. 2). New Jersey: Pearson.

In Kenneth Frampton's essay *Towards a Critical Regionalism: Six Points for an Architecture of Resistance* speaks about timelessness and placelessness of the modern environment. Architecture becomes to be considered out of the frame where it arises.⁶³⁰ But frame by itself should be reconsidered. To make frame determination, firstly boundary should be determined. Definition and novel understandings of boundary are already mentioned in previous chapter. What has importance is the state in which boundary are finding themselves, and that is consistence, blurred envelop that surrounds virtual and real milieu, and even fostering towards losing its existence.

A great example of looseness of boundary between inside and outside and no existence of in-between with a given consideration is cartoon *Howl's Moving Castle*.⁶³¹ Doors as architectural elements play role of openings to the different frames, and by it becoming the main element for all processes of switching from one to another possible world; architecture in such consideration finds itself residing in space that is out of all spaces; in an emptiness that has been not discovered yet or being thrown away.

Context in which modern environment has found itself will be examined here in framework of philosophical understandings.

Kurokawa talks about extensions of the frame of possible architectures, in between tradition and postmodern architecture, within the context of philosophical symbiosis. He has suggested different methods that could be followed: (1) symbiosis of past and present; (2) recombination of fragments of historical forms, and placing them freely throughout works of contemporary architecture; and (3) expression of the invisible ideas, aesthetics, lifestyles and historical mind-sets that lay behind historical symbols and forms.⁶³²

⁶³⁰ Frampton, K. (1983). *Towards a Critical Regionalism: Six Points for Architecture of Resistance*. In H. Foster (Ed.), *The Anti-aesthetic: Essay on Postmodern Culture* (pp. 16-31). Port Townsend, Washington: Bay Press.

⁶³¹ Miyazaki, H. (Director). (2014). *Howl's Moving Castle* [Motion Picture].

⁶³² Kurokawa, K. (1994). *The Philosophy of Symbiosis* (2nd Edition ed.). London: Academy Editions., p. 27.

A contrary to the age of machine is, called by Kurokawa, an age of life. While the first one has placed importance on function, the latter one places it on meaning.

*The architecture of the age of life will be an architecture open to regional contexts, urban contexts, and nature and the environment. It will move towards a symbiosis of nature and human beings, of the environment and architecture.*⁶³³

Beauty in such age could be a value that shows successfulness. Concepts of the Beauty form the past will be here clashed with novel understandings of the world we live seen through aspect of philosophy. The idea is to search for possible context as a result of a symbiosis of past understandings of Beauty and novel understandings of World. Such clash founds its relevance in switch from one to the many, or from monistic approach to multiple choice. Deleuzian multiplicity is derived from mathematical term manifold.⁶³⁴

Ideas are multiplicities: every idea is a multiplicity or a variety.

'Multiplicity', which replaces the one no less than the multiple, is the true substantive, substance itself.

*...Instead of the enormous opposition between the one and the many, there is only the variety of multiplicity - in other words, difference.*⁶³⁵

Beauty taken from different contexts could definitely help us to bring new insights about concept of Beauty and out of what it consisted of. For Tolstoy, the good and beautiful are sitting in relations that show limitations in understandings of act and by products of their particular act. By that, when someone acts that could be 'good' but could not be said that is beautiful even though there is not possibility that act is beautiful, but still, Beauty is inevitable part of what is considered as good. But when some by products are beautiful it does not mean they are

⁶³³ Kurokawa, K. (1994). *The Philosophy of Symbiosis* (2nd Edition ed.). London: Academy Editions., p. 29.

⁶³⁴ Translator's preface in Deleuze, G. (1994). *Difference and Repetition*. (P. Patton, Trans.) New York: Columbia University Press.

⁶³⁵ Deleuze, G. (1994). *Difference and Repetition*. (P. Patton, Trans.) New York: Columbia University Press, p. 182.

necessary good.⁶³⁶ Tolstoy is talking more about semantical understandings and limitations of the language, these relations of good and beautiful could be tested by looking in Nature. No one ever tested sustainability of nature. Nature is per se sustainable, while it is not always true. All beautiful things in Nature are not necessarily good ones.

For Plato, the Beautiful is considered as an Idea, and it is in itself, a direct correspondence of what One is to Oneself. It has a compact Nature, where all that is beautiful leads to self-absoluteness.⁶³⁷

*Created, I reply, being visible and tangible and having a body, and therefore sensible; and all sensible things are apprehended by opinion and sense and are in a process of creation and created. Now that which is created must, as we affirm, of necessity be created by a cause. But the father and maker of all this universe is past finding out; and even if we found him, to tell of him to all men would be impossible. And there is still a question to be asked about him: Which of the **patterns** had the artificer in view when he made the world-the **pattern** of the unchangeable, or of that which is created? If the world be indeed fair and the artificer good, it is manifest that he must have looked to that which is eternal; but if what cannot be said without blasphemy is true, then to the created **pattern**.*⁶³⁸

Kantian Beauty does not have rules; it is apart from concept; it is not relative; it is irrelevant towards object; it is universal.

*For Kant, the Beautiful is neither a judgement of objective utility (external Analogy) nor a judgement of objective completeness (internal Analogy), but becomes a mechanism which is supposed to maintain the possibility of value judgements of an object in relation to itself, neither strictly for me nor in reference to what constitutes it...In other words, the possibility of objects that can be judged without a concept is proof that objects are either more or less beautiful, either more or less themselves.*⁶³⁹

⁶³⁶ Tolstoy, L. (1995). *What is Art?* (R. Pevear, & L. Volokhonski, Trans.) London: Penguin Books.

⁶³⁷ Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press.

⁶³⁸ Plato. (360 B.C.E). *Timeus*. (B. Jowett, Trans.) <http://classics.mit.edu/Plato/timaeus.html>.

⁶³⁹ Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press, p. 339.

For Hegel, Beauty artworks “which constitute the self-unfolding Idea of Beauty”⁶⁴⁰ possess spirit that was its initiation standpoint; and being determined by historical progress finally be “complete which the history of the world will need its evolution of ages.”⁶⁴¹

George Santayana, in work “The Sense of Beauty”, talks about inseparable Beauty, within its own boundary, a Beauty that has no parts; a contrary to the world of nature, that can be analyzed by analyzing its parts.

*The worlds of nature and fancy, which are the object of aesthetic feeling, can be divided into parts in space and time. We can then distinguish the material of things from the various forms it may successively assume; we can distinguish, also, the earlier and the later impressions made by the same object; and we can ascertain the coexistence of one impression with another, or with the memory of others. But aesthetic feeling itself has no parts, and this physiology of its causes is not a description of its proper nature.*⁶⁴²

*...Beauty as we feel it is something indescribable: what it is or what it means can never be said...It is an affection of the soul, a consciousness of joy and security, a pang, a dream, a pure pleasure. It suffuses an object without telling why; nor has it any need to ask the question. It justifies itself and the vision it gilds; nor is there any meaning in seeking for a cause of it, in this inward sense.*⁶⁴³

Santayana defined Beauty as a “pleasure regarded as the quality of a thing,”⁶⁴⁴ rewarding it with an attribute of intrinsically positive value.

⁶⁴⁰ Hegel, G. W. (1886). Selections from Hegel's Lectures on Aesthetics. (e. Bosanquet, & W. Bryant, Eds.) *The Journal of Speculative Philosophy*, Retrieved (March, 3, 2017) from: <https://www.marxists.org/reference/archive/hegel/works/ae/>.

⁶⁴¹ Ibid.

⁶⁴² Santayana, G. *The Sense of Beauty: Being the Outline of Aesthetic Theory*. New York, Chicago, Boston: Charles Scribner's Sons. Source: The Project Gutenberg eBook.

⁶⁴³ Ibid.

⁶⁴⁴ Ibid.

9.3 Possible contexts

Intensification

Tristan Garcia rewards beautiful as an objective value “that it takes when one finds or does not find in it something more and better than itself, or not more and better than itself.”⁶⁴⁵ Consideration of beautiful goes together with identification of possible difference of something, which is not, but could be, or about how much something is insufficiently itself. Seen through history, beautiful is:

*Again, it was defined first as an Idea, then as an ideal, then as a subjective idea, then as a mere form of an object’s self-intensity, then as a concept, then as the relationship between form and object, then as a cultural concept or a naturalised concept. In the West, that which the Beautiful was emptied insofar as that which was likely to be beautiful expanded.*⁶⁴⁶

Raising question instead of what can be beautiful or ugly, what the beautiful can be,⁶⁴⁷ Garcia gives an answer:

*Any thing can be beautiful or ugly: for any thing does not correspond to a norm of selfhood, but is itself intensely.*⁶⁴⁸

Beautiful for Garcia is if thing is intensely itself, and by that “what assures the interchangeability of things, since the reduction of the Beautiful to the ‘intensely itself’ makes beautiful things exchangeable with each other.”⁶⁴⁹

This is giving an opportunity for everything, which is something, to be intensifying and to become aestheticized. So, all algorithms or even the simplest equations could be beautiful since there can all become something.⁶⁵⁰

⁶⁴⁵ Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press, p. 342.

⁶⁴⁶ *Ibid.*, p. 340.

⁶⁴⁷ Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press.

⁶⁴⁸ *Ibid.*, p. 341.

⁶⁴⁹ *Ibid.*, pp. 341-342.

⁶⁵⁰ Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press.

Place of Nowhere

In the book, *Why the World Does Not Exist*, Markus Gabriel gives an explanatory idea of the existence of the things besides the domain of the universe, and the world in it. For him world does not exist. Giving an explanation about nowhere, he refers to the Victor Pelevin's novel *Buddha's Little Finger*, and the line of answer by Pyotr Voyd that the Universe is nowhere, and that the domain of all domains 'is not really a place.'⁶⁵¹

*Nothing becomes something in our constant activity of naming the void.*⁶⁵²

The meaning of being, the meaning of the expression "being," or rather "existence," is sense itself. This is revealed in the non-existence of the world. The non-existence of the world triggers an explosion of sense. For everything exists only because it appears in a field of sense...

*...the meaning of life is the engagement with infinite sense, in which we are fortunately able to participate.*⁶⁵³

Gabriel claims that the world is bigger than the object domain defined by natural science, well known as a Universe. World by Gabriel, consists of all intangible things, like dreams are, possibilities even unrealized ones and everything that occurs by us, not besides us.⁶⁵⁴

*For I claim not only that the world does not exist but also that everything exists except the world.*⁶⁵⁵

*...although the world does not exist, there do exist infinitely many worlds, which in part overlap but are also partly independent of one another.*⁶⁵⁶

⁶⁵¹ Gabriel, M., & Zizek, S. (2009). *Mythology, Madness, and Laughter: Subjectivity in German Idealism*. London/New York: Continuum International Publishing Group.

⁶⁵² *Ibid.*, p. 17.

⁶⁵³ Gabriel, M. (2015). *Why the World Does Not Exist*. (G. S. Moss, Trans.) Cambridge/ Malden: Polity Press, p. 220.

⁶⁵⁴ *Ibid.*

⁶⁵⁵ *Ibid.*, p. 9.

⁶⁵⁶ *Ibid.*, p. 65.

Gabriel's intention is not towards cracking the formula that describes everything, and certainly not the world since such formula does not exist and is demonstrated by thought that not everything in the world is connected, and by it cannot be ruled.⁶⁵⁷

*Just because everything exists does not mean that all is well or that all existing things or structures are somehow equally valid. We find ourselves together on a great expedition – we have arrived here from nowhere, and together we set out into the infinite.*⁶⁵⁸

Holistic Image

State of being isotropic, or having properties or uniformity in all orientations is already mentioned in previous chapters. We saw that together with polar different state of being anisotropic; both, anisotropic and isotropic, are expressed in works of Nature and as well in human creation. Integration of the system by global rules, gives its results in understandings of a holistic oriented approach⁶⁵⁹ stated by Willard van Orman Quine. Quine's criticism on analyticity and reductionists given in the essay *Two Dogmas of Empiricism*; have concluded in explanation of holistic theory and meaning. He comes to understanding that all things are interconnected. Certainly, different from statement, of Markus Gabriel, that things are connected, but not necessarily connected. Quine is stating that experience is a boundary condition of manmade fabric and that it is actually totality of our knowledge. Process of reevaluations is process of obvious interconnections. Adjustment of system, can make any statement true, and also shows ignorance towards its immunity.⁶⁶⁰

⁶⁵⁷ Gabriel, M. (2015). *Why the World Does Not Exist*. (G. S. Moss, Trans.) Cambridge/ Malden: Polity Press, p. 220.

⁶⁵⁸ *Ibid.*, p. 211.

⁶⁵⁹ By Dummett, Duhem-Quine thesis gives a ground for holism, in Dummett, M. (1994). *The Logical Basis of Metaphysics (William James Lectures)* (3rd Edition ed.). Cambridge: Harvard University Press, p. 231.

⁶⁶⁰ Dummett, M. (1994). *The Logical Basis of Metaphysics (William James Lectures)* (3rd Edition ed.). Cambridge: Harvard University Press.

