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# Modifying the universe around us: the design act as a transformative semiosis process.

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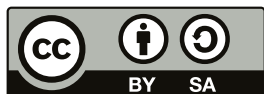
## Abstract

Underpinning the anthropocosmic conception of the philosopher Valery Nikolae-vich Sagatovsky is the understanding of being as a unitary totality in which matter, soul and spirit are on an equal footing in terms of dignity and value. In this manner, ontology, anthropology, theory of knowledge, axiology, ethics and aesthetics are harmonically unified in human activity with regard to the world and human beings themselves. This approach allows an overview of ideas about the world, human beings and the human-world relation. The aim of the research is to step into an exploratory dimension of the human-nature relation and attempt to trace innovative directions of non-conventional thinking. To look at design as a configuring act and a tool through which to modify the environment in which we live, and which in turn modifies us (in a recursive way). In order to change perspective, it is appropriate to focus on the idea of design as a generative component of language, investigating the relations between design and modification of the information that surrounds us.

The paper contributes to the definition of design disciplines as a semiotic category with a constructive function in that artefacts of use and communication enact not only meanings, but also transformations within social history, changing the world's image and perceived reality. Therefore, it is crucial to offer interpretative elements that can help researchers link studies in innovative and unconventional ways.

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**Modificar el universo que nos rodea: el acto de diseño como proceso de semiosis transformadora.**

**Resumen:**

En la concepción antropocósmica del filósofo Valery Nikolaevich Sagatovsky subyace la comprensión del ser como una totalidad unitaria en la que la materia, el alma y el espíritu están en pie de igualdad en términos de dignidad y valor. De esta manera, la ontología, la antropología, la teoría del conocimiento, la axiología, la ética y la estética se unifican armónicamente en la actividad humana con respecto al mundo y al propio ser humano. Este enfoque permite una visión general de las ideas sobre el mundo, los seres humanos y la relación humano-mundo. El objetivo de la investigación es adentrarse en una dimensión exploratoria de la relación entre el ser humano y la naturaleza, e intentar rastrear direcciones innovadoras del pensamiento no convencional. Mirar el diseño como un acto configurador y una herramienta a través de la cual modificar el entorno en el que vivimos y que a su vez nos modifica (de forma recursiva). Para cambiar de perspectiva conviene centrarse en la idea de diseño como componente generativo del lenguaje, investigando las relaciones entre diseño y modificación de la información que nos rodea.

El artículo contribuye a la definición de las disciplinas del diseño como una categoría semiótica con una función constructiva en la que los artefactos de uso y comunicación representan no solo significados, sino transformaciones dentro de la historia social, cambiando la imagen del mundo y la realidad percibida. Por tanto, es crucial ofrecer elementos interpretativos que puedan ayudar a que los investigadores vinculen los estudios de maneras innovadoras y no convencionales.

## Introduction

All objects that surround us undoubtedly have at their origin a need, old or new, that justifies their existence. This is a self-evident truth that, like the others, only explains a fraction of reality. In fact, in addition to the links between needs and things, there are also links between things and things. The appearance of things is governed by our changing attitudes towards the processes of invention, repetition and disposal. Since the universe remains recognisable between one moment and the next, each instant is almost an exact copy of the one that immediately preceded it. The changes that occur are small in relation to the whole (Kubler, 1972). Recursiveness is a property that makes it impossible to analyse a system without considering its close relationship with the whole, which affects its state in a synchronous, instantaneous, continuous manner. To consider the design system (the production of artefacts and the resulting interactions) a subsystem of nature is to apply the same recursive property to it and related systems. The use of the artefact transforms the activity for which it was designed, the transformation concerns both the reorganisation of the perceptual-motor modalities of interaction with the environment and the modalities of planning actions and social relations (Berkun, 2020).

By re-reading the history of the creation and evolution of artefacts, one can see that human activity is the fundamental object of the representation that is created. The subject of design is interaction (Mangano, 2008; Rizzo, 2000). This means that the design process is capable of altering the totality of variable systems, given their constant and continuous interaction. The act of designing implies a propagation in terms of change in the configuration of nature, independent of the will of the designer. In turn, these changes (or mutations) have consequences in time and space, generating events and phenomena that are embedded in the network of relations that is the world around us (Cimatti, 2000; Prodi, 1982). In the many historical attempts to depict the complex systems that govern the universe and the relation between humans and nature, a centred representation has always been used (figures 1, 2, and 3).

