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TOWARDS A NEW UNDERSTANDING OF NATURE: MATERIAL ECOLOGY IN ARCHITECTURE

A THESIS SUBMITTED TO
THE GRADUATE SCHOOL OF NATURAL AND APPLIED SCIENCES
OF
MIDDLE EAST TECHNICAL UNIVERSITY

BY

BERRİN ÖZDEMİR

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submitted by **BERRİN ÖZDEMİR** in partial fulfillment of the requirements for the degree of **Master of Science** i**n Architecture, Middle East Technical University** by,

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ABSTRACT

TOWARDS A NEW UNDERSTANDING OF NATURE: MATERIAL ECOLOGY IN ARCHITECTURE

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Nature has changed and updated throughout history as a definition that human species describes the environment in which they live, by attributing meaning to materials, forms and behaviors outside than human activity. Until the Renaissance, nature was believed to be the creation of a transcendental power with an absolute plan containing occult messages about its ideal state to be puzzled, but later it began to be considered as a chaotic environment that should be ordered by human. With the cooperation of the humanistic tradition inherited from the Renaissance and the Industrial Revolution's ability to allocate resources to the masses, nature has turned into a domesticated built environment that is the design of human, and this transformation has increasingly been included in the field of culture, which is interpreted as ‘not nature’. In this case, nature has been updated as a term that corresponds to ‘wildlife’ and material resource waiting to be formed in accordance with the programming of social life. However, nature, organized and formed according to human needs, has become a geologic layer called the Anthropocene, and has caused an ecological crisis. Many academic argue that the cause of this crisis lies in our anthropocentric relationship with the concept of nature. Materialism, which is a discourse that uses matter as a post-human and heterogeneous ontological ground in understanding nature, is currently debated with post-human issues under

the title of 'new materialism'. There are many undercurrents included in this school of thought, however, the study is positioned in the discourse of performative matter, which evaluates nature as the different combinations of matter-energy. According to this understanding, form is considered as the behavior of matter as a response to both internal forces of a self-organization and external forces of its environment and it is a continuous process. This epistemological approach, which can expand from inanimate substances to biological bodies, has also entered the field of architecture as a current debate. In this context, architecture, which is a discipline on matter and form relations, is shifting from a formalist to a performative approach that takes form through communication with external influences. This study focuses the post-human relationalities as the root of ecological problem. On the architectural scene, the ecological potential of matter is currently studied under ‘material ecology’. This approach that asserts its ecological argument by the unconventional use of biological agents as architectural materials and informing matter with the help of digital technologies, has been chosen as a case for bringing forth the debated ecological performative matter potentials in the architectural process. However, the cases had been issued as initial architectural research indicating the performative matter and architecture in formation process rather than an architectural orientation of practice. Within the scope of the study, the ecological problem is associated with human’s nature understandings. In the first part of the framework, the correlation between the idealist nature understanding and applied formalist architecture was examined historically, and the ecological rift it produced was evaluated. In the second part of the framework, an ecologic and performative nature understanding, which is in a formation process is discussed with its historical and philosophical aspects through the discourses of ecology and performative new materialism. A corresponding performative architectural proposal was exemplified through 'material ecology' studies and its ecological potentials were evaluated

Keywords: New materialism, material ecology, performative, anthropocentrism, nature-culture continuum

ÖZ

YENİ BİR DOĞA ANLAYIŞINA DOĞRU: MİMARLIKTA MALZEME EKOLOJİSİ

Özdemir, Berrin
Yüksek Lisans, Mimarlık
Tez Yöneticisi: Prof. Dr. İnci Basa

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Doğa, insan türünün içinde bulunduğu çevreyi, insan faaliyeti dışındaki materyallere, biçimlere ve davranışlarına anlam yükleyerek tariflediği bir tanım olarak, tarih boyunca değişmiş ve güncellenmiştir. Rönesansa kadar aşkın bir güç tarafından mutlak bir planla tasarlandığına ve ideal halinin çözümlenmesi için örtük mesajlar içerdiğine inanılan kavram, sonrasında insan tarafından düzenlenmesi gereken kaotik bir ortam gibi değerlendirilmiştir. Rönesans'tan devralınan hümanist gelenek ve Endüstri Devrimi'nin kitlelere kaynakları tahsis edebilme kapasitesinin iş birliği ile, doğa insanın tasarımı olan evcilleştirilmiş yapılı çevreye dönüşmüş ve bu dönüşüm giderek doğanın değili olarak yorumlanan kültürün alanına dahil edilmiştir. Bu durumda doğa sosyal hayatın programlanması doğrultusunda form verilen hammadde ile vahşi hayatı karşılayan bir terim olarak kullanılmaya başlamıştır. Ancak insan ihtiyaçlarına göre düzenlenmiş doğa, güncel olarak antroposen adı verilen ölçümlenebilecek bir jeolojik katman haline gelmiş ve bir ekolojik krize sebebiyet vermiştir. Pek çok akademik çalışma bu krizin nedenini doğa kavramıyla kurduğumuz insan merkezci ilişkide yattığını öne sürerek bu kutuplaştırıcı ve hiyerarşik ontolojiye alternatifler araştırmaktadır. Ortodoks tarih anlatısının dışına çıktığımızda, doğanın anlaşılmasında insan-dışı ve heterarşik bir

ontolojik zemin olarak maddeyi kullanan bir diskur olarak materyalizm, insan-dışı argümanlarla ‘yeni materyalizm' başlığında güncel olarak tekrar tartışmaya açılmaktadır. Bu başlığın altında pek çok alt akıntı bulunmaktadır, ancak çalışma doğayı madde-enerjinin farklı bir araya gelişleri olarak yorumlayan, performatif madde söyleminde pozisyonlanmıştır. Bu anlayışa göre form her bir araya gelişteki öz-örgütlenmenin çevresiyle olan karşılıklı iç-dış kuvvetleri doğrultusunda maddenin davranış biçimidir ve süreğendir. Cansız olarak nitelendirilen maddelerden biyolojik bedenlere kadar genişleyebilen bu düşünce altlığı, mimarlığın da güncel tartışma alanına girmiştir. Bu bağlamda, madde ve form ilişkileri üzerine bir disiplin olan mimarlık, formalist bir yaklaşımdan, dışsal etkilerle iletişimi doğrultusunda form alan performatif bir hatta doğru kaymaktadır. Bu konuya ekolojik problem perspektifinden yaklaşıldığında, performatif bir mimarlık arayışı ‘malzeme ekolojisi’ başlığında oluşmaya başlamıştır. Ekolojik savını biyolojik ajanların konvansiyonel olmayan bir biçimde mimari materyal olarak kullanılması ve dijital teknolojilerin yardımıyla maddenin bilgilendirilmesi üzerinden kuran yaklaşım, karşılıklı ilişkinin mimari süreçte yaratabileceği potansiyeller üzerine bir örnek alanı olarak seçilmiştir. Ancak mimarlığın pratiğe dönmüş halinden çok, tez bağlamında konu edilen performatif madde ve form alan mimarlığa ilişkin öncü bir işaretçi konumunda değerlendirilmiştir. Çalışma kapsamınca ekolojik problem insanın doğa okumalarıyla ilişkilendirilmiştir. Çalışmanın çatkısını oluşturan ilk hatta idealist doğa düşüncesi ile uygulanan formalist mimarlık arasındaki korelasyon tarihsel olarak incelenmiş ve ürettiği ekolojik yarık değerlendirilmiştir. Çatkının ikinci hattında ise form alma sürecinde olan performatif bir doğa anlayışı ekoloji ve yeni materyalizm söylemi üzerinden tarihsel ve felsefi yönleriyle tartışmaya sunulmuştur. Buna karşılık gelebilecek performatif bir mimari öneri ‘materyal ekolojisi’ çalışmaları üzerinden örneklenmiş ve ekolojik potansiyelleri değerlendirilmiştir.

Anahtar kelimeler: Yeni materyalizm, malzeme ekolojisi, performatif, antroposentrizm, doğa-kültür sürekliliği

To my belowed aunt, Hürriyet Mukaddes Demirci.

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CHAPTER 1

INTRODUCTION

"All is interaction"[1]

Form's decoupling with interaction is observed in any case, from biological beings to buildings and ideas. However, the formal boundaries imply the opposite of their open-ended historical timeline, a fixed condition.

For instance, we collectively form a time frame as Friday and live accordingly. A Friday is a Friday because we've decided to function it so. It is a result of the need to interpret and order time in a labor organizational community as a form of information. The more this information is accumulated, the more it gains legitimacy and autonomy. As people born into it, Friday-bounded operations proliferate, by losing its historicality. Furthermore, this information of time only belongs to humanly world. It is not meaningful for other beings' vitality. Time flows for every being in different conditions with different relationalities and as DeLanda argues, it does not need human mind to operate.

We form the cities in the same way we form Fridays, as a result of the need to interpret and order environment in a labor organizational community. As our epistemology towards things are constructed with a human-centered historicity and pre-formed conditions of the world, the more the cities are accumulated, the more they gain legitimacy and autonomy swaying through idealism.

[1] The original saying is "Alles ist wechselwirkung." Generally translated to English as "Everything is interaction." However, Sanford Kwinter on his conference at SCI-Arc suggests this use.
SCI-Arc Media Archive, *Sanford Kwinter: This Is Your Brain on Design (April 5, 2011)*, accessed July 27, 2021, https://www.youtube.com/watch?v=uVCL99bPDmM&t=6172s&ab_channel=SCI-ArcMediaArchive.

The idea about the form's relationality is generated by evolution theory and later these relationships started to be studied under ecology. As a branch of science dealing with the species' relationships with their environment, ecology asserts scientific findings that contradicts the idealistic boundaries of the life forms by considering these boundaries' historical relationality. Similar to reverse engineering, it states all species have a habitat which is the specific environment that the species occur as a result. And ecosystems, which are the dynamic relationship of these species, are correlational, so the boundaries of the co-dependent communities are resilient and responsive from single organism to biosphere level. In order to understand the species physical form ecology considers the interior and exterior conditions, and approaches the form, as a field of negotiation.

As ecology focuses on the formation processes of biological beings, neomaterialist agenda broadens this perspective to all forms and their relational conditions by centering the matter. Since living and non-living are epistemological divisions separating mind and matter, neomaterialist approach ignores this schism by arguing the matter's performative capacities are on operation in each different condition and offers an extended ecological template.

Architecture had been understood as the passive human habitat, 'formed' to organize the environmental forces. Throughout history this form had been closely related with what we understand from the nature to the point that we transformed the nature into what we understand. As these forms are relational to human sphere, it hardly connects the non-human sphere of the ecological chain. At this point the thesis throws a question to the possibility of an architectural form as an ecological response that actively negotiating between the humanly organization of environment and external organization of non-human sphere by using neomaterialist approach as a speculative template

1.1 Definition and Contextualization of the Problematic

This study is theoretical research on the connection of architectural form's correlation with nature understandings and situates on new materialism theory as an ecological template for architectural production.

For a species in the ecological chain needed to adapt, human beings had been on a recursive respond to biological and cultural conditions, with the help of designing. As Ingraham puts it, "*human life has not always had the biological privilege it seems to enjoy today."*[2] In a way, we can think of design as a very quirky response for the evolutional motto, survival of the fittest. By producing techniques and technical objects instrumentalized for fitting the conditions for our species' survival, or rather organizing the life, especially by the externalization of design objects, we have gained a massive advantage. Among these objects and techniques of evolutional shields, may be the most observable one is architecture. Catherine Ingraham explains this shielding as:

> "At the very least, it is extremely odd that, over our long period of development as biological beings, we have more or less predetermined our own niches and almost taken ourselves out of the evolutionary stream." [3]

The blocking character of these niches excluded much of the evolutional trouble. The comfort it created had reached to a point as Buckminster Fuller said: "Reform the environment. Do not try to reform humanity."[4] and placed a dome over Manhattan.

[2] Ingraham, *Architecture, Animal, Human*. p 6
[3] Ibid. Pp 6-7
[4] Fuller, R. B. (1966, Nov. 12). What I have learned: How little I know. Saturday Review, 70.

Figure 1 - R. Buckminster Fuller, Dome Over Manhattan, 1961

In evolution, the way that species form the environment according to their own needs in order to survive is called 'niche construction'.[5] This behavior, which can be observed in many species from bacteria to ants, from beavers to humans, is an evolutionary method of self-organization. Richard Dawkins argues this as 'extended phenotype' that is the gene's effects on environment.[6] Some organisms construct their shells as a biologic code in their genotype, which is called as exoskeleton in biology. [7] In other words, how species organize their environment is an evolutionary immanence that turns into the species itself. The niche construction is the labor of nature, all species to some extent apply transformative actions to environment. However, when considering the human species 'niche' construction, a fairly unjust impact is observed considering biodiversity.

[5] Blake Matthews et al., "Under Niche Construction: An Operational Bridge between Ecology, Evolution, and Ecosystem Science," *Ecological Monographs* 84, no. 2 (2014): 245–63. p 245
[6] Richard Dawkins, *The Extended Phenotype: The Long Reach of the Gene* (Oxford University Press, 2016).
[7] Rick Dolphijn, "The Resonance of Disparates Spinoza, Damasio, Deleuze and the Ecology of Form," in *Philosophy After Nature* (Rowman & Littlefield, 2017). p 55

Figure 2 - Beaver Dams Across Rivers, Ilya Haykinso

We call our niche construction the 'built environment' and its ratio is now a huge threat on the biomass that the geologists currently debate on defining this humanly layer as a geological unit named 'Anthropocene'.[8] This term had been offered by atmospheric chemist Paul J. Crutzen and biologist Eugene F. Stoermer in 2000, with the claim of "the influence of humans -prosthetically extended through technology and fossil fuel energy- is eclipsing that of the rest of nature." [9] Where did this change start is subjected to discussion, according to Paul Crutzen it was around 1800 where the fuel-based industries took the action and resulted in a population explosion. Another claim by palaeoclimatologist William Ruddiman is that it started approximately 8000 years ago with agricultural act.

Although being uncertain about if this is a new epoch, when it exactly started, and how it will evolve, it is beyond doubt that humans had been a major geological force on biosphere. "Through mining activities alone, humans move more sediment than

[8] Monastersky, R. Anthropocene: The human age. *Nature* 519, 144–147 (2015)
[9] Bronislaw Szerszynski, "The End of the End of Nature: The Anthropocene and the Fate of the Human," *Oxford Literary Review* 34, no. 2 (2012): 165–84. p 169

all the world's rivers combined. Homo sapiens has also warmed the planet, raised sea levels, eroded the ozone layer, and acidified the oceans." [10]

However, the effects of Anthropocene evoked a mysticism instead of a responsibility similar to Thomas Cole's famous Course of Empire Series. The human, who appears on harmonious nature as a corruptive creature, transforms it into built environment with architecture, causing a decadence, and yet the mystical power within nature moves relentlessly after overcoming humanity.

Figure 3 - Thomas Cole Course of Empire Series
1:The Savage State 2:The Pastoral State 3:The Consummation 4: Destruction 5:Desolation

[10] Monastersky, R. Anthropocene: The human age. *Nature* **519,** 144–147 (2015)

Although this painting belongs to the early 19th century, it is possible to say that a similar point of view of nature -non-human sphere- and culture -human acts in total- pursues without changing much today. According to Freud and philosophical anthropology, culture is the attempt to overcome nature.[11] And according to Kant's philosophy "identification of what man is, as opposed to what he is not (nature)"[12] As Nancy Tuana stated, it is ethically important to understand how and why we apply epistemological separations to continuums. [13] To understand the polarization, a historical reading of the symbolization of nature and human gains importance since how we understand nature and how we want to transform it is directly linked to architectural ecology.

Humans name the surrounding world within their associated boundary as nature. Borrowing from Morton, the word "nature" refers at least three different meanings. "First, it is mere empty placeholder for a host of other concepts. Second, it has the force of the law, a norm which deviation is measured. Third, "nature" is a Pandora's box, a word that encapsulates a potentially infinite series of disparate fantasy objects." [14] The discursive vagueness of the terms creates as Basa states, "illusion of communication" and "terminological and conceptual confusions".[15] It is the substance and essence at the same time. Currently, we are faced with a staggering ecology crisis in hierarchical ontology, defined both below us as a mere resource problem and above us with the revival of nature myths.

Nature had always been the material resource of human however as our symbology attributed to it shifted, human behavior and therefor architecture preceded. Using the relationality as departure point for the thesis, the problem is defined at the core of the nature understandings. In the first route, the static tendencies for an idealistic

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[11] Christian Lotz, "From Nature to Culture? Diogenes and Philosophical Anthropology," *Human Studies* 28, no. 1 (2005): 41–56. p 42
[12] Ibid. p 45
[13] Nancy Tuana, "Viscous Porosity: Witnessing Katrina |," in *Material Feminisms* (Bloomington: Indiana University Press, 2008).
[14] Timothy Morton, *Ecology Without Nature: Rethinking Environmental Aesthetics* (Harvard University Press, 2009). p 14
[15] Inci Basa, "Environmental Discourse of Architecture," *International Journal of Environmental Studies* 66, no. 2 (April 2009): 271–79, https://doi.org/10.1080/00207230902859796. p 273

understanding of nature are analyzed historically and matched with the architectural formalism that lacks relationality. In the second route, neomaterialist nature understanding is asserted as a metastable condition, with its history and and its performative approach to form is investigated.

The new materialism, which can be considered as an update on the philosophical position of materialism, projects a heterarchical ontologic reading of nature. The term is coined by feminist philosopher Rosi Briadotti first, to argue the materialistic, body related problematics with a post-human agenda, however later it became a materialistic template for various current non-human issues. As materialism claim, all is material already, new materialism's main update is to exclude anthropocentric presumptions. Within the body of the thesis Manuel DeLanda's performative new materialistic approach is used as a template.

> In a very real sense, reality is a single matter-energy undergoing phase transitions of various kinds, with each new layer of accumulated "stuff" simply enriching the reservoir of nonlinear dynamics and nonlinear combinatorics available for the generation of novel structures and processes. Rocks and winds, germs and words, are all different manifestations of this dynamic material reality, or, in other words, they all represent the different ways in which this single matter-energy expresses itself. Thus, what follows will not be a chronicle of "man" and "his" historical achievements, but a philosophical meditation on the history of matter-energy in its different forms and of the multiple coexistences and interactions of these forms.[16]

These arguments also have a direct linkage to ecological thinking. What new materialism offers here is an epistemological attempt to broaden the relationality to matter in relational conditions instead of biological life merely. In a sense, new materialistic approach provides a speculative understanding of matter for ecology to put forward in scientific methodology.

[16] Manuel DeLanda, *A Thousand Years of Nonlinear History* (Zone Books, 1997). Pp 21-22

In this context, form is interpreted as a response of matter to environmental conditions, from chemical compounds to complex organisms, in accordance with its own potentials. It is interpreted as a performative process that constantly regenerates and evolves according to external conditions, and therefore cannot be considered independently of its predecessor, successor conditions and its environment.

Architecture as a discipline, forms the nature / matter according to a humanly program. Form-giving to matter as architecture according to symbolic relations of social theory and programatization swayed towards a form-seeking architecture by the changing needs. The form-seeking architecture is mostly achieved via architectural program's privilege or unfolding of an informed code via diagrammatization. However, the ecological disconnection of architecture asserts a new approach, the architecture of a form-seeking matter.

The architectural discipline had evaluated matter as an inert substance needs to be formed. Yet, as the matter is understood with its performative capacities, architecture's quest of form-seeking can be an ecological response. Currently, these studies are generally produced under genetic architecture. By material computation, digitally informed materials according to their potentials are used as building materials and form becomes a behavior that is expected to mediate between the programatized interior and environment. This behavior shapes the mediated form encoded through certain rules, and thus transmitted, that can manifest itself when it reaches a certain maturity. In the body of this thesis, material ecology had been evaluated for such a field of study.

1.2 Aim, Methodology and Literature Review

As ecologic problem prioritized as a global issue, architectural production begins to be questioned in means of its approaches. The aim of this study is to examine the ecological non-relationality of architecture produced by the symbolic relationship with nature on a historical basis and to present an alternative ontology of nature

through new materialism that can result as ecologic architecture. It is considered that the ecological connection made with architecture through new materialism, will provide a template for the next studies to be established in this direction.

Throughout the thesis, the relationship between nature and architecture was discussed from overlapping historical, philosophical, scientific, and architectural readings obtained from a literature review on academically referenced theses, articles and books. In the selection of these resources, a special concern was made on their issue dates to contain current issues. In the fourth chapter case studies are presented to exemplify the carried out discussions unfolded with succeeded analyses.

1.3 Structure of Thesis

The first chapter, contextualizes and defines the problem, projects the aims and the frame the study.

The second chapter, ‘nature and world-views’ is asserted as two parts. The first one is the historical reading of nature with idealistic approaches. ‘Idealist’ stands for an autonomous understanding of nature with a pre-formed and persistent condition generated by the form-giving subject which presented as the root of the ecological problem. ‘New materialist’ stands for a relational, form-seeking and metastable condition generated by the matter-energy’s performative capacities which presented as an ecological path.

The first part aims to match the idealistic approaches for nature concept with human positioning and architectural form by following the periods of Western History as a timeline. It is considered as a schematization effort, therefor these matchings are revealed with the general characteristics.

The second part aims to put forward new materialist approach on nature as an undercurrent on historical stream in order to be a template for the preceding chapter following this route. After the historical context is provided, the current frame of the

discourse is presented as vital, negative, and performative. Among these branches of during the thesis relates with performative new materialism.

The third chapter, ‘new materialism and ecology’, aims to bridge the ecology as a field of science and new materialism as a philosophical positioning. Ecology mainly focuses on relationalities of the ‘living nature’ and their ‘passive habitats’. Architecture is also evaluated as a passive habitat that the form is received by the active subject of human species. However performative new materialism asserts a speculative positioning to matter by not separating living from the non-living and placing the matter’s intrinsic capacities to operation. Therefore, it can be an ecological template for an active architectural understanding, a form-seeking behavior. In this chapter the theoretical and philosophical lexicon of ecology and new materialism is gathered and combined to ground the architectural behavior.

The fourth chapter, ‘performative new materialism and ecologic architecture’, aims to put forward a performative behavior on architecture for ecologic relationality. As the chapter is subdivided into two parts, the former investigates the ecologic architecture’s environmental continuity relationships, the ladder an architecture on performance.

The fifth chapter, ‘material ecology ‘aims to exemplify the precedent discussions by presenting the works of Neri Oxman and MIT Media Lab’s ‘Mediated Matter’ Group under the name of Material Ecology as case. The works on matter can be considered as an R&D process for architectural matter’s potentials on creating form, rather than applicable strategies. The works was found to be in relation both with performative new materialism and ecologic frame the thesis assert throughout the body.

The final chapter, ‘conclusion’ aims to superimpose the on the body of the thesis and argue. What is attempted here is to reveal the idealistic understanding of nature swaying through new materialism for ecologic concerns on the perspective of architecture. In order to achieve this aim, starting from the correlations of nature and architecture historically, an alternative reading on history, philosophy, science and architecture, is tried to be constructed as an alternative on material conditions.

CHAPTER 2

NATURE AND WORLD-VIEWS

> "Indeed, there is not, and never has been, such thing as 'meaning' or 'ideology', not, in any case, one separate from the physics of history and power, a physics, not incidentally, which is always a physics of forms: be it the form of an idea, the form of an epoch, or the form or a tool." [17]

Throughout history, nature has been a human-centered environmental terminology for attributing meaning to matter's varied forms and their forces. The intertwined relationship of matter, form, force and meaning had tried to be understood recursively. Since these relationships was understood in a more extended historicality with cumulative information of humanity via intergenerational communication skills, natural myths gradually evolved first to philosophic and empirical methodologies, later to scientific explorations.

Here, two different approaches of nature tried to be presented, first idealist condition, then new materialist condition. Two of the approaches historically evident however the formal approach gained more legitimacy until recently. In idealistic comprehension of the nature, the meaning is assigned to form. Force is the form's behavior provided from an outer source and matter is the mechanical, inert component of the form. Form is considered to be self-referential, autonomous and nonrelational. This understanding of the form generally matched with stable, or hylomorphic nature. Although this worldview not necessarily center human, as being the observation subject, the positioning always privileged human.

[17] R.E. Somol et al., "What Is the Status of Work on Form Today?," *ANY: Architecture New York*, no. 7/8 (1994): 58–65. p 65

n materialistic conditions the meaning is assigned to matter. This understanding claim form is a spatio-temporal response of matter, and the experienced world is only possible through materiality which observed in various conditions of it. Force is the matter's capacities in different conditions and intrinsic to all matter.

In such a worldview the form is not finite, but rather is a continuous change, depending on reciprocal forces of self-organizational matter and environmental matter. In this approach form of matter becomes contextual and it depicts an open-ended, metastable, and performative nature.

In a similar manner Timothy Morton criticizes in his *Ecology Without Nature,* how we form nature as an autonomous definition is also based on assumptions. He argues that there is no such thing as nature, but the notion consists of a set of ideological fixations as the trustworthy grounds for humanity's constructs.

Matter, form, force, and meaning are also the architecture's main themes. In the idealistic understanding of nature, architecture revealed as a form applied on matter, with a symbolic force which generate its meaning. Generally referred as 'formalist architecture', this hylomorphism can be linked 'with form-giving, autonomous, and hegemonic subjectivity's act of forming a passive matter waiting to be formed. (style, order, typology, etc.)'[18]

The study in general has the claim that human-centered worldviews produced a non-relational positioning with nature and architecture in response reflected the same autonomy towards non-human environment resulting in ecological crisis. So, the first part of the chapter focuses on asserting the process of non-relationality. By following the classical Western Historical Timeline, it is aimed to present the idealistic nature understanding by matching these views with social theory constructions as well as physical constructions of architecture to corelate the relationship of nature theory and architecture.