*Each man is given a scientific heritage plus a continuing barrage of sensory stimulation; and the considerations which guide him in warping his scientific heritage to fit his continuing sensory promptings are, where rational, pragmatic.*⁶⁶¹

At a same time, Gabriel and Quine's statements do find their similarity in regards to existence. Quine essay of *On What There Is*, gives an ontological understanding for all that exists.

*To be is to be the value of a bound variable.*⁶⁶²

Simplification of that statement gives a more easy digestive understanding on what there is:

*Variables are those x's and y's that vary according to given rules and axioms, and they can take on the value of whatever category of object is "expressible" within that theory: numbers, protons, human beings, cells, and so on. A bound variable is one that is set before a quantifier, that is, a symbolic device that allows one to say "x exists".*⁶⁶³

Illusion of the Intrinsic Properties That Objects Do Not Possess but We Do

Having in mind *Principle of Charity*, properties of an object links with the ones that object has, when is perceived, Paul Boghossian and David Velleman argue, whether concept of color has to be the link to the visual experience.⁶⁶⁴

⁶⁶¹ Dummett, M. (1994). *The Logical Basis of Metaphysics (William James Lectures)* (3rd Edition ed.). Cambridge: Harvard University Press, p. 46.

⁶⁶² Ibid., p. 15.

⁶⁶³ Origi, G. (2016, October 25). *What's New About 'New Realism'?* Retrieved April 12, 2017, from The Berlin Review of Books.

⁶⁶⁴ Boghossian, P. A. (2008). Color as a Secondary Quality. In P. A. Boghossian, *Content and Justification: Philosophical Papers* (pp. 293-314). New York: Oxford University Press.

*Galileo seems to have found it very natural to say that the property an object appears to have, when it appears to have a certain colour, is an intrinsic qualitative property which, as science teaches us, it does not in fact possess.*⁶⁶⁵

Their research upon visual experience of color has its reference (i) “intrinsic sensational qualities of a visual field”⁶⁶⁶; and (ii) “that intrinsic colour properties of the visual field are the properties that objects are seen as having when they look coloured.”⁶⁶⁷

Confronting intentionalist theory, in understandings of “visual experience of location as the attribution of location to something”,⁶⁶⁸ doing an experiment that describes red spot on after-images, Boghossian and Velleman have realized a possibility of “appearing in a location without appearing to be in that location.”⁶⁶⁹ A requirement to succeed in experiment of red color on after-image, they come out with introduction of additional locations that are having an impact on veridicality of experiencing colors: (i) location as intrinsic property of features in the visual field, and (ii) location as represented by resulting the visual experience.⁶⁷⁰ By that Boghossian and Velleman have multiplied our visual fields, or better saying regions of our visual field.

*By “gilding or staining all natural objects with the colours borrowed from internal sentiment” as Hume puts it, the mind “raises in a manner a new creation.”*⁶⁷¹

Finally, a man is reporting visual quality of what his eyes tell him, and that a quality does not inhere in external objects but to his visual field.⁶⁷²

⁶⁶⁵ Boghossian, P. A. (2008). Color as a Secondary Quality. In P. A. Boghossian, *Content and Justification: Philosophical Papers* (pp. 293-314). New York: Oxford University Press, p. 293.

⁶⁶⁶ *Ibid.*, p. 307.

⁶⁶⁷ *Ibid.*

⁶⁶⁸ *Ibid.*, p. 304.

⁶⁶⁹ *Ibid.*

⁶⁷⁰ *Ibid.*

⁶⁷¹ *Ibid.*, p. 307.

⁶⁷² *Ibid.*

Plurality of the Beauty

Crispin Wright in paper *A Plurality of Pluralisms* talks about four basic modes of pluralism regarding truth: analogy of meaning, family resemblance, one concept / many properties and one property / many properties.⁶⁷³

*...maybe truth doesn't always consist in the same kind of thing...*⁶⁷⁴

Having an interest in realism and objectivity, Wright talks about different 'kinds' of truth, assigning it elastic nature and manifestation via various applications. Comparing truth with pluralism of the game given by Douglas Edwards' suggestion to compare truth with winning, Wright searches for possible pluralism in truth:

*Truth is an end of thought and talk, it is suggested, in the way that winning is an end of game-play.*⁶⁷⁵

Having a reference in Edwards' conditionals:

If you are playing chess, then if you checkmate your opponent's King, you have won.

*If you are playing draughts, then if you take all your opponent's pieces, you have won...*⁶⁷⁶

Plurality in this clash of truth and game is given in different things that should be accomplished to win the game, so by it, shows shades of the truth. Truth by Wright is besides that variable realizable, also elastic and expresses overlapping and networking.⁶⁷⁷

Applying it in architectural domain, since Wright finds plurality of specific things in different domains, architects succeed in given task, by implementing variable possibilities, and if that gives a truthful result it may enable to end the "game" by

⁶⁷³ Wright, C. (2013). *A Plurality of Pluralisms*. In N. J. Pedersen, & C. D. Wright (Eds.), *Truth and Pluralism: Current Debates* (pp. 123-154). Oxford: Oxford University Press. p. 138.

⁶⁷⁴ *Ibid.*, p. 123.

⁶⁷⁵ *Ibid.*, p. 145.

⁶⁷⁶ *Ibid.*

⁶⁷⁷ *Ibid.*

beautiful result. Wrights understandings of truth as manifold, gives a possibility to Beauty to have same nature and to be more than just one.

Limits of Imaginations

Tomas Nagel in his critique of what is wrong in statement *What Is it Like to Be a Bat?* reviewed objective and subjective implications of understandings of someone's descriptions. His approach is based on revision of how experience could be explanatory tool for someone's statement regarding surrounding milieu. By not neglecting importance of "a phenomenology which is in this sense objective may permit question about the physical basis of experience to assume a more intelligible form"⁶⁷⁸; but by giving attention to the subjective experience that is to be better candidate for "objective description."⁶⁷⁹ Herewith it has to be understood that Nagel applies an objective experience from one familiar sort to the one of less familiar sort, while subjective is subjective in boundaries of one sort.

*Our own experience provides the basic material for our imagination, whose range is therefore limited.*⁶⁸⁰

It is seems that limitations in imaginations in order to understood experiences of less familiar sorts are obvious.

Talking about movie *Arrival*⁶⁸¹, director Denis Villeneuve has determined to make a physical environment, which is used in movie as a scene of connection between two worlds, alien and human one (Fig. 9.2).

*When you inside of that spaceship color, sound and perspective are different from that you found on Earth.*⁶⁸²

⁶⁷⁸ Nagel, T. (1974). What is like to be a bat? *The Philosophical Review*, LXXXIII (4), 435-450, p. 450.

⁶⁷⁹ Ibid.

⁶⁸⁰ Ibid., p. 436.

⁶⁸¹ Heisserer, E., Chiang, T. (Writers), & Villeneuve, D. (Director). (2016). *Arrival* [Motion Picture].

⁶⁸² Denis Villeneuve about a scene from movie *Arrival*, featuring Amy Adams in Dragis, M. (2016, November 10). Review: Aliens Drop Anchor in 'Arrival,' but What Are Their Intentions? *The New York Times*.

Screen between humans and aliens, for director, was created as a tool for making tension. Used screens are making barrier between two worlds, but at the same time opening screen in-between worlds, or overlapping the worlds and opening new possibilities. It is a tool for displaying two different views, seen from our and their side. The screen also seems as a tool for merging these two views, since main purpose in the movie was to determine whether they, aliens, are coming in piece or not, to make us determine how to behave.

Creating by Beauty

Richard Rorty a neo-pragmatists works towards recalculations of pragmatism, a context that distinguishes philosophy and metaphysics. Relevance to this research has his understanding of contrasted duality of what is real and what is not, and of normal and abnormal.

*Rorty also acknowledged that “true” is an absolute, context independent term, and that it makes no sense to say “true for me but not for you”. It has, he admitted, a useful “cautionary” role to play in inquiry, since it warns us that however well justified we think a belief may be, it may turn out to be unjustified at some future date to some future community.*⁶⁸³

He argues against idea of reality presented as representation of mind via picture/mirror of nature. Rorty’s suggestion was, instead of involving a “mirror of nature” or representation of the external reality, rather to go with description of the world.

*Nobody will be able to predict his own actions, thoughts, theories, poems, etc., before deciding upon them or inventing them.*⁶⁸⁴

To complete wholeness of “objective truth” one has to assemble all predictions of incommensurate descriptions, among others, Beauty. Beauty for him is more power than giving.

⁶⁸³ Westbrook, R. (2009). The Pragmatist Family Romance. In C. Misak (Ed.), *The Oxford Handbook of American Philosophy* (pp. 186-196). Oxford Handbooks Online, p. 194.

⁶⁸⁴ Rorty, R. (1979). *Philosophy and the Mirror of Nature*. Princeton, New Jersey: Princeton University Press, p. 387.

*Everything is what it is, by virtue of its relations to everything else.*⁶⁸⁵

By referring to Nabokov, Rorty thinks that someone who successfully deals with the Beauty does not recapture it, but creates something else.⁶⁸⁶ That has reference to his thoughts regarding “abnormal” insights that have to be reached by offering new metaphors.

Possible Worlds

Stuart Kauffman believes in dualism of real Actuals, Res Extensa derived from Descartes and real Possibles, Res Potentia derived from Aristotle.⁶⁸⁷ Origin of *Imagination* is from Latin imaginari “picture to oneself”; while *Possible* is Latin possibilis, from posse “be able”.⁶⁸⁸ Together *Imagination* and *Possible* could be “to have the freedom to picture to oneself new possible scenarios to catalyze change”. Possible and imaginary worlds are merging with real one, seen through history.

According to David Lewis, promoter of multiverse, there is only possible entity which exists in possible world, and what is “actual”⁶⁸⁹ is actual only relative to our “actual world”, the one we speak about. So to speak, everything is actual.⁶⁹⁰

*Possibilities are not always possible worlds. There are possible worlds, sure enough, and there are possibilities, and possible worlds are some of the possibilities. But I say that any possible individual is a possibility, and not all possible individuals are possible worlds. Only the biggest ones are.*⁶⁹¹

⁶⁸⁵ Rorty, R. (2000). Of Beauty and Consolation: Part 23. (W. Kayzer, Interviewer).

⁶⁸⁶ Ibid.

⁶⁸⁷ Kauffman, S. (2010). *Res Extensa, Res Potentia And the Poised Realm*. Retrieved May 16, 2016, from National Public Radio: <https://www.npr.org/sections/13.7/2010/08/17/129250892/res-extensa-res-potentia-and-the-poised-realm>

⁶⁸⁸ Oxford Dictionaries. (2016). Retrieved May 15, 2016, from Oxford Dictionaries Language matters: <http://www.oxforddictionaries.com/definition/english>

⁶⁸⁹ Dawid Lewis has some reservations regards “actual” for full understandings see: Lewis, D. K. (1986). *On the Plurality of Worlds*. Oxford: Blackwell.

⁶⁹⁰ Lewis, D. K. (1986). *On the Plurality of Worlds*. Oxford: Blackwell.

⁶⁹¹ Ibid. p. 230.

Debates of Realist and Anti-realist

Michael Dummett used debates between realist and anti-realist while talking about, among others, possible worlds, actual ones, future and past ones.⁶⁹²

Following David Lewis's argumentation regards actuality of possible worlds, Dummett, in the essay *Could There Be Unicorn?* debates value of external appearance as an importance for determination of the existence and meaning. In such understandings, he calmed that non existence of unicorns could not be demonstrated by the missing properties of means or identification of what is consisted under the term species.

*We can distinguish three possible theories about species terms that yield arguments to show that, given that there are no unicorns, and never have been, it is not true that there might have been any.*⁶⁹³

His explanation of existence of the unicorns is following logics of the two truth-values, a product of relativization of many classical truth-values and, to the points of the space, where space could be understood as Leibnizian possible worlds. Consideration that each world is absolutely possible comes from:

*"Possibly A" could be understood as being true in any given world just in case "A" was true in some possible world, and "Necessarily A" as being true in any given world just in case "A" was true in every possible world.*⁶⁹⁴

As a conclusion of Dummett's debate "there might be unicorns and, indeed, just possibly may be."⁶⁹⁵

⁶⁹² Murphy, B. (n.d.). *Michael Dummett (1925—2011)*. Retrieved March 2, 2017, from Internet Encyclopedia of Philosophy: <http://www.iep.utm.edu/dummett/>.

⁶⁹³ Dummett, M. (1996). *The Seas of Language*. Oxford: Clarendon Press, p. 332.

⁶⁹⁴ *Ibid.*, p. 329.

⁶⁹⁵ *Ibid.*, p. 346.