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Figure 1 *Philosophical-scientific creation of human beings, fresco in Anagni Cathedral, Italy, 1702-1104 AD.Eames*
Fuente: Eames y Eames, 2016.



Figure 2: *Miniature by Battista Agnese depicting the cosmos, with a mappa mundi in the centre surrounded by the celestial spheres and a zodiac, 16th century.*
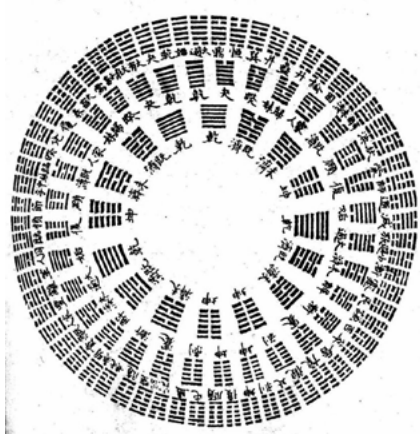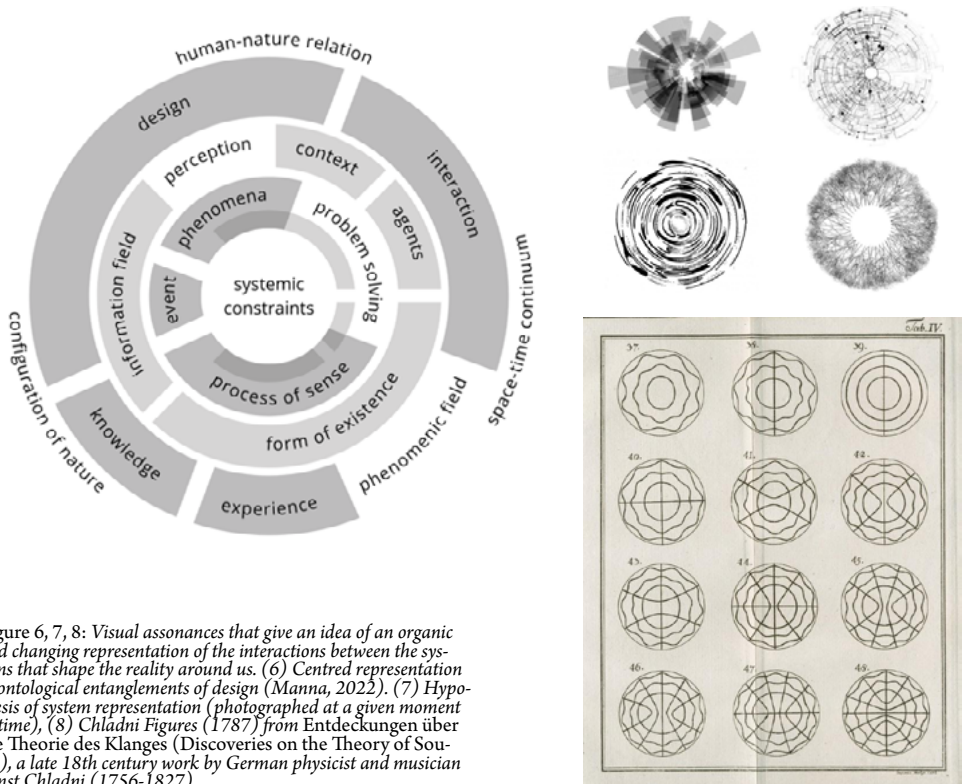


Figure 3: *The Nuclear Hexagrams. This handy chart shows the nuclear hexagrams arranged in a circle ( from Qing dynasty, 1644).*

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This is because ontological models based on the circle guarantee a representation of the space-time continuum and make it possible to visually render the infinite combinatorial mutability of nature while circumscribing it in a scheme.

The circular model allows the semantic connection of multiple levels of reading and interpretation of what exists. The relations that can be depicted make it possible to visualise combinatory mechanisms that favour the understanding and study of the world even on different planes. An example: the circle drawn by John Coltrane to synthesise his music theory (figure 4 and 5) and how this can be related to the geometric principles that drove Einstein's theory of relativity (Stephon, 2016). Different fields that find match-points in the inspiration that drives the quest for knowledge.