[18] Nizam Onur Sönmez and Furkan Balcı, "Mimarlıkta Biçim ve Biçimlenmenin İnsansonrasına Giriş 1/3," *XXI Mimarlık, Tasarım ve Kent Dergisi*, 2020, https://xxi.com.tr/i/mimarlikta-bicim-ve-bicimlenmenin-insansonrasina-giris-1-3#ref4.

As an undercurrent from the historical approaches about a relational nature understanding, 'New Materialism' is introduced with its metastable worldview in the second part of the chapter. In this part it is only aimed to discuss the certain positionings of 'New Materialism' as a faculty of though. Its philosophical backgrounds and potentials to ecological architecture will be unfolded in the preceding chapters.

2.1 Nature With Idealistic Approaches

2.1.1 Ancient era

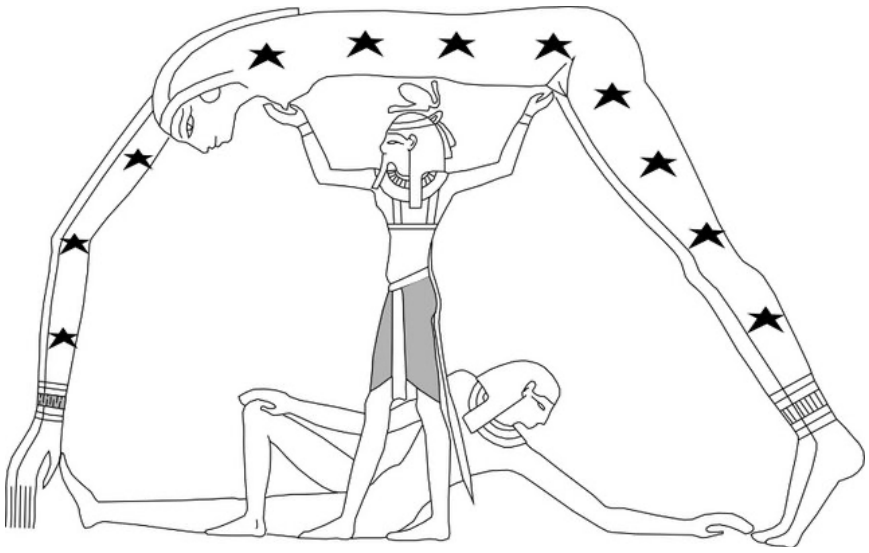


Figure 4 - Egyptian Representation Illustrating The Gods
Earth (Geb), air (Shu) and celestial vault (Nut); modified after Erman, A. 1907. A Handbook of Egyptian Religion. Constable ed., London.[19]

During the ancient threshold, nature was understood through ecotheological relationships, generally as the personification of cosmos by the idealization of human behavior. "Myth, turned into history, began with the creation of gods."[20] Among this

[19]José-Javier Alvaro, *THE AGES OF THE EARTH A JOURNEY FROM THEOLOGY TO GEOLOGY*, 2019. p 11
[20] Ibid. p 13

understanding nature was the terrestrial layer, generally represented with mother nature symbologies. The personification of nature is evident with Goddess worship figures among the first human images including Venus figures dating back to Cro-Magnons of the Upper Paleolithic period between 35.000 and 10.000 BC.[21] Isis (ca. 7000 – 6000 BC) the principle Goddess of ancient Egypt, was known as the giver of life and responsible for cycles such as breathing, the alteration of day and night, the flooding in Nile, the yearly passage of the stars across the heaven.[22] In many cultures this personification differentiates, however they all have similar purposes.

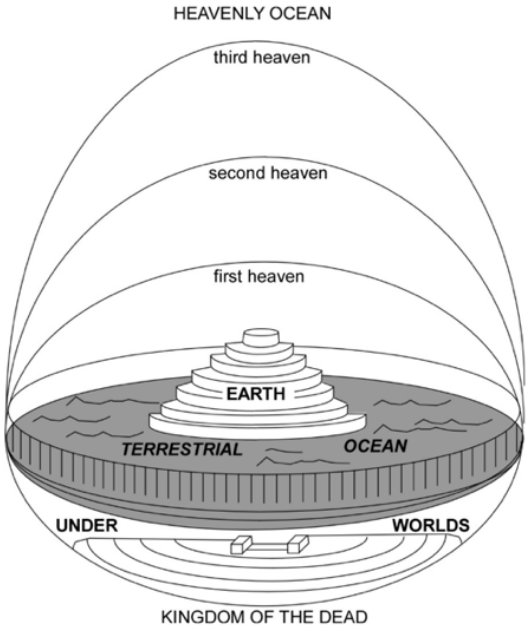


Figure 5 - Babylonian Cosmology
Representation of a hemispherical Earth with the sky (An), the terrestrial ocean (Absu) and the underworld (Kur); modified from Horowitz, W. 1998. Mesopotamian Cosmic Geography. Eisenbrauns, Winona Lake, Indiana, USA. [23]

[21] Peter J. Ucko, "The Interpretation of Prehistoric Anthropomorphic Figurines," *The Journal of the Royal Anthropological Institute of Great Britain and Ireland* 92, no. 1 (1962): 38–54. cited in Dennis E. Jelinski, "There Is No Mother Nature: There Is No Balance of Nature: Culture, Ecology and Conservation," *Human Ecology* 33, no. 2 (2005): 271–88. p 274
[22] Joan Chamberlain Engelsman, *The Feminine Dimension of the Divine* (Chiron Publications, 1994). cited in Jelinski, "There Is No Mother Nature."
[23] Alvaro, *The Ages Of The Earth A Journey From Theology To Geology*. p 16

Also, a cosmologic unity understanding is witnessed. As a proto-scientific observation, in many of the ancient cosmology, the myth is overlapped with the geography. And the transcendental analogies on vertical schemes begin to be established as sky was the realm of Gods considered positive and underground as the realm of dead considered negative.

> Mesopotamia the inhabitants imagined the Earth (ki) as a flat disk, which ended up being the domain of Enlil, the most important figure in the Sumerian pantheon. There was a mass of drinking water under the earth, the domain of Enki (Ea in Akkadian texts) and source from which the fertilising waters of the rivers and springs that emerged from the inland ocean were fed; hence Enki's relationship with fertility and creation. The sky (an), located above the Earth, was the dominion of An (Anu in Acadian), nominal head of the pantheon and personification of the authority. The spirits of the dead dwelled in the infernal world (kur), which the texts always place underground.[24]

Considering the human and nature relationships during this era, although locally differentiate, human and nature overlapped within material and meaning. The nature form is tried to be understood by the direct form of the human body (f, or symbologies of nature conveyed through the humanly ideals as the domain of Gods. Either case the direct analogy of humanly idealization of nature is evident. Human can be considered as in harmony with nature rather than fighting with nature. Since nature is seen as sacred and perfect, it is a work that must be protected, understood and obeyed.[25]

Architectural features and settlement characteristics reveal that the cosmic observations, geographic opportunities, and ideal behaviors obtained from the social life shaped the formal understandings. As the geographies are different from each

[24] Alvaro, *The Ages Of The Earth A Journey From Theology To Geology*. p 15
[25] Metin Demir, "Doğa Merkezli Dünya Görüşü ve Derin Ekoloji" (Bachelor's Thesis, İstanbul, İstanbul University, n.d.), accessed August 24, 2021.

other in terms of the opportunities they offer (the scarcity of natural resources, different forms of conditions that will ensure the continuity of human life, the differences of the struggle with other beings in the ecosystem) the architectural characteristics also differ, depending on the material and local techniques however 'Site and Rite' behaviors can be traced in China or Africa.[26] In the examples of Göbeklitepe and Stonehenge similarities of architectural symbology is witnessed. Despite the chronological and geographical differences. From this era, architectural formalism inherited some psychological pairings left by this common past; axes, enclosures, grids, centers, and polarities.[27]

Figure 6 - Göbeklitepe –9500 BC
Şanlıurfa, Turkey German Archeological Institute, Photo E. Küçük

As an early architectural example, Göbeklitepe settlement consists out of a set of circular enclosure with massive stone pillars with anthropocentric abstractions and animal reliefs. This monumental structure is thought to be designed for purely religious ritualistic reasons due to the findings on "1) the presence of 'special buildings' with elaborately carved monolithic T-shaped pillars; 2) the absence of

[26] Lynch, K. (1981) *Theory of A Good City Form. Cambridge:The MIT Press* Pp 73-81
[27] Ibid.

domestic structures; and 3) its lack of reliable water sources." [28] A series of scholarly work argue the pillars and the positioning of the site corelates with some celestial objects for religious symbologies.[29]

Figure 7 - Stone Henge –3000 BC to 2000 BC
Salisbury, England David Goddard/Getty Images

Another early settlement of Stonehenge again shows similar architectural characteristics with the use of material, articulation, symbology and positioning.

Its programatization is not strictly known, based on estimations, it was being used as a ritual site for burial, connection space with anchestors, socializing and feist. In the example of Stone Henge, the observation of cosmos is traced by the positioning of the design. It is understood that architecture undertakes the symbolic meaning tried to be established with the sublime by being in connection with the Sun, Moon and

[28] Lee Clare, "Göbekli Tepe, Turkey. A brief summary of research at a new World Heritage Site (2015–2019)," *e-Forschungsberichte*, October 12, 2020, 81–88, https://doi.org/10.34780/efb.v0i2.1012. p 82
[29] Alessandro Lorenzis and Vincenzo Orofino, "New Possible Astronomic Alignments at the Megalithic Site of Göbekli Tepe, Turkey," *Archaeological Discovery* 03 (January 1, 2015): 40–50, https://doi.org/10.4236/ad.2015.31005.

stars' location which is the transcendental space. This reveals that they could perceive the scale of the cosmos and shape their architectural designs according to these observations.[30]

2.1.2 Classical era

In the classical era, there were numerous attempts to explain the events in nature that can be generally categorized as holistic approaches. By the growing interest in astronomy, the personified nature image of the ancient civilizations was replaced with occult cosmologic readings by the inherited transcendental symbology towards vertical schemes. Generally, the order of cosmos had been interpreted as a psycho-geography where material and reason separated. As a result of this point of view, Greek thinkers described nature as a living being with a mind.[31] Among this unified understanding, the cosmos was 'created' and 'described'.

The initial question of Greek philosophy is a question of nature. The first philosophers, and also the first natural philosophers, the Ionian School assumed that all natural things constitute a single world of nature and tried to find out what the common substance that formed this world was. The first answer to this question came from Thales, as he saw the world as a soul-bearing thing, a living organism or animal whose soul contain lower organisms within it. According to him, a single stone or a tree is both a living organism in itself and a part of a large living organism called the world .[32]

[30] Melih Kamoğlu, "Evrimsel Mimarlığın Doğa Felsefesi-Mimarlık Ilişkisi Üzerinden Değerlendirilmesi" (Karadeniz Teknik Üniversitesi, 2020), https://tez.yok.gov.tr/UlusalTezMerkezi/tezSorguSonucYeni.jsp. p 13
[31] Robin George Collingwood, *The Idea of Nature* (Oxford University Press, 1960).
[32] R. G. Collingwood, *The Idea of Nature* (Oxford, New York: Oxford University Press, 1992).

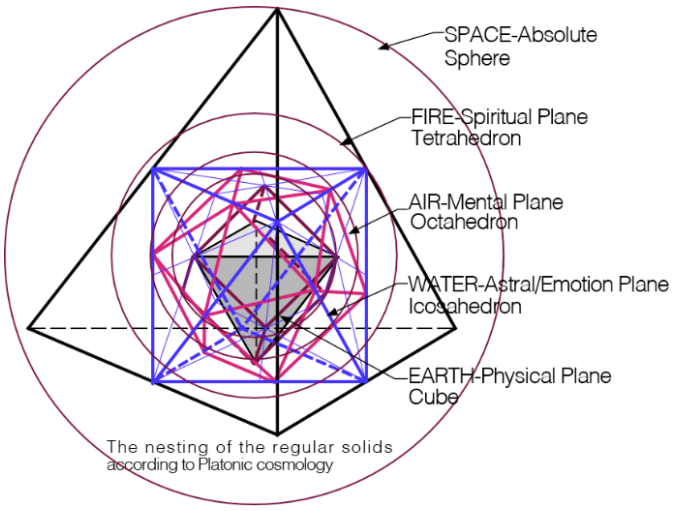


Figure 8 - Platonic Cosmology
The nesting of the regular solids according to Platonic cosmology.

A very important movement that followed, the Pythagorean school, abandoned its effort to find the unchanging essential matter but rather focused on the essential geometry that do not change. Plato, who proceeded in this way, claim that the universe seperates into two realms, one is the realm of Being 'the World of the ideals', the other the realm of becoming 'lived world'. The universe is the work of Demiurge who created the World from purely mathematical ideal form that is the underlying principles of matter. "These geometries are depicted as, perfect volume, with Being at its center and Becoming its circumference…. The universe is made of four elements represented by one of the four solids: fire for the tetrahedron, earth for cube, water by the icosahedron and air by the octahedron. "[33]

[33] https://mind-matrix.net/the-ascension/the-mind-matrix-kingdoms/multi-dimensional-realities/13a-platonic-cosmology/

Figure 9 - Aristotelian Cosmology
Geocentric celestial spheres Peter Apian *Cosmographia* (Antwerp, 1539)

Also, for Aristotle, who based his philosophy on empirical observation, nature is a living organism on process. Everything contains an effort (nisus) that will activate the potentials in it and try to realize itself in accordance with the Logos.[34]

By centering the earth, astrologically observed planets and stars were given sublime meanings. According to Aristotelian cosmology at centre are the four elements of Earth, Water, Air and Fire. Then there are successive spheres for the Moon, Mercury, Venus, the Sun, Mars, Jupiter and Saturn. The outer three spheres are: the Firmament (including the stars), the Crystalline Heaven, and the Primum Mobile. Beyond this is the Empyreal Heaven, the Abode of the Blessed.

Movement and life understood attached together, differentiating the animate from inanimate. And the bifurcation of matter and movement had been reasoned with soul.

[34] Demir, "Doğa Merkezli Dünya Görüşü ve Derin Ekoloji." Pp 6-7

Plato situated the soul as a mathematical entity coded in the "ideal world" whereas Aristotle had a more naturalistic approach where he assigned essences to materials and metaphorically classified a scheme for the living organisms known as "Scala Naturae"(Fig 11) representing their degree of perfection[35]. Although quite theological, this idea of ranking the organisms, gave a root for scientific taxonomy.[36]

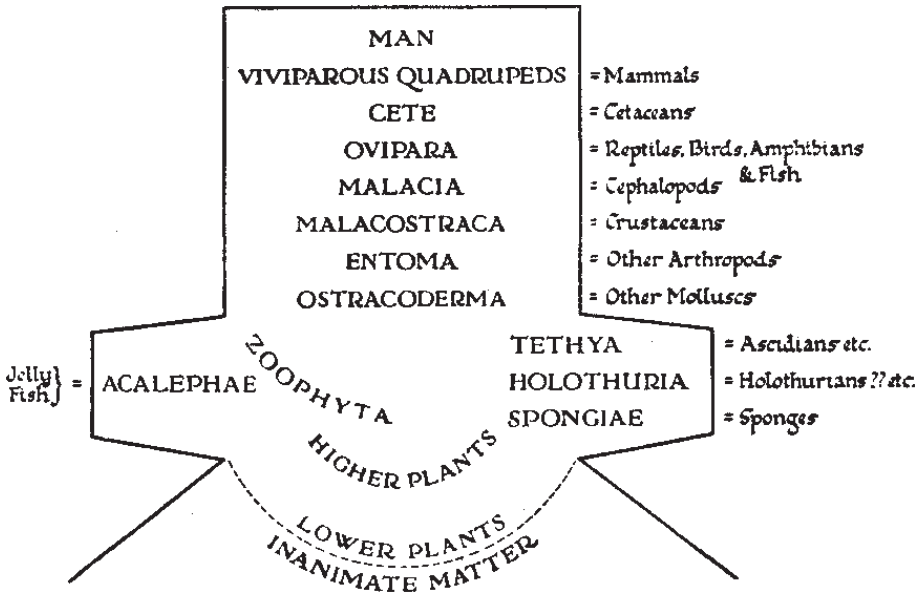


Figure 10 - The Ladder of Nature (scala naturae)
Aristotle demonstrating the great breadth of his interests in the whole animal kingdom, plants, and inanimate materials.

As 'man' ranked highest in this taxonomy, during this era human body had been evaluated as the reflection of creation's highest degree of perfection.

During this era, the architectural approach shows direct corelations with natural form's sublime meanings. The architects positioned as the mediators between the

[35] William Hodos, "Evolution and the Scala Naturae," in *Encyclopedia of Neuroscience*, ed. Marc D. Binder, Nobutaka Hirokawa, and Uwe Windhorst (Berlin, Heidelberg: Springer, 2009), 1212–15, https://doi.org/10.1007/978-3-540-29678-2_3118.
[36] Armand Marie Leroi, *The Lagoon: How Aristotle Invented Science* (Penguin Publishing Group, 2015).

nature's perfection and human-made environment. This analogy revealed itself in anthromorphism meaning human form derived from the Greek words anthropos human and morphe. [37] According to the era's most important architectural resource, Roman architect Vitrivius' "On Architecture (De Architectura)", human body was evaluated to be a micro-cosmos reflecting the universal order by a transcendental will, therefore order on architecture, can be achieved via the proportions of human body. The Vitrivuan Man is described as the fitting of a healty male body while standing tall on open arms and legs, into a perfect circle drawn from the navel. (Fig 12) Also the abstract analogies of human body in the form of columns representing a formal grammar for architectural discipline, 'architectural order' represents male, female and maiden bodies. [38]

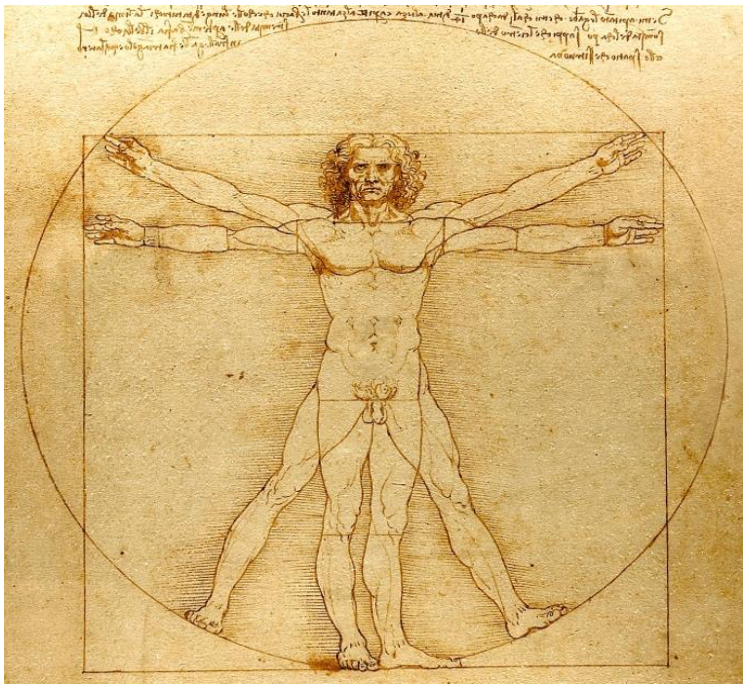


Figure 11 - Vitrivuan Man, Leonardo Da Vinci, 1490

[37] Kamoğlu, "Evrimsel Mimarlığın Doğa Felsefesi-Mimarlık Ilişkisi Üzerinden Değerlendirilmesi." p 22
[38] Melis Deniz Özbek, "Dipsiz Doğa: Mimarlığın Zemin Hayalleri" (Master's Thesis, Istanbul, Istanbul Technical University, 2021). Pp 20-21

The most important source that can be used when evaluating the relationship between Roman architecture and natural philosophy, in which the direct influences of ancient Greek thinkers can be read, is the book titled "On Architecture (De Architectura)" written by the Roman writer and architect Vitruvius.

According to this book architecture consists of; arrangement (ordinatio), design (dispositio), harmony (eurythmia), symmetry (symmetria), conformity (decor) and distribution (distribution). Anthropomorphism is derived from the Greek words anthropos human and morphe meaning in human form. According to Vitruvius, since nature creates the human body in such a way that there are certain proportions between the parts and the whole, architects should also pay attention to the proportions of the individual parts to the whole in the buildings they design. In this context, correct design of temples is not possible without proportion and symmetry.[39]

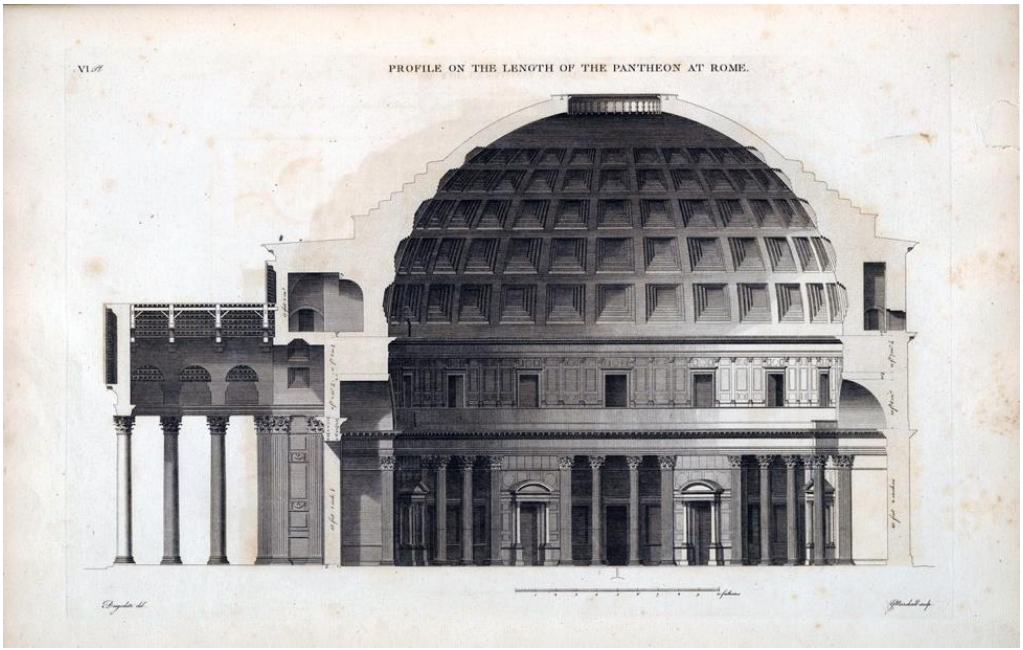


Figure 12 - Pantheon Sectional Elevation

[39] Kamoğlu, "Evrimsel Mimarlığın Doğa Felsefesi-Mimarlık Ilişkisi Üzerinden Değerlendirilmesi." p 22

As an example of form in this era, Pantheon. As a manifest of Roman religion and nature perceptions, Pantheon is combination of symbolization on order, harmony, and unity in a religious framework. Rather than s conservative Christian faith, this structure, was designed as an expression of the universality that exists in its form and meaning. Its shape, the disc of light at the top of the dome, the seven main niches, including the apse, emphasizes their planetary workings and the unity of the state's continued existence. In this context The Pantheon is dedicated to all the gods to symbolize the unity of the state and gods.[40]

2.1.3 Medieval era

During the Middle Age the idealist understanding of nature proliferated and got complicated with much of the celestial religions and their local interpretations. However as the ancient Greek the natural incidents was tried to be understood via natural mechanisms, during this era nature began to be seen as eternal, created by God for the sake of a purpose.[41] According to Cevizci, while nature and human are at the core of Ancient philosophy, there is God at the core of medieval philosophy.[42] As the God-centered explanation of the nature is fixed with religious hermeneutics, much of the knowledge of the ancient world remained, geocentric model was still thought to be the basis of the universe and the development on natural sciences did not proliferated. However, as the interest in alchemy increased and emergent elements revealed the evident world's primary matter superseded with primordial matter.[43]

[40] Kamoğlu. p 22
[41] Ibid. p 24
[42] Ahmet Cevizci, *Felsefe Tarihi: Thalesten Baudrillarda* (Say Yayinlari, 2018). Cited in Kamoğlu
[43] Jürgen Mittelstrass, "World Pictures: The World of the History and Philosophy of Science," in *An Intimate Relation: Studies in the History and Philosophy of Science Presented to Robert E. Butts on His 60th Birthday*, ed. James Robert Brown and Jürgen Mittelstrass, Boston Studies in the Philosophy of Science (Dordrecht: Springer Netherlands, 1989), 319–41, https://doi.org/10.1007/978-94-009-2327-0_16.

The humans in the social narrative also remained as in Aristotle's concept of "Natura Scala", however this had been interpreted as a God-given order resulting in the depiction of a very strict social hierarchy.

> "For, among those beings which exist, and which are not of God the Creator's essence, those which have life are ranked above which have none…. And among things that have life, the sentient are higher than those which have no sensation, as animals are ranked above trees. And, among the sentient, the intelligent are above those that have no intelligence- men, e.g., above cattle. And, among the intelligent, the immortal, such as the angels, above the mortal such as men. These are the ranks according to the natural order."[44]

However, although the social order very strict, it could be said that human was still seen as a part of nature, despite being assigned the highest of chain on earthly beings in hierarchal order.