The Environment of New Sensibility

Susan Sontag in the essay *One culture and the new sensibility*, is referring to the merge of art and science. She is promoting environment that is based on artistic understandings and fostering towards expansions of the way we like things oriented more on form and less on content. Result of such understandings or better say wider understandings of the environment comes from our view of the things nowadays, but also it has its reference to historical continuum, referring that our/new sensibility is not merely biological but also historically specific. All that, regarding new environment we live in, drags along new standards, of pluralistic sensibilities and open and inerasably accessible Beauty.⁶⁹⁶

Additionally, we can mention Lillian Lieber's character SAM, a symbiosis of science, art, and math. Lillian Lieber is a mathematician who spoke about infinity from the aspects of behaving as an "intuitive" being, that yearns for art, searches for support in science, and tries to find reason by math. SAM is not a character that recognized field of its authority, but rather widens its milieu of recognition, by merging all three mentioned fields.⁶⁹⁷

...*"S" in order to "observe" the world,*
his "A" ("intuition") to sense
some basic ways to translate his
"observations",
and his "M"
*to derive his "results"...*⁶⁹⁸

Merge of science and art is very well visible in the work of Santiago Ramon y Cajal. As a father of neuroscience, Cajal has used art to express his scientific work. The drawings in the book *Beautiful Brain: The Drawings of Santiago Ramon y Cajal*, shows his attempt to visually answer the questions of "How do

⁶⁹⁶ Sontag, S. (1966). *One culture and the new sensibility*. In S. Sontag, *Against Interpretation and Other Essays* (pp. 293-305). Picador.

⁶⁹⁷ Lieber, L. R. (2007). *Infinity: Beyond the Beyond the Beyond*. New York; Toronto: Rinehart & Company, Inc.

⁶⁹⁸ *Ibid.*, pp. 6-7.

nerve impulses travel between separate cells?” or “What is the neurological basis of reflexes?” Making his neural drawings he was more oriented to the hand drawings, rather than of tracing over microscopic picture (Fig. 9.3 and 9.4).⁶⁹⁹

*A graphic representation of the object observed guarantees the exactness of the observation itself.*⁷⁰⁰

Observer-independent Reality

Philosopher John Searle's understands consciousness (Fig. 9.5) as biological phenomenon, like all other similar, such as for example photosynthesis is. As the famous problem of the mind and body relation, Searle gives an explanation that our mind can go from a state of consciousness to the state of unconsciousness, depending on the behavior of molecules. He advocates reconsideration of thesis of consciousness, that is fostering non existence of consciousness, taking it as illusion only, or as computer simulation of the brain.⁷⁰¹

Conciseness, as defined by Searle consists of all the states of feelings, sensation or awareness. It begins in the morning, after sleeping without dreaming, and continues, all day until we fall asleep or die, or otherwise become unconscious. Dreams belong to the realm of consciousness. The relationship between reality and illusion is, in fact, the relationship between that how the things consciously seem to us, and what they really are. Referring to Descartes, we cannot doubt the existence of our own consciousness.⁷⁰²

⁶⁹⁹ Popova, M. (n.d.). *Beautiful Brain: The Stunning Drawings of Neuroscience Founding Father Santiago Ramón y Cajal*. Retrieved April 6, 2016, from Brain Pickings: <https://www.brainpickings.org/2017/02/23/beautiful-brain-santiago-ramon-y-cajal/>

⁷⁰⁰ Santiago Ramón y Cajal in Popova, M. (n.d.). *Beautiful Brain: The Stunning Drawings of Neuroscience Founding Father Santiago Ramón y Cajal*. Retrieved April 6, 2016, from Brain Pickings: <https://www.brainpickings.org/2017/02/23/beautiful-brain-santiago-ramon-y-cajal/>

⁷⁰¹ Searle, J. (2013, May). Our shared condition — consciousness. *TED*. TEDxCERN.

⁷⁰² *Ibid.*

*Consciousness creates an observer-independent reality...Their existence is observer-relative...Computation only exists relative to consciousness...You can have completely objective science, a science where you make objectively true claims, about a domain whose existence is subjective, whose existence is in the human brain consisting of subjective states of sentience or feeling or awareness. So the objection that you can't have an objective science of consciousness because it's subjective and science is objective, that's a pun. That's a bad pun on objectivity and subjectivity. You can make objective claims about domain that is subjective in its mode of existence.*⁷⁰³

The properties of consciousness, according to Searle are: (i) real and irreducible; (ii) qualitative; (iii) subjective; (iv) come in unity of single conscious feelings; and (v) have the causal influence on our behavior.⁷⁰⁴

Ghost in the Machine

British philosopher Gilbert Ryle, in the book *The Concept of Mind*, gives critique to duality of body-mind problem. To introduce different logical category, one that sits contrary to the concept that separates mind and body, which Ryle calls “ghost in the machine”, he said:

*The workings of minds had to be described by the mere negatives of the specific descriptions given to bodies; they are not in space, they are not motions, they are not modifications of matter, they are not accessible to public observation. Minds are not bits of clockwork, they are just bits of not-clockwork. As thus represented, minds are not merely ghosts harnessed to machines, they are themselves just spectral machines.*⁷⁰⁵

He is trying to prove that duality in understandings of matter and mind has dissipated. Talking about sensation, he refers to the connection between mind and body.

⁷⁰³ Searle, J. (2013, May). Our shared condition — consciousness. *TED*. TEDxCERN.

⁷⁰⁴ *Ibid*.

⁷⁰⁵ Ryle, G. (2009). *The Concept of Mind*. London/New York: Routledge, p. 9.

*When theorists pose such 'wires and pulleys' questions as, 'How are past experiences stored in the mind?', 'How does a mind reach out past its screen of sensations to grasp the physical realities outside?', 'How do we subsume the data of sense under concepts and categories?', they are apt to pose these problems as if they were problems about the existence and interconnections of hidden bits of ghostly apparatus. They talk as if they were doing something like speculative anatomy or even counter-espionage.*⁷⁰⁶

Giving an explanation towards differences of sensation and observation, he starts with observation that faces duality in its attempt to act towards observation of something or successful act of observing. His understandings towards observation go by linking to experiences of the person that is faced with impulses from environment when sensing goes towards thinking.⁷⁰⁷

*The sense of 'thinking' in which a person following a familiar tune can be said to be thinking what he is hearing, is not that thoughts of past auditions are occurring to him. He has not forgotten how it goes, but he is not recalling how it formerly went.*⁷⁰⁸

Further, Ryle does not make difference between sensation and mind or as he puts "incident in his sensitive life and another incident in his intellectual life"⁷⁰⁹ but rather, as he called it, "'semi-hypothetical' or 'mongrel-categorical' statement"⁷¹⁰. Finally, discovery of difference leads him to conclude that:

Observing is using one's ears and eyes. But using one's ears and eyes does not entail using, in a different sense, one's visual and auditory sensations as clues. It makes no sense to speak of 'using' sensations. It will not even do to say that in watching a cow, I am finding out about the cow 'by means of' visual sensations, since this too would suggest that sensations are tools, objects which can be handled in the same sorts of ways as the things seen and heard can be handled. And this would be

⁷⁰⁶ Ryle, G. (2009). *The Concept of Mind*. London/New York: Routledge, p. 201.

⁷⁰⁷ Ibid.

⁷⁰⁸ Ibid., p.207.

⁷⁰⁹ Ibid.

⁷¹⁰ Ibid.

*even more misleading than it would be to say that manipulating a hammer involves first manipulating my fingers, or that I control the hammer by dint of controlling my fingers.*⁷¹¹

Constructors of Reality

In the book *The Threefold Cord: Mind, Body, and World*, Hilary Putnam calls for naïve realism, having an idea that:

*...we in some sense in perception are in direct touch with external objects...*⁷¹²

The author is proponent of conceptual relativity, “the claim that sometimes two scientific theories have different ‘ontologies’ in the familiar Quinian sense, that is, ‘taken at face value’ their quantifiers range over different sorts of objects, and yet there is a systematic way of interpreting each theory in the language of the other that renders them (not just empirically equivalent, but) explanatorily equivalent—that is, every explanation of a physical phenomenon provided by one theory goes over the interpretations in question, into a perfectly good explanation of the same phenomenon (but one that is very different, at least at ‘face value’).”⁷¹³ Switch from being an advocate of internal realism, Putnam turns to conceptual relativity as an explanation in failure of:

*One could think of both experiences and concepts as forms – to use what I think is McDowell’s own language – of openness to the world. I should not have seen us as “making up” the world (not even with the world’s help); I should have seen us as open to the world, as interacting with the world in ways that permit aspects of it to reveal themselves to us. Of course we need to invent concepts to do that. There is plenty of constructive activity here. But we don’t construct reality itself.*⁷¹⁴

⁷¹¹ Ryle, G. (2009). *The Concept of Mind*. London/New York: Routledge, p. 211.

⁷¹² Putnam, H. (2010, January 28). Interview a Hilary Putnam, Doctor Honoris Causa. (U. C. Madrid, Interviewer).

⁷¹³ Putnam, H. (2014). Hilary Putnam interviewed by Naoko Saito and Paul Standish. *Journal of Philosophy of Education*, 48 (1), 1-27, p. 2.

⁷¹⁴ Putnam, H. (2013). From quantum mechanics to ethics and back again. In M. Baghramian (Ed.), *Reading Putnam* (pp. 19-37). London/New York: Routledge, p. 27.

The idea which conceptual realist should see that reality is independent, “mind-independently real, for all that, and each of its states, is a mind-independently real condition that can be represented in each of these different ways.”⁷¹⁵

*...there is a real world out there, most of which we did not create, and it's not simply our interpretation, our logical construction.*⁷¹⁶

Nothingness as a Material

Even though and because of his already exposition towards architectural realm, a main proponent of speculative realism, Graham Harman is not taking part in this chapter, but as a opponent of such understandings, the philosopher Ray Brassier is considered here. He is credited for coining the term "speculative realism," even he has no sympathy for it.⁷¹⁷ His thought, as he explained, is oriented towards nihilism and crisis of meaning. Brassier is stressing notion of meaning by reconfiguring terms of space, life, time or casualty, that are certainly changing picture of our understandings of the world.⁷¹⁸

Over the course of a few centuries, the longstanding assumption that everything exists for a reason, that things are intrinsically purposeful and have been designed in accordance with a divine plan, is slowly but systematically dismantled, first in physics, then in chemistry, and eventually in biology, where it had held out longest.

*...a project is now underway to understand and explain human consciousness in terms that are compatible with the natural sciences, such that the meanings generated by consciousness can themselves be understood and explained as the products of purposeless but perfectly intelligible processes, which are at once neurobiological and sociohistorical.*⁷¹⁹

⁷¹⁵ Putnam, H. (2013). From quantum mechanics to ethics and back again. In M. Baghramian (Ed.), *Reading Putnam* (pp. 19-37). London/New York: Routledge, p. 28.

⁷¹⁶ Putnam, H. (2014). Hilary Putnam interviewed by Naoko Saito and Paul Standish. *Journal of Philosophy of Education*, 48 (1), 1-27, p. 3.

⁷¹⁷ Harman, G. (2010, July 23). *brief SR/OOO tutorial*. Retrieved March 20, 2017, from Object-Oriented Philosophy: <https://doctorzamalek2.wordpress.com/2010/07/23/brief-srooo-tutorial/>.

⁷¹⁸ Brassier, R. (2011, March 4). I am a nihilist because I still believe in truth. (M. Rychter, Interviewer) *Kronos*.

⁷¹⁹ *Ibid.*

Brassier's nihilism strives for abundance and revision of beliefs of the world, and with transformation of thoughts to work on effective and sufficient intervention on it.⁷²⁰

He has participated together with musicians, in the project of *Idioms and Idiots*, which has an aim for "a better understanding of the representation of art in art"⁷²¹. Their attempt was to make concert that has social space value, besides production of sound value and extraction of the sound into event. Their focus was on bringing a structure that could be percept as stabile to its instable level. Their work was aligned against normalization of the processes, trying to answer what world is not, rather than to improvise what it is, by taking the audience to reside in a strange place.

*What is created is not a unified sense of space or time, but a heterotopias where one's location contains different spaces and temporalities.*⁷²²

Peak of human acceptance of whole 'experiment' starts when "density of the atmosphere becomes too much and is rendered oppressively physical." Their play is based on NON-philosophy that treats philosophy as non material and also NON-idiomatic. Both approaches NON-philosophical and NON-idiomatic, work towards picture of single and universal considering music or philosophy "as One".

*It presumes knowing and at the same time the non-use of what is known as an object, as a material.*⁷²³

9.4 Summary

Correlations and complementation between the architecture and philosophy are not new. In history, we can detect collaborative works between architects and philosophers, like within Bernard Tschumi, Peter Eisenman and Jacques Derrida's project of *Parc de la Villette*. Derrida declares:

⁷²⁰ Brassier, R. (2010/2011). An Electronic email conversation: Metal Machine Theory. (Mattin.org, Interviewer).

⁷²¹ Brassier, R., Guionnet, J.-L., Seijiro, M., & Mattin. (2010, May 7). *Idioms and Idiots*. Retrieved March 20, 2017, from Idioms and Idiots: http://www.mattin.org//recordings/IDIOMS_AND_IDIOTS.html

⁷²² Ibid.

⁷²³ Ibid.