Figure 5: *Diagramming sentences from A Practical Grammar by Stephen Watkins Clark (1847).*

Figure 4: *The so-called "Coltrane circle" (1967) which resembles what any musician will recognise as the "Circle of Fifths," but incorporates John Coltrane's own innovations.*

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What is placed at the centre is the constant that inextricably binds the whole system and allows the total interaction of variables (figure 5). Each model used to represent the cosmos places systems in gravitation around a central element that frames the analysed universe. While the gravitating systems can rotate and interact with each other, the centre holds them together and stabilises them, giving meaning and perspective to the cosmos described. In the article published in *Inmaterial*, Vol.7/No.13, referring to the interdisciplinary ontological entanglements that can be identified in a systemic view of design, an attempt was made to trace the systemic and relational connections of the semiotic entities gravitating around the design system understood as an element of nature's configuration (Manna, 2022). A circular representation could be realised by placing 'systemic constraints' at the centre of the diagram (Ceruti, 2009). These allow the organisation of systems to be stable and to maintain coherence of meaning even while 'routing' the systems of relations (Figures 6, 7, and 8).



Figure 6, 7, 8: *Visual assonances that give an idea of an organic and changing representation of the interactions between the systems that shape the reality around us. (6) Centred representation of ontological entanglements of design (Manna, 2022). (7) Hypothesis of system representation (photographed at a given moment in time), (8) Chladni Figures (1787) from* Entdeckungen über die Theorie des Klanges (Discoveries on the Theory of Sound), *a late 18th century work by German physicist and musician Ernst Chladni (1756-1827).*

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Interestingly, all these representations present a kind of visual assonance that unites them in form despite their different fields of study. The centre represents the constraint needed to describe a cosmos and gives coherence and stability to an intricate bond of relations involving the variables of a system that can be as complex as it is changeable. To place design processes at the centre of a cosmos is to consider human activity as an act of configuring the universe itself. The designed world thus becomes an entity independent of the designer who generated it and assumes its own identity and role in terms of form and meaning in relation to what exists (Mendoza-Collazos, 2016).

After all, it is not possible to separate the observed world from the one who observes it; the designed world from the one who designs it. Human existence, therefore, is something that always exists in relation to the world, so human activity is one of the configuration variables of nature itself. To explore the cosmos of design, it is essential to go back to the meaning of design itself, looking at the root of the design process as an act of transformation (Zingale, 2020).

Artefacts of use and communication enact not only meanings, but also transformations within social history. In several respects, and particularly when seen in relation to design, semiotics could also be defined as the science of transformations, because the use of signs – of artefacts – modifies the knowledge, values and beliefs of a culture. Signs modify life (Zingale, 2016b) and life – as nature – is semiosis, hence language. In this sense, the image of the world, as we perceive it, is nothing other than the manifest image of the processes of semiosis (Sellars, 1972) and where humanity becomes nature thinking itself. This direction allows us to identify a principle of continuity in the relationship between nature and humans where human action (the act of designing) becomes an instrument of nature (language) to shape itself. We are in the field of the semiotics '*of the whole*' where sign and representation converge in perceived reality and there is no substantial difference between '*things*' and '*signs*' (Cimatti, 2000).

At this point, it is appropriate to clarify the interpretative key of the word 'design' in this paper. The intention here is not to look at design as a generic

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- and conventional - technological or engineering component of human action but, on the contrary, to emphasise the idea of design as a result of our species' ability to interpret and produce symbols. A representative conception of design, therefore, that prescinds from the object and looks at the design act as a practice of constructing the physical and social world around us. A practice of transforming the existing and information related to it (Dennett, 2017).

Design does not just mean '*project*'. The act of designing involves other acts that precede it. Design is an action driven by intention and purpose, and not merely the final act in which all this takes shape in an artefact. The focus that semiotics places on design no longer concerns only the way in which this artefact, as a cultural text, manifests itself, but also other aspects: (*i*) everything that happens to the mind when it is engaged in an action of design; (*ii*) the semiotic actions that an artefact performs once it becomes an experience of use (Zingale, 2020). The 'meaning of things' comes as much before the artefact (the design process) as after, in what it determines (in changes in social and cultural life). It is therefore necessary to look at the transformative power of design and investigate the relations that can be explored in this research.