In the Medieval Era, since the belief in God was the basis of the perception of reality, materialist nature was seen as a lower ranked reflection of God, and dogmatic understanding shaped the era's characteristics. In this context, architecture also revealed the depictions of the holy book.[45]

As architectural spaces church structures come to the fore in early Christian and Byzantine architecture. When the designs of the churches are examined, it is seen that the Platonic basic geometric forms and symmetry are frequently used. However, in churches, in parallel with the understanding of the Christian faith that cares about the soul, the interior space is given more importance than the external appearance of the building. In other words, with the Early Christian and Byzantine architecture, the focus of the design shifted to the interior where the mystical reflections of God's

[44] Saint Augustine, *The City of God, Vol. 2, by Aurelius Augustine* (T. and t. clark, 1871). Cited in Ecologies of Architecture Research Group, *Gökhan Kodalak. Nature - Architecture Continuum*.
[45] Kamoğlu, Pp 24-25

presence were created.[46] A good example of this interior mysticism with light can be witnessed in Byzantian chruch, Hagia Sophia, as well as the dome representing the celestial vault and cube representing earth. [47]

Figure 13 - Hagia Sophia, Byzantine Institute, 1948

In this context, an effort was made to convey the divine to the earth in Hagia Sophia, by effectively incorporating light, which is a natural element, into the building and using the universe description of the period in the design decisions of the building. For this reason, Hagia Sophia is a unique example of the reflections of the God-centered perception of nature on architecture. The expressed desire for openness also manifests itself in the perception of nature and its reflection on architecture.

[46]Leland M. Roth, *Mimarlığın öyküsü: öğeleri, tarihi ve anlamı* (Kabalcı Yayınevi, 2000). Cited in Kamoğlu, "Evrimsel Mimarlığın Doğa Felsefesi-Mimarlık Ilişkisi Üzerinden Değerlendirilmesi." p 25

[47] Roth, *Mimarlığın öyküsü*.cited in Kamoğlu, "Evrimsel Mimarlığın Doğa Felsefesi-Mimarlık Ilişkisi Üzerinden Değerlendirilmesi." p 29

2.1.4 Renaissance era

In the Renaissance Era, the natural philosophy bifurcates into two directions. One is the conservative approach, relates with the revival of Classical Era and the other one is the mechanical universe understanding leading to Enlightenment.

In the first stage, inherited and accumulated experience, in the light of the canonic perspective tried to be derived from the classical era. Shaped by the Italy's pioneering Medici family's finance and expectations on reflecting the human ideals on earth via arts and architecture, the built environment and art had formed around these symbolizations.

The cosmology and worldview are reflected in hermetic tradition with the reinvention of the mythical Greco-Egyptian sage, priest and philosopher Hermes Trismegistus in 1471 by Catholic priest Marsilio Ficino.[48]During this era Geocentric model also remained as it is depicted in the Holy scripts. However the most fundamental difference between the Classical and Renaissance natural theory is their grasping of logos attributed to nature. While in Classical approach it was thought that the movements in nature were realized by the arrangements of the logos inherent in nature itself, in the Renaissance it was thought that logos and life.

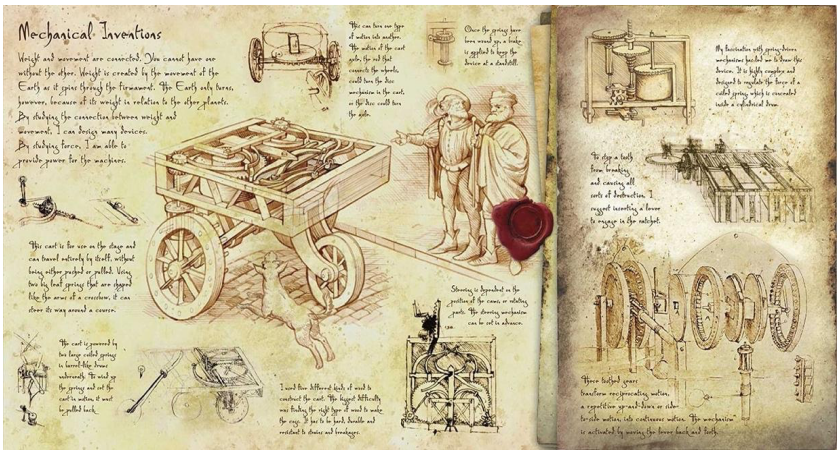


Figure 14 - The Inventions of Leonardo da Vinci, Jasper Bark

[48] Mittelstrass, "World Pictures."

In the second stage, nature existed in the competence of God as an external factor. [49] With the increase of the influence of mathematics on the Renaissance natural philosophy, nature was conceived as a machine that operates based on certain mechanisms, and the language that explains the operation of this machine has been accepted as mathematics. [50] Since the operation of a machine requires an active force or motivating factor outside itself, the active power here in the Renaissance theory of nature came to the forefront as God. [51] In this context, a worldview based on science and objective knowledge has emerged and the idea that nature can be shaped by reason has begun to sprout.

Another factor that led the Renaissance thought away from the dogmatic framework is the emergence of the humanist understanding that puts the human being in the center. The emergence of the humanist understanding has direct relations with the rediscovery of the ancient philosophical texts, because the Renaissance thinkers placed the understanding of Pythagoras as their own philosophy, which states that man as the measure of everything.[52] This humanist tradition revealed itself both in social theory, art and architecture. However rather than reflecting the complexities, during the Renaissance an understanding of the human life that rested on ideas of "unchanged values" and "unchanged constancy".[53] Therefor the mathematization of Vitruvius Man by Leonardo Da Vinci depicted a circumcised man not with the organs or muscles, only by the finitude and symbolization of an ideal.

During this era the idealized human, especially 'man', ranked up in the hierarchy of Nature Scala. The social order can be traced from Marsilio Ficino's explanation:

> "Who has ever seen any human beings kept under the control of animals, in such a way as we see everywhere hers of both wild and domesticated animals

[49] Robin George Collingwood, *Doğa tasarımı* (İmge Kitabevi, 1999).
[50] Collingwood, *Doğa tasarımı*.
[51] Ibid.
[52] Kamoğlu, "Evrimsel Mimarlığın Doğa Felsefesi-Mimarlık Ilişkisi Üzerinden Değerlendirilmesi." p 30
[53] Sigfried Giedion, *Space, Time and Architecture: The Growth of a New Tradition* (Harvard University Press, 1977). Pp xxxiv cited in Ingraham, *Architecture, Animal, Human*. p 24

obeying men throughout their lives? Man not only rules the animals by force, he also governs, keeps and teaches them…. Man, tramples on the earth, furrows the water, ascends into the air in the tallest towers…. How marvelous is the construction of his buildings and cities! Hence, Man who provides generally for all things, is a kind of God. ”[54]

Figure 15 - The Great Chain of Being - Didacus Valades - *1579*

During the Rennaisance, architecture also in relation with the Classical Era. As architecture translates the perfectness in nature via ordered and hiearchal relations, the Classical tradition of proportion is revisited as an assurance for beauty and this proportion in architectural tradition gains an authority. [55]

Humanist tradition tried to be reflected in arts and architecture with “scale, mathematics, proportion with respect to human body”. They saw architecture as a

[54] Marsilio Ficino, *Platonic Theology, Volume 5: Books XV–XVI*, ed. James Hankins, trans. Michael J. B. Allen (Cambridge, Mass: Harvard University Press, 2005) pp 234 . cited in Ecologies of Architecture Research Group, *Gökhan Kodalak. Nature - Architecture Continuum*.
[55] Özbek, “Dipsiz Doğa: Mimarlığın Zemin Hayalleri.” p 21

mathematics-based discipline dealing with the act of designing space, and as a part of this, they considered the rules of perspective as a scientific analysis of the parts of universal space.[56] In addition to this understanding, they believed they could reflect the perfect proportion in nature by creating a universal system of proportions with the combination of basic geometric forms, which Plato defined as absolute beauty, [57] According to Alberti, this proportions does not reveal architect's mere imagination[58], it reflects the order of the world and the architect's duty is to design via this tool.[59] In general, during Rennaisance Era, the nature is reflected via idealization on the rational perception of nature by idealizing it to proportions, basic geometric forms, volumes and surfaces. So the architectural characteristics inherited the mathematization of the symbologies.

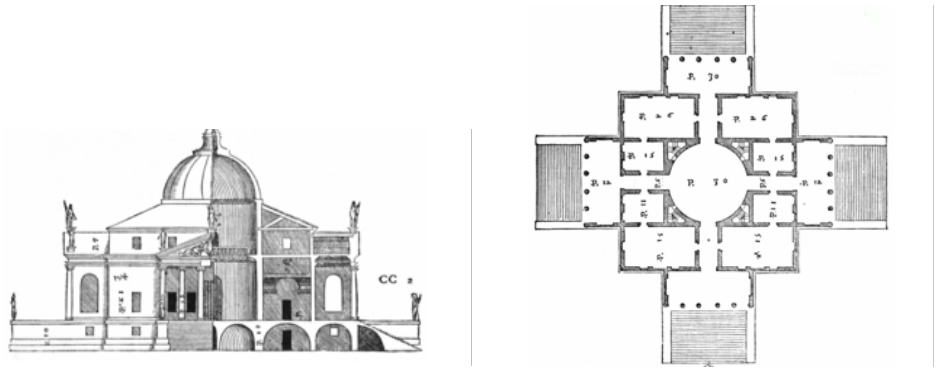


Figure 16 - Villa Rotonda in the Quattro Libri Dell'Architettura - Palladio -1570 [60]

[56] Rudolf Wittkower, *Architectural Principles in the Age of Humanism* (London: Academy Editions, 1988). Cited in Kamoğlu, "Evrimsel Mimarlığın Doğa Felsefesi-Mimarlık Ilişkisi Üzerinden Değerlendirilmesi." p 36

[57] Kamoğlu, "Evrimsel Mimarlığın Doğa Felsefesi-Mimarlık Ilişkisi Üzerinden Değerlendirilmesi." p 36

[58]Leon Battista Alberti, *The Ten Books on Architecture* (Dover Publications Inc., 1986). P1 Cited in Özbek, "Dipsiz Doğa: Mimarlığın Zemin Hayalleri." p 22

[59] Alberti, *The Ten Books on Architecture*. P14 cited in Özbek, "Dipsiz Doğa: Mimarlığın Zemin Hayalleri." p 22

[60] Tomás García-Salgado, "A Perspective Analysis of the Proportions of Palladio's Villa Rotonda: Making the Invisible Visible," in *Nexus Network Journal: Canons of Form-Making In Honour of Andrea Palladio 1508–2008*, ed. Stephen R. Wassell and Kim Williams, Nexus Network Journal (Basel: Birkhäuser, 2008), 269–82, https://doi.org/10.1007/978-3-7643-8766-2_5. p 270

As one of the most influential architects of Rennaisance, Palladio designed his villas using proportionate series of numbers based on basic geometric forms. Also his site choice characteristics are in connection with the countryside for landscape panaromas. In this context, one of his most prominent designs is Villa Rotunda. The building, in which square and circle are used as basic geometric forms, is also planned symmetrically and the building has been elevated to give the best experience of the surrounding countryside.

2.1.5 Enlightenment era

During the Enlightenment, dogmatic nature philosophies superseded mechanization of the universe. One of the most influential causes on dogmatic abandonment was the 1543 Copernican Revolution where the geocentric cosmology was replaced with heliocentric cosmos theory which clashed the religious texts and their philosophic relations. As a result, astrology had lost its importance in the Eastern world whereas in the Western world the interest got accelerated. Together with emerged mechanical worldview during Renaissance, that interpreted nature as machine, this paradigm shift tiled the roots for Enlightenment.

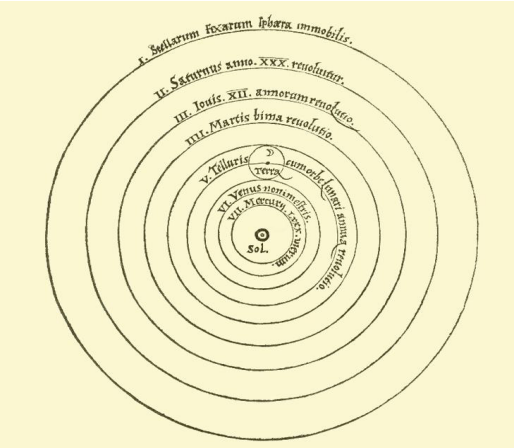
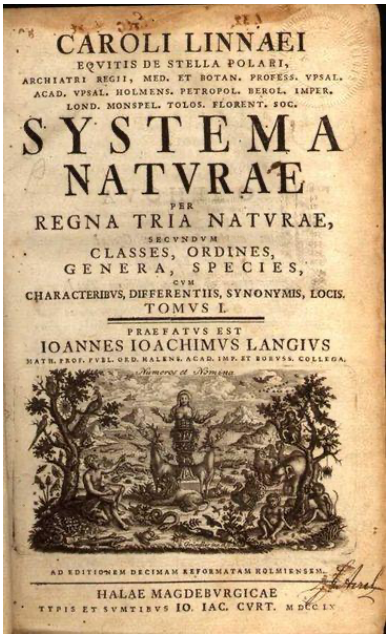


Figure 17 - Heliocentric model from Nicolaus Copernicus' *De revolutionibus orbium coelestium* (On the Revolutions of the Heavenly Spheres)

By Newton's assertation on the laws on motion, in Philosophiæ Naturalis Principia Mathematica in 1687, the cosmos was explained via certain principles instead of God's will. Although Newton was not intended to take God out of the picture, this depiction of cosmos rendered "God as a retired engineer.[61] However, since in Newton's closed universe, the absolute time and space theory consisted a constant loss of energy; God's occasional intervention was necessary for compensating the loss.[62] The Newtonian paradigm is called "classical mechanics" now and still being used for understanding the behavior of the mechanical systems in closed conditions.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ACAD. VPSAL. HOLMENS. PETROPOL. BEROL. IMPER.
LOND. MONSPEL. TOLOS. FLORENT. SOC.
SYSTEMA
NATVRAE
PER
REGNA TRIA NATVRAE,
SECVNDVM
CLASSES, ORDINES,
GENERA, SPECIES,
CVM
CHARACTERIBVS, DIFFERENTIIS, SYNONYMIS, LOCIS.
TOMVS I.
PRAEFATVS EST
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MATH. PROF. PVBL. ORD. HALENS. ACAD. IMP. ET BORVSS. COLLEGA.
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AD EDITIONEM DECIMAM REFORMATAM HOLMIENSEM.
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Figure 19 - Carl Linnaeus Systema Naturae

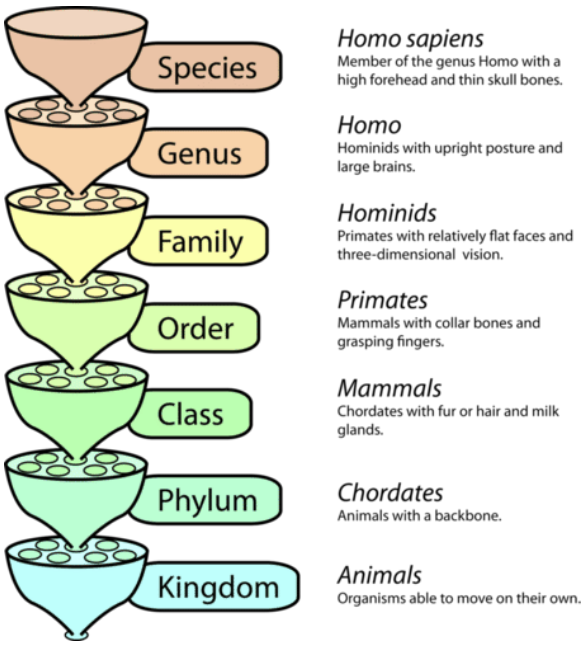

Figure 18 - Linnean Taxonomy, Human

[61] E.J. Dijksterhuis, *De Mechanisering van het Wereldbeeld*, Amsterdam: Meulenhoff 1950, p 539. cited in Mauro Scalercio, "Dominating Nature and Colonialism. Francis Bacon"s View of Europe and the New World," *History of European Ideas* 44, no. 8 (November 17, 2018): 1076–91, https://doi.org/10.1080/01916599.2018.1512282.
[62] Mittelstrass.

Another framing characteristics of the Enlightenment era, was taxonomy and classification.[63] The Aristotelian classification of beings in a ranked order also proliferated in the field of biology where the Swedish botanist, zoologist and physician Carl Linnaeus (1707–1778) introduced the Linnaean taxonomy. In his taxonomy, the ranking idea remained, however Linnaeus was the first naturalist to include man within the animal kingdom[64] This created debates as he was criticized "For although Man ranks first among the animals, he should in fact be considered to excel all other living beings which were created by God to Man's delight and benefit."[65]

In the natural philosophy, the most important change made by Descartes. He promoted a mathematical description of nature and introduced Cartesian Coordinate System. He is considered as the father of modern thought, as he placed the cogito, consciousness, at the center of the universe. And nature, including God, is only grounded in consciousness. [66]

During Enlightenment, as a result of proliferating scientific findings, human and nature got separated with clear lines. While myth subordinated 'man' to nature, enlightenment subordinated nature to 'man'. This absolute distinction has led 'man' to perceive the nature in which 'he' exists as a completely external element, which has led to the reification of nature for man. Science and technology became the tools of human domination over nature. Nature has turned into an object to be learned about in order to dominate.[67] As Cartesian rationalism divides existence into consciousness and matter, complete model of anthropocentrism, which gives all rights to human beings and does not give any rights to nature, including the animal kingdom, has been put forward.[68] This dichotomization of nature and culture gave

[63] Ingraham, *Architecture, Animal, Human*.
[64] "Linnaeus and Race," The Linnean Society, accessed August 4, 2021, https://www.linnean.org/learning/who-was-linnaeus/linnaeus-and-race
[65] Ibid.
[66] Demir, "Doğa Merkezli Dünya Görüşü ve Derin Ekoloji."
[67] Ibid. p 7
[68] Ibid. p 7

license to mastery over the natural world.[69] As Descartes stated, "to render ourselves as lords and possessors of nature."[70]

The developments in the science and philosophy led an epistemological shift that reflected to architecture as rejection of cosmic and rigid tradition and instead offering an architecture based on resilient fiction. [71] As the 17. Century architectural environment is polarized as Classicists and Modernists, the main argument of Classicists was to lose the inherited principles of architecture, that was believed to be the assurance of the beauty. However, by the gained Cartesian skepticism, modernists didn't believe these assurances was canonic, instead they argued it was contextual.[72] As Classicists believed cosmologic approach on proportions and order defined the norm, modernists objected this. According to Claude Perrault as a modernist, the Vitruvian five orders cannot be justified with the distance to stars or human body, However these can be justified with common opinions of the architectural environment. [73]

By the rational tradition in philosophy led to an orientation to clear rules and principles in architecture triggered the birth of Neoclassicism. [74] Jean-Nicolas-Louis Durand (1760-1834 argued classical antiquity should be rearranged according to the eternal principles of geometry. His architectural methodology, in line with Perrault's objection to tradition, offers to ground the meaning in architecture to function instead of restricting cosmic symbologies. In this context, he produces a self-referencial

[69] Jelinski, "There Is No Mother Nature." p 275
[70] René Descartes, *Discourse on Method*, Adam and Tannery, vol. VI (Paris: Librarie philosophique, 1976). Cited in Jelinski, "There Is No Mother Nature." p 275
[71] Özbek, "Dipsiz Doğa: Mimarlığın Zemin Hayalleri." p 64
[72] Ibid. Pp 28-37
[73]Anthony Gerbino, "Were Early Modern Architects Neoplatonists? The Case of François Blondel," *Architectural Histories* 2 (June 1, 2014), https://doi.org/10.5334/ah.bm. cited in Özbek, "Dipsiz Doğa: Mimarlığın Zemin Hayalleri." p 37
[74] Robert Furneaux Jordan, *A Concise History of Western Architecture* (Harcourt Brace Jovanovich, 1984). Cited in Kamoğlu, "Evrimsel Mimarlığın Doğa Felsefesi-Mimarlık Ilişkisi Üzerinden Değerlendirilmesi." p 46

architectural style, based on structure and formal geometry. [75] Thus, Madrazo claims, the self-referencial architecture of Durand free from or may replace nature.[76]

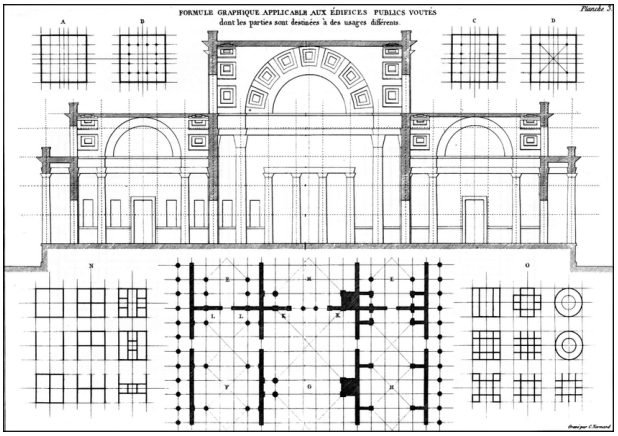

Figure 20 - Combinatorial Modular Grid, Jean Nicolas Louis Durand
combinatorial modular grid defining the walls and columns, and composition of the whole building by axes of symmetry, engraving.

2.1.6 Modern era

The Modern Era represents the antagonist positioning towards tradition, via the ideals of Enlightenment for scientific methods and rationalism. Also, other very important characteristics of the era, together with the invent of press resulting a reform of education and with the industrial revolution in the 18th century leading to mass production, human beings were in connection more than ever.

The era is referenced with Marx's famous line, "everything that is solid melts into air" due to constant revisions of information. By the improvement of technology, production techniques, overgrowing population and increasing social needs, Modern Era's leading characteristics are universality and speed. Although numerous changes during this era, since the first part of the chapter revisits history for seeking idealistic approaches, epistemological shifts on macro-scale relationalities such as Darwin's

[75] Özbek, "Dipsiz Doğa: Mimarlığın Zemin Hayalleri." Pp 55-56
[76] Leandro Madrazo, "The Concept of Type in Architecture: An Inquiry into the Nature of Architectural Form" (Doctoral Thesis, ETH Zurich, 1995), https://doi.org/10.3929/ethz-a-001503629.p205 cited in Özbek, "Dipsiz Doğa: Mimarlığın Zemin Hayalleri." p 56

Evolution Theory, Einstein's Theory of Relativity, Marx's Communist Manifesto was excluded from this historical reading. With the inherited understanding from the Enlightenment of bifurcation of matter and meaning as nature and culture remained, during this era nature began to be evaluated something to measure, calculate and a mere resource.

During this era, human-centric hierarchal understanding reveals itself in number of attempts. According to Kant human is the highest level of creation and a final result that the whole creatures obeyed. Kodalak claims, the modern though after Enlightenment bases on a strict hierarchy of human supremacy.[77] Also another important advancement is the Universal Declaration of Human Rights which defines the human ideals to norm the law. As the critics generally goes to social injustice it creates by privileging European Male, due to the topic of the thesis, what is found important here is the universal humanly ideals reveal the need of creating a norm.

In the architectural realm, due to the changes in production, information and social organization, the techniques and priorities differentiated, theories superseded. By the change in social organization new typologies emerged such as train stations, suburban houses, skyscrapers have revealed a variety of buildings that have no precedent in the past. Also, by the capacities of Industrial revolution, new construction techniques and new form proposals proliferated. [78]

"For the first time in history, if the modern organization can place the core of architecture, through the organization of the city, knowledge could ensure, the uninterrupted production of technical objects that can protect the masses against nature through a light and air controlling shell (building), yet most importantly it could establish a world of abundance." [79]

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[77] Gökhan Kodalak, "Mimarlık ve Doğa: Kıyametin Eşiğinde Aşkınlıktan İçkinliğe Yolculuk," *Dosya 47 - Küresel Salgın ve Mekan* 47 (2020): 44–51. p 46

[78] KALKAN, "The Relations between Nature-Inspired Design and Architecture in Time and Its Reflections." p 14

[79] Nizam Onur Sönmez and Furkan Balcı, "Mimarlıkta Biçim ve Biçimlenmenin İnsansonrasına Giriş 1/3," *XXI Mimarlık, Tasarım ve Kent Dergisi*, 2020, https://xxi.com.tr/i/mimarlikta-bicim-ve-bicimlenmenin-insansonrasina-giris-1-3#ref4. Translated by the thesis author

As a result of rational understanding of nature with the process of mechanization, modern architecture presents a design approach that abstracts and idealizes nature, with the organization of clear and pure geometric forms.[80] The architectural motto of modernism had been "Form follows function," stated by Louis Sullivan. He conveyed his discourse by giving examples from nature. According to him, everything in nature has distinguishing shape and appearance. These shapes in nature are 'given' to animals, trees, birds, and fishes a characteristic feature and helps us to identify them. Whether it's a soaring eagle, a newly bloomed apple tree, the drifting clouds, or the gleeful swans, form follows function, and its nature's rule. [81]

When the whole system is rearranged and distributed dominating the machine, it could be said that the machine became the building block of production. While this assigned a great deal of transition on the production and know-how, resulting in International Style, at the same time it blocked the way of individual thinking, also resulted in the postmodern burst.

Figure 21 - Villa Savoye, Le Corbusier, 1929-31

[80] KAMOĞLU, "Evrimsel Mimarlığın Doğa Felsefesi-Mimarlık Ilişkisi Üzerinden Değerlendirilmesi." Pp 61-62
[81] KALKAN, "The Relations between Nature-Inspired Design and Architecture in Time and Its Reflections." p 18

One of the most important symbols of modernism is the French architect Charles-Edouard Jeanneret aka Le Corbusier (1887-1965). With the great influence of Cubism, geometric forms were used in Le Corbusier's designs by making them more abstract. Expressing that architecture should not be combined with decorative design, Le Corbusier revealed a rationalist architectural design approach that deals with the anatomical reality underlying past forms rather than decoration details.