*The Collège international de Philosophie should provide the place for a meeting (rencontre), a thinking meeting, between philosophy and architecture. Not in order to finally have them confront each other, but to think what has always maintained them together in the most essential of cohabitations.*⁷²⁴

This research, explained in Methodology chapter, has more concern towards searching niche for or of possible architecture, somewhere which does not belong to any particular domain. So, if in the past we faced separation of the disciplines and later its fusion towards interdisciplinary approach, today we should consider fostering towards antidisciplinary working in spaces which simply do not fit into any existing academic discipline, making its specific field of study with its own particular words, frameworks, and methods.⁷²⁵

Approach that foster breach of the limits of known disciplines, Derrida calls “limitrophy”:

*It is not about what grows and increases to the limit, but that which nourishes the limit, generates it, raises and complicates it. Everything that I would say definitely doesn't consist in erasing limit, but rather multiplies its figures, complicates, thickens, delimits, folds, divides the line while making it grow and multiply.*⁷²⁶

*With limitrophy, we are undoubtedly in a zone of resonance between architecture and philosophy.*⁷²⁷

Beauty is looked as limited, mostly considering its visual determination and occupation of some actual reality. But seen as limitless, and considering its domain of processes of “making”, it will link us with intangible world. Connection between intangible and tangible has many possibilities and it is not one direction

⁷²⁴ Jacques Derrida, “Point de folie – maintenant l'architecture”, in *Psyche. Invention de l'autre*, Paris: Galilée, 1987. Source: Younès, C. (2013). Architecture and Philosophy: Paradoxes and Metamorphoses of Their Meeting. *SAJ Serbian Architectural Journal Architecture of Deconstruction: The Specter of Jacques Derrida*, 5 (1), 39-46, p. 40.

⁷²⁵ Ito, J. (2016). *Design and Science*. (D. Hillis, Ed.) *Journal of Design of Science (JoDS)*, 1 (1).

⁷²⁶ Younès, C. (2013). Architecture and Philosophy: Paradoxes and Metamorphoses of Their Meeting. *SAJ Serbian Architectural Journal Architecture of Deconstruction: The Specter of Jacques Derrida*, 5 (1), 39-46, p. 42.

⁷²⁷ *Ibid.*, pp. 43-44.

way. In the last project of Michael Hansmeyer and fellow Benjamin Dillenburger, called *Grotto II* from series of *Digital Grottesque*, authors succeeded to produce or to make tangible something we cannot even visualize. So, completely algorithmic design was printed out, without having known how it will look like in the end of the process. It is a new kind of architecture that “emphasizes the viewer’s perception, evoking marvel, curiosity and bewilderment.”⁷²⁸ Even if there is no particular purpose given yet to these columns (Fig. 9.6), they are examples of 21st century Beauty, as in the past was the case with carved stone balls.

A contrary to project of *Grotto II*, also exhibited at Pompidou Centre, on collective exhibition under the name *Mutations-Créations / Imprimer le monde, 2017*, sits work overseen by architect Kengo Kuma and developed by the students from Tokyo University. Both projects are showing latest possibilities and input towards architectural creation, given by advance digital technologies, but latter one *Drawn-in-place* (Fig. 9.7) project, is adding human role in whole process of fabrication, by introduction of 3D printing pen.⁷²⁹ Difference between these two projects is in given freedom to humans, making them being attached to virtual realm. Printing pan transforms human body to a medium that links actual and possible.

Wide as possible spectrum of thought given in this chapter like: intensification, occupation of place that is nowhere, holistic wholeness, illusion of the intrinsic properties that objects do not possess but we do, plurality and creation by the Beauty, limits of imaginations, debates of realists and anti-realists, possible worlds existence and creations, the reality of new sensibility or the observer-independent one, constructors of reality, a ghost in the machine, or nothing as a new material is giving a contemporary picture of the world tendencies. This all is telling about deeper consideration of human, computer and technical construction.

⁷²⁸ Hansmeyer, M., & Dillenburger, B. (2017). *Concept: Digital Grottesque*. Retrieved July 20, 2017, from Digital Grottesque: <https://digital-grottesque.com/concept/>

⁷²⁹ Lee, K. K. (2017, April 20). *Kengo Kuma Rethinks the Role of Human Hand in Today's 3D Printing*. Retrieved April 20, 2017, from World Architecture Community: http://worldarchitecture.org/architecture-news/cvpfe/kengo_kuma_rethinks_the_role_of_human_hand_in_today_s_3d_printing.html.

Deriving from previous philosophical understandings, and starting with two concepts of philosophical comprehensions of mentioned philosophers, Marcus Gabriel and his concept of the knowledge and facts; and relation of intensification of Beauty and true given by Tristan Garcia following understandings or relations have been concluded:

- Concept of knowledge and facts

*A FACT is something that is true of something.*⁷³⁰

Marcus Gabriel sees facts and objects equally important, non-existence of facts excludes true about all things, concluding that there is no existence of the world without facts. Gabriel defining an object domain suggests maneuver, called ontological reduction that literally means, “leading back.”⁷³¹ This “requires substantial scientific knowledge, whether this be of a natural, historical, or sociological kind.”⁷³²

*In the end, regarding the question of the existence of facts, it is of no consequence whether or to what extent we can know them at all. Indeed, the concept of a fact and the concept of knowledge are connected in diverse ways. Still, no analysis of this connection should lead to the false result that there exist no facts but only interpretations, and consequently the analysis, at some point, must likewise be erroneous.*⁷³³

- Concept of Beauty and true

For Tristan Garcia, all values are meaningful if they are understood between two senses of (1) substantial values and (2) economic values.⁷³⁴ Relation between values of Beautiful and true is founded in in-between of exposing and weakening the relational terms, that have an idea towards intensification of all that is

⁷³⁰ Gabriel, M. (2015). *Why the World Does Not Exist*. (G. S. Moss, Trans.) Cambridge/ Malden: Polity Press, p. 33.

⁷³¹ *Ibid.*, p. 37.

⁷³² *Ibid.*, p. 38.

⁷³³ *Ibid.*, p. 44.

⁷³⁴ Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press, p. 351.

something. No matter whether is true, beautiful, good, all values are objective, and shared between each other:

Values are qualities of things that we find in them without them being there. They mark the transformation of things into variable intensities. Each thing receives with its value what makes it simultaneously exchangeable with another and irreplaceable.

*...Values intensify them, give them depth, and uproot them from the flat world. They transform their determinate extension into an interplay between more or less variable values, which give them their irreplaceable singularity.*⁷³⁵

Both Beautiful and true “reveal its intensive character by desubstantialising.”⁷³⁶

Beautiful shows its application and existence entirely in things, while true “always concerns the being and comprehension of objects,”⁷³⁷ and diminishes the intensity of opposite, which is false, but it does not reduce it to nothing. In modern time value of true is twofold, firstly, it becomes doubted and secondly, it is flank attack on truth.⁷³⁸

*If to find the beautiful is to find something (and to intensify it), to find the truth is to find a relation between objects (and to intensify it).*⁷³⁹

- Concept of knowledge and true

According to Plato to know something, one should know its essence, but leaving possibility instead to know essence, to explain its essence or explain why things are so. By that, definition of knowledge is “true belief bound by an aitia logismos.”⁷⁴⁰ Paul Boghossian in book *Fear of Knowledge: Against relativism and*

⁷³⁵ Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press, p. 353-353.

⁷³⁶ Ibid., p. 343.

⁷³⁷ Garcia, T. (2014). *Form and Object A Treatise on Things*. Edinburg: Edinburg University Press.

⁷³⁸ Ibid.

⁷³⁹ Ibid., p. 342.

⁷⁴⁰ Fine, G. (2003). *Plato on Knowledge and Forms: Selected Essays*. Oxford: Oxford University Press, p. 6.

constructivism, adds that, belief to be knowledge, has to be aside justified, true as well.⁷⁴¹

- Concept of Beauty and facts

Business Insider web page, has collected eleven (11) facts of Beauty, related to humans, defined by different methods and scientific proofs. Here, they are mentioned to be applied to architecture, as a childish comparison, or naïve but with an aim to connect it to the tendencies of how Beauty is perceived as a successful tool:

*The vertical distance between the eyes and mouth, and the horizontal distance between the eyes are key determinants of the "ideal" face; The left side of the face is prettier; Beautiful people make about 5% more an hour than their average-looking colleagues; Beautiful people are happier; Being too attractive can hurt job and scholarship opportunities; Attractive men and women have higher IQs; Women find men less attractive when they smile; the opposite is true for women; Women are more attracted to men who are desired by others; Men prefer women with child-like faces; We are more likely pick up on the personality traits of attractive people than unattractive people; People want a partner who looks like their parents.*⁷⁴²

- Concept of fact and true

Facts and true are directly related to question of actualized and possible worlds:

*Facts...are the objects of certain mental states and acts, they make truth-bearers true and correspond to truths, they are part of the furniture of the world.*⁷⁴³

⁷⁴¹ Boghossian, P. A. (2006). *Fear of Knowledge: Against relativism and constructivism*. Oxford: Oxford University Press.

⁷⁴² Spector, D. (2012, May 10). *11 More Fascinating Facts About Beauty*. Retrieved April 14, 2017, from Business Insider: <http://www.businessinsider.com/facts-about-beauty-2012-5#not-everything-in-life-is-a-product-of-good-breeding-12>.

⁷⁴³ Mulligan, K., & Correia, F. (2013, Spring). *Facts*. (E. N. Zalta, Ed.) Retrieved April 14, 2017, from The Stanford Encyclopedia of Philosophy: <https://plato.stanford.edu/archives/spr2013/entries/facts/>.

...Where x is a fact, $es(x)$ (the existence-set of x) is the set of all worlds at which x exists. And where G is a set of facts, $ces(G)$ (the conjunctive-existence-set of G) is $\bigcap x \in G es(x)$, i.e. the set of worlds at which all elements of G exist, and $des(G)$ (the disjunctive-existence-set of G) is $\bigcup x \in G es(x)$, i.e. the set of worlds at which some elements of G exist. Notice that $ces(\emptyset) = W$, $des(\emptyset) = \emptyset$, and that given any $G \neq \emptyset$, $ces(G) \subseteq des(G)$.⁷⁴⁴

- Concept of knowledge and Beauty

In justifying Beauty by knowing it, rather than by illusion of what appearance of it has brought a dual nature of the way we accept Beauty, by sensors and by brain could be helpful. Contrary to this relation is Slavoj Žižek's understanding of truth. He said that there are more truths, whether we can say the same for Beauty, in the appearance and in what is hidden beneath it. As an example, Žižek refers to Agatha Christie's story where Hercule Poirot discovers ugliness and Beauty in the same person. Putting on a wig, a lady has obfuscated her Beauty. As an answer to whether is possible opposite to become beautiful, from being ugly, with a same trick, and what will remain in man's infatuation beyond deception, Poirot answers: "No, my friend, it announces the beginning of wisdom."⁷⁴⁵

*Such a skepticism, such an awareness of the deceptive nature of feminine beauty, misses the point, which is that feminine beauty is nonetheless absolute, an absolute which appears: no matter how fragile and deceptive this beauty is at the level of substantial reality, what transpires in/through in the moment of Beauty is an Absolute – there is more truth in the appearance than in what is hidden beneath it.*⁷⁴⁶

Karl Chu is saying that we are witnessing the rumblings of Promethean fire, invoked by new understandings in computation and biogenetics, that makes

⁷⁴⁴ Mulligan, K., & Correia, F. (2013, Spring). *Facts*. (E. N. Zalta, Ed.) Retrieved April 14, 2017, from The Stanford Encyclopedia of Philosophy: <https://plato.stanford.edu/archives/spr2013/entries/facts/>.

⁷⁴⁵ Gabriel, M., & Žižek, S. (2009). *Mythology, Madness, and Laughter: Subjectivity in German Idealism*. London/New York: Continuum International Publishing Group, p. 133.

⁷⁴⁶ Ibid.

possible to engender something from almost of nothing, that takes us to the realm of nothing. Final goal served to us, by understandings of biogenetics, is to engineer a new species, by using computation as a certain novel alchemy of our age.⁷⁴⁷

Beauty is a value found in inorganic and organic substances, as well as in processes of its mutation to react and become reactors, switching from one possibility and actualization to another. Beauty becomes sharing value that does not recognize realm, better having its own, and by no need for justification is autonomous.

By being limitless and dynamic system of value, Beauty does not denying its previous stages, always containing, like genetic system, the description of itself is authentic in self-replications. For Tristan Garcia beautiful is self-intensification, being greatest possible itself. Rewritable concept, taken from genetics is deriving to the realm of Beauty, unknown value towards recalculated sustainability. Architecture has lost its initial ground and it should not try to implement philosophical one, but rather invent its own, beyond metaphors, analogies, even beyond knowledge but not to omitting it; to explain and invent itself, to create and involve voids into new void, an simulacrum of ourselves.

⁷⁴⁷ Chu, K. S. (2004). Metaphysics of Genetic Architecture and Computation. *Perspecta: Building Codes*, 35, pp. 74-97.



Figure 9.1 Jusuf Hadzifejzovic, project Property of Emptiness, exhibited on Migrants of Mental Spaces, exhibition held in Museum of Contemporary Art Vojvodina, Novi Sad, from 1^{6th} of December 2016 to 2^{9th} January 2017.; curated by: Sanja Kojić Mladenov. Photograph by Nermina Zildzo.