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**From power to act: design as a process of information changes**

"The concept of power has a long history in Western philosophy and, at least since Aristotle, occupies a central place in it. Aristotle opposes - and, at the same time, binds - the power (dynamis) to the act (energy)", states Giorgio Agamben (2005, p. 280), "I am convinced that this concept has never ceased to operate in the life and history, in the thought and practice of that part of humanity, which has increased and developed its power to such an extent that it has imposed its power on the entire planet". The Aristotelian idea relates the human condition to four stages of power: possibility (I can), impossibility (I cannot), necessity (I cannot not), contingency (I can not). Power is preserved in the act and this is its direct expression. Human action, therefore, helps to configure the nature by taking into account the stages of power, through which activity is regulated (table 1).

| Set | Structured set | System | Sub-system |
|---|---|---|---|
| *possibility* (I can) *impossibility* (I cannot) *necessity* (I cannot not) *contingency* (I can not) | will (*intentionality*) | power | act |

Table 1: *The power system in relation to possibility variables*

In a structured set of 'will' – a human's ability to strive with intention and full autonomy towards the realisation of determined ends – it is evident that the four stages of power significantly affect the attainment of the act (figure 9). The close relation of the conditions of *impossibility* and contingency to the *will* (intentionality) can be deduced from the reference system. *Possibility* and *necessity* do not alter, nor prevent, the expression of a *will* in *act*. On the
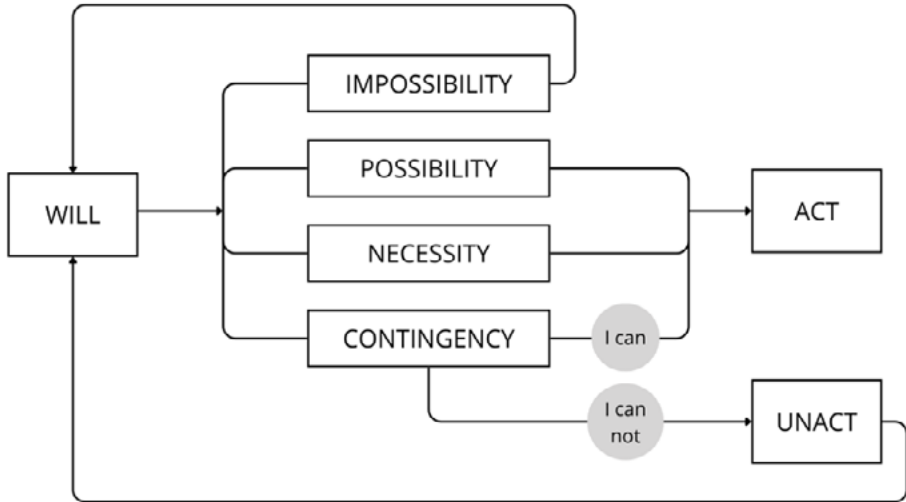
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Figure 9: *Simple diagram representing flows concerning state transitions from intentionality to act (or unact)*

contrary, in the case of *non-will, necessity* influences the relation with the *act*: 'I would not, but I need'.

*Possibility* and *necessity* do not alter or prevent the expression of an *acted will*. This means that human activity, understood as a configuring act, depends on the state of power. The act, in terms of possible actions, is subject to the conditions of *impossibility* and *contingency*. In the case of *impossibility*, there is no alternative and any expression of *will* is excluded. The state of *contingency*, on the other side, presupposes the presence of an alternative capable of altering the condition of power itself. In other words, there is a possibility of expression of *will* as well as a possibility of *non-expression*. In short, one is in a state of total power when one can and chooses not to act. The definition of a state of *contingency* of power is essential to talk about design in ethical terms, where ethics involves a behavioural fork in the road, a choice of what is thought to be right over what can be defined as wrong.

Design can be the expression of an act that is possible, necessary, but above all contingent (Jullien, 2006). It is important to clarify and specify that, in a configurational system, impossibility and contingency are determining factors as much as the configurational act itself. This means that in the system,

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the absence of the configuring act (unact) has the same value and weight as presence. Presence and absence of the configuring act are equivalent. Both are points in a process aimed at changing the form (transforming) of the existing. To clarify the systemic relationship between the plane of possibility and the plane of transformation, it may be useful to view the act as a cross-sectional component in the system's relationship (table 2) between power states (intentionality) and change processes:

| Set | Structured set | System | Sub-system |
|---|---|---|---|
| possibilities | will | power | act |
| will | power | act | input |
| power | act | input | transformation |
| act | input | transformation | process |
| input | transformation | process | output |

Table 2: *The systemic entanglement of the act in relation to reference systems linking the plane of the possible with the real world of transformations*

In a systemic relation, the act – intended as a design action on reality – can be framed differently based on the system of reference. It changes connotation contextually with the analysed plane. From this perspective, we see the emergence of "the semantic capacity of the act" to connect the sphere 'of the possible' with that of reality, where transformations take place (figure 10). In other words, the act determines the semantic materialisation of possibilities in the real world, generating inputs that can potentially trigger new transformative processes. In this manner, the state of things is modified by what happens or does not happen. The act is the point of contact between possibility and reality.