In this context, he reawakened the spirit of classicism and geometry by aiming to purify the architectural tradition with the help of technology rather than breaking away from the architectural tradition.[82]

2.2 Nature As Materialistic Approaches

Nature is a shorthand terminology for many of the relationships enclaving human. As seen in the previous part, although the understanding of nature had shifted from, pre-designed, created, theological space waiting to be revealed by human, to calculable and measurable space waiting to be ordered by human, it is possible to claim the optimism for revealing a cosmic order had pursued. Timothy Morton argues that there is no thing as nature, but there are ideological fixations about the nature as the trustworthy grounds for humanity's constructs. However, as these fixations overlap, intersect, and supersede each other, it becomes almost impossible to ground, yet at the same time these accompanying connotations generally imply a idealistic world-view.

Another approach for nature had been an understanding via materiality. Materiality of the world is a long-debated approach, and rather than the hierarchal idealism, it argues a heterarchal ontology. As Eagleton puts it, materialism is not a discourse of everything, yet it can affect everything.[83]

[82] KAMOĞLU. p 58
[83] Terry Eagleton, *Materyalizm* (İstanbul: Tellekt, 2021), http://www.idefix.com/Kitap/Materyalizm/Felsefe/Felsefe-

The academic Western thought, that especially catalyzed after the Enlightenment thinkers such as Newton and Descartes, is rooted on the mechanical worldview which defines the 'matter' as 'passive' and 'mind' as 'active'. However, in recent years, scholars redefining the matter as 'alive', 'lively', 'vibrant', 'dynamic', 'agentive', and 'active'.[84] This school of thought roots in 'materialism' for centuries however on newly emerging discussions these theoreticians are grouping under the title of "new materialism" which also problematize the anthropocentric and constructivist orientations of most twentieth-century theory.[85] Stressing the limits of the mechanistic worldview that legitimize itself with anthropocentric binaries of nature - culture, meaning – matter, gender – sex, etc. this cross-cultural effort tries to fill them with divergent perspectives. Inherited by the Marxist approach of materialism, throughout the 80's, Briadotti argues, especially Althusser's "Pour un materialisme aléatoire", his students Foucault, Deleuze, and Balibar had a consensus of redefining the terminology according to current social theory.[86] There are many trajectories on the term and Christopher Gamble, Joshua Hanan and Thomas Nail, efforts to orient the terminologies' divergent use. To them, 'performative' or 'pedetic'[87] materialism is significant considering the future potentials of this approach, yet they emphasize all approaches mainly find their common ground on their anti-perspective of presumptions on human-observer perspective on matter. However, assigned vitality to matter in these three perspectives are differentiating on whether they associate it with a sort of 'essence' or rejecting the metaphysical ascriptions on their ontological being.

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[84] Christopher N. Gamble, Joshua S. Hanan, and Thomas Nail, "What Is New Materialism?," *Angelaki* 24, no. 6 (November 2, 2019): 111–34, https://doi.org/10.1080/0969725X.2019.1684704.

[85] Gamble, Hanan, and Nail.

[86] Rosi Braidotti, "The notion of the univocity of Being or single matter positions difference as a verb or process of becoming at the heart of the matter," n.d., accessed August 9, 2021.

[87] Pedetic is used for the random movement of the particles. Terminology is associated with the botanist Robert Brown as Brownian movement.

Matter is what it does or "how it moves," as Thomas Nail puts it.[88] Their main stresses were on these 3 deductions. The neglect of matter: Corelating the matter passive attributes, reinforces the presumptions on the anthropocentric binaries. Science envy: Scientific practices and discourses are not evaluated performances of matter, but they are also evaluated with their production in the way they describe the world. The fetish of novelty: Rather than the novelty association with new precursor, Performative materialism should be understood as a recovery of the former materialism understanding since the matter had always been on motion.

2.2.1 Old materialisms

2.2.1.1 Ancient materialism

The Western discourse had rooted its legitimacy dating back to atomism of pre-Socratic era's which later modified by Epicurus, where the material assigned an understanding from the human observation as passive and motionless.

Leucippus and Democritus argued the atoms were the irreducible particles moving in void with the ability to merge in different compositions from stars to gods. This naturally evident observation is rather ontological instead of epistemological, to Democritus even the mind is constituted out of atoms, not separated as essence. However, ancient atomists assign a passive conception to matter so it renders these awaiting particles obligated to an outer force. The materiality they create is a pre-defined finiteness, it is not exposed to any other performance of being. This is related with the era's cosmic narrative, seeing the universe as a closed system.

The deterministic model of Democritus had been altered by Epicurus' occasional unpredictability assigned to atoms resulted in a chain reaction which created room

[88] Thomas Nail, "Being and Motion (Oxford University Press, 2018)," accessed August 10, 2021, https://www.academia.edu/37573917/Being_and_Motion_Oxford_University_Press_2018_. cited in Gamble, Hanan, and Nail, "What Is New Materialism?"

for human agency's effect on material. Both models, Democritus' deterministic and Epicurus' probabilistic materialism, although attained with endless possibilities of compositions and decomposition, describes a fixed result, due to these compositions' non-performative idealistic finitude.[89]

2.2.1.2 Modern materialism

With the Renaissance's mechanistic worldview, the ancient understanding of 'form and matter' which had a deterministic model replaced itself with 'force and mechanism' as vital became a synonym for mechanic.[90] However, the action of the movement remained as God or a force as Francis Bacon described:

> "The laws of Nature, which now remain and govern inviolably till the end of the world, began to be in force when God first rested from his works and ceased to create."[91]

Although the mechanistic worldview promised an understanding of calculability by dividing the fixed cosmos to definable parts, this view of Bacon incorporated a metaphysical vitalism by claiming these parts are the externalization of the God in the first place. Sharing a similar view, Descartes, who made a sharp distinction between mind and body, resembles the human to a God-engineered automata, capable of great motions yet preconditioned by God.

> "Just as necessarily as the movement of a clock follows from the force, position, and shape of its counterweights and wheels."[92]

Similarly, to Rene Descartes, Thomas Hobbes also indicated the autonomous laws of a mechanical nature where God became the causality of these laws however, he

[89] Gamble, Hanan, and Nail, "What Is New Materialism?"
[90] Ibid
[91] Francis Bacon, "The Confession of Faith," in *The Works of Francis Bacon*, James Spedding, vol. 14 (London: Green, 1602), 1857–74. Pp 49-50 cited in Gamble, Hanan, and Nail, "What Is New Materialism?"
[92] Descartes, *Discourse on Method*. p 50 cited in Gamble, Hanan, and Nail, "What Is New Materialism?"

assigned an internal power to material which he defines as endeavor, tendentia, conatus and appetitus. However, this inner force was an "infinitesimal movement." Therefore, it's possible to say the fire died out just as in the moment it flared making its infinitesimal movement.

As a general approach, modern materialism defines the matter as non-operative, inert, and therefore exposed to power by a external Theological force. It can be said that the ancient materialism was essentialist, claiming matter and energy are inert that is incapable of creating forms. During this era, Creationism was the reasoning behind the form, which has a plan and therefore a form was not subjected to change.

2.2.1.3 Failed materialism

According to Gamble, Hanan and Nail[93] ancient and modern materialisms agree in the sense of matter's inert presumption, deficient of movement, lack of self-knowledge and therefor in need for an external force. However, these materialisms, assign human an exceptional position of self-knowledge and ability to apply force on material. What Gamble, Hanan and Nail defines as failed materialism is the approach of isolating mind from the material world and deny human's applied force on material.

Albeit being a supporter of the Newtonian and Cartesian approach of trying to calculate the matter and mechanics, Kant believed human mind can never calculate the ultimate reality due to human mind's correlationalism through matter reconstructing it in the thinking process. To him, "noumena" are the immaterial things constituting reality which human can access through the appearance's "phenomenon". By this view the matter becomes like a generative code reproduced in human mind always with a deviated version of itself when attempted to be captivated in any method. This discontinuity through ultimate and constructed

[93] Gamble, Hanan, and Nail, "What Is New Materialism?"

realities tiled the way of a constructivist, epistemological approach of matter, that is classed as "failed materialism"

One example is given as Jacques Lacan, [94] who asserted the fragmented human conscious in three parts through his "mirror stage" as real, imaginary, and symbolic. Imaginary constitutes the self-image, that is occurred in the symbolic conscious of the person through language that renders reality always at an unreachable far distance. According to Manuel DeLanda, caging the 'real' to the limits of language, is dehistoricizing human by ignoring the biological cognition.[95] Another example of failed materialism is Judith Butler's performative alternative to Lacan.[96] According to her, ongoing process towards the real by "iterative citationality" always constructs a reality that forms another norm by constructing and deconstructing as a performance. Standing at the threshold of new materialism and language, her division with Lacan's real, imaginary and symbolic that she involved the thought towards the form as a performance that constructs another reality, whereas in Lacan's version these 3 domains were stable, however "Butler continues to presume that there really is a pre-existing and unchanging ontological division between human discourse and matter, as domains." [97]

2.2.2 New materialisms

Even though no variety of new materialism has yet created a dominant orthodoxy, its primary theoretical and philosophical hypotheses are defended by scientific research, either on the matter embodied in the alive conducted by all branches of biology, or on the characteristics of the vitality of matter carried out by all branches

[94] Ibid.
[95] Manuel DeLanda, "Any materialist philosophy must take as its point of departure the existence of a material world that is independent of our minds," n.d., accessed August 9, 2021.
[96] Judith Butler, *Bodies That Matter: On the Discursive Limits of "Sex"* (London and New York: Routledge, 2011). Cited in Gamble, Hanan, and Nail, "What Is New Materialism?"
[97] Gamble, Hanan, and Nail, "What Is New Materialism?" p 118

of the natural sciences. This research direction invites scientific investigation to develop through trans- and cross-disciplinary encapsulations, hence, through

transverse approaches, innovative modes of analysis and ways of conceptualizing and investigating material reality. It also invites a better appreciation of the urgent contemporary challenges related to the environmental, demographic, geopolitical and economic changes and challenges that the contemporary world is encountering. Through the support of theoretical discourses about complexity and chaos, materialism advocates the instability, fragility and interactivity of our multi-faceted environments, but also, and above all, the inextricability of all sociocultural formations and the materiality of these environments. [98]

Manuel DeLanda [99] in his conference in Sci-Arc, gives the Eskimo language as an example since they have 29 different words for different conditions of snow and asks whether this caused by 29 different experiences through snow, or they experienced 29 different conditions since they have this much of words. Which one is precedent, language, or experience?

According to Kant, it's only by having different conceptions of snow, we can relate with it. So, this type of human consciousness requires the language's formal conditions. However, DeLanda disagrees,

> "I also reject the neo-Kantian thesis of the linguisticality of experience. To assume that human experience is structured conceptually is to dehistoricize the human species: we spent hundreds of thousands of years as a social species, with a division of labor (hunters, gatherers) and sophisticated stone tool technology. Language is a relatively recent acquisition. Are we to assume that those ancient hunter gatherers lived in an amorphous world

[98] Maria Vogiatzaki, "Architectural Materialisms: Nonhuman Creativity," in *Architectural Materialisms: Nonhuman Creativity* (Edinburgh University Press, 2018), 1–28, https://doi.org/10.3366/edinburgh/9781474420570.003.0001. p 5

[99] SCI-Arc Media Archive, *Manuel de Landa: New Materialism & the Mind (February 6, 2008)*, accessed August 11, 2021, https://www.youtube.com/watch?v=HO77gVnZ0O4&ab_channel=SCI-ArcMediaArchive.

> waiting for language to give it form? That's Creationism again, you know: 'And the word became flesh.'"[100]

New materialism differs from the older definitions of ancient, modern and failed materialisms via their attitude towards problematizing the human epistemology towards matter. Being said this, the same ground on accepting the materials' capacities of morphogenesis, supersedes itself with other reasonings towards these performative capacities. Gamble, Hanan and Nail[101] scrutinizes new materialisms in three sections, vital new materialism, negative new materialism and performative new materialism.

2.2.2.1 Vital new materialism

This type of materialism can be is historically traced in Deleuze's reading of Spinoza and Leibniz in 60's with their monist theory of nature by assigning a vitality to matter itself, in contrast to modern materialists such as Bacon, Descartes, Hobbes, and Newton that defined the essence as an external force. In Spinoza's term "God or nature" reflected a worldview, the ontological meaning of matter is now overlapped with what's divine meaning the material has its own motion, potential. By evaluating the matter as an active being, Spinoza elevates the Hobbes' material understanding with a conatus to the highest level. Leibniz on the other hand assigns this immanence to force that moves the matter where he also defines the matter as a mental construction.

> "Space, time, and motion have something akin to a mental construction [*de enterationis*] and are not true and real per se but only insofar as they involve

[100] Manuel DeLanda, "Any materialist philosophy must take as its point of departure the existence of a material world that is independent of our minds," n.d., accessed August 9, 2021.
[101] Gamble, Hanan, and Nail, "What Is New Materialism ?"

the divine attributes of immensity, eternity, and activity or the force of created substances. ”[102]

The current followers of assigning a vitalism to matter itself is found on Jane Benett, which is quite close to performative materialism. In her definition of the vital matter, a transcendental essence does not activate the matter, it is not constructed in human mind, it is rather defined as the performative capacity of the matter itself. However, as Elizabeth Grosz unveiled [103] the Deleuzian reading of Spinoza recalls an idealism since this type of materialism leaves the ancient and modern materialism's ontology of an external force, and failed materialism's anthropocentricism, yet again creates an idealism for that it creates an ontology of forces, not an ontology of matter. [104]

2.2.2.2 Negative new materialism

Named by the Gamble, Hanan and Nail[105], this type of materialism neglects the thought oriented to matter creates a relation, or in other words this correlational relationship of matter and thought does not exist in material ontology. Two perspectives here is given from "speculative realism" and "object-oriented ontology".

Quentin Meillassoux describes his speculative realism as by making a distinction of matter and mind. To him, human mind corelates thinking and matter yet non-thinking matter existed before the cognition through matter. He describes the matter as 'radically contingent' and therefore can create compositions of form. However, this separation of thought, according to Gamble, Hanan and Nail leaves the dualistic nature between matter and thought without an explanation of this separation.

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[102] Leibniz, *Specimen Dynamicum I/II*. p 445 cited in Gamble, Hanan, and Nail, "What Is New Materialism?"
[103] ELIZABETH GROSZ, *The Incorporeal: Ontology, Ethics, and the Limits of Materialism* (Columbia University Press, 2017), https://doi.org/10.7312/gros18162. p 13 cited in Gamble, Hanan, and Nail, "What Is New Materialism?"
[104] Thomas Nail, *Being and Motion* (Oxford University Press, 2018). Pp 309-19 cited in Gamble, Hanan, and Nail, "What Is New Materialism?"
[105] Gamble, Hanan, and Nail, "What Is New Materialism?"

Another approach on negative materialism. For example, Graham Harman's "object-oriented ontology" conceives a de-centered and unsubstantial reality whose core is overflowed with relational properties of real or even fictional objects. In this scenario, our own subjectivity, and its attempts to understand the character and nature of the world, along with any other subjective act of imagination, calculation, and so on, is rather an agential object than an act of subjective agency - we are something amongst many-things.[106]

> "What is real in the cosmos are forms wrapped inside forms, not durable specks of material that reduce everything else to derivative status. If this is 'materialism', then it is the first materialism in history to deny the existence of matter." [107]

So, in a way this approach can be defined as the opposite of vital materialism that assigned an ideal of essence, this approach rejects any correlation towards matter.

These approaches towards matter sometimes are not regarded as materialism by the critics, even though the material being is embraced freeing from anthropocentric thought, it regards thought is intrinsic to human and non-material.

2.2.2.3 Performative new materialism

The third type, performative new materialism, elaborates matter caged in human mind, yet it also argues mind is matter and contingent. Previously addressed new materialisms had shifted from epistemology to ontology however, performative materialism defends epistemology and ontology are inherent on one another. Barad calls this approach 'ontoepistomological' [108] as she argues that there are no strict boundaries that separate the observer from the observed world. However, she also

[106] Pedro Sargento, "New Materialism and Neutralized Subjectivity. A Cultural Renewal?," *Cultura International Journal of Philosophy of Culture and Axiology* 10 (January 1, 2013): 113–25, https://doi.org/10.5840/cultura201310216.
[107] Karen Barad, *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning* (Duke University Press, 2007). p 170
[108] Barad. Pp 43-44 cited in Gamble, Hanan, and Nail, "What Is New Materialism?"

remarks her discomfort with everything had been reduced to a flat language territory, even materiality itself.[109]

According to Vogiatzki the capacities of matter are revealed via scientific findings, and the passive substantialism of Cartesian conception updated. Especially via Einstein's relativity theory, provided a new understanding to matter:

> "In the twentieth century, Einstein's theory of relativity revealed that there was no distinction between mass and energy because the two supposedly opposing poles were interchangeable and convertible into one another; therefore, they were in a sense equivalent. Evidence of the existence of atoms, the energy of the charged nucleus and spinning electrons, the exploration of the relation between the mass of nucleus and electrons and the atoms' volume, the study of protons and neutrons, particles, quarks and gluons divulged a new ontology of matter based upon complexity, instability, fragility, unpredictability and interactivity. Matter has since been conceived as vibrant, recalcitrant, animated and living, exhibiting self-organizing properties which, in the complexity of their environments, could cause unpredictable effects and produce novel configurations." [110]

According to this understanding the "matter is no longer about being, but about becoming." [111] Understanding everything in different variations of a matter-energy, reveals a new template of thought to matter. The epistemological divisions to mind – matter, living – nonliving, gains a heterogeneous ground. In his attempt of historicizing matter in different conditions, Manuel DeLanda exhibits a performance of scientific philosophy and rewrites history from the matter perspective.

> "In the nonlinear spirit of this book, these three worlds (geological, biological, and linguistic) will not be viewed as the progressively more sophisticated of an evolution that culminates in humanity as its crowning achievement. It is

[109] Barad, *Meeting the Universe Halfway*. p 170
[110] Vogiatzaki. p 3
[111] Ibid.

true that a small subset of geological materials (carbon, hydrogen, oxygen, and nine other elements) formed the substratum needed for l iving creatures to emerge and that a small subset of organic materials (certain neurons in the brain) provided the SUbstratum for language. But far 'from advancing in stages of increased perfection, these successive emergences were-and will be treated here as-mere accumulations of different types of materials, accumulations in which each successive layer does not form a new world closed in on itself but, on the contrary, results in coexistences and interactions of different kinds. Besides, each accumulated layer is animated from within by self-organizing processes, and the forces and constraints behind this spontaneous generation of order are common to all three." [112]

[112] DeLanda, *A Thousand Years of Nonlinear History*. p 21

CHAPTER 3

NEW MATERIALISM AND ECOLOGY

As asserted in previous chapter, throughout history, nature was first understood as pre-formed variations of matter with different behaviors/movements. Aristotle's Natura Scala identified these forms as beings which had been separated as living and nonliving on a hierarchal scheme. Living was a shorthand terminology for the observable worlds' moving matter. In his ontology, these life 'forms were designed and moved' by a transcendental power. Later this understanding of 'formed and moved matter' shifted to a mechanical understanding of 'matter to be formed and moved.'

Performative new materialism assigns matter intrinsic potentials, by taking the human mind from the center of the equation. While the dualistic understanding of mind and matter indicates a schism, with mind referring to energy that moves matter, new materialism considers energy as intrinsic to matter's potentials. Therefore the 'matter itself forms and moves'. So, the idealistic understanding of nature frames the world by the form and assigns meaning to it, however performative new materialism asserts that nature is the matter in different conditions. Just as Morton argues in his Ecology Without Nature, all anthropocentric divisions belong to our epistemology towards ontology.

As the performative materialist perspective roots in scientific findings as well as philosophy, there is still a gap between the scientific epistemology and this school of thought. Performative materialism stresses that there is no distinction between living and non-living. It is the matter's behavior, that is in relation with environment each time. As ecology asserts every living being is relational to their environment and linked to each other, performative materialism claims the same condition via replacing the living being with matter. So, new materialism is already about the

ecology, and this chapter aims both to emphasize the philosophical linkage between ecology and performative materialist philosophy and a loose pinning of the philosophical concepts that helps to understand new materialist agenda.

3.1 Ecology

Ecology concept can be traced in 1864 *Man and Nature* by George Perkins Marsh, with the claim that organisms are linked to their surrounding environment that they had been adapted in. [113] As the term coined by zoologist Ernst Haeckel in 1886, it etymological roots comes from Greek *oikos* meaning 'house, dwelling place, habitation' and *logia* meaning 'study of'.[114] Early conceptions of the notion goes as far as Heredotus' mutualist observation of 'natural dentistry' as sandpipers feed from the Nile Crocodiles tooth. Proliferated from Aristotle's distinctive classification of beings in Natura Scala, to Linnean taxonomy and Darwin's evolution theory, this field of science emerged from the understanding of reciprocal character of organisms with their environments.

> "By ecology, we mean the whole science of the relations of the organism to the environment including, in the broad sense, all the 'conditions of existence'. Thus, the theory of evolution explains the housekeeping relations of organisms mechanistically as the necessary consequences of effectual causes; and so forms the monistic groundwork of ecology. "[115]

The monistic theory is explained by Jacobsen as in these definitions; Spinoza's approach of understanding the nature as one singular entity immanent in all beings is called 'cosmological monism', radical materialism's explanation on simplifying

[113] A. G. Tansley, "The Use and Abuse of Vegetational Concepts and Terms," *Ecology* 16, no. 3 (1935): 284–307, https://doi.org/10.2307/1930070.
[114] "Ecology | Origin and Meaning of Ecology by Online Etymology Dictionary," accessed September 25, 2021, https://www.etymonline.com/word/ecology.
[115] R. C. Stauffer, "Haeckel, Darwin, and Ecology," *The Quarterly Review of Biology* 32 (1957): 138–44, https://doi.org/10.1086/401754.

everything to matter and movement is called ‘reductive monism’ and ecology’s part and whole methodology is called as ‘holistic monism’.[116]

Here, if the totality of the system is defined as a closed system, an idealistic condition occurs. As an example of holistic monism theory founded by James Lovelock and Lynn Margulis in 70’s, Gaia Hypothesis[117], asserts whole universe is one living organism named ‘Gaia’.

Also as explained in the previous chapter, if materialism’s active matter constructs a closed world that the boundaries can be defined, this monism can generate an idealistic stance. Therefore, both ecology and performative new materialism holds a stance on open-ended monism understanding.

Ecology consists of ecosystems, which can be considered as the parts of the whole. The energy enters the system via photosynthesis and circulates among the biotic- ‘living’ and abiotic- ‘non-living’ components. And there is a certain energy transfer in between those dynamically integrated parts. As the conditions differentiate due to many variables, these complex adaptive systems respond via self-organizing patterns.[118] Ecosystems outcome of this environmental response is biodiversity.

Performative Materialism’s ‘matter-energy’ and ecology’s ‘ecosystem’ or ‘organism’ behave in similar explanations considering the fluxes of energy and self-organizing adaptive complexities. However, as in the example of DeLanda’s, the active and passive understandings attributed to organism and matter is challenged by claiming the abiotic process on geology also consisted an active process depending on its self-organizational capacities and environmental conditions.[119] Performative materialism’s outcome of this environmental response is all diversity in matter.

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[116] Eric Paul Jacobsen, *From Cosmology to Ecology: The Monist World-View in Germany from 1770 to 1930* (Peter Lang, 2005). p 10
[117] J. E. Lovelock, “Gaia as Seen through the Atmosphere,” *Atmospheric Environment (1967)* 6, no. 8 (August 1, 1972): 579–80, https://doi.org/10.1016/0004-6981(72)90076-5.
[118] S. Levin, “Ecosystems and the Biosphere as Complex Adaptive Systems,” *Ecosystems*, 1998, https://doi.org/10.1007/s100219900037.
[119] DeLanda, *A Thousand Years of Nonlinear History*.

Ecosystem consists of species and all the species have a specific environment called ‘habitats’ which can be considered as the physical condition involving all biotic and abiotic resources that is somehow in relation with that specific species. As these conditions are consists multiple variants, niche construction is the act of the species environmental manipulation according to their needs.[120] According to this human act of shaping the environment is directly related with our species’ evolutionary condition.

Another issue ecology and performative materialism are mutual yet broaden by performative materialism is ecology’s consideration of the organisms as alive ‘active’ and physical environment as, ‘passive’. As DeLanda offers an alternative reading for the ‘abiotic’ elements of minerals and their evolutionary contribution with human, his speculative stance also creates another ecological discussion line.