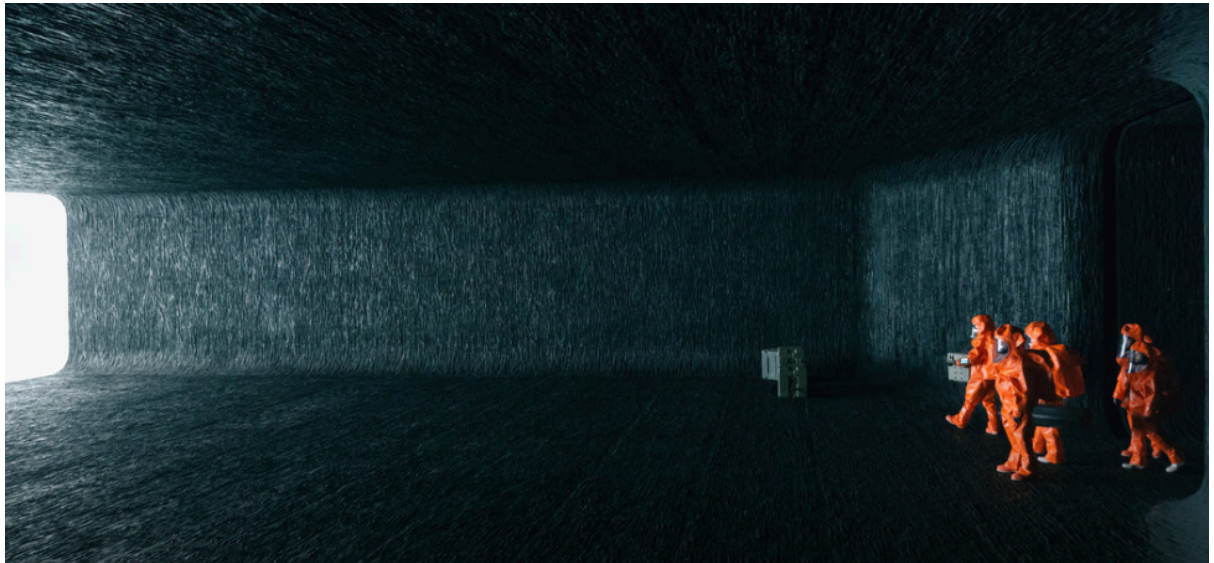


Figure 9.2 Scene from movie *Arrival* by director Denis Villeneuve, about the border of two realities that do not clash before. It is talk of extensions of the limits of our imagination.

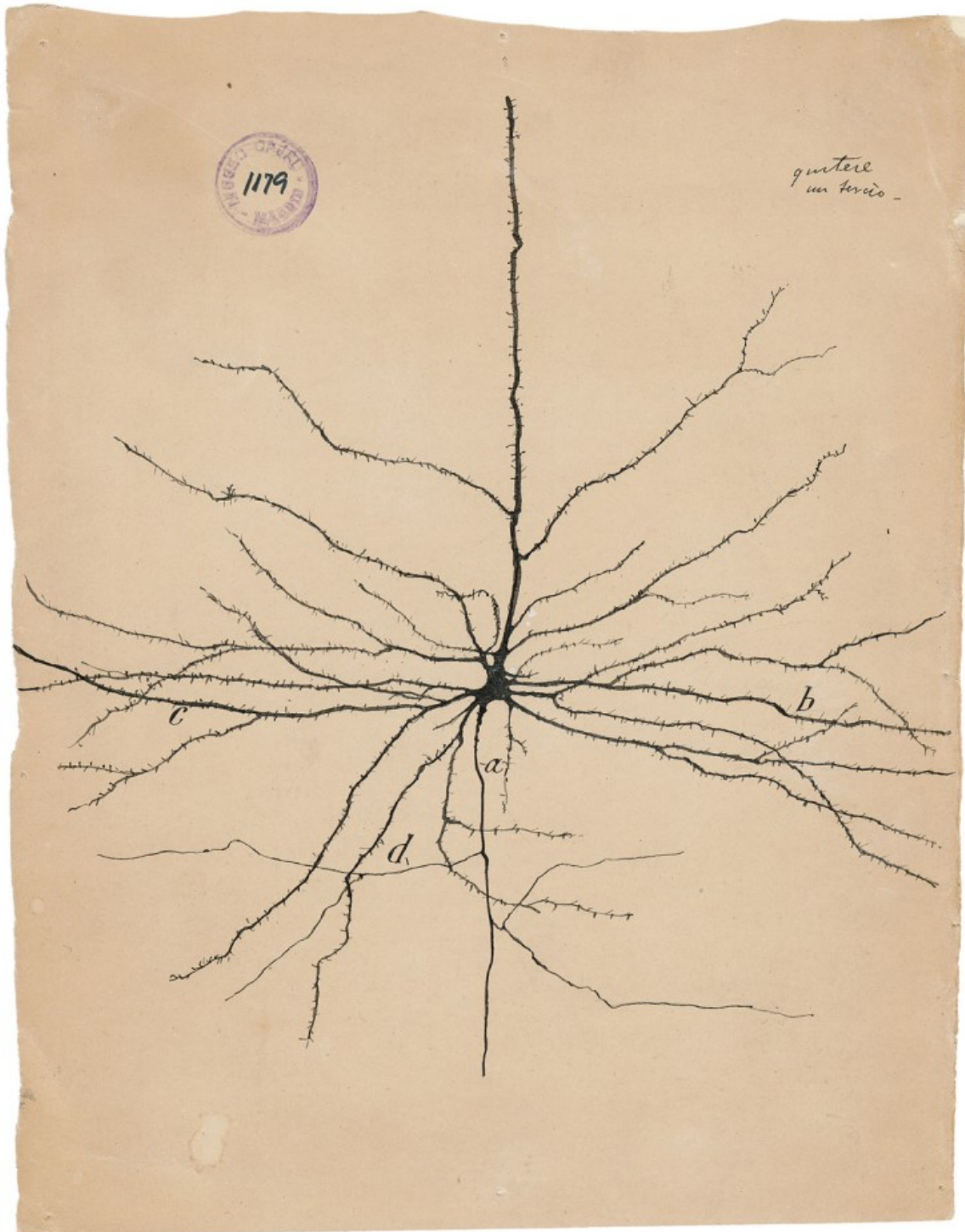


Figure 9.3 Drawings of Santiago Ramon y Cajal of his scientific work on brain.

Source:<https://www.brainpickings.org/2017/02/23/beautiful-brain-santiago-ramon-y-cajal/>
_6/4/2017.

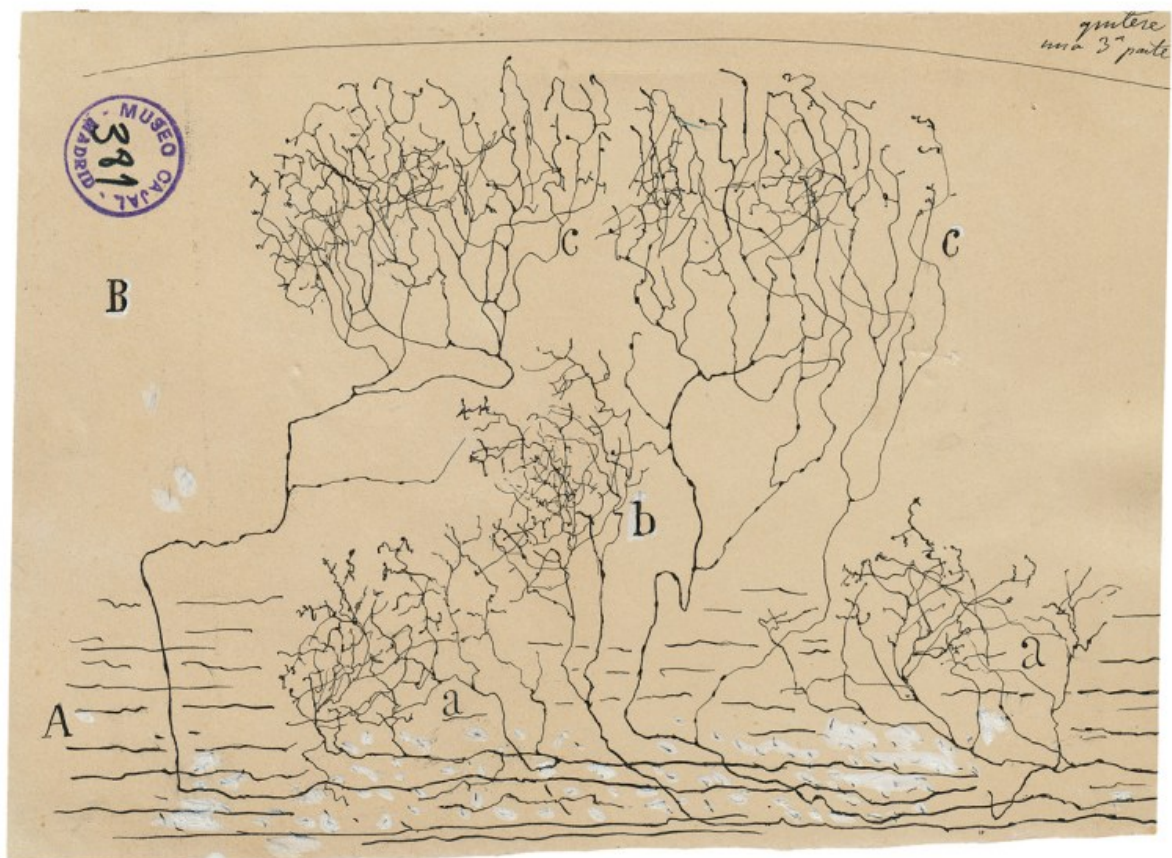


Figure 9.4 Drawings of Santiago Ramon y Cajal of his scientific work on brain.

Source: <https://www.brainpickings.org/2017/02/23/beautiful-brain-santiago-ramon-y-cajal/>
_6/4/2017.



Figure 9.5 Self Reflected project of how consciousness looks like by Dr. Greg Dunn (artist and neuroscientist) and Dr. Brian Edwards (artist and applied physicist). Project is done by technique reflective microetching. Pictures are showing Beauty of how the brain perceiving itself.

Source: http://www.gregadunn.com/self-reflected/_17/4/2017.



Figure 9.6 Project Digital Grotesque II, Grotto II by Michael Hansmeyer and fellow Benjamin Dillenburger, commissioned by at Centre Pompidou Imprimer le monde exhibition. Photograph courtesy of Fabrice Dall'Anese.

Source: https://digital-grotesque.com/architecture/#grotto2_17/4/2017.



Figure 9.7 *Drawn-in-place project* developed by the students from Tokyo University and overseen by architect Kengo Kuma, adding a human role into digital fabrication, by it merging digital technologies, creation, science, with human mind and sense. Project took a part of collective exhibition *Mutations-Créations / Imprimer le monde in Pompidou Centre, 2017*. Photograph courtesy of T_ADS.

Source:http://worldarchitecture.org/architecture-news/cvpfe/kengo_kuma_rethinks_the_role_of_human_hand_in_today_s_3d_printing.html
_21/4/2017.

CHAPTER 10

10 Conclusions

Beauty is unbearable, drives us to despair, offering us for a minute the glimpse of an eternity that we should like to stretch out over the whole of time.

_ Albert Camus, Notebooks.

10.1 Conclusions

This chapter will offer concluding remarks on the research topic *Justify Beauty*, and develop importance of the approach of the *Architectural Sensorium*. It will point back initial problems and objectives, formulated in introductory chapter, by doing revisions of partial summaries being given by the end of each chapter. This in turn gives final proposals regarding justification of the Beauty and formulation of an approach that is taking importance of an *Architectural Sensorium*. Being framed like this, research questions will be answered and as well reflect on research methods. Potentials towards future studies will be given.

10.2 Conceptualization of Chapters

Consideration of the wider scope of impacts in understanding the fields of technology, biology, anthropology, computation, and architecture, together with philosophical comprehensions, has served to the novel ideas of life we live in. Chapter called *Introduction* indicates theoretical and philosophical support to possible changes of architecture understandings.

The listed initial problems and focal terms that are framing picture of novel understandings, being clashed with the old ones, have influenced architectural consideration of the Beauty together with sensorium that serves to the idea of making an architecture as an organism that shows capabilities towards recalculation.

It is evident that architecture finds its association with novel terms that are framing our era, like are chaos, adaptive systems, genetic algorithms or cellular automata. Increasing relations and recognition of fields that these novel terms describes, serves to reveal interaction of the system within environment, and by it architecture and environment.

It is less clear whether architecture accepts within its discourse these new understandings, and if it does, do we, architects do our best towards illuminating these interests in our design. Equally important is whether and how architecture could or should resonate new insights of the world we live in.

Increasing understandings whether and how architecture could or should resonate new insights of the world we live in has opened a question to what environment we should reflect to, adapt or better say resonate architecture.

Additionally, it opens problem in regards to concept, structure, form, material, and similar, or better saying, whether concept and structure are undergoing acts of adaptation, reflection or resonance, or their main purpose. All that show possibilities for departure of architecture from humans, seeking for successful example and how we could weight its success. Context of current interest,

together with mentioned problems has been taken as a ground notion of the problem statement.