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A specific example can be given by considering the game of chess. The rule about the movement of pieces dictates that when a player touches his pieces,
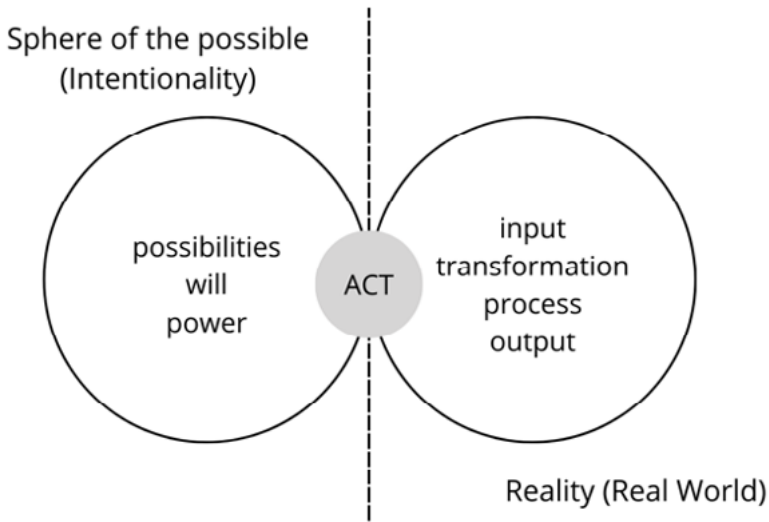


Figure 10: *The act can be seen as connecting the immaterial world of ideas and possibilities with the physical reality of transformations*

he must move the first of those touched. If the player touches the opponent's pieces, he is obliged to capture the first one that can be captured with a legal move from among the touched pieces. If it is not possible to make legal moves with the touched pieces, the player is free to make another move. The 'touch' includes the intention to make a move, to act on the touched pieces. A move is considered completed when the player leaves the piece on the target square. The mere touch of a piece can determine the course of a chess game. The touch manifests the intention, and this takes the form of a 'move' when the piece is left on the chessboard. The touch changes an intention into a concrete event.

Thought manifests itself in reality through 'touch' and when the move is made, a new order of things is configured on the chessboard. The touch and the move become input for the strategy of the opponent who, in turn, will act on the configuration by triggering new inputs through his moves. The chessboard is the real world, what happens in the minds of the players is the world

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'of the possible'. The touch is the intention that manifests itself, the design act. The moves are the events that define a new configuration of the existing, by determining a state of things different from the previous one. After a move, the information on the chessboard changed.

Design acts in reality in the same way: the designer's intentions to solve a problem appear in the real world in the form of processes and artefacts. Design arises from the will (intentionality) to satisfy a desire, a need. George Kubler (1972) distinguishes 'artistic' from 'useful' design (invention), where the former modifies human sensibilities and the latter modifies the physical and biological environment. Specifically, the design process of a 'useful' artefact will be examined. Designing is the activity behind the construction of any complex object, be it material or merely conceptual. The act of designing identifies a process that, through the appropriate use of technical standards, calculations, specifications and drawings, arrives at the definition of the procedures necessary for the production of an artefact (Capece, 2020). 'Design' is when there is an action oriented towards an end, starting from an intention and through a form (Zingale, 2017).

> A process is the complex of transformations or transfers of matter, energy and information carried out in a physical body, human/artificial mind, or system. From a systemic point of view, a 'process' is identified by any change in the system, i.e. a transformation that returns one or more outputs from one or more inputs (Figure 11).
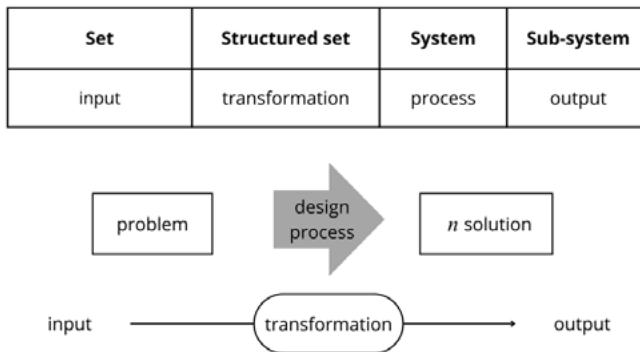
| Set | Structured set | System | Sub-system |
|---|---|---|---|
| input | transformation | process | output |