> “In the organic world, for instance, soft tissue (gels and aerosols, muscle and nerve) reigned supreme until 500 million years ago. At that point, some of the conglomerations of fleshy matter-energy that made up life underwent a sudden mineralization, and a new material for constructing living creatures emerged: bone. […] confirming that geology, far from having been left behind as a primitive stage of the earth's evolution, fully coexisted with the soft, gelatinous newcomers. […] complexification of the animal phylum to which we , as vertebrates, belong, it never forgot its mineral origins: it is the living material that most easily petrifies, that most readily crosses the threshold back into the world of rocks. For that reason, much of the geol ogical record is written with fossil bone. […] About eight thousand years ago, human populations began mineralizing again when they developed an urban exoskeleton: bricks of sun-dried clay became the building materials for their homes, which in turn surroun ded and were surrounded by stone monunlents and defensive walls. This exoskeleton served a purpose similar to its internal

[120] Arnaud Pocheville, “The Ecological Niche: History and Recent Controversies,” *Handbook for Evolutionary Thinking - Springer*, 2015, 547–86.

counterpart: to control the movement of human flesh in and out of a town's walls. ”[121]

3.2 Matter And Environment

Although Darwin's natural drift of evolution did not aim a change in formal perception, the presumed hylomorphic body understanding was also beginning to drift towards morphogenetic body perception. Rooted from the words of matter ‘hyle’ and shape ‘morphe’, ‘hylomorphic’ refers to the finished and ‘designed’ form of the ‘living’ beings. [122] It’s the Aristotle’s model as DeLanda explains; genesis of form as external to matter, as imposed from the outside like a command on a material which is thought as inert and dead.” [123] Here the ‘meaning’ is teleological. With the emergence of the Darwinian understanding, creationism’s plan towards the hylomorphic form of the species had also evolved through the performative line. This approach of form, although started peculiar to ‘living beings’ and ‘organisms’, gradually unfolded in the general reasoning of form. According to Balcı and Sönmez, “while hylomorphism considers the description of the object or the shell as a subject that is partially independent of experiences and processes, morphogenesis assumes the claim of putting the shell in a line of formation that corresponds to the environment and functioning…. Such a formation does not recognize a predesigned form, harmony or unity, and matter ceases to be passive.[124]

> “Natural selection is the blind watchmaker, blind because it does not see ahead, does not plan consequences, has no purpose in view. Yet the living results of natural selection overwhelmingly impress us with the appearance of design as if by a master watchmaker, impress us with the illusion of design and planning. ”[125]

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[121] DeLanda, A Thousand Years of Nonlinear History. Pp 28-29
[122] Andrej Radman, “Figure, Discourse: To the Abstract Concretely,” 2010, 430–51. p 433 footnotes
[123] Manuel DeLanda, “The Machinic Phylum,” in Technomorphica (V2_ publishing, 1997).
[124] Sönmez and Balcı, “Mimarlıkta Biçim ve Biçimlenmenin İnsansonrasına Giriş 1/3.”
[125] Dawkins, The Blind Watchmaker. p 21

This understanding of the form-giving, everchanging, active understanding of environment had been criticized by Heidegger, for ignoring the active performance of the organism.

> "In Darwinism such investigations were based upon the fundamentally misconceived idea that the animal is present at hand, and then subsequently adapts itself to a world that is present at hand, that it then comports itself accordingly and that the fittest individual gets selected."[126]

According to Buchanan's interpretation of Heidegger, the problem roots in Darwin's material ontology towards the animal and environment as 'present at hand' beings first and his consideration of the evolving process follows as second, ignoring how they 'become'.[127]

The presumption towards a change in form reduced to chance, furtherly investigated by biologist Jakob Johann von Uexküll, whose studies had been interpreted by Deleuze and Guattari as Spinozian ethology.[128] His focus of work was on the concept of 'meaning'. To him all organisms subjectively responds to their environments in accordance with what it 'means' to them on their worldly practices. In his famous 'Umwelt und Innerwelt de Tiere' (1909), Uexküll analyses the environment in three categories; 'environing world' (umwelt), 'inner world' (innenwelt) and 'surrounding world' (umgebung). Umgebung and umwelt differ according to the meaning attributed by the organism. The umwelt is a specific type of environment that the organism has chosen to interact, with the motives of the innenwelt, whereas umgebung is the composed world, a multitudes of environing worlds. In order to explain the umwelt (self-centered world) theory, Uexküll exemplifies different vitalities of the same flower to different species.

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[126] Martin Heidegger, The Fundamental Concepts of Metaphysics: World, Finitude, Solitude (Indiana University Press, 1996). P263 cited in H. Peter Steeves, Animal Others: On Ethics, Ontology, and Animal Life (SUNY Press, 1999). p 226

[127] Buchanan, Onto-Ethologies. p 47

[128] Buchanan. p 6 Deleuze's Spinoza has a monist approach towards nature, arguing all beings are immanent and material manifestations of one single being that is -in his own words- 'Nature or God'. Uexküll's episteme towards his findings is in line with Spinoza's episteme towards ontology.

"Let us consider, for example, the stem of a blooming meadow-flower and ask ourselves which roles are assigned to it in the following four Umwelts:

(1) In the Umwelt of a girl picking flowers, who gathers herself a bunch of colorful flowers that she uses to adorn her bodice;

(2) In the Umwelt of an ant, which uses the regular design of the stem-surface as the ideal path in order to reach its food-area in the flower petals;

(3) In the Umwelt of a cicada-larva, which bores into the sap-paths of the stem and uses it to extract the sap in order to construct the liquid walls of its airy house.

(4) In the Umwelt of a cow, which grasps the stems and the flowers in order to push them into its wide mouth and utilizes them as fodder. "[129]

From all these different umwelts that had been superimposed, he composes a 'worldview of harmony' that creates the reciprocal meaning for multiple inhabitants.

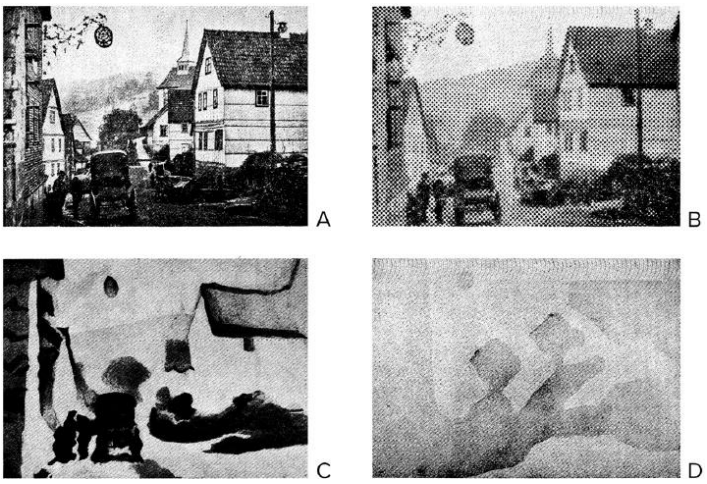

Figure 22 - A Stroll Through the Worlds of Animals and Men: A Picture Book of Invisible Worlds, Jakob von Uexküll, 1934.
A, A village street photograph; B, the same village street, photographed through a screen; C, the same village street, as seen by a fly; D, the same village street, as seen by a mollusk

[129] Donald Favareau, Essential Readings in Biosemiotics, vol. 3, Biosemiotics (Dordrecht: Springer Netherlands, 2009), https://doi.org/10.1007/978-1-4020-9650-1.

Revealing the intrinsic capacities of organisms for responding the outer stimuli by sensories, and reciprocally form-giving with this act, created a new basis for morphogenetic understanding. Also, decision making process attributed to human agencies had started to be investigated in means of animal behavior.

Uexküll's studies on animal expanded in the works of Georges Canguilhem from animal studies through the understanding of technicities. He talked about the notion of 'individual' with its reference to the vitality. To him the individual was a terminology to define the finite form of any being yet his argument on this notion did not offer an hylomorphic understanding of form, just as the opposite, he wanted to bring a new discussion between the tensions of life and form. He considered 'living' as being the dynamic 'centre' which structures and is structured by the milieu. [130] The individual here stands in-between, whatever that it that kept it together. For that togetherness he assigned a 'meaning' just as Uexküll;

> "Biology must first take the living to be a meaningful being; it shouldn't take individuality to be an object, but a character in a meaningful context. To live means to radiate out from a centre of reference that cannot itself be referred without losing its original meaning."[131]

In his explanations the internal milieu is not exterior to the physical milieu. His individuality exhibits a porosity. He expressed this understanding not only biological terminologies, but also on the cultural milieu of the human being is understood as a continuum. And in 1952 he wrote;

[130] Dominique Lecourt and Arne De Boever, "The Question of the Individual in Georges Canguilhem and Gilbert Simondon," in Gilbert Simondon: Being and Technology, ed. Alex Murray, Arne De Boever, and Jon Roffe (Edinburgh University Press, 2012), 176–84.
[131] Georges Canguilhem, La connaissance de la vie (Paris: Vrin, 1969). p 143 cited in Lecourt and Boever, "The Question of the Individual in Georges Canguilhem and Gilbert Simondon."

> "The notion of milieu is in the process of becoming a universal and obligatory mode to capture the experience and existence of living beings." [132]

However, if we are to talk about a reciprocal constant change, Caunguilhem's 'individual' that is under the effect of constant experiences still implies a finitude in being, a formal condition. To Giles Simondon's ontology, beings are the processes of their 'individuations'. 'Individiation' explains the moment where the form and environment become relational. This process is continuously shaped by the 'pre-individual' because the individual is only partially and intermittently separated, and the trans-individual, the individual needs to insert his existence into it.[133] This approach places a fluidity in being and depicts a constant effort in between the tensions of intrinsic and extrinsic forces. Here, Aristoteles' 'law of the excluded middle' defining 'the separative boundary' generating interior and exterior becomes a relational negotiation during the constant phases of actualization. This type of ontology describes a heterarchal and immanent 'becoming' which Simondon defines as 'actualization'.[134] Actualization is both the matter and meaning at the same time.

In order to explain Simondon's theory, Kodalak exemplifies an everyday event by giving the example of a bowl of water. Although it is possible to measure and quantify certain qualities of water (individual), water's fixed properties don't reveal that it changes its phase after 100 °C at sea level. This is the capacity of water waiting to be emerged, relational to its environment (individuation) which produce a 'cross-individuation' (transindividual). So, it is true that the water can be found in a specific condition when in a specific type of container. However, it is also in relation with the pre-individual conditions as well as accommodating capacities for producing trans-finite 'cross-individualizations' with its environment, that is, innovations based on interaction. In summary, Simondon argues, none of the individuals, cannot be

[132] Georges Canguilhem, Knowledge of Life (Fordham University Press, 2008). p 98 cited in Buchanan, Onto-Ethologies. p 7
[133] Lecourt and Boever, "The Question of the Individual in Georges Canguilhem and Gilbert Simondon." p 182
[134] Anne Sauvagnargues, Deleuze et l'art (Presses universitaires de France, 2005). p 90 cited in Georges Teyssot, "The Diagram as an Abstract Map," Architectural Research 2019 Issue (2020): 86–105.

defined or comprehended without considering them together with a common pool of 'pre-individual' potentials that compose them and enable them to differentiate and innovate.[135]

> "The individuated being is not all of being, nor the first being; instead of understanding individuation starting from the individuated being, the individuated being must be understood starting from individuation, and individuation from pre-individual being, according to several orders of magnitude."[136]

Another interesting contribution of Simondon's ontology of individuation, the process is not assigned to 'living' organisms solely. "Everything from hammers to architectural structures, from glasses to motors, from computers to artificially intelligent robots, are included in these technological objects."[137] Later Guattari coined the term 'machinic phylum' for the materials' worlding technicity.[138] Phylum is a main division in a taxonomic system[139] associated with animal kingdom. By involving the machines in the evolutionary stream both Guattari and Simondon argue, technical objects evolve, they are the pre-individuals of their type and their individuation is reciprocal with their 'associated milieu'. To give an example, when we follow the evolution of the phone, we witness the evolving phases of phones as individuals, each phone is a pre-individual for the same species of technical objects, it has an 'associated milieu' of electric, internet, side industries, institutions and so on, as well as it effects all the environment it is in relation with, transforming the environment in an open-ended direction. And the evolution of the machinic phylum cannot be seen as independent of human and human cannot be seen as independent of these objects, as we had been transformed via our phones. Therefore, Simondon

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[135] "Simondon ve Teknolojik Objelerin Yaşamı," Manifold, accessed September 2, 2021, https://manifold.press/simondon-ve-teknolojik-objelerin-yasami.
[136] Gilbert Simondon, "The Position of the Problem of Ontogenesis," Parrhesia 7 (2009): 4–16. p 10 cited in "Simondon ve Teknolojik Objelerin Yaşamı."
[137] "Simondon ve Teknolojik Objelerin Yaşamı."
[138] Andrej Radman, "Figure, Discourse: To the Abstract Concretely," 2010, 430–51.
[139] "Phylum," accessed September 6, 2021, https://dictionary.cambridge.org/dictionary/english/phylum.

argues a heterarchal approach, which human is not above this technical object, but among them.[140]

3.3 Biosemiotics

> "The World does not speak to the observer. Animals and humans communicate with cries, gestures, speech, pictures, writing, and television (and internet), but we cannot hope to understand perception in terms of these channels, it is quite the other way around. Words and pictures convey information, carry it, or transmit it, but the information in the sea of energy around each of us, luminous or mechanical or chemical energy, is not conveyed. It is simply there. The assumption that information can be transmitted and the assumption that it can be stored are appropriate for the theory of communication, not for the theory of perception. "[141]

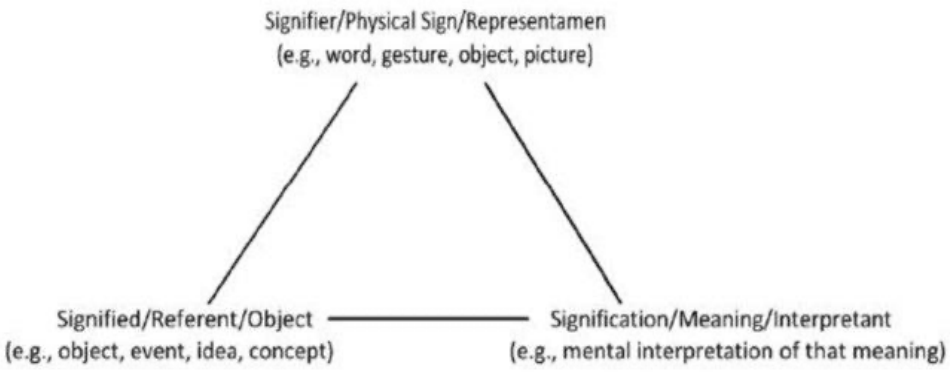


Figure 23 - The triadic relationship of sign, referent, and meaning[142]

[140] Sönmez and Balcı, "Mimarlıkta Biçim ve Biçimlenmenin İnsansonrasına Giriş 1/3."
[141] James J. Gibson, The Ecological Approach to Visual Perception: Classic Edition (New Jersey: Lawrence Erlbaum Associates, 1979), https://doi.org/10.4324/9781315740218. p 242 cited in Andrej Radman, "Gibsonism: Ecologies of Architecture" (Doctoral Dissertation, Delft, Tu Delft, 2012), https://www.academia.edu/1321724/Gibsonism_Ecologies_of_Architecture. p 36 intro
[142] Image retrieved from Kamini Jaipal - Jamani, "A Semiotics Discourse Analysis Framework: Understanding Meaning Making in Science Education Contexts," Semiotics: Theory and Applications, January 1, 2011, 191–208.

Semiotics rooted from the Greek words, ‘seme’ meaning sign, symptom and ‘semeion’ interpretation.[143] The emergence and spread of the notion targets the relationship between the sign, signified and signifier.

The first usage of sign as a reference is seen on Aristoteles. As the semiotic history can be traced through ancient Greek, it revealed itself as a discourse in the 19th century by Charles Sanders Price and Ferdinand de Saussure. According to Saussure, a linguistic sign, does not connect the concept (signified) and linguistic image (signifier), it is rather a mental connection between the sound as a signified and the mental construct as signifier. So according to Saussure, the correlation between the sign and signified, can be understood conventional or arbitrary. [144] However, as DeLanda argues, neo-Kantian approach dividing the experience into categories and prioritize the definitions of these categories instead of the experience itself had taken over the 20th century. To DeLanda experience is a fluid and continuous thing. Quoting from Arendt:

> “ […] In other words, the time continuum, everlasting change, is broken up into the tenses past, present, future, whereby past and future are antagonistic to each other as the no-longer and the not-yet only because of the presence of *man*, who *himself* has an “origin,” *his* birth, and an end, *his* death, and therefore stands at any given moment between them; this in-between is called the present. It is the insertion of *man* with *his* limited life span that transforms the continuously flowing stream of sheer change […]” [145]

According to this, the variation is constant with the fluidity of time however a perception towards this is only achieved by human via getting sections of it, separating it from the rest, creating similarities and rendering it as something that is

[143] “Semiotic | Origin and Meaning of Semiotic by Online Etymology Dictionary,” accessed September 4, 2021, https://www.etymonline.com/word/semiotic.
[144] Metin Demir, “Biyosemiyotik Projesi: Doğanın İçinde Kültürü Konumlandırma Girişimi,” Hayat Sağlık Dergisi, no. 4 (n.d.): 26–39.
[145] Hannah Arendt, The Life of the Mind: The Groundbreaking Investigation on How We Think (HMH, 1981). p 203

frozen at that similarity, (hylomorphic attitude). As in DeLanda's example of Eskimos' having 29 different definitions for snow, doesn't reveal that there are 29 same experiences, it rather expresses they similarized 29 experience since their attributed importance to snow as a material to build, walk, touch, interact. To him, what comes first is the material experience, then the classification of experience via language precedes, not the other way around.[146]

Semiotic studies expanded to biosemiotics by the ethological studies of Uexküll concentrating on the subjectivity of the umwelt from the umgebung. In short biosemiotics can be understood as the semiotics within the living organisms that scrutinize not only the cultural references of human, but also non-conscious- non-intentional references belong to human and organisms in general. So, such approach cancels the prioritizing mind over body that sets the ground for ecological rupture.[147]

3.4 Information and Mind

According to Gibson, information is relational. Related with the understanding of the 'umwelt' every being has their world of relation with an assigned significance. This significance creates an intensity, which cannot be measured.

According to Bateson, what we call 'idea' is 'difference.[148] And the universe consists out of numerous differences, which we can be in relation with. Bateson names this difference 'information' 'a difference which makes a difference'.[149] In Brockman's explanation, a raindrop hitting the ground from behind, is 'different' but doesn't make a difference. (doesn't have a significance as DeLanda offers.) However, the

[146] Manuel DeLanda, "Uniformity and Variability An Essay in the Philosophy of Matter," in Scribd (Doors of Perception 3: On Matter Conference, Amsterdam: Netherlands Design Institute, 1995), https://www.scribd.com/document/262394209/Uniformity-and-Variability. p 11
[147] Demir, "Biyosemiyotik Projesi: Doğanın İçinde Kültürü Konumlandırma Girişimi."
[148] "Bateson, Dağıtık Akıl ve Sibernetik Ekoloji," Manifold, accessed September 2, 2021, cited in https://manifold.press/bateson-dagitik-akil-ve-sibernetik-ekoloji.
[149] "Bateson, Dağıtık Akıl ve Sibernetik Ekoloji."

raindrop on your nose has information.[150] We are only creating relations to the ones that have information for us in the vast sea of differences.

This vast sea of differences is the total capacities of the intrinsic and the extrinsic is called 'mind' according to Bateson. This system of relationality is to Bateson called the 'Cybernetic System'. According to Bateson, namely a thermostat has a mind since it is in relation with a specific type of umwelt that transforms and transformed. So, the Bateson's 'mind' is not a quality ascribed to 'living' -which is an epistemological bifurcation towards ontology-, it is immanent to every being due to their relationality with their environment. This 'mind' is not bounded by our brain, it is distributed. Whether being a human, animal, thermostat, Turkish pine forest or coral reef, we are all different emergences of this distributed mind. Although Bateson's definition is similar to Spinoza's 'Nature or God' definition, Bateson also creates a ecotheological stance towards nature, by connecting all beings to a singularity that he calls 'mind', his cybernetic understanding that all beings are in a fluid continuum with numerous differences worth considering. [151]

3.5 Affect and Affordance

According to DeLanda, the concept of affect is related with both agencies' capacities of affecting and being affected. Even though the word associates and reduces the meaning only to emotions, which is a quality that we assign only to human and animals, the word refers a capacity intrinsic to all beings, organic and inorganic.[152]

Similar to Uexküll's organism – environment relations, perceptual experience must be meaningful to the subject, with both definitions of the word, significance and signification. This means the experience should make a difference as well as assigning a worlding practice, namely a behaviour for that particular event. For

[150] Radman, "Gibsonism."
[151] "Bateson, Dağıtık Akıl ve Sibernetik Ekoloji."
[152] Manuel DeLanda, "Causality and Meaning in the New Materialism," in Architectural Materialisms: Nonhuman Creativity (Edinburgh University Press, 2018), Pp 31–45.

example, in the model of animal visual perception, their visual experience conveys the opportunities and risks which effect their behavior. The same environment is what affects and affected by them. This pool of potentials and capacities is referred to the term of affordances.[153] The relational capacity is interpreted by Gibson as proto-epistemological.[154]

In the conventional psychology, the act is towards an object, which creates subject-object relation. Affordance theory opposes this type of episteme in relationality for ignoring the forces from the environmental actors. According to Gibson, this type of fallacy can be traced if we subordinate monkey's act of climbing, to monkey's perception of the environment first and start climbing with his agile performance later. To him, if the tree didn't have a vertical, solid truck with texture to afford this climb, then the monkey wouldn't be able to climb the tree. This type of relationality, both declares that the tree doesn't have an essence of climbability without its environment as well as the monkey doesn't have an ability of climbing. It is a performance of reciprocal capacities which they are both active. [155] Similar to the romantic poem-like explanation of Uexküll;

"If the flower were not bee-like,
If the bee were not flower-like,
The harmony would have never succeed."[156]

DeLanda argues, that the affordances need to be understood in terms of a mind-independent world. He gives the example of a knife, as a sharp object that has an identity in the human's cultural realm to cut and material properties such as length, weight, cross section of its blade and so on. Although measuring these properties are exhausting effort, theoretically it can be done. And if the knife cuts the bread, the

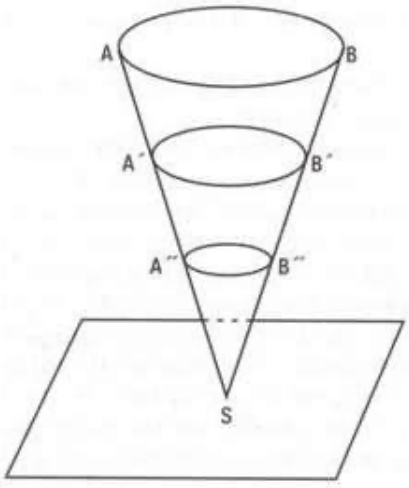
[153] Manuel DeLanda, "Causality and Meaning in the New Materialism," in Architectural Materialisms: Nonhuman Creativity (Edinburgh University Press, 2018), p 42
[154] Radman, "Figure, Discourse," 2010. p 448
[155] "James J. Gibson ve Sonluötesi İmkânlar," Manifold, accessed September 2, 2021, https://manifold.press/james-j-gibson-ve-sonluotesi-imkanlar.
[156] Jakob von Uexküll, A Foray into the Worlds of Animals and Humans: With A Theory of Meaning (U of Minnesota Press, 2013). p 198

identity of knife is actualized. However, the knife may have never even be used for its predecided identity of cutting the eatery. But this doesn't end the capacities of the knife which can never be measured. So he claims, the relational character of affects creates a mind-independent, open-ended world. [157]

3.6 Non-organic Memory

The most controversial part of new materialism occurs while tracing the continuum between inorganic and organic life, however debates on this field worth catching. According to some new materialists, there might have been some updates about our understandings towards matter, memory and brain and how it connects to vitality. Vitality of the matter had been questioned by many thinkers such as "Epicurus, Spinoza, Nietzsche, Thoreau, Darwin, Bergson, Driesch, Adorno, Foucault, Serres and Deleuze." Contemporary scholars like Bennett and Briadotti reinterprets these onto-theological dualisms such as "life/matter, human/animal, will/determination, organic/inorganic as well as the dialectical reconciliation between these polarities" by using 'New Materialism' as a ground. [158]

According to Bergson, there are three stages of memory. (Fig 28)



[157] DeLanda, "Causality and Meaning in the New Materialism." Pp 33-34
[158] Vogiatzaki, "Architectural Materialisms."

Figure 24 - Bergsonian Cone of Memory

The image of the cone is composed of a plane and an inverted cone, which is inserted into the plane from its summit. Bergson's "P plane" is "the plane of my actual representation of the universe." And the "SAB" cone symbolizes memory, especially true memory or regressive memory. At the bottom, "AB", represents unconscious memories, the oldest surviving memory, which appears spontaneously, for example, in a dream. When descended, different areas of the past, sorted according to their distance or closeness to the present. At the top of the cone, "S", there is the image of the body, which concentrated at one point, is the present.[159]

Although the image does not stand for an inorganic matter, Raymond Ruyer's argument towards the memory is intrinsic to all beings can be explained via this diagram.

> "The main difference between physical beings and the most complex organisms does not probably derive from the instantaneity or the absence of memory in the former but from a lack of detachment of this memory, which in physical beings is always inherent to the rhythm of activity, which is only ever 'the form in time' and does not constitute a trans spatial 'reserve' clearly detached from the actual. "[160]

So according to this theory brain is a detached reserve of memory. Another interesting claim towards brain, although very speculative, is from Antonio Damasio, linking the brain with the 'economy of the body'.