Objective becomes framework towards timeless architecture that consists of its aesthetical fact. Following concept of Darwinian pre adoptions, architecture fosters towards multiple functions, which even if they are already in, are not counted yet. Considering the freedom to picture new possible scenarios to catalyze changes, we are entering an epoch of architecture with new scenarios and new materiality. By introducing fields of senses, reflexes, and learning mechanisms into body of architecture, this thesis has derived three main points found as theoretical platform: (1) Genetic Architecture, (2) Material Ecology and (3) Performance-Oriented Architecture. That has served as an outline for discussion of: (i) generic terms such as self-replicating, self-organizing and self-synthesizing, (ii) perceptual selecting, exploring, and focusing on attention, and (iii) behavioral categories of action, interaction, and transactions. Improvement of all three fields has been proposed and it becomes a supplement to the mentioned concepts. The thesis searches for a sensory niche displayed inside of *Architectural Sensorium*.

The chapters at the beginning of the thesis exanimate background troika of human natural and computer-generated patterns which are possessing instruments for serving the idea of hybrid theory called *Architectural Sensorium*. Discussions introduced by morphodynamic, morphogenetic and performative methods in design, observe self-similar, self-adaptive, self-organizing and self-deleting attributes. They are articulating aesthetical outcome that follows from correlation between these methods. Application of certain methods has been discussed by examples from each particular field. This gives a basis for an architectural method of developing architecture in relation to the processes that follow the idea of recalculation which has been derived from Nature.

Chapter 6 (Unfinished!) lists several possible growing fields in process of design that relies on the idea of recalculation and thus serves possibility for making *Architectural Sensorium*. Delineation of these fields into concepts was proposed, based on an evolution that has been generated from the background troika.

Concept of synthesis, synergy and merge derived categories of (i) generic term (ii) perceptual selection, exploration, and focus on attention, and (iii) behavioral. Clash of these categories become manifested and distributed in most nowadays design works.

Momentous changes of life we live are argued in order to understand what effect these changes have on perception of Beauty. So, changes become obvious in switch measurements giving an importance to angstrom measurements, 0D, sensuous surfaces, mechanism for listening, reaction and adaption of signals from inner and outer environments, an essence, never ending recalculations embedded in roots, animated forms from order to disorder, multiple, many in one, one in many, more singularities, undergoing processes, pluriverse. Lastly, the chapter includes benefits toward better connection and interrelation of real and artificial, physical and digital. Pattern presents a central statement by duality of notion, abstract and concrete one, and thus medium for interaction between tangible and intangible, artificial and natural, physical and virtual.

If the form in crisis expresses its most aesthetical state⁷⁴⁸, then the idea to grasp that form, will result in an aestheticized future. This chapter is trying to analyze examples of architectural creations through the basic strategies that are determined in senses, reflexes and learning mechanisms.

Chapter 7 (Fast Forward) is given an extension of thesaurus of architectural realm. It is searching for the principles of progressive step towards materiality, sensibility, and collective interactions. Seen via theoretical, technological and philosophical standpoints, protocols of self-synthesis, self-synergy and self-merge, extended notion of information, space, bounds, virtual and physical realm, and giving it a new dimension, that is to be used for defining new theory and existence of architecture within sensorium. New definitions of terms that are related to architecture or could be related to architecture are providing an attempt towards creation of an entity that will be sensing as humans do.

⁷⁴⁸ Referring to architecture that has found itself in radical and enduring situation like it was at the beginning of the Renaissance in Picon, A. (2010). *Digital Culture in Architecture. An introduction for the design professions*. Basel: Birkhäuser.

Discussions based on generative and genetic perspectives and its application on architecture was indicating an additional definition and relations of notions of the senses, sensation, sensibility and thus information that is tilling bounds of architectures. Ambient, atmospheres and moods are enabling an argument for an architectural model that has been originally formulated by process of decompositions of architecture into its omni-layers.

Parallel, it was suggested that process of decomposition, exhibits procedures that can be constructed or enhanced from (1) what is present in that particular space; (2) what is present in observer of the space; and (3) what is introduced from other realm.

By correlating insights of previous chapters, in Chapter 8 (Techniques for Early Diagnosis of Beauty), Beauty has been introduced as a common element and value of architectures. It is exploring advances and concepts, which are being used for forming, set of criteria for diagnosing Beauty. It is examining Beauty through understandings of design products, tools, and experiments. Existence of Beauty is an indiscernible part of existence of the things, an unknown known⁷⁴⁹ envelope that is essential part of our lives. Sub-section of “Design Products” is answering the question what the body of architecture is. Sub-section “Tools” is discovering brain senses and mood strata for being creators of *Architectural Sensorium* with necessity to proceed transmission, transformation and processes. In “Experiments”, it is open stratum of unknown, exploring embedded novelties, divided of meanings, dematerialized/rematerialized, readable/unreadable, changeable/permanent, and shaped/reshaped presences of an essence of our physicality.

Final Chapter (Dialoguing with Philosophy) deals with synthesis of proposed approach and suggested concept, within its values. It discussed associated approaches and concepts of philosophical and architectural realm. Similarities and differences of concept and approach are synthesized in thoughts of younger generation of philosophers. This has allowed wider understandings of

⁷⁴⁹ Referring to unknown knows, things we know but we do not know that we know from: Zizek, S. (2010, July 10). *Arquitectura y placer*. Conference: More for Less.

architectural discourse in relation to today life understandings, pointing towards search of concepts and contexts of possible architectures. By examinations of three aspects of architecture out of boundary, inside boundary, in-between boundary, the chapter defines notion of context and searched for possible context.

10.3 Beauty Justification and Existence of Architectural Sensorium

Given architectural framework was based and formed on examination of the objectives of the thesis that has task for identification, description, and justification of proposed hybrid theory of *Architectural Sensorium*. Background troika of patterns formulation, given at the beginning, and further formulations through instruments of different approaches define the extension of the terms related to research. Correlation has derived Beauty as elementary for forming *Architectural Sensorium*. Final proposition was stressed by philosophical insights to open it towards possible contexts of architectural creation. Discussion through each chapter has derivated propositions in their summary as follows:

Proposition 1: An architecture that displays mechanism for listening, reaction and adaption

Arguments for creations of architecture that is listening, reacting and adapting according to the signals received from inner and outer environments are coming from similar understandings from Nature. Expressing hierarchy in structural control, functions, and material compositions, such an entity is optimal in its behavior and usage of components. The proposition suggests and promotes processes of recalculation found in Nature to become an instructor for “shape formers” of future architectural entities. So, “shape formers” of *Architectural Sensorium* are being seen as multiple, many in one, one in many, never ending, more singularities, undergoing process, pluriverse, modification and transformation from one into many and vice versa. With a possibility to produce almost everything out of nothing, we are getting close to become the Nature itself.

Proposition 2: Switch from importance of synthesis to importance of synergy

Arguments of making sensuous surfaces are seeking for depositing materials but as well (un)materials, like it is cultural milieu. Man creation is proposing an architecture that is morphing situation rather than material itself, touching intangible world with a high potential to become part of tangible one. Made out of components, measured *in angstrom* and with touch of humans, creations instead of promoting synthesis like Nature does, promote synergy. Proposition made out of this investigation is towards an aggregated Beauty, that was seen before as more abstract but today, being denuded becomes more real than ever.

Proposition 3: Merge as a protocol

Importance is given to generic protocols that provide architecture of multiple and many-body form. "Shape formers" herewith become all collected data that crosses identities between humans and machines. It is proposing aestheticization as an effective actuator of the time, where life is imitating artificial life. If Nature is doing synthesis, humanity synergy, computer-mediated patterns are result of merge between humans and machines, and soon between humans and humans, no matter whether they are biological or syntactical encounters.

Proposition 4: Fusion of synthetic, synergic and emergent systems are preparing for taking us somewhere else

Arguments on growth that are derived from Nature clashed with very creation derived from art and architecture, gives an impact on the notion of Beauty. Beauty has been deconstructed via (1) changes of function while visual dimension is preserved; (2) changes of perception while visual dimension remains; (3) changes of both visual and perceptual dimension, while function remains. Thus, Beauty has a role to prepare our visual and perceptual acceptance to take us somewhere else.

Proposition 5: Architecture that is constantly editing itself

Adding the role of architecture that intensifies or employ intensified attributes; giving an importance to attributes of unconventional elements or functions; usage of materials and forms that certainly never performed functions before or that are

usually not assigned to certain material or form proposes an endless narrative of architectures.

Proposition 6: *Beauty as an actant in narratives of architecture*

Proposition of architecture that senses as humans do, comes from arguments that lead investigation of tools, derivation of products and exploration on experimentation about Beauty and possibilities for producing architecture that (1) acts as a machine does; (2) acts as humans do; or (3) acts as Nature does. Starting from derivation of products partial conclusion follows as given: architecture is consisted of architectural products; experimentations are telling us that architecture in future should not be limited only to products; investigation of tools is putting focus on architecture that examines its nature, by the architecture itself. What make an architectural product to be, are pattern/matrixes/fluxes. Architectural works are becoming Beings as the result of the order of pattern. Architecture is the possibility of patterns. Architecture in the future is to explore the Beauty, and all disciplines for which the Beauty is relevant are relevant. Pattern as being final result of architectures (products) is inseparable from the processes which have come to them but is not exclusively the only possible form of creation. Products of architecture in the future are not only products any more – those are the “might Beings”. While there is a need to work and act on architectures, and any logic or rigor in patterns or matrixes, architecture is not perfect. Perfect architecture will exist autonomously.

Proposition 7: *Justifying Beauty by knowing it*

Spectrum of thought given in this chapter as: intensification, occupation of place that is nowhere, holistic wholeness, illusion of the intrinsic properties that objects do not possess but we do, plurality and creation by the Beauty, limits of imagination, debates of realists and anti-realists, possible worlds existence and creations, the reality of new sensibility or the observer-independent one, constructors of reality, a ghost in the machine, or nothing as a new material gives a contemporary picture of the world tendencies. Following concepts based on philosophical comprehensions of concept of the knowledge and facts sit in relation to intensification of Beauty and true: (1) concept of knowledge and facts; (2) concept of Beauty and true; (3) concept of knowledge and true; (4) concept of

Beauty and facts; (5) concept of fact and true; (6) concept of knowledge and Beauty. Beauty becomes sharing value that does not recognize realm, having its own and by no need for justification is autonomous.

10.4 Answering and Restating Research Questions

Conclusions on questions that have been formulated in the introductory chapter and discussed, evaluated, elaborated and reflected through theoretical, argumentation, historical, qualitative and correlational research methods, in previous chapters, herewith are stated for each open question:

(Q1) What theoretical assessments and procedures are needed to process and evaluate evolvement of the architectural discourse in the world we live in?

(Q2) What might be materiality for forming and structuring architecture that resulting as interaction of contemporary scientific, technology and industrial design?

These two questions can be answered in relation to each other. (Q1) is central of the Chapter 6 (Unfinished!), while (Q2) has been studied in background troika and examined by Chapter 6. Selected cutting edge projects displayed in today artistic and architectural fields are promoting creations that rely on their own emergence, existing and growing towards endless recalculation of their order, and thus becoming open towards their inner and outer milieu. These understandings are fostering a basis for architecture that rely on fusion of synthesis, synergy and merge and serving for better connection and interrelation of milieu, whether real or artificial, physical or digital. Derived from these arguments, partial conclusions made by following attributes of the complex adaptive systems, divide architecture into categories of (i) generic relating to self-replication, self-organized and self-synthesized, (ii) perceptual relating to selection, exploration, and focused on attention, and (iii) behavioral categories relating to action, interaction and transactions.

Process of growth clashed with process of creation, first has been extracted from sciences and second derived from art and architecture, give alternations to assessments and procedures in creation of architecture. These alternations

between scientific and artistic procedures serve for reviling aggregate Beauty presented as layered, atomic in before hidden milieus, being abstracted by holistic approach, but now becoming more real and naked than ever. So, aggregate Beauty becomes new standard of the beautiful, finding its main understandings in intrinsic characteristics altered with extrinsic correlations of the potential milieu. Changes of function while visual dimension is preserved; changes of perception while visual dimension remains; changes of both visual and perceptual dimension, while function remains; are ways of segregation.

Fact that nowadays we can merely produce any materials or better say structures from almost nothing enables us of making novel materials and forms. So, restated question is: are we then more into making like Nature, or becoming Nature?

This question is an opening towards future discussion regarding architecture that has lost its initial ground and should not try to implement existing one, but rather invent new, beyond metaphors, analogies, even beyond knowledge but not to omitting it; to explain and invent itself, to create a simulacrum of ourselves.

(Q3) What is sensibility of architecture that responds on characteristics of world we live in?

(Q8) If we evaluate senses do they become more real, passing from virtual to real? If we anaesthetize them is it possible to reach limit or borders of virtual and real? How we can use experience in architecture and modify its sensory guidance to the more beneficial ways of making?