Figure 11: *Representation of the design process as a systemic transformative process from input to output*

The design process, therefore, comprises the set of making-sense processes that, ordered in a sequence of events, configure the solution to a given problem. This means that design, understood as a configuring act, implies the identification of the parameter of meaning that gives an event the reason to occur and effect a change in the system (Gaiardo et al., 2022). In this way, there are an infinite number of possible events, like the infinite number of solutions to the same problem. The difference in result is inherent in the brain (black box) of the designer, i.e. it depends on the idea of sense developed in the human (variable component with respect to space-time). It would make no sense, for example, to build a crystal hammer, unless one wanted to communicate something in artistic terms.

One could say, at this point, that in an infinite panorama of possibilities, the ordered sequence of events (consequence of a human action) generates the project, which in turn reflects a solving intention (problem-solving). It should be specified that the contours of a set of making-sense processes cannot be marked in a definite manner but, on the contrary, seems to be more of a shifting boundary line, which allows the constant passage of elements. The sense of the artefact is to be found in one of the effects that it will be able to produce. It is to be sought in its consequences, in everything that happens once it is brought into its contexts of use (La Fortuna, 2023; Zingale, 2016b).

In this manner, the design process depends on the continuous changes of the whole, on the changing continuum of the space-time system. The design act becomes like a path of transformation of sense: a semiotic path that is configured as a translating and inferential passage from a 'BEFORE' state of things to an 'AFTER' state - a transformed state - of things (Zingale, 2020; Deni, 2019). A representation such as the following can only be interpreted as a kind of photograph of the process at a given moment in time, in which possible solutions (x1, x2 … xn) are depicted in a defined time ($\Delta t$) (figure 12).

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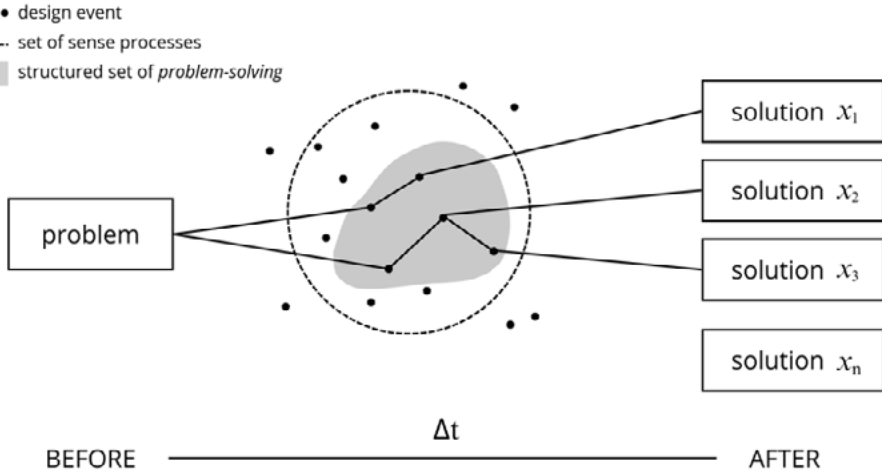
Figure 12: *Simple diagram illustrating the sequence relationship between design events and how they change reality by transforming 'before' into 'after'*

Events have an influence on the outcome of the process when they are organised in a 'sequence of making-sense' that allows the solution to the initial problem to be obtained. To describe the relationship between the design process and the modification of existing information, Dennett (2018) focuses on the concept of semantic information, clarifying that it does not refer to Shannon's concept used in cognitive science. Design activity always involves using available semantic information to improve the outlook of something by modifying its parts in an appropriate way. The definition of 'semantic information' and 'design' are linked in a circular manner where a process transforms a portion of the environment by altering its connected systems. By transposing this type of representation to the process of information transformation by nature, one obtains an (equally open) system through which one does not have a set of making-sense processes but rather the set of semantic combinations in events and phenomena (Moutat, 2023). The object of observation is the 'form of information" that changes after the design process (figure 13).
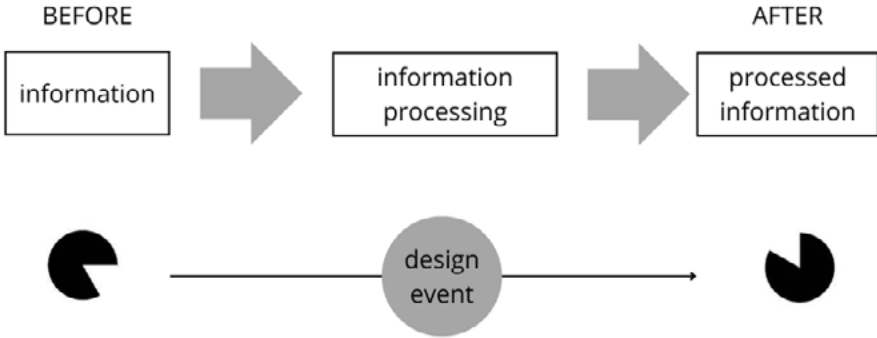
Figure 13: *Simple diagram illustrating the information transformation process through the design event*