> "We have a brain for a very interesting reason. We have a brain because with a brain we can run the economy of the body in a better way. Throughout

[159] Leonard Lawlor, The Challenge of Bergsonism (A&C Black, 2003). p 4
[160] Raymond Ruyer, Neofinalism (Minneapolis: University of Minnesota Press, 2016). p149 cited in Radman, "Machinic Phylum and Architecture." p 5

evolution you have organisms that are bodies without brains – and they do a pretty good job of running their economy and running their life. ”[161]

Another claim that conflicts brain and memory correlation is the architectural production of Difflugia Coronata. As a single-cell creature, it only feeds and reproduces, without a nervous system and therefore it also doesn't have a brain. However, it produces a very complex architectural body, (Fig 26) called 'exoskeleton'.[162]

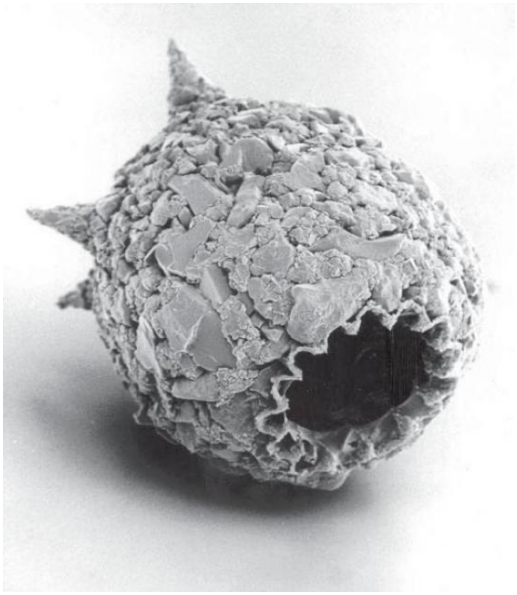


Figure 25 - Difflugia Coronata's Exoskeleton

In order to emphasize it is the matter with performative qualities, not 'life' passing through in and out of the inert matter, DeLanda approaches this subject with historicality. In his approach the most important in the new materialistic stance is to understand the continuity of things.

In his *A Thousand Years of Nonlinear History*, gathering biology, geology and linguistic to human history. The book consists of chapters 'Lavas and Magmas'

[161] Antonio Damasio, 'How Does the Mind Connect with the Body, Neurologically?' accessed 25 June 2012, http://bigthink.com/ideas/23023 cited in Rick Dolphijn, "The Resonance of Disparates Spinoza, Damasio, Deleuze and the Ecology of Form," in Philosophy After Nature (Rowman & Littlefield, 2017). p 57
[162] Dolphijn. p 55

connecting history and geology, 'Flesh and Genes' connecting history and biology, 'Memes and Norms' connecting history with linguistics. While referencing to DeLanda's book, Dolphijn comments as;

> "Not taking consciousness, linguistics or any other humanist systematics as its point of departure, rereading paleobiology[163] … DeLanda radically rethinks the notion of life from the autopoietic[164] systems that happen on the surface of the earth. … DeLanda notes that five hundred million years ago a sudden mineralization intruded the soft tissue or at least cooperated with it. The mineral world became part of life ever since as an integral part of its oneness, creating new forms of life previously unknown. A new life should not be reduced to the organic or the inorganic matters from which it came to be. "[165]

In DeLanda's ontology, "The matter has morphogenetic capacities that does not need any 'mind' to operate. "[166] According to Radman, the first thing while grasping an ontology of new materialism, one needs to acknowledge 'matter does matter' with or without the human understanding.[167] Keeping this as a departure point, the latter

[163] Paleobiology is the branch of paleontology dealing with fossil life forms, especially with reference to their origin, structure, evolution, etc. "Definition of Paleobiology | Dictionary.Com," www.dictionary.com, accessed September 4, 2021, https://www.dictionary.com/browse/paleobiology.

[164] Autopoiesis is a term coined by Humberto Maturana and Francisco Varela for defining a system capable of reproducing and maintaining itself by creating its own parts and eventually further components. "Definition of AUTOPOIESIS," accessed September 4, 2021, https://www.merriam-webster.com/dictionary/autopoiesis. DeLanda also uses the same terminology.However as DeLanda argues their use of terminology autopoiesis, or self-organization is different. "When it comes to this common concept, our main difference with Varela is that Varela uses the concept mainly in connection with the brain (the capacity of groups of neurons to organize themselves), while for me the concept is also applicable to a mind-independent nature. On the other hand, autopoiesis, besides self-organization, contains the concept of autonomy, a kind of inclusion that makes the lived world independent from the outside (making it an Umwelt). I reject this part because it leads us directly to Kantian idealism." Manuel DeLanda, Manuel De Landa Söyleşisi, Kampfplatz dergisi issuu 11, 2017, https://www.kampfplatzdergi.com/2018/09/manuel-de-landa-soylesisi-11-say.html.

[165] Dolphijn, "The Resonance of Disparates Spinoza, Damasio, Deleuze and the Ecology of Form." p 59

[166] DeLanda, "Any materialist philosophy must take as its point of departure the existence of a material world that is independent of our minds."

[167] Radman, "Figure, Discourse," 2010. p 432

to think of is the relations. And the third is the 'centre of indetermination' where the intrinsic and extrinsic capacities negotiates as percepting and acting.

> "It is absurd to think that complex self-organizing structures need a 'brain' to generate them. The coupled system atmosphere-hydrosphere is continuously generating structures (thunderstorms, hurricanes, coherent wind currents) not only without a brain but without any organs whatsoever. The ancient chemistry of the prebiotic soup also generated such coherent structures (auto-catalytic loops) without which the genetic code could not have emerged. And bacteria in the first two billion years of the history of the biosphere discovered all major means to tap into energy sources (fermentation, photosynthesis, respiration)."[168]

Using Henri Bergson and Gilbert Simondon as sources, Deleuze argues in Difference and Repetition that an oscillatory relationship develops an entropic arrow between force and form. For Deleuze, this is open-ended continuous act simultaneously generate actual and virtual, that is, the individual matter and the pre-individual which is a pool of possibility not yet actualized.[169] In Briadotti's word, Deleuzian approach towards this morphogenesis is as follows:

> "A piece of meat activated by electric waves of desire, a text written by the unfolding of genetic encoding. Neither a sacralised inner sanctum, nor a pure socially shaped entity, the enfleshed Deleuzian subject is rather an "in-between": it is a folding-in of external influences and a simultaneous unfolding outwards of affects. A mobile entity, an enfleshed sort of memory that repeats and is capable of lasting through sets of discontinuous variations,

[168] DeLanda, "Any materialist philosophy must take as its point of departure the existence of a material world that is independent of our minds."
[169] Teyssot, "The Diagram as an Abstract Map."

while remaining faithful to itself. The Deleuzian body is ultimately an embodied memory." [170]

3.7 Non-Linear Causality and Meaning

According to DeLanda, the relationship between cause and effect generally goes together with 'meaning' in the historical sense. From the perception of an 'idealist', causality has a preconditioned effect. From the perspective of an 'empiricist', observer is the link between two events, like the billiard balls' conjunction, where the first event is the precedent of the other, therefore it is traceable and measurable. However, from the perception of 'new materialist' events occur, whether there is an observant or not. [171]

To deeply scrutinize the relationship of 'causality and meaning' DeLanda offers a semantic revisit. To him the word 'meaning' has two main associations: one is 'signification' and the other is 'significance'. Although they look similar, when a friend asks, 'What do you mean?' the dictionary definition is referred which is the 'signification', yet, when one complains about 'my life has no meaning' it refers to a lack of difference, lack of 'significance'. So, something with no signification is 'nonsensical', on the other hand something with no significance is 'trivial'. Therefor DeLanda argues, the connection between meaning and causality is linked through significance, not signification[172]

In addition to the semantic bifurcation of the word 'meaning', there are problematic linearity connotations with the word 'causality' too, which is 'Same cause, same effect, always.[173] Radman draws an ethological diagram to exemplify the linear and non-linear causalities. Although it is an organism and behavior diagram, it can be generalized to inorganic matters. Much similar to Bergsonian cone of memory, the

[170] Braidotti, "The notion of the univocity of Being or single matter positions difference as a verb or process of becoming at the heart of the matter."
[171] DeLanda, "Causality and Meaning in the New Materialism." p 31
[172] Ibid. Pp 39-40
[173] Ibid. p 31

diagram begins with stimulus (S) and response (R) on the narrow upper part. This part stands for the deterministic, mechanical, linear mode of production which has tick as a less complex organism similar to basic logic's if, then. "*If* a tick smells a warm-blooded animal, *then* it latches onto it." As the diagram expands downwards, the 'stimulus' transforms into 'perception' (P) and 'response' transform into 'action' (A). In the case of a cat, the stimulus and response multiplied and therefore it creates several causal chains. Here Radman exemplifies Bateson's, "a cat's nip is different than its bite" because his actions cannot be traced via linear causality, it can play as well. Finally in the bottom part of the diagram, conceptual persona transforms into human, which sets apart the perception and action with a recurrent causality. Here, the epistemological semiosis gets involved alongside with the material-energetic constraints.[174]

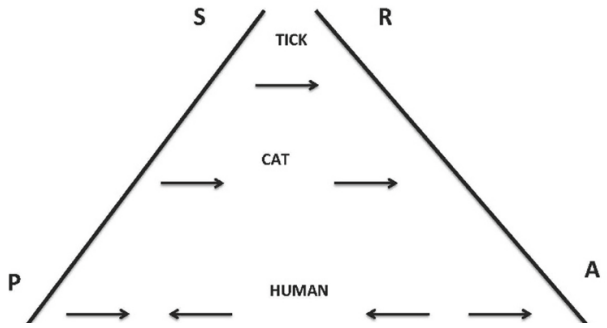


Figure 26 - Inserting the interval between stimulus (S) and response (R). The degree of nemonic detachability is measured by the width between the two poles and the 'direction' of causality. The recursive causality designates the cause (P) coming into being with the effect (A). a [neofinalist] conditioning of the present by the future [175]

> "Perception is context-dependent and adaptive. It is not a Turing process, Edelman insists, because the world is a non-labelled place. Data does not equal information. The ecological approach to perception knows no such thing as 'sense data'. Ecological, it must be qualified, stands for reciprocity

[174] Radman, "Machinic Phylum and Architecture." p 4
[175] Image access Radman. p 5

between the life form and its environment. Their mutual relation is not one of computing but of resonance or affective attunement. The reality is not 'chunked'. [...] Our categories are retroactively imposed as a result of analytic reflection. Most importantly, our cognition depends utterly on motion, that is, sensori-motor interaction. 'Begin in the middle! [...] Don't assume to know in advance how the chunking will resolve!'" [176]

3.8 Problem of Boundaries

Materialist theory describes an understanding of formal condition, that is historical, relational and reciprocal. According to Manuel DeLanda, materialist philosophy emerges with the separation of material and mind until it creates the question of "origin of the enduring identity of the inhabitants of that world". One is the Aristotelian approach of assigning an "essence" to materiality. However, the rejection of that creates a different alternative, the individuation of the material itself by considering it as the result of a many layered a historical process. In the example of Bateson's conversation with his daughter, reveals the formal stagger, from the description of a child.

> "Daughter: Daddy, why do things have outlines? Father: Do they? I don't know. What sort of things you mean? D: I mean when I draw things, why do they have outlines? F: Well, what about other sorts of things – a flock of sheep? Or a conversation? Do they have outlines? D: Don't be silly. I can't draw a conversation. I mean things. F: Yes – I was trying to find out just what you meant. Do you mean "why do we give things outlines when we draw them?" or do you mean that the things have outlines whether we draw them or not? D: I don't know, Daddy. You tell me. Which do I mean?" [177]

[176] Radman.
[177] Stavros Kousoulas and Jorge Mejía Hernández, "Transversing Formalisms," FOOTPRINT, April 30, 2018, 1-6 Pages, https://doi.org/10.7480/FOOTPRINT.12.1.1969. p 1

Imagining matter in the morphogenetic condition, requires a new type of form understanding. According to Radman, "Thinking the continuum calls for a 'logic of sense' where 'sense' in Deleuze could be said to stand for significance (conditions of real, not merely possible experience). This continuum damages our understanding of variation and autonomy. Even when we consider the body of human as an outlined form, that assumptions that we have towards its outlines, autonomy and singularity seems to be questioned. From the narrative of Kodalak;

> "Until now, we have acted with the presupposition that human and non-human creatures sharing the same body are separate entities… Nonhuman viruses are part of and are part of our DNA that determines our operating system to a certain extent. These viral DNA fragments make up 8 percent of the human genome, according to recent measurements… Each of us, that is, all multicellular creatures, including humans, animals and plants, are actually beings that originated and evolved from the intermingling of a bacterium and an archaea 1.6 to 2.1 billion years ago…. From an evolutionary perspective, this is our creation story; each of us is a a symbiotic alliance of single-celled microorganisms. In other words, our self-appointed humanity also has inhuman origins and genealogies, even if we accept such a definition of humanity. Therefore, the metropolitan structure of the human body bears the traces of a common life with non-human modes of existence, both genetically and evolutionarily. This understanding makes it possible to define our existence through complex negotiations between human and non-human modes of being, rather than insisting on defining our existence through a pure imagination of humanity. "[178]

It is possible to say, architecture as a form seeking discipline, had been catalyzed after the Industrial Revolution, had been motivated by the intrinsic properties of

[178] "Mikrobiyota Metropolü ya da İnsan Vücudu," Manifold, accessed September 5, 2021, https://manifold.press/mikrobiyota-metropolu-ya-da-insan-vucudu. His main reference on this topic is Gkikas Magiorkinis, Aris Katzourakis, and Pagona Lagiou, "Roles of Endogenous Retroviruses in Early Life Events," Trends in Microbiology 25, no. 11 (November 1, 2017): 876–77, https://doi.org/10.1016/j.tim.2017.09.002.

anthropocentric practices which are linguisticality, measurement and transference. The linear relations of Cartesian approaches rely on the "'retroactive reasoning' from the domain of the visible" and instead of this dialectic approach Rem Koolhaas offers "paranoid critical method" in his *Fabrication of Evidence* section of *Delirious New York.*[179]

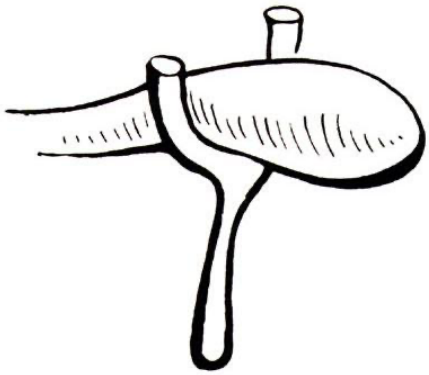


Figure 27 - Diagram of the inner workings of the Paranoid-Critical Method: limp, unprovable conjectures generated through the deliberate simulation of paranoiac thought processes, supported (made critical) by the "crutches" of Cartesian rationality[180]

In order to apply the perspective of matter and forms' relationality, their capacities of affecting each other requires "a new understanding of geometry" which is not based on the "law of the excluded middle" alongside with "a whole new vocabulary… as well as a new set of conceptual tools. "[181]

Radman argues, 'topology' as a geometrical approach is actually invented for the last 150 years, however it only gains the attention of the formal approaches regarding the architectural scene.[182] Such studies had been proliferated under the studies of

[179] Radman, "Figure, Discourse," 2010. p 434
[180] Image referenced from the article of Radman, Rem Koolhaas, Delirious New York: A Retroactive Manifesto for Manhattan (The Monacelli Press, LLC, 2014). P236 cited in Radman, "Figure, Discourse," 2010. p 434
[181] Radman, "Figure, Discourse," 2010.
[182] Ibid. p 434

rheologists[183] such as “Friedrich Gauss and his disciple Bernhard Riemann (manifold), Henri Poincaré (phase space) and Felix Klein (Erlangen program), to name but a few. ”[184]

“Starting in-between. The term intra-view is derived from Karen Barad’s intra-action which “signifies the mutual constitution of entangled agencies” In other words, entities emerge out of performative relationalities in a continuous process of becoming. “Through intra-action, worlds are (re)configured in diffraction patterns”[185]

[183] The definition corresponds to "study of the deformation of the flow of matter," 1929, from French rhéologie; see rheo- "current of a stream" + -logy " “Rheology,” in Online Etymology Dictionary, accessed September 2, 2021, https://www.etymonline.com/word/rheology.
[184] Radman, “Figure, Discourse,” 2010.p 434
[185] Jacqueline Barreiro and Melisse Vroegindeweij, “New Materialist Becomings and Futurities: A Panel Intra-View,” *Matter: Journal of New Materialist Research* 1, no. 1 (February 17, 2020), https://doi.org/10.1344/jnmr.v1i1.30132.

CHAPTER 4

PERFORMATIVE NEW MATERIALISM AND ECOLOGIC ARCHITECTURE

As asserted in previous chapter, both ecology and Performative New Materialism consider the relationality in the core of diversity. However, as ecology prioritize the conditions of 'living' against 'non-living' conditions, Performative New Materialism is used as a broadening agenda for ecology.

When architecture considered as a discipline between form, matter and behavior, new materialism's arguments on matter-energy's relationality, produces a new path through ecological thinking. As a terminology that currently started to be used, 'architectural ethology', can be a reference title for an architecture that is on a mediatory position between the environment and humanly functioning, which can exhibit a type of negotiation process with environment. It can be described as 'what architecture does', instead of symbolic constructions concerning 'what architecture is'.

In the architectural dictionary this corresponds to a form-seeking attitude, which Achim Menges collects under the name of 'Performance Based Design'. The formalist behavior of architecture concerned on 'what architecture is', that presented in the first chapter, is evaluated as the core of ecological problem due to its non-relationality to non-human environment and pursued a form-giving approach to matter.

What is not presented in the first chapter is that the same architectural history also contains a line of form-seeking processes. [186] The programmatic reflection to architectural mass and character as the modern architecture's main behaviour, the

[186] For an extended history on these form-seeking discussions, see Sönmez and Balcı, "Mimarlıkta Biçim ve Biçimlenmenin İnsansonrasına Giriş ."

organic architecture of Frank Lloyd Wright mediating between the topologic conditions and functioning, diagrammatic architecture as an architectural genetic unfolding in spatial characteristics, Cedric Price's Fun Palace where events define the architectural space, parametrically coded design as a dynamic diagrammatization process, political spaces at the intersection of marginal power domains… All exhibits the different types of performances which architecture had been a mediator of, yet these are responsive to human-centric conditions. By not trivializing this aspect of architecture, another condition of off-human needs to be involved.

"What if architecture, always considered as driven exclusively by human cognition and perception, could amplify its everlasting explorations for novelty by escaping from its human-centered entanglements and opening itself up to creative symbioses and dependencies with other, nonhuman forms of cognition and sensing? "[187]

As current architectural discipline lacks non-human world repertoire, architecture's close contact with the material milieu reflecting 'what human is' does not respond to what is not human. According to Gorny, architecture "seems to lack a reciprocal awareness of how its steady rearranging of the built environment matters."[188] Here Gorny talks about the building's very material existence and mentions 'architectural ethology'.

Starting to think of architecture on 'what it does' involves its performances both in human and off-human conditions requires a template. Although as a philosophical stance, Performative New Materialism doesn't aim architecture in specific, however architecture can be tested on its performances via material in literal sense. This chapter presents architecture and environment as an ecological discussion first, and in the second part it presents Performance Based Architecture and Material Based Performance as an ecological positioning in the second.

[187] Vogiatzaki, "Architectural Materialisms." p 20
[188] Robert Alexander Gorny, "Reclaiming What Architecture Does: Toward an Ethology and Transformative Ethics of Material Arrangements," *Architectural Theory Review* 22, no. 2 (May 4, 2018): 188–209, https://doi.org/10.1080/13264826.2018.1481809. p 1

means of material behaviors is currently gaining importance. For the architectural discipline matter had been a succeeding input of design, following the form. It had been evaluated due to its technological capacities of the form to be applied.[189] Such a behavior can be matched with architectural ethology.

4.1.1 Architecture and Ecology

To call the architectural culture ignorant can be a very reductive approach on one hand, given how much collective effort had been put through for the sake of life-privileging. It is the 'niche construction'[190] of the human species, as an act of survival. For some theorists, it is even possible to call architecture an exoskeleton or extended phenotype, because our species cannot be separated from the architecture now. Paleoanthropologist André Leroi-Gourhan reveals that mutual evolution of technical objects (tools and production processes) and, all aspects of culture (hence, architecture, too) with human body, due to natural selection's intertwined relationship between human and environment.[191] With a similar approach, in DeLanda's retrospective to human, *One Thousand Years of Nonlinear History*, he claims minerals and organic tissue started cooperating five hundred million years ago. And he argues, the urban bodies can be our another material alliance.

"[…] in many ways the processes of individualization that conclude into the human being are not too different from those that end up with the D. coronata since about eight thousand years ago 'human population began mineralizing again when they developed their urban exoskeleton'. "[192]

However, this 'material alliance' had been the apparatus of human supremacy by carefully detaching 'the rest'. The pillars of our anthropocentric civilization roots on

[189] Zülal Nurdan Erbaş Korur, "Insight into Genetic Architecture: Conceptual Approach in Contemporary Architecture" (Istanbul, Istanbul Technical University, 2012). p 5
[190] Niche construction is specific organisms' act of altering their physical environment.
[191] Sönmez and Balcı, "Mimarlıkta Biçim ve Biçimlenmenin İnsansonrasına Giriş 1/3."
[192] Manuel De Landa, *A Thousand Years of Nonlinear History* (Zone Books, 1997). p 27 cited in Dolphijn, "The Resonance of Disparates Spinoza, Damasio, Deleuze and the Ecology of Form." p 60

excluding the complexity of nature 'outside' and defining an ordered realm of 'inside'. Therefor for the 'umwelt' of human, the complexity of environment is reduced to a 'field of resource' which only the domesticated entities had been welcomed. Not the wilderness but the agriculture and landscape, not the animals, but the domesticated species, not the cyclings but the conditioned air and nice views and so forth… Regarding this inside – outside relationship Ingraham depicts the architecture's staggering positioning.

"It (architecture) allows biological life to circulate 'in its midst' and cyclical processes (weather, for example) to surround it. And it maintains an insistently human enclave inside its borders…. Architecture also maintained a crucial and confusing permeability because biological life, in order to survive, has always required something like a free passage between inside and outside; some vital movement from protected to open air…. perhaps the window could be seen as a kind of reference to a hypothetical 'open field 'which humans lived before architecture, - keeping in mind that the word 'field' itself prevents us from imagining that the moment we 'became human' was anything other than a moment of also 'becoming architectural'."[193]

Ingraham defines the ordered life of interior as 'becoming architectural' meaning architecture becomes a tool of domesticating, or reorganizing environment for humanly purposes. According to Radman, including the environmental effects to the field of psychology and considering 'niche construction' as an affect in the biological evolution are newly emerging contemporary approaches.[194] However, environmental relationship via our 'niche construction' of architecture and urbanism, had created an 'asymmetrical condition' as Ingraham puts it since it is for life and blocking life.

"This asymmetry that I have introduced as a difference between one thing, life, which privileges itself and another thing, architecture, which is indifferent to this privilege, mimics to some degree, the asymmetry between a biological organism and

[193] Ingraham, *Architecture, Animal, Human*. Pp 7-8
[194] Radman, "Figure, Discourse," 2010. p 431

any ecological milieu, with the obvious but very problematic addition of a motivated connection between the artifice and artificer. The connection has changed over time depending on the relative status and value of human life and the relative status and the value of architecture." [195]

Here the asymmetry Ingraham mentions, is in line with notions of autopoiesis and milieu. Autopoiesis is the self-organizational capacities of an actor, privileging itself, and milieu is the total result of rest of the self-privileging other actors. So, the game includes both actions, inwards, and outwards. Therefore, architecture as a self-privileging -autopoietic- external body for human is no stranger to the mode of production in nature. However, as Bruce Clark commented in a humorous manner 'nobody likes the auto anymore',[196] auto is referential to an identity debate. Therefore, the autopoiesis of human, requires 'straw man's[197] regarding the definitions of what human is, what should be their wills and ethics. As a result of this definition, architecture has transformed into an anthropocentric practice that defines form through representation.