Above questions, sit in relations to each other. They are answered in Chapter 7 (Fast Forward) and Chapter 9 (Dialoguing with Philosophy). If mind is abstracting sensuous impulses then senses are more objective than mind. Arguments that are clashing equipment of baby born with architectures such as capacities of mechanisms to sense, reflex or learn, lead to work on an answer how architecture is manifested? Whether we can say that, it was an attempt of Artificial Intelligence to make machines, which would act, as human and sense like human.

Nature is machine with capacities to sense. Nature recalculates its entities having communication routes. Is it possible to produce forms that use natural sensorium in order to recalculate themselves? Following previous discussions on (Q1) and (Q2) we could foster towards bypassing design, that was into design inspired with Nature and through Nature, and came to the point to design instead of Nature, but with help of Nature.

Opened possibilities by introduction of hybrid theory of Architectural Sensorium are in relation to the niches, hidden spaces of our realities that are enhancing, extending or altering our known senses. Force that pushes architecture to distinguish what is its own known milieu, will work to over simulate notion of senses, to make it act as a body in crisis that will by its behavior redefine its notion. Such processes make decomposed architectures, an omni-layered entity, crucial in the construction of possibilities for making impossible; affecting and being affected by its sensuous; and understanding importance and relations to the Beauty with embodiment of its own sensorium. It is important that omni-layering architectural entity sets into motion a human experience, and by its possibilities extends own senses. Disembodied architecture where relevance of its body is important, but its spatial organization, or better say its deformations are left to be oscillating constantly between a realistic interpretation and dimension of the interpretations that should be discovered. Derived from interplay of environment and architecture, and relying on importance of bleached border of real and virtual environment; void, rather than solid; and raising importance towards an aesthetical environment, partial conclusions are as follows: constructing or enhancing an ambient or atmosphere (1) from what is present in that particular space; (2) from what is present in observer of the space; and (3) what is introduced from artificial realm.

Certainly, today we are more going towards imitation of artificial life or bleaching border of real and artificial, rather than between real and real. Questions that should be raised are: From which realm should the proof of successfulness come then? Who is our deceived entity to proof our success? Could Beauty be a value that shows successfulness? Being found in inorganic and organic substances, as well as in processes of its mutation to react and become reactors, switching from

one possibility and actualization to another Beauty becomes sharing value that does not recognize realm, having its own.

(Q4) Does architecture have to be goal-seeking system regarding its allure for adaption to its environment, or could be per se adaptive. Does adaption have to have trigger? Does it have to be collective interaction as evolution?

Mentioned devices and projects in Chapter 6 (Unfinished!) show examples which are not made to have capacities for solving a given real world problem. Some of them rely only on capacity to transmit Beauty. They certainly employed scientific search for making possible of impossible or stressing biological evolution and technological development and by it discovering niches of possible worlds.

Above arguments could reformulate question into: Does architecture generate real or rather virtual reality?

(Q5) Designing out of space and time with (un)material. Moving forward from design lying on algorithms taken from nature or design deploying new materials like biomaterials, to designing by (un)material, in order to emancipate architecture and finally stress out notion of Beauty. Here the question may be raised: What (un)material in the context the architecture may entail.

The question is relevant for Chapter 9 (Dialoguing with Philosophy) and it points to the reviving context of the very architecture seen as a truthful existence of something, inside of nothing. Meaning something where it is thought that existence is stopping. Giving benefits towards nothingness rather than something will certainly bleach border between one and another milieu, illusion of treating reality by trying to imitate not life, but artificial life will make us anaesthetized for determination to what realm we belong.

In past, we attempted to project ourselves to the Moon; after that Moon has become our close neighbor. Whether we can conclude about what is happening today, is taking us back to the idea of going somewhere else.

Defining all possible (un)materials for building or growing, or thinking about new architectural beings could be an endless process. Definition of why something is something could be seen from physical or metaphysical point. Placing (un)material in one of mentioned pools seems to be quite impossible. From mentioned (un)materials in this research, it is obvious that some of them represent pure physicality in one fold and when they are unfolded or refolded again they are expressing pure metaphysical notion. Via experiments in one notion, another one is discovered. It seems that physical and metaphysical materials have raised border in between, like artificial and natural ones did, or like structures and composites did.

(Q6) Does brave new world we are creating have its geometry? Is that geometry a never-ending pattern? How could architecture advance, proceed; reinsert itself into a pattern of successfulness?

Question is related to chapters that are presenting background troika of this research, and theoretical and technical assumptions examined in Chapter 6 (Unfinished!). Following Bousso's holographic bound, a general relation between the curved geometry of space-time and its information content is given. Information tells space-time how to curve; space-time tells information how to disappear. There is evidence for a universal relation between geometry and information.⁷⁵⁰

Mysterious forces in this possible universe are manifesting themselves via patterns that could be seen, for example in light, which has mechanisms, among others, to transmit information about earliest epochs.

Background troika by human, computer, and Nature mediated patterns, has considered pattern formations as historical, evolutionary and genetic geometries, shapes, distributions, sizes, expressing their genericness, in many of its structures. Pattern formation not necessarily reflects its material nature, but sometimes follows a logical and intuitive geometrical formation, reflecting and satisfying its utility and aesthetics. The world set as self-replicated, self-

⁷⁵⁰ Bousso, R. (2014). Perturbative Proof of the Covariant Entropy Bound. *FQXi 4th International Conference on Physics of Information*. Puerto Rico.

assembled and self-synthesized, provides an exciting vision towards a new model of constructions in architecture and its Beauty. Engagement of geometries, shapes, sizes, repetitions in gaining better performances or exploring new possibilities could be observed by introducing metamaterials. Researchers are working on pattern formation that enables and controls directional movements of designed artefacts. A distribution of cells that is in accordance of their specialties and interactions between cells is a natural process. While Nature originates creation of patterns by placing specialized type of cells, like it is example of leaf surfaces, computer also mediated patterns formation, depending on subjective behavior of the particular cell within its neighbors.

The growth of possible architecture is forced by geometry's potential, human's creativity, material's performances, and combination of all three. The body of such creation is in contacts with the substance of flows of information, self-organizing network of desire for becoming a monadic subject that embodies both, real and artificial realm, and by it presents manifold worlds. They are becoming devices for performative, visual and perceptual nature of materials, structures, and flash of their bodies.

Gradual creation of beings by Nature has improved their powers.⁷⁵¹ Nature by achieving its successfulness has an ability to create complex, less complicated structures by using simple components. Each entity has been exposed and modified by influences of its environment.⁷⁵²

An importance of environment, or milieu ambient, for life is reflected through Lamarckian exploration of monads, the most imperfect animals, which do not possess power of seeking the food, but still staying alive, by "an internal inhibition of absorbed matters."⁷⁵³ From monads to intelligent creations, Nature gradually employed importance from external stimuli to the internal ones. By that, Nature "transported into the interior of these animals that force productive of movements and of actions which in truth it would not dominate at first, but which has come to

⁷⁵¹ Packard, A. S. (2007). *Lamarck, the Founder of Evolution His Life and Work*. Gutenberg EBook of Lamarck, the Founder of Evolution, by Alpheus Spring Packard, p. 328.

⁷⁵² Ibid., p. 323.

⁷⁵³ Ibid., p. 328.

place, in great part, at their disposition when their organization should become very much more perfect.”⁷⁵⁴

If there are less perfect forms that are instructed from outside, and more perfect that are instructed by inside, how can we understand architectural creations? Where would sit that inside and outside trigger of architecture?

Patterns are not having an in and out, they create solids and voids. They do not interpret, but rather morph forms, relying on gesture, possess duality of being part of artificial and real, tangible and intangible.

We move from the world of natural patterns to man-made patterns and computer patterns, in search for novel form making strategies that comply with Natural points of flow and recalculations, but still, Nature will stay as our milieu ambient for application and successfulness.

(Q7) Can information design the boundaries of architecture? How to integrate the concept of information into architectural design? How can architectural design help us understand the deeper role of the concept of information? If architecture is about idea, does architecture then represent a physical view of an idea?

Question is related to Chapters of background troika for making base for further developments of thoughts in Chapter 7 (Fast Forward). Unity of quantum mechanics, gravity and matter could lead us to some phantasm matter that will violate rule of information, in given space-time geometry, controlled by the area.⁷⁵⁵ In quantum mechanics, information cannot be lost. We are surrounded by information; we are receiving, producing, transforming information and evolving it again into network. Explained by Bousso, amount of information that one can fit on surface, box, at a density of one bit per Planck tile, is sufficient to tell you absolutely everything that could happen to that box. Meaning that amount of

⁷⁵⁴ Packard, A. S. (2007). *Lamarck, the Founder of Evolution His Life and Work*. Gutenberg EBook of Lamarck, the Founder of Evolution, by Alpheus Spring Packard, p. 330.

⁷⁵⁵ Bousso, R. (2014). *Is Information Fundamental? Closer to Truth*. (R. L. Kuhn, Interviewer) PBS.

information is limited by area, not volume. Boundaries are tiled by one bit per Planck⁷⁵⁶, or better say tiled by information.

Myriad of nerves that are connecting every spot on our skin with brain, are populated on surface of skin. All that system is involved in sensory experience to abstraction of that experience. Our skin is by that understanding, also tiled by information. If architecture is designing void using boundaries, and boundaries are consisted out of tiles of information, then architecture and information are strongly connected in production, definition, and formation of space.

Introduction of information in process of creation, and understandings of universe that is rather discrete than continuous is opening possibilities for perception of architecture as digital form and by that discrete, rather than analog e.g. continues.

Disembodiment of the information unified all modes of communication and by it architecture. So, information could be embedded in different forms of architectural creations and being disembodiment, again represented in realm of digital. For Marvin Lee Minsky, an American cognitive scientist, in the field of artificial intelligence, there is no actual or real world, only possible one.⁷⁵⁷ Scientists are making models to describe reality. Architecture is getting a role of descriptor of the possible worlds.

Information has revolutionized notion of architecture, but what architecture means from perspective of information. How architecture is seen from the realm of information?

Jackson Pollock perpetrator of abstract expressionism is saying that he is working like Nature does, inside out.⁷⁵⁸ Pollock is not abstracting nature, but an environment that is for him a canvas.⁷⁵⁹ Such abstraction is than transmitted, and

⁷⁵⁶ Bousso, R. (2014). Is Information Fundamental? *Closer to Truth*. (R. L. Kuhn, Interviewer) PBS.

⁷⁵⁷ Minsky, M. L. (2014). Is Information Fundamental? *Closer to Truth*. (R. L. Kuhn, Interviewer) PBS.

⁷⁵⁸ Emmerling, L. (2003). *Jackson Pollock 1912-1956*. Koln: Tachen.

⁷⁵⁹ Taylor, R. (2006). *Chaos, Fractals, Nature: A New Look at Jackson Pollock*. Eugene: OR: Fractals Research Laboratory.

received by our sensorium, meaning that abstraction becomes sensually accepted. Information is agent that can be transferred into abstract, material or sensual notions.

(Q9) How to produce increasingly fit architecture in environments which are highly uncertain? What is environment? Should we extend our knowledge of the environment? Can we understand ultimate essence of architecture as a construction of void?

Searching for definition of surrounding environment that is reflecting and being reflected by an architectural work, terms of atmosphere and ambient, are added to the list of notions that are of interest to this work and pointed within Chapters 7 (Fast Forward) and 9 (Dialoguing with Philosophy). Partial conclusions of constructions of an ambient or atmosphere, derived from interplay of environment and architecture, and relying on importance of bleached border of real and virtual environment; void, rather than solid; and raising an importance towards an aesthetical environment, are as follows: (1) constructing or enhancing an ambient or atmosphere from, what is present in that particular space; (2) from what is present in observer of the space; and (3) what is introduced from artificial realm.

Metaphysical layer of Beauty has been the divulgation of Slavoj Žižek's so called 3rd layer, which sits between in and out, between walls. Even it is called 3rd mysterious space, it considers parts that we rely on but deny its existence. Something that has an obvious impact of our lives, such as it is water or electrical installation or has political-ethnical responsibility, meanings or ideological confrontations. That gap that has been folded from division of in and out, the envelope of the space becomes essential part of our lives. That is something that Žižek is calling unknown knows, things we know but we do not know that we know.⁷⁶⁰ Here comes importance of patterns that is reviling this gap, building gap of the gap, new space, new perspectives, and certainly new voids.

⁷⁶⁰ Žižek, S. (2010, June 10). Lecture: Arquitectura y placer. Conference *Arquitectura Más por Menos*, Pamplona 9 -11, June 2010).

(Q10) *How can we programme our design procedures so that problem-solving capabilities are built by “what architecture could become” rather than “how to do it”?*

Question becomes central for Chapter 9 (Dialoguing with Philosophy). Nowadays, we can merely produce materials or better say structures from almost nothing. We are making novel materials and forms. Printing material and designed forms simultaneously will change every step forward. Nature does not celebrate crisis, neither criticizes. By the recalculations, enhancing its entire structure it makes problems be solved. Nature does not work but is working. It is designing without material, without using any labor. Are we then more into making like Nature, or becoming Nature?