Form is the 'cultural grid' that filters matter. What we perceive is 'semiotic substance' put into form and thus organised (Mangano, 2008). Design processes are included in this constant flow of changing information and therefore contribute to the configuration of what exists in these terms. This transposition, from the design process to the self-configuring process of nature, in terms of information, allows us to understand the view of human activity as a design component of nature. In other words, human design actions add up to natural combinatorial possibilities that allow existing information to continuously transform itself.

The reference system (the cosmos of relations between humanity and nature) presents itself as a stochastic place in constant mutation. A system with high entropy where humanity contributes through its actions to the continuous exchange of information and its evolution (Gaiardo et al., 2022; de Vinck, 2024). Here – as in all open systems – the same final state can be reached in different ways and from different initial conditions (von Bertalanffy, 1967).

At this point, it is appropriate to ask whether there is a design entropy, since the focus of the discourse on design (as a configuring act) has been in terms of informational transformation, i.e. nature's ability to transform information about itself, also using human activity. The term entropy denotes the possibility of equiprobable combinations in a given system. In an information system, the level of entropy is lowered by the communication code, which reduces the combinatorial possibilities of information. Information

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itself has a very high level of entropy in the possibilities of composition of a message. In order to understand the relationship between entropy, information, nature and design, it is worth mentioning the iconic example of Umberto Eco (1972) in the introduction of the book *Aesthetics and Information Theory*: if all the letters of the alphabet, which can be formed on a typewriter keyboard, formed a system of very high entropy, we would have a situation of maximum information. The information at source, as freedom of choice, is remarkable, but the possibility of conveying this possible information by identifying a complete message becomes difficult. The ordering function of the code intervenes here. What is achieved by introducing a code? It limits the combination possibilities between the elements in play and the number of elements that make up the group. A probability system is introduced into the source's equiprobability situation: certain combinations are possible and others less so. The information of the source decreases, the possibility of transmitting messages increases. With the superposition of the code, a source with a high entropy, as was the typewriter keyboard, reduces its options; the moment I, in possession of the code of the Italian language, start writing, the source has a lower entropy (figure 14).
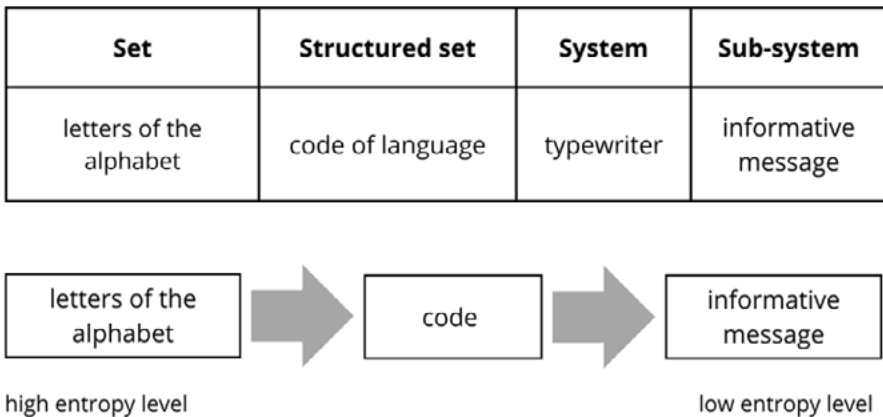
| Set | Structured set | System | Sub-system |
|---|---|---|---|
| letters of the alphabet | code of language | typewriter | informative message |

| letters of the alphabet | → | code | → | informative message |
|---|---|---|---|---|

high entropy level         low entropy level

Figure 14: *Simple diagram illustrating the information transformation process in the creation of an information message that lowers the level of semantic entropy*