"Architecture in anthropocentrism was always motivated by an abstract, intellectual or fictionally composed conception of the human and its body. […] The history of architecture in anthropocentrism is nothing more than the history of the impact that the non-linear changes in the conception of the human body made on humanity's spatial manifestations. Architecture in this context was nourished, framed, and conducted by a different ontological understanding of what the human was, or what

[195] Ingraham, *Architecture, Animal, Human*. p 8
[196] The Ecologies of Architecture is a neo-materialist research group of the Theory academic group at TU Delft Faculty of Architecture and Built Environment. The debate can be followed from here; Ecologies of Architecture Research Group, *Design Space: Technicities and the Built Environment*, 2021, https://www.youtube.com/watch?v=cBiBAgxC5FM.
[197] The term is borrowed from Nizam Onur Sönmez, who conveys the descriptions of 'human' in the history of humanism as 'straw man' with reference to 'straw man fallacy' to indicate that the drawn frame is made up of fabricated bases. Poedat, *İnsansonrasının Geçmişi ve Samandan Adamlar*, 2021, https://www.youtube.com/watch?v=twDcFMWAuIc.

it should become. The building and the city were thought, conceived, and designed to mirror the human body." [198]

However, although accepting the legitimacy of critics towards anthropocentrism or humanism, the collective effort on defining what human is, more currently under the terminology of humanism, shouldn't be reduced to a intentional sinister attitude. Reading the world with the human glasses and trying to shape the world in a human-positive manner -as most beings do in their umwelt with their act of niche construction-, is not what got human fired from the harmonic, heavenly nature, as it is implied in some of the ecological approaches. Nature is not harmonic in the sense of serving endless amenities to its agents. As stated in the previous sections, the reciprocal character of things to environment occurred both ways, internally and externally, in different intensity of forces. As Deleuze puts it "Everything happens through the resonance of disparates."[199]

" […] we make no distinction between man and nature: the human essence of nature and the natural essence of man become one within nature in the form of production or industry, just as they do within the life of man as a species. Industry is then no longer considered from the extrinsic point of view of utility, but rather from the point of view of its fundamental identity with nature as production of man and by man [who ceaselessly plugs an organ-machine into an energy-machine, a tree into his body, a breast into his mouth, the sun into his asshole: the eternal custodian of the machines of the universe. This is the second meaning of process as we use the term: man, and nature are not like two opposites […] rather, they are one and the same essential reality, the producer-product. "[200]

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[198] Edited by Etienne Turpin, "Architecture in the Anthropocene: Encounters Among Design, Deep Time, Science and Philosophy," *Critical Climate Change*, 2013, https://doi.org/10.3998/ohp.12527215.0001.001. p 7

[199] Dolphijn, "The Resonance of Disparates Spinoza, Damasio, Deleuze and the Ecology of Form." p 55

[200] Gilles Deleuze and Félix Guattari, *Anti-Oedipus: Capitalism and Schizophrenia* (Minneapolis: University of Minnesota Press, 2000). p 5 cited in Berrin Özdemir, "The Mystification Of Nature At The Crossroads And Thoughts On A New Habitat" (Metu Seminar Paper, METU, 2018). Pp 11-12

From the reading of Deleuze and Guattari, nature is a mode of production for every being, for the economics of their surveillance. Here, I'd argue, may be, it is this 'economics' that create sympathy between things that are in different resonances, and a 'more economic alliance' might be related to what shape our ethical understanding from the core since ethics had always been axiologic, and the values are related with the worldviews. Therefore, Harraway calls out for a state of new human ethics, which is a symbiotic autopoiesis, sympoieses:

" […] it implies instead that we eventually move beyond the ethically-too-facile view of autopoietic thinking in favour of what Donna Haraway describes as "sympoieses": shared deterritorialisations through which things evolve not out of themselves, but in co-constitutive and co-adaptive processes of "becoming-different-together." [201]

The understanding of continuum as a symbiotic negotiation is also expressed in the romantic wording of Erzen:

"The environment is a place of encounter, togetherness and sharing. In order to live the infinite existence of the environment, it is necessary to set aside prejudices and pre-made decisions, practical and self-seeking purposes. No qualitative expression is possible without a second being watching, presenting and perceiving their own body as a touchstone. The song of the bird, the scent of the flower, the roar of the storm, the blue of the sky and all the greens of the world are the expressions of this awareness... As I become aware of them, they become a part of me.... I am nested in the environment. Therefore, everything that is outside and inside my body is in continuity with each other. Both are part of my infinite and limited being. [202]

Briadotti as a post-humanist, feminist, and new materialist theoretician, claims the quest for symbiosis starts via thinking outside of the boundaries of our current human

[201] John Protevi, *Life, War, Earth: Deleuze and the Sciences* (U of Minnesota Press, 2013). p 31 Donna J. Haraway, *Staying with the Trouble: Making Kin in the Chthulucene* (Duke University Press, 2016). p 58 cited in Gorny, "Reclaiming What Architecture Does."
[202] Jale N. Erzen, "Yeryüzü Bedenim," in *Üç Habitus: Yeryüzü, Kent, Yapı* (Yapı Kredi Yayınları, 2015). Pp30-31

‘exceptionalism’. Her call is very radical, ‘becoming animal, becoming-earth and becoming-machine.’

“The planetary or becoming earth dimension brings issues of environmental and social sustainability to the fore, with special emphasis on ecology and the climate change issue. The becoming- machine axis cracks open the division between humans and technological circuits, introducing biotechnologically mediated relations as foundational for the constitution the subject.”[203]

However, as anthropocentric reading of environment with an autonomous supremacy is considered reductionist for easing the story on behalf of individual, Briadotti’s call towards formatting our human selves, dissolves the inner forces and eases the story on behalf of environment. Much like the monism traced in Islamic mysticism’s Mansur Al Hallaj, saying ‘En el Hak’ (I am God), Enlightenment thinker Baruch Spinoza’s ‘Nature or God’ (Deus sive natura), or Gaia hypothesis which gained importance with 1970 Lovelock novels claiming the world consists of one living organism, this effort of depicting the meta-story creates a framed world-view again.

4.1.2 Architecture and Performance

4.1.2.1 Brief history of the performance notion

The ‘performative turn’ is a paradigm shift in many aspects of life and first emerged in the 1940s and 1950s. According to the history Menges provides, the first development of the notion is made by scholars as a dramaturgical paradigm relates culture with performance. Later by John Langshaw Austin’s claim of “speech is not a passive practice, but, instead, constitutes a form of ‘self-referential’ action, an

[203] Poedat, *İnsansonrasının Geçmişi ve Samandan Adamlar*.

active practice that can affect and transform realities"[204] its relation with behavior was bridged.

Figure 28 - Cut Peace, Yoko Ono, 1964

As one of Yoko Ono's early performances, the artist sits on stage dressed and with scissors and audience take turns to cut a piece off.

These developments vaulted to arts and led to situation specific performances during the era. As this idea incorporates with many variable condition, performance-arts also proliferated many type of art forms and art shifted from 'works' to 'events'. [205]

By Umberto Eco's characterization of 'open work', performance gains a correlational meaning however as he points out he does not entail a 'leissez faire' condition, but rather a guiding direction from the designer.[206] Eco's 'open work'

[204] "John Langshaw Austin, How to Do Things with Words - PhilPapers," accessed October 6, 2021, https://philpapers.org/rec/AUSHTD. cited Michael Hensel, "Performance-Oriented Architecture - Towards a Biological Paradigm for Architectural Design and the Built Environment," *FORMAkademisk* 3 (May 1, 2010): 36–56, https://doi.org/10.7577/formakademisk.138.
[205] Hensel, "Performance-Oriented Architecture - Towards a Biological Paradigm for Architectural Design and the Built Environment."p 39
[206] Umberto Eco and Professor of Semiotics Umberto Eco, *The Open Work* (Harvard University Press, 1989). Cited Hensel, "Performance-Oriented Architecture - Towards a Biological Paradigm for Architectural Design and the Built Environment." P40

corelates with architecture's operation and establishes a possibility of environment as an active agent.[207]

As Hensel asserts this condition of mutual affects, he speculates the 'performative capacity' of architectural space's many strata of performance, that actually shaping the environment and shaped by.

> "With regards to the broader implication of the 'performative turn', one may argue that it is culture that is affected, and that architecture belongs to, and that it is always already shaped by and in turn shapes culture, environment and, further, is shaped increasingly by what might be called 'culture of environment'" [208]

4.1.2.2 Performance based architecture -From Mechanic to Organic

Architecture in the modern era had been under the two polarizing ends, form or function. However, as American sculptor Horatio Greenough defines beauty might be a promise of function, action as the presence of function and character as the record of function.

The famous debate roots in Sullivan's famous quote 'form ever follows function' Loos' book of 'Ornament and Crime', and MOMA'S 1932 exhibition of 'International Style' form and function disassociated as functionalism accelerates.[209]

In the functionalism critiques of Aldo Rossi and Tschumi from 70s onwards, 'time' is invited into the space and Tshcumi coined the notion of 'event'. And the event notion later reinforced by retrospective readings of Bergson, Whitehead, Deleuze, Foucoult and so on. As Kwinter explains this notion as the architectural performance

[207] Hensel, "Performance-Oriented Architecture - Towards a Biological Paradigm for Architectural Design and the Built Environment." p 40
[208] Hensel. p 41
[209] Hensel. p 43

"not by how it appears, but rather by practices: those it partakes of and those that take place within." [210]

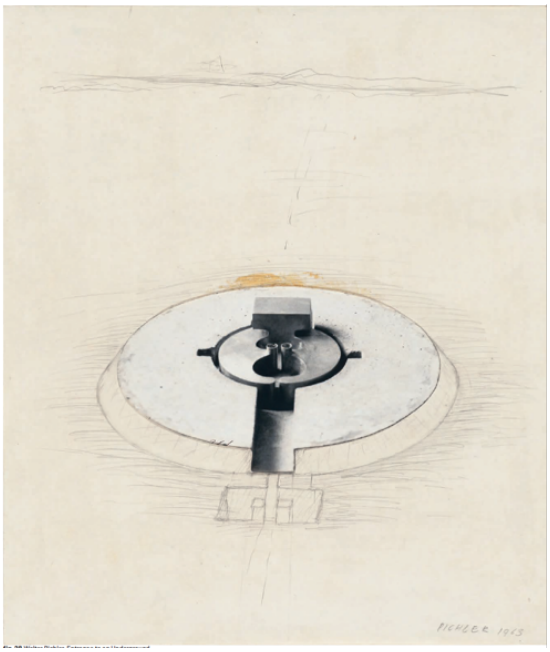

Figure 29 - Walter Pichler, Entrance to an Underground City, 1963[211]

According to Hensel, for the architectural performance, the shift occurred during 60's when architectural discipline's engagement with mechanical and electrical devices. Marginally observed in the' designs of space flight, cold war bunker, or survival facilites in case of cold war, interior environment and ecology was achieved. [212]

Another aspect of architectural performance was with the cybernetic and automation concepts' involvement that helped buildings to be understood as a distributed reciprocally conditioned complex machine. Cedric Price's 1964 Fun Palace as an influential example is a performance based, open ended, event space.

[210] Hensel. p 44
[211] Hadas A. Steiner et al., *Neri Oxman: Material Ecology*, 1st ed (New York: The Museum of Modern Art, 2020). p 25
[212] Hensel, "Performance-Oriented Architecture - Towards a Biological Paradigm for Architectural Design and the Built Environment." p 41

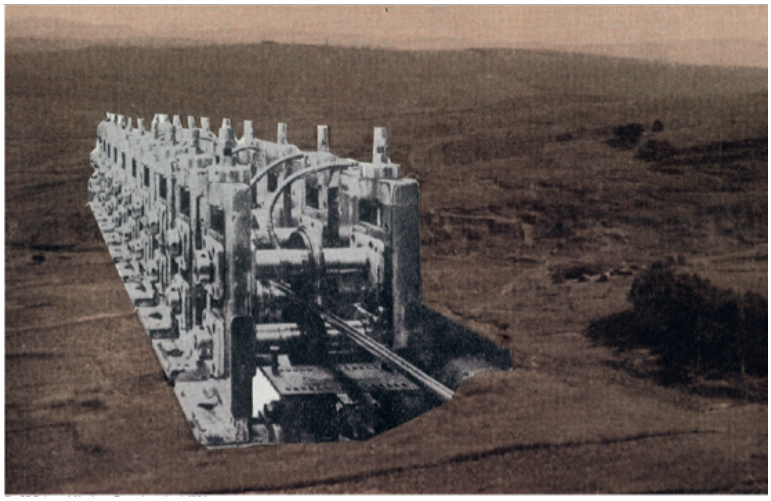

Figure 30 - Transplantation I, Raimund Abraham, 1964 [213]

"Developed with avant-garde theater director Joan Littlewood, relying on experts such as the cybernetician Gordon Pask and the psychiatrist Morris Carstairs, Fun Palace has best been described as a wide range of contemporary discourses and theories such as emerging cybernetics, information technology, and game theory Situationism, and theater to produce new kind of improvisional architecture to negotiate the constantly shifting cultural landscape of the postwar years." [214]

Figure 31 - Fun palace for Joan Littlewood Project, Cedric Price, 1959-61[215]

[213] Steiner et al., *Neri Oxman*. p 26
[214] Steiner et al. p 26
[215] Steiner et al. p 26

In August 1967, with the American Journal Progressive Architecture's special issue on performance design, the performance concept was began to be understood as Kwinter's ethological definition of 'not by how it appears, but rather by practices'. The 'systems analysis, systems engineering and operations research' was at the core of discussion and integrating the buildings mechanics to structures in a more organic manner was offered as in the example of François Dallegret's anatomy of a dwelling.' [216]

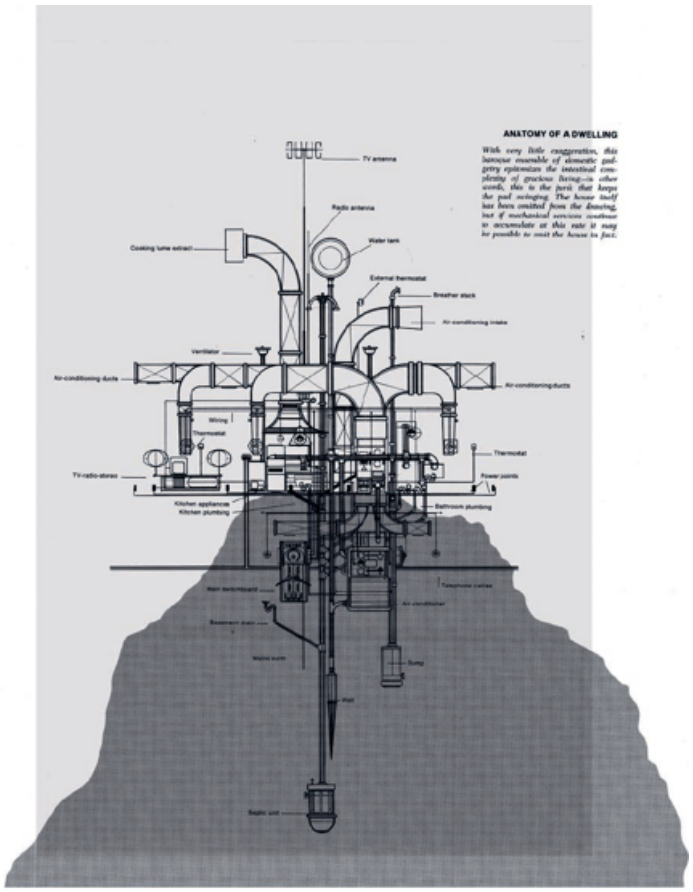

Figure 32 - François Dellegret -Anatomy of a Dwelling -1965[217]

[216] Steiner et al. p 29
[217] Steiner et al. p 29

In 1970, Nicholas Negroponte's 'The Architecture machine: Toward a More Human Environment' which he dedicated to architectural performance, generation, evaluation and adaptation had been highlighted as three key concepts.

Figure 33 - The Architecture Machine, Nicholas Negroponte, 1970[218]

In early 1980's Greg Lynn in Archeology of the Digital, presented the possibilities of Digital architecture including the works of the works of Eisenmann and Gehry. Digital culture and digital fabrication also had been a shift in performance based design from mechanism to the algorithm.

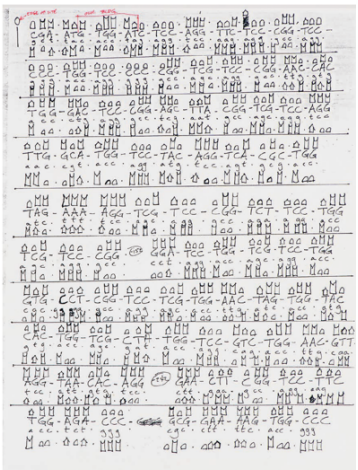

Figure 34 - Schematic representation of DNA, Eisenman/Robertson Architects,1965,

[218] Steiner et al. p 29

As the digital shift proliferated in many ways, 'Generative Architecture' emerged where the design process is reciprocally progressed between the computer and architect. Starting as a architecturally controlled parameter, the geometric code generates an organic result.

The organic, generally a short-hand to nature related design- references a wide range of applications in architecture. With the generative architecture's possibilities, a genetic approach is integrated alongside with other disciplines such as of science, technology, and biology. Architects Such as David Benjamin, Skylar Tibbits and Jenny Sabin invested in such new expression. In this type of production architectural position transforms into leading between the different variants rather than form-giving. [219] To this approach Oxman states:

> "Unlike the Industrial Revolution, which was ecology-agnostic, this new approach tightly links objects of design to the natural environment. " [220]

4.1.2.3 Material Based Performance in Architecture

> "One can start from the idea that the world is filled not, in the first instance with facts and observations, but with agency. The world, I want to say, is continually doing things, hings that bear upon us not as observation statements upon disembodied intellects but as forces upon material beings. Think of the weather. Winds, storms, droughts, floods, heat and cold – all of these engage with our bodies as well as our minds ... Much of everyday life, I would say, has this character of coping with material agency, agency that comes at us from outside the human realm and that cannot be reduced to anything within that realm. My suggestion is that we should see science (and, of course technology) as a continuation and extension of this business of

[219] Oxman, statement to the tenure committee, cited inNeri Oxman, "Material Computation," in *Fabvolution* (Disseny Hub Barcelona: John Wiley & Sons, 2012), https://neri.media.mit.edu/publications/article/material-computation.html. p 31
[220] Oxman, statement to the tenure committee, cited inOxman. p 31

> coping with material agency.... These remarks, then, sketch out a basis for a performative image of science, in which science is regarded a field of powers, capacities, and performances, situated in machinic captures of material agency. And my aim ... is to understand scientific practice within such a performative idiom." [221]

As expressed in the early chapters, evaluating everything as matter and its capacities, has a direct correlation with architecture since it is a material practice transforming human environments. "Material responds to stimuli and can thus be utilised strategically in the orchestration between material and energetic exchanges. [222] Due to their interactions and with social life's dynamics, the built environment generates. [223]

On the other hand materials haven't been understood in means of their full potentials. Human alliance with material shaped itself on reducing the change and neutralizing. However, thinking material with its behavior capacities, its organization and relation to dynamic exterior can create a whole new potentiality. The shell of the building can be understood instead of a blocking the relationality, an organizational responsive layer to everchanging interior and exterior conditions.[224]

With such an understanding the rigid distinction of formalism with materialization can mutualize via material performance. In order to achieve such architecture, its crucial to understand the biological materials potentials. As an example, responsive materials for surfaces generally is not preferred since their performance can create instability, within a stability privileging formal account. On the other hand, when

[221]Andrew Pickering, *The Mangle of Practice: Time, Agency, and Science* (University of Chicago Press, 1995). Pp 6-7 cited in Hensel, "Performance-Oriented Architecture - Towards a Biological Paradigm for Architectural Design and the Built Environment." p 40
[222] Hensel, "Performance-Oriented Architecture - Towards a Biological Paradigm for Architectural Design and the Built Environment." p 40
[223] Michael Hensel, Defne Sunguroglu Hensel, and Achim Menges, "Material Performance," *Architectural Design* 78 (March 1, 2008): 34–41, https://doi.org/10.1002/ad.639. p 38
[224]Hensel, Sunguroglu Hensel, and Menges.p 38

this is understood as a potential of material it is possible to produce new type of relationality with the environment via building material and the form inseparably.

> "Take pine cones, for instance: after detachment from the tree, they can open and close, time and again, due to changes in the moisture content of the material and in reaction to the relative humidity of the environment, in order to release seeds when relatively high environmental humidity grants favourable conditions for proliferation." [225]

Figure 35 - Pinecone Morphology
In order to release seeds when relatively high environmental humidity grants favourable conditions, pinecones can open and close, time and again, due to changes in the moisture content of the material and in reaction to the relative humidity of the environment.

In the Studio of Achim Menges in HfG Offenbach, Department for Form Generation and Materialization, the study produced on veneer composites explores the material of wood in different humidity conditions aims to develope a responsive surface. The form is considered to be a mutual modualtion of external stimuli, material response and system behaviour.

[225] Hensel, Sunguroglu Hensel, and Menges. p38

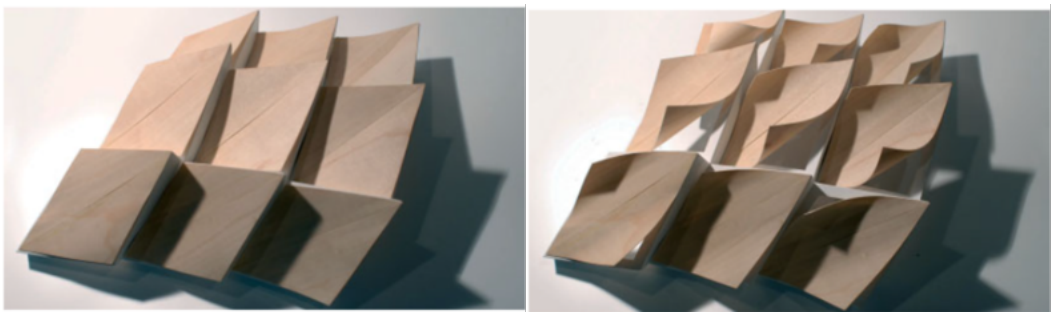

Figure 36 - Steffen Reichert, Responsive Surface Structures, 2006/07
Department for FormGeneration and Materialization (Achim Menges), HfG,
Offenbach,Germany,

Nine veneer composite components indicate the change of surface shape and related surface porosity in response to an increasing level of relativehumidity. Key design parameters, such as fibre orientation or the ratio ofthickness, length and width, can be related to the element's specific responseto changes in moisture content and resultant shape change. [226]

Figure 37 - The functional full-scale prototype of the Responsive Surface Structures research project. [227]

[226] Michael Hensel, Defne Sunguroglu Hensel, and Achim Menges, "Material Performance," *Architectural Design* 78 (March 1, 2008): 34–41, https://doi.org/10.1002/ad.639.
[227] Hensel, Sunguroglu Hensel, and Menges, "Material Performance," March 1, 2008. p 41

In order to generate an understanding towards material, the materials need to be understood via their characteristics. For example biological systems load bearing conditions are in relation from macroscale formation to their microscale tissue organisation to loads.[228]

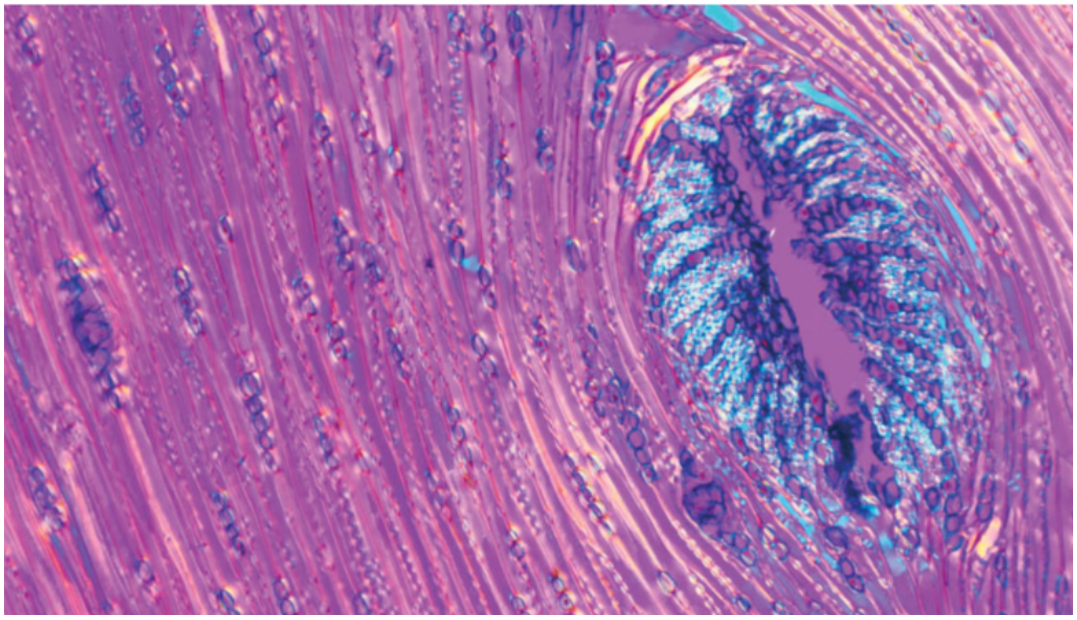

Figure 38 - Polarised light micrograph of a pine
The section shows the structure of the wood around a knot seen as a blue oval to the right. Knots are formed where branches converge on the trunk of the tree. The image also shows sap-conducting tracheids, elongated cells in the xylem of vascular plants, shown here in pink. The tracheids have thick walls studded with small pores, so-called pits that allow these to flow from one cell to another. All tracheary elements will develop a thick lignified cell wall and affect the mechanical behavior of the wood.[229]

[228] Hensel, Sunguroglu Hensel, and Menges. p 38
[229] Hensel, Sunguroglu Hensel, and Menges. p 38

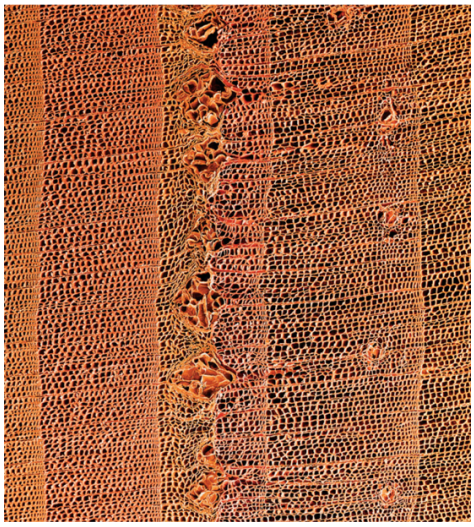

Figure 39 - Scanning electron micrograph of wood from a Siberian pine tree showing the internal differentiation of wood. The vertical sections are the growth rings, one for each year in the life of the tree. This specific part of the tree dates from AD534 (left) to AD539 (right). In AD536 the northern hemisphere underwent severe cooling, which caused deformations in the structure of the wood due to water freezing within the cells. The following year was cooler than average, too, yielding a decrease in growth. [230]

As Hensel and Sunguroğlu claims, architecture holds a potential on material behavior, by trying to examine the materials, their responsive conditions and internal organizations.

[230] Hensel, Sunguroglu Hensel, and Menges. p 38

CHAPTER 5

MATERIAL ECOLOGY

5.1 Moma on Material Ecology

Figure 40 - Installation view of the exhibiton, “Neri Oxman:Material Ecology” Photograph by Denis Doorly.