Senses, information, boundaries, and spaces are all having an importance of creation of architecture giving its touch towards unpredicted characteristics of Beauty. State of architecture that is relying on such an understanding which is more than impermanence and it is transmitted by sensorium, being an only reality we have, even it is uncertain.

We are living new lives, said Stuart Kauffman, our reality is beyond imagination, said by Adriaan Geuze and Matthew Skjonsberg.⁷⁶¹ Imagination is dual possible, actual real or artificial real. Stuart Kauffman believes in dualism of real Actuals, Res Extensa derived from Descartes and real Possibles, Res Potentia derived from Aristotle.⁷⁶² Origin of Imagination is from Latin *imaginare* “form an image of, represent” and *imaginari* “picture to oneself”; while Possible is Latin *possibilis*, from *posse* “be able”.⁷⁶³ Together Imagination and Possible could be “to have the freedom to picture to oneself new possible scenarios to catalyze change”. Performance of such architecture, or by performing such architecture, could magnify reality and merge it with virtual, setting it in possible world without border

⁷⁶¹ Geuze, A., & Skjonsberg, M. (2012). Dancing with Entropy. *Architectural Design*, 82 (5), pp. 124-129.

⁷⁶² Kauffman, S. (2010). *Res Extensa, Res Potentia And the Poised Realm*. Retrieved May 16, 2016, from National Public Radio: <https://www.npr.org/sections/13.7/2010/08/17/129250892/res-extensa-res-potentia-and-the-poised-realm>

⁷⁶³ Oxford Dictionaries. (2016). Retrieved May 15, 2016, from Oxford Dictionaries Language matters: <http://www.oxforddictionaries.com/definition/english>

of virtual, real or possible, being now, opening its position towards Faustian propositions.

Impermanence, imagination, uncertainty, and possibilities are part of complex nexus that is the world itself and architecture in it. Architecture, no matter if it is emerged from environment or emerging an imaginable environment, covered by information, percept by senses or explored through windows of its bounding is in constant editing of itself. Putting editing to the main role is re-placing importance of pure process to build into complex process of creation.

Following given answers on stated questions, formulates hypothesis:

Architectural design could be clever, invisible, self-sustainable, ethical and poetical. Architecture could be understood not as an isolated egocentric, but the direct participant in the world's order. From the architectural design that was into design, and through design we came to the point to design for design, and architecture qua architecture. Our discipline allures to reinvent its coherence and an argumentation not as a model but as the very armature of the system itself.

Thus, we came to the overreaching question and state that:

Architectural Sensorium, if it is central of understanding of architecture can be designing with (un)material, and thus become direct participant in world order, an architectural "beings" able to sense, respond, reflect, resonate, adapt, change, copy and paste its extrinsic and intrinsic environment.

Beauty of such creation cannot be attributed by classical subjectivity/objectivity, symmetry, divine, standards based on sizes and shapes, elegance, or gracefulness, but by something which has more relation to the movable, changeable, re-refreshed, alive, self-synthesized, self-synergic and self-merged attributions. To be in-between virtual and real, these creations, or better new growing entities, are making legitimate scientific pursuit for evoking a strange Beauty from one and many realities.

If it is possible to decompose everything and to abstract it into 0s and 1s or to its superposition, and to model it again in many-body, then we can say that Beauty could be treated the same.

Immersed in some matter that has been re-dimensioned, body of Beauty has been exchanged, extended and interconnected in myriad and many-body ways with distinct formal and visual consequences seen in matter and location. For instance, (un)material of such body is not stable, neither characterized by its location. Since (un)material could be implemented into many-body patterns, by the interface of humans, Nature or computers, many-body by itself shows permeable characteristics related to the boundaries of its localization. It is a process of terrific creative osmosis and highly economical form for new ways of sustainability. By being limitless and dynamic systems of value, Beauty is not denying its previous stages, always containing, like genetic system, the description of itself is authentic in self-replications. Rewritable concept taken from genetics is deriving to the realm of Beauty, an unknown value towards recalculated sustainability.

By elaboration of arguments, we are standing the confirmation of stated question:

Is the Beauty continual shaping of perpetually novel environment, which embedded in itself primordial power of Nature's ways of designing the things? And if architecture emerges as a result of sensitive, responded, reflected, adapted, changeable, resonated, copied and pasted information from environment, what about Beauty? It leads us to conclude that Beauty has ontological intrinsic notion and performative value, both being unstable.

Beauty obviously exists possessing a value of inorganic and organic substances, switching from one possibility and actualization to another. Beauty becomes sharing value that does not recognize realm, it is better having its own and by that eligibility, it is being a part of possible worlds. So, if it is only possible, it means it is autonomous. Stage of being autonomous does not require any justifications.

*From various faiths and beliefs that this world can be improved, the belief in the embassy of beauty as something that could really serve as an improvement of reality, perhaps it's naive, but not devoid of any authenticity.*⁷⁶⁴

10.5 Reflection on research methods

Proposition and arguments found within this research have been followed by mixed set of strategies of logical argumentation, historical research, qualitative, correlational ones, each explained in methodology chapter. The theoretical, historical, technological and contextual frameworks based on literary sources are discussed as case studies and cutting edge examples.

In regards to research position, thesis Justify Beauty is striving to find niche in between disciplines that not necessarily belong to one disciplinary field and by it, belongs elsewhere. Research across disciplines not necessarily calls for an interdisciplinary approach. It is rather trying to prove antidisciplinary as something that is about working in spaces, something that simply does not fit into any existing academic discipline. From integrated to fragmented research we came to new approach across disciplines that serves to indefinite interaction of areas that do not belong in any particular discipline.⁷⁶⁵

So, the result by its nature does not belong to any particular field of discipline, but rather is serving to an antidisciplinary. Finally, so-called problem of Justifying Beauty has been expressed as a new integrative, antidisciplinary set of repositions from one thought to another with mutual benefits. It is rather being seen like forking process, linearity of research process is avoided while classical analysis/synthesis steps have been overcome.

Mixing strategies and introduction of cinematic techniques of shooting gives a possible way for searching through vast architectural realm. Idea was to open a specific field within realm of architecture and to give an opportunity to invent its

⁷⁶⁴ Krleža M., *Dnevnik* (Diary), vol. 5, 1922, Sarajevo, Oslobođenje, 1977.

⁷⁶⁵ Ito, J. (2016). *Design and Science*. (D. Hillis, Ed.) *Journal of Design of Science (JoDS)*, 1 (1).

own particular ways of looking and making frameworks and methods and to see inside of itself.

10.6 Future discussions

The restatement of research questions has generated possible future discussions towards a milieu and context of architecture that does not rely on real or artificial, but rather on its own characteristics. This extends research work to discover what these characteristics are and what elements are fostering it. As extended understandings of propagation of our own milieu future discussions on creation of not only Architectural Sensorium but also global one are needed. Interconnections of sensors will foster creation of global sensorium that will foster our consciousness further.⁷⁶⁶

In the movie *Arrival*⁷⁶⁷, used screens are making barrier between two worlds, but at the same time opening revealed space in-between overlapping the worlds and opening new possibilities. It is a tool for displaying two different views seen from our and other side. Screen seems a tool also for merging these two views since main purpose in the movie was to determine whether they, aliens, are coming in piece or not, to make us determine how to behave. So, even being presented as informational surface screen still does not allow us to see another milieu from origin of itself.

*If space is infinite, we were anywhere,
at any point in space.*

*If time is infinite, we are at any point in time.*⁷⁶⁸

Hints have been given to future study of Internet of Things (IoT) and how IoT could become “shape former” of global sensorium. Strengthen appearances of IoT, for its transformative capacities of merging physical space into virtual one.

⁷⁶⁶ Zaera-Polo, A. (2017). The Posthuman City. *Architectural Design, 4D Hyperlocal: A Cultural Toolkit for the Open-Source City*, 87 (1), pp. 26-35.

⁷⁶⁷ Heisserer, E., Chiang, T. (Writers), & Villeneuve, D. (Director). (2016). *Arrival* [Motion Picture].

⁷⁶⁸ Borges, J. L. (1989). *Book of Sand*. Penguin.

Appendix

GENERAL CONCLUSIONS of the author Master thesis “Architecture of the Clash” UIC, Barcelona, 2008

With the arrival of Digital era, a comprehension of the world we live in is changing; the world where the relations among things are presented through the informatic and communication technologies definitely changes the attitudes towards architecture.

This book’s goal is not the presentation of architecture of the past, marvellous examples that surround us as something wrong, nor its aim is to understand the strategies presented in it as something right. Its goal is to try to approach all the richness of possibilities offered to us about new insights of the world, and not just those in science and technology, but also those in philosophical comprehension.

The development of digital communication is definitely demolishing the barriers between, not only the physical boundaries, but also the transcendental ones, which is reflected in permeation of all spheres of life.

The architecture, as other branches of art, technology and science, demonstrates its transparency. It results as a product of confrontation. It emerges as a response of the revolution, not in the sense of revolutionary rebellions, but revolutionary introduction of a new comprehension, which will provide it evolution.

The objects of the past found themselves in the era of post-humanism, to which the most vital ones will adjust. The works of Matt Clark, also known as ‘Building Cuts’, celebrate the negative areas of the town, intervening on them.

The objects of the future will confront their environment in the idea of its creation. The systems and strategies of architecture presented in this book does not represent the ideal ways of action, nor are eager to be presented as leaders, quite opposite, they deny the leaders and deal with confrontations.

The master title 'Architecture of the Clash' comes exactly from this idea of confrontation, as well as the idea of revolution (referring to the punk-rock band of the same name) which, is presented here as the evolution of the contemporary world and thought.

The houses of future represented by inserting of chips, which perform certain functions as a dole in contemporary life, are already the expressions of archaic and obsolete understanding, like the understanding of cyborg creation by inserting the implants into the metal body.

Objects of the future are not created by inserting chips into shells of the shelters; they are based on logical consideration and represent the echo of the contemporary world. Those objects are bearing the information, which is dynamic, and permeates not only through the object itself, but the entire network in the world.

The architecture is a mirror that reflects the information and the computation. That mirror has to be a reflection of faster and faster change of the world; the information flows and the idea is not to stop its flow, but to create a route - net.

Exactly that flow of information demolishes one system, actually an organism, transforming it into another. How to create the systems which will continuously match the flow of information, and at the same time keep the integrity, which will allow them to transmit the information to the other systems, as well as to transform and evolve it in that process.

Architecture has found itself in the role of the systems of communication.

The information is transmitted by it, it's transforming, mutate. The projects described in the book are representing sometimes even extreme visions and ideas, so that the experiment, which describes the process would attempt, as drastically as possible, to percept the world and its faster and faster change.

A change, actually the information, makes these complex architecture systems to incur, grow, transform, and as it is a logic on which base they became, the

termination of the state of uncertainty as well as the state of constant variability, will lead to their extinction.

These are the explorations aspiring, by extreme experimenting, to find the qualities of architecture and the world of post-human era. They represent the haute-couture architecture; those are self-organizing systems illustrating non-linear dynamism of the world where they reside.

“In true art, there is nothing accident. It's Mathematics. Everything can be calculated in it, everything can be known in advance. The artist knows and understands what he wants to express, and his work cannot transmit one impression on one and other impression on the other person supposing, of course, that those are the people of the equal level. He will always produce, with mathematical precision, the same impression.”

Creating the network of interactions between science, technology and architecture, new ways of comprehension and application are created giving new organisms of architectural effect, in which flows of creation inevitably intervenes the philosophical interpretation of the world and culture. In order to express the idea, which extends through the contemporary architectural work, every chapter is linked with one aspect of art.

The evolution art, the development of textile and fashion scene, dance and music as well as film, have a purpose to explain that the tendencies of life and culture currently surrounding us have found their place in these means of presentation too.

If we consider that the ideas and understandings of these aspects of art outmatched the architecture in its application in reality, we can conclude that architecture does not represent the form of futurism - maybe it just functions on a bigger scale which provides it with, not the superiority over other arts, just a different angle of observation. Equally, it doesn't allow it to stay in status quo; it should forcefully participate in the world's dynamics.

Evolutionary artists introduce the concept of the evolutionary process in their work, resulting in not just beautiful creations, but the creations that logically present the artist's aspiration for achieving the goal of presenting the initial idea. Although the computer simulations, with the help of algorithms, have made these creations, they show the forms that could be found in the Nature. Frequently these forms are not presented by computers, but by the hands and needles. It is irrelevant to talk about if the nuns of the Benedict's monasteries at the island of Hvar (Croatia) use the computer techniques and algorithms for the production of the Hvar lace. Creating their works from the ancient times, their only rule is not to work during the storm because the wind entangles the thread they use. Using the strings, they create the works that have not an initial logic of fractals, but they surely remind of such form as well as the form of many nature sources.

The information flow through the objects introduces the architecture as a ball of strings, with the infinite number of beginnings and endings that it is made of.

The digital era is clever, invisible, self-sustainable, ethical and poetical.

Architecture of this era is not an isolated egocentric, but the direct participant in the world's order.

Immature poets imitate; mature poets steal. (Eliot, 1969)

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