Architect Neri Oxman and MIT Media Lab’s Mediated Matter Group[231] had an exhibition on MOMA in 2020, named Material Ecology[232]. As a contemporary art

[231] Mediated Matter is a collaboration with MIT Media Lab and Neri Oxman. Their explanation towards themselves as follows: The Mediated Matter group focuses on Nature-inspired design and design-inspired Nature. We conduct research at the intersection of computational design, digital fabrication, materials science, and synthetic biology, and apply that knowledge to design across scales—from the micro scale to the building scale. “Group Overview ‹ Mediated Matter,” MIT Media Lab, accessed September 8, 2021, https://www.media.mit.edu/groups/mediated-matter/overview/.

[232] Material Ecology exhibition held place in MOMA at 22February-25 May 2020, organized by Senior Curator Paola Antonelli from the Department of Architecture and Design, and Director, Research and Development; and Assistant Anna Burckhardt, Curatorial Assistant, Department of Architecture and Design.
“Neri Oxman: Material Ecology | MoMA,” The Museum of Modern Art, accessed August 12, 2021, https://www.moma.org/calendar/exhibitions/5090.

museum, after including the Department of Architecture and Design in 1932 MOMA shared an interest in architectural futures.

Figure 41 - Modern Architecture, International Exhibition, MOMA, 1932[233]

Some examples from the early exhibitions are such as "Modern Architecture: International Exhibition" in 1932, "Machine Art" in 1934 curated by Philip Johnson, aimed to involve art and architecture in order architecture to be influential on the cultural discourse.[234] Through the exhibitions, the official narration of the 20th century takes place, and via this Media institutions terminologies such as 'international style' and 'deconstruction' begins circulating.[235] Therefore, exhibiting the architecture of Neri Oxman and Mediated Matter Lab of MIT indicates the orientation of such an architectural approach. The editorial opening of the press release of MOMA was written by curator Paola Antonelli. In order to express why

[233]Image retrieved from "Installation View of the Exhibition, 'Modern Architecture: International Exhibition.' | MoMA," The Museum of Modern Art, accessed September 8, 2021, https://www.moma.org/calendar/exhibitions/2044/installation_images/12371.
[234] Hadas A. Steiner et al., *Neri Oxman: Material Ecology*, 1st ed (New York: The Museum of Modern Art, 2020). p 9
[235] Baharak Tabibi, "Exhibitions As The Medium Of Architectural Reproduction 'Modern Architecture: International Exhibition'" (Master's Thesis, METU, 2005). Pp 61-62

this exhibiton gained importance, she starts with a tribute to change by quotating Heraclitus "Everything flows, and nothing stays the same"[236]

> "One of the most distinctive characteristics of the human species is a fraught relationship with change. […] Most entities – glaciers, plankton, clouds, tigers, or dandelions, for instance- go with the flow, adapting, and evolving over time to accommodate change and accept its aftermath, however unfortunate. Not humans. […] We take pride in out ability to interfere with and even manipulate the flow. In so doing, we create consequences - not only for us, but form all species."[237]

As can be understood from the Antonelli's foreword, the tension here is on a formal axis of formalist and performative, with their contingencies to flow. Oxman and Antonelli's first collaboration dates back to 2006, with a similar exhibiton curated by Antonelli: *Design and the Elastic Mind.* There Oxman featured four works from her Material Ecology project -Subterrain, Raycounting, Monocoque, and Cartesian Wax, each exploring "natural and biological phenomena and the potential to use computation to reconstruct them at larger scales, demonstrating how this new technology could inform the future of designing and making objects. "[238]

> "Material Ecology is an exhibiton not only about the future of architecture and design but also about the future role of the designer as the initator of a process that exists within systems and ecologies, rather than as the form-giver of an object or the follower of functions. MOMA's curatorial team has selected seven projects, some realized by Oxman independently, most of them with MMG,[239] to highlight the impact that her attitude is having on the next generation of designers; of materials-, computation-, and life scientistst;

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[236] The Museum of Modern Art, *Neri Oxman—Material Ecology | Live Q&A with Paola Antonelli and Neri Oxman | VIRTUAL VIEWS*, accessed August 12, 2021, https://www.youtube.com/watch?v=TUjlAGhukhE&t=1168s&ab_channel=TheMuseumofModernArt. Italics added

[237] Hadas A. Steiner et al., *Neri Oxman: Material Ecology*, 1st ed (New York: The Museum of Modern Art, 2020). p 13

[238] Steiner et al.

[239] Mediated Matter Group

of engineers, clients, and – through her work and her public talks, citizens. ”[240]

Figure 30 - Subterrain.
Micrograph image of a butterfly wing (left); analysis of metarial behavior according to stress, strain, heat flow, stored energy, and deformation from applied loads and temperature differences (middle); reconstructed tissue (right)[241]

In the press release made by MOMA, they state the projects exhibited were not the finished products but the production phases of the materials. The media content visualizing the scientific efforts alongside of the works, reveal how biology, architecture and design can shape the future. To witness all objects are designed as if grown—no assembly required. [242]

5.2 What is Material Ecology?

In the opening premier, Oxman defines her term Material Ecology as;

> “Ecology is the science that defines relationships between organisms and other organisms, and/or organisms and the natural environment,” Oxman explains. “Material ecology basically aims to place materials; things that are artificially made, designed, in the context of natural ecology. And the hope

[240] Steiner et al., *Neri Oxman*, 2020. p 33
[241] Image retrieved from Steiner et al. p 13 Subterrain three issues (a leaf section, a butterfly wing, and a scorpion claw) were analyzed at the microscale and reconstructed in macroscale using digitally controlled, very fine mill to create three-dimensional wood prototypes.
[242] Neri Oxman, “MoMA ANNOUNCES MONOGRAPHIC EXHIBITION OF ARCHITECT, DESIGNER, AND INVENTOR NERI OXMAN IN EARLY 2020,” n.d., 3.

is that in the future, we will design with natural ecology in mind, such that all things will relate, adapt, respond to the natural ecology. The vision, of course, is that in the future, one will not be able to differentiate or separate between the natural and the artificial, for good and for bad."[243]

According to Oxman, architecture is being characterized by a separation of form and matter which catalyzed in Renaissance by the architectural theories" self-directed approach towards architectural body.[244] She draws attention to Industrial Revolution's machine-based mode of production, that subordinated the material under form which became disassociated with the environmental forces. By Digital Revolution the gap between form and matter got even broader, with a lot of formal liberty. That, and with the current ecological conditions -generally modern design found responsible of- is what tiles the way for a new materiality. She explains the possibilities this new field provides as;

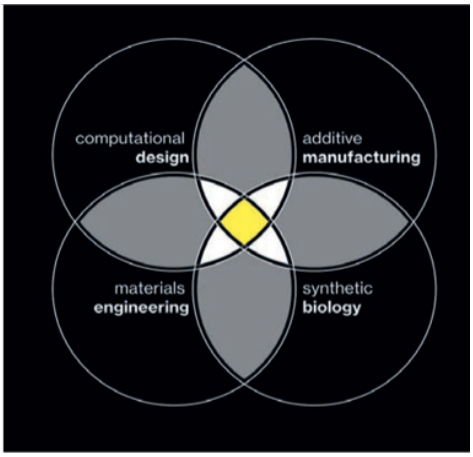

Figure 31 - Neri Oxman. Material Ecology Venn diagram. 2015[245]

[243] The Museum of Modern Art, *Neri Oxman—Material Ecology | Live Q&A with Paola Antonelli and Neri Oxman | VIRTUAL VIEWS.*
[244] Neri Oxman et al., "Material Ecology," *Computer-Aided Design* 60 (March 2015): 1–2, https://doi.org/10.1016/j.cad.2014.05.009.

[245] Image retreived from Steiner et al., *Neri Oxman*, 2020. p 15

"We are now at a very exciting moment where we can design nature *herself*. So, with the appearance of tools, techniques and technologies associated with synthetic biology, we can basically re-envision, reimagine, augment, make better, heal the environment and nature as we know it. Where does design stand in this crossroads and what are the technological and ethical implications of this? I think my team and I stand in that crossroad physically, but also mentally challenging some of the questions that design, and designers face at that intersection between biology and technology, nature and culture, and the melding and fusing of the two."[246]

5.2.1 Krebs Cycles

While engaging with nature, Oxman and MMG uses Krebs metabolic cylcle as a compass. [247]

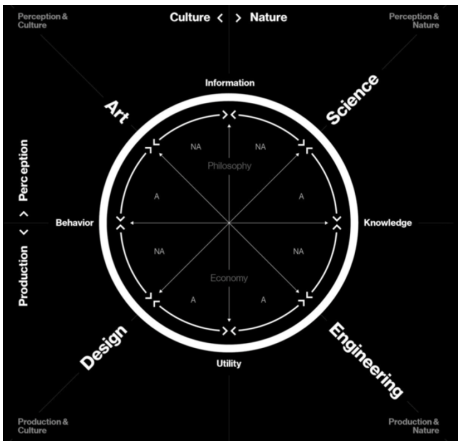

Figure 32 - The Krebs Cycle of Creativity – Domains - 2016[248]

[246] The Museum of Modern Art, *Neri Oxman—Material Ecology | Live Q&A with Paola Antonelli and Neri Oxman | VIRTUAL VIEWS*. Italics added
[247] the sequence of reactions by which most living cells generate energy during the process of aerobic respiration. It takes place in the mitochondria, using up oxygen and producing carbon dioxide and water as waste products, and ADP is converted to energy-rich ATP.
[248] Steiner et al., *Neri Oxman*, 2020.

The Krebs Cycle of Creativity I is defined as a framework that treats the fields of art, science, engineering, and design as a way of collaborative thinking and action, in which the input of one person becomes the output of another.

They believe that the transition from one field to another will generate intellectual energy, or they call it CreATP. In its definition, representatives of science interpret and predict the world around them, transform information into knowledge, representatives of engineering apply scientific knowledge to develop solutions to empirical problems, and transform knowledge into practicality; design representatives produce maximum functionality and enhancement The human experience solution transforms utility into behavior and creates awareness of the surrounding world, transforms behavior into new insight into information, and re-presents the data that start the scientific cycle.

Diagram's vertical axis stands for, from the theoretical to the applied (economic). The north marks the human exploration into the unknown whereas the south stands for the productions and outcomes. The horizontal axis leads from nature to culture, from understanding, describing, to creating.

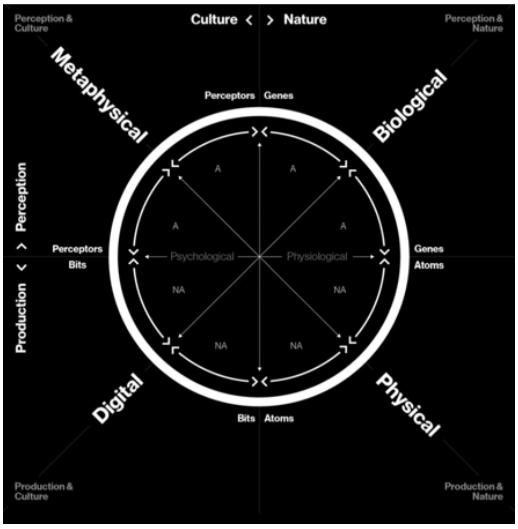

Figure 33 - The Krebs Cycle of Creativity II – Units - 2016[249]

[249] Steiner et al. p 17

The Krebs Cycle of Creativity II replaces the domains of the first iteration with realms that explain, predict, change, and perceive the world, each of them identified by a unit associated with it. In order for design objects, structures, and interventions to be able to inform and influence the natural ecology, designers must be able to freely move between the ways of seeing and making in the world and the units that build them – physical units (such as the elements of the periodic table), digital units, (pixels), and biological units (genes).

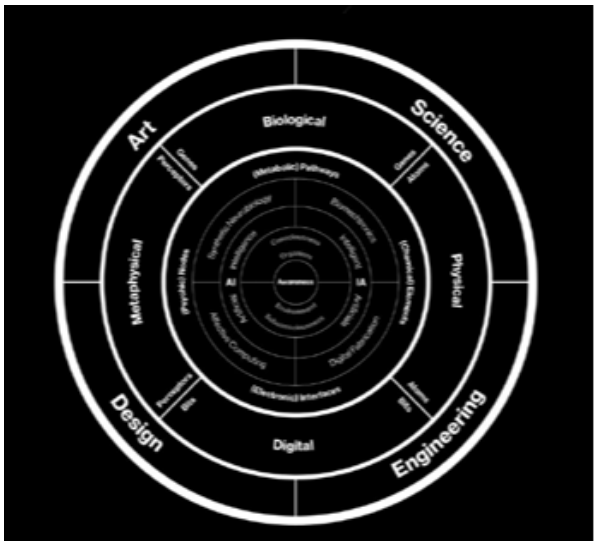

Figure 34 - The Krebs Cycle of Creativity III – Domains and Units

The Krebs Cycle of creativity III combines the first two iterations in a diagram of ideal interdisciplinary design practice, with unencumbered transitions among the realms and domains laid out in KCC I and KCC II. It can be interpreted from top to bottom as it relates to the organisms and its environment and left to right as it relates to forms of artificial Intelligence or Intelligent Artifacts.[250]

[250] Steiner et al., *Neri Oxman*, 2020.

5.3 Silk Pavillion - Silkworm-spun Pavilion

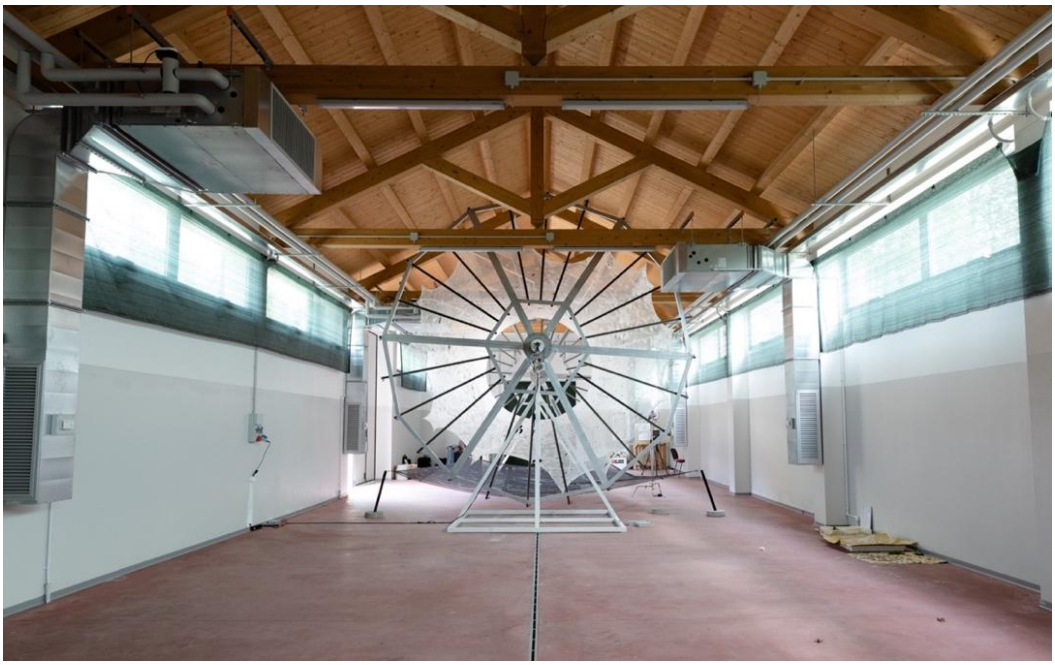

Figure 42 - Kinetic jig rotary structure and soluble knit, Neri Oxman and Mediated Matter

The centerpiece work is called Silk Pavilion II, which is a site-specific version of the Silk Pavilion, designed for the MOMA. As Oxman defines, it is “a structure done by silkworms”, which deployed the manufacturing process to silkworms together with the kinetic jig rotary structure, and she believes their role on design as “orienting”.

The design question starts with how to extract the silk without boiling cocoons as they do in the tactile industry and imagine a material at the intersection of sericulture-manufacturing and bio-digital design. By assigning 17532 silkworms, the first question pops to mind is the animal welfare. The project team starts with unfolding current sericulture methods, which is by dissolving the adhesives in order silk filaments to unroll, harming the development of the organism. In Silk pavilion, as well as the humanly potentials, the project is also though as a habitat of silkworms where they can grow, produce, mate, and fertilize. By keeping the positive attitude towards their production, their statement is rather open for critiques, as long as it helps a co-operative future.

Figure 43 - Concentrated silk deposition at point connections between knit and suspension cables, Neri Oxman and Mediated Matter

Figure 44 - Female silkmoths laying eggs within circular vessels, Neri Oxman and Mediated Matter

Figure 45 - Long exposure photograph of rotating jig enabling uniform silk deposition, Neri Oxman and Mediated Matter

As the methodology, silkworms had interacted with a horizontal kinetic structure rotating clockwise constantly in order to enable the silkworms' upward spinning. The pavilion consists of a primary structure stretched by a cable system to support the soluble mesh. The After a 10-day production process between the silkworms, robotic jig and humans collaboration results in a layer of fiber, an cohabitation environment, an awareness ton on-human World, and a new production method to observe and measure the outcomes. The density of the fiber differentiates depending on the local environmental factors such as the direction, duration and intensity of heat and light, as well as the topology of the kinetic hyperboloid.[251]

[251] "Silk Pavilion II," Silk Pavilion II, accessed August 13, 2021, https://oxman.com/projects/silk-pavilion-ii.

5.4 Totems – Melanin-Infused Columns

Figure 46 - Architectural proposal for an environmentally responsive melanin-infused structure, Neri Oxman and Mediated Matter

Considering the loss of species due to ecological crisis, Oxman and Mediated Matter group speculates the potentials of chemically synthesizing melanin and program its behavior for biodiversity. Melanin is 307-million-year-old, which can be regarded as successful if measured by survival. Defined as the "color of life", it is a "substance that defines the color of skin, hair, and eyes." It works as a barrier for ultraviolet radiation alongside of its other critical roles such as "mechanical protection, energy harvesting, cell growth, metal binding, thermal regulation, and protection from oxidative stress".[252] Mediated Matter highlights the importance of this material by comparing it to gold in the age of climate change and how it can support the human survival.

[252] "Totems," Totems, accessed August 13, 2021, https://oxman.com/projects/totems.

During the production process, the group chemically synthesizes melanin from a mushroom enzyme (tyrosinase), and a protein block, (L-tyrosine). Another material, pigment, can be extracted from many sources such as bird feathers and cuttlefish ink, and processed in steps.

After obtaining the melanin and pigment, these genes can be engineered into some species of bacteria. Via this method the obtained surface can response to environmental differences by coloration. Mediated Matter and Neri Oxman stating that they are in search of such responsive biological substances -which they name as environmental augmentation- from micro to macro scales. Totems is such a series of basic research, designating the potentials of melanin. In each sphere there is a computationally “grown” channel, filled with melanin.

Figure 47 - Liquid eumelanin (dark) infusion into computationally grown and 3d printed channels, Neri Oxman and Mediated Matter

CHAPTER 6

CONCLUSION

Throughout the thesis what is tried to be conveyed is to assert two types of world-views, idealist and materialist and their correlational architecture.

In the first part of nature and world-views the idealistic approaches tried to be collected together. Considering the meaning assigned to nature, human positioning with that symbology and emerging architecture relationships the findings goes as;

In the Ancient Era;

-Nature was idealized as a superhuman God.

-Human beings saw nature as something to be obeyed, as understood from the ritual spaces, and therefore it was in higher hierarchy,

-Architectural formalism, generally found as ritual spaces, geometric forms corelating cosmological relationships are traced and the vertical relationship as a theological symbology is witnessed in the representation of architecture.

In the Classical Era;

-During the classical era, nature was a field of curiosity implying an order to be revealed. The nature was idealized as the creation of a sublime power, which philosophers explained with various ways many of which rooted the natural sciences.

-Human was seen at the center of every measurement. According to Aristotle's empirical taxonomy's episteme, 'man' was above all other natural beings, yet nature was seen as the creation of God

-Architecture formalism during this era tried to find ideal forms, order, proportion and symmetry in corelation with the assigned ideas to nature.

In the Medieval Era;

-Nature during this era is idealized on dogma, as defined in the religious books therefor, there was not much of progress in natural sciences. Everything had been predesigned by God, and defined.

-Aristotle's concept of "Natura Scala" remained still and had been interpreted as a God-given order resulting in the depiction of a very strict social hierarchy.

-Architectural formalism during this era shaped via God-centered worldview and architecture of interior spaces emerged, and cosmologic connections in the interior area, like the use of light and dome as a vertical connection. The use of basic forms pursued.

In the Rennaisance Era;

-During this era nature had been idealized as the God's perfect At the same time nature was started to be understood rationally with mathematical rules.

-Similar to Classical era, human was at the center of everything and 'men' was seen at the higher of the chain in Valades' Great Chain of Being. The humanist tradition began.

-In architecture, mathematical rules, rational design, ideal proportions and as a method perspective was applied.

In the Enlightenment Era;

-During this era nature was idealized as a machine God has given the princibles of.

-During this era human and nature started to be seen as separate from each other, in the realms of nature and culture and humans felt superior to nature.

-In architecture, formalist Neoclassicism emerged in order to rearrange classical antiquity with the eternal principles of geometry.

In the Modern Era;

-During this era nature was idealized like a machine and understood via positive sciences. Instead of a sublime relationship, nature was started to be seen as a field of resource.

-Humans also idealized themselves, as well as defining what human is, human rights also started to be defined mutually.

-In architecture, nature become a resource and a template for abstraction. The architecture has formalism on production techniques and cultural connections.

Due to this finding, it is possible to say that nature idealizations, ontologic hierarchy and a formalist tradition are always hand and hand. Although gradually differentiate, what mutualize these approaches is their stance on the claim of a hierarchal stable condition. This is found ecologically problematic due to non-relationality with life.

In the second part of the thesis what is asserted is the understanding of new materialism as a route to a metastable condition where everything is in a heterarchal relationship which is thought as an ecological perspective.

Old materialisms;

In these types of material understandings energy was not accepted as a potential of matter, although the whole world is understood as the mechanical emergences of matter. Mind and matter separation is accepted within this type of materialisms.

-During the ancient era the matter was believed to be the emergence without a capacity waiting to be energized.

-In the modern threshold matter was understood as the mindless part of a mechanistic object. Energy and matter was separated.

False materialism is presented as the worldview that world is consisted out of thought.

New Materialisms;

New materialist puts forward a non-human agenda and instead of a mind-body seperations they claim matter is overlapped with energy. All the new materialists have consensus on the part that, every ‘matter’ has a historicity, each have their capacities and performs some alliances. There is no human supremacy, there is no difference of essence and matter, human is yet another form of matter with its own type of capacities. However, their separations emerge on the point, as they assign meaning to the self-organizational capacities of matter.

-Vitalists evaluate matter as the immanent part of a sublime power,

-Negative materialists evalueate matter as something non-correlational with thought but only ontological beings

-Performative materialists claim matter is all, which has a intrinsic capacity.

As the thesis asserts an ecological positioning towards ontology, the suceding parts of the thesis follows the idea of matter’s intrinsic capabilities of energy and self organisation.l eading an open-ended, metastable world-view.

In the third chapter of the thesis ‘new materialism and ecology’ the main purpose was to reveal some trajectories that new materialist approach is rooted and ecology’s corelations with these underpinned concepts.

Starting with ecology, ecosystem, habitat, ecological niche, and exoskeleton concepts human and architecture relationship was tried to be extracted from the cultural domain and placed into the ecological chain, just as any other species. However as a field of science concentrated on ‘living’, what is tried to be presented is the philosophical and proto-scientific background of non-living may not be a necessary separation. Although the collected theories can be called loose, given the vastness of the topic, almost an arbitrary selection of readings were presented,

considering the accumulations of references while reading the New Materialists. In the part ‘matter and environment’ the main claim was on the constructing a new epistemology towards diminishing the polarities of living-nonliving, substance and environments, and morphogenetic nature of their reciprocal relationship. In the part ‘non-organic memory’ speculative perspectives had been presented in order to reject the division of mind and body. In the part ‘non-linear causality and meaning’ the readings mainly focused on our empirical approach towards attributing meaning to events, by situating ourselves as the center of perception, but as the relationships gets complex, the emergences may not be easily followed from the perception of the human. And the ‘problem of boundaries’ sums up the problematics of these disassociations.

In the fourth chapter, performative new materialism and ecologic architecture, the introduction is made via architecture and ecology and this had been evaluated as the architecture’s potentials of creating an environmental relationship. By accepting continuum is embraced as a compass, it is questioned what kind of approach to be taken towards the rest of the ecological actors.

In the second part of the chapter the notion of ‘performative’ is questioned in its emergence, its relation with architecture historically and potantials on material. As a material discipline, architecture is evaluated as the potential application area for the performative new materialism’s application area.

In the fourth chapter ‘material ecology’ Oxman’s approach on architecture had been presented in a more detailed approach. On April 2020, an exhibition took place on MOMA by the same name. As MOMA had always been influential on architectural milieus, it also is an indicator that new materialistic thought on architecture is gaining importance. By using the exhibitions book as a template, from the viewer of the exhibition’s visitor, my aim was to nothing more than pointing the alliance of new materialistic thought with architectural positioning and it’s potentials.

So instead of trying to ‘return nature’, as a very mystical call, we can try to communicate with nature, in the ways that we had been practicing. As soon we let go of our superior attitude towards non-human, and exploit resources very ignorantly, we may look for symbiotic intersections, or research on what kind of alliances can we make, before giving a shot to life on Mars.

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