Considering in systemic terms the typewriter as an instrument through which to communicate a message (to give form to information so that it can

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be understood by a receiver), one can transpose this structure to the idea of a design system and thus to the complexity of nature itself. In the case of the design system, the sense code lowers the entropic level relative to the combinations of possible processes (Kubler, 1972). The plane of relations seems to be that of design as an element capable of lowering the level of entropy of nature by using humanity as a complex organism capable of intervening in the chaotic matrix of the universe. Complex organisms, evolved and capable of forming an intent, can produce effects that are non-locally correlated with that intent. If, in addition to intent, attention also exists, then a process of coherence is created in nature that somehow reduces the randomness of things by directing them towards a precise and orderly course: all this coincides with a decrease in entropy (Teodorani, 2007).

Intentionality becomes an element of semantic categorisation between random nature and causal nature where humanity makes the difference in organising information and generating language through sense processes. And it is precisely intentionality that determines the lowering of entropy (figure 15).
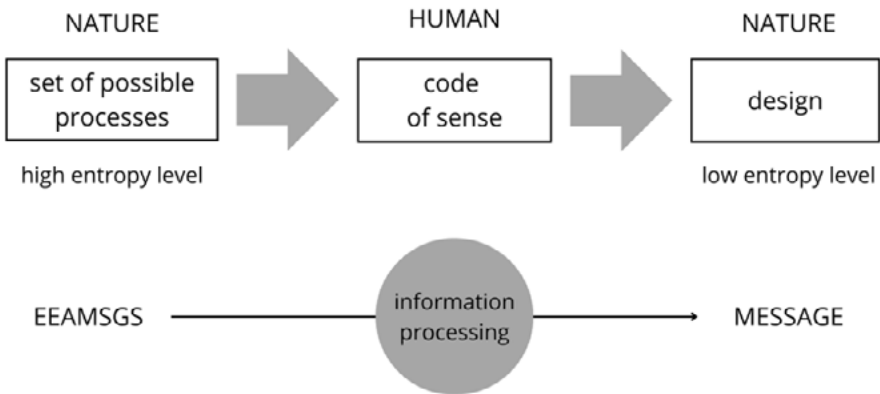


Figure 15: *Simple diagram illustrating the transformation process of information in relation to man's activity of generating meaning codes for reading and interpreting nature (reality)*

Nature, however, retains a very high level of entropy with regard to the informative change process, which is why nature is attributed the potential to signify and not to communicate. This distinction must be made: the concept

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of signification should not be confused with that of communication. When we talk about communication, we refer to the process by which someone (the sender) transmits something (the message) to someone else (the receiver). In the case of signification, on the contrary, the sender is not present, except as a kind of projection of the receiver (figure 16). It is precisely the receiver, who decides to consider a certain element of reality as a message, or more precisely a sign, a representation of the relationship between signifier and signified, which does all the communicative work of interpretation. Does this mean that nature can be perceived as a system with an entropy level which is lowered through the observer's interpretative code?
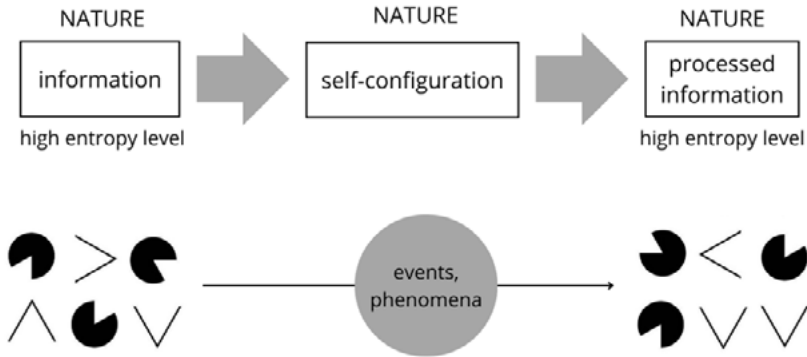


Figure 16: *Transposition of the information transformation process by considering the activity of nature in relation to itself*

Anolli and Legrenzi (2001) define communication as an observable interactive exchange between two (or more) participants, endowed with reciprocal intentionality and a certain level of awareness, capable of sharing a certain meaning on the basis of symbolic and conventional systems of signification and signalling according to the reference culture. In other words, one cannot attribute a communicative capacity to nature because no communicative intentionality can be demonstrated in it, nor is it possible to detect that 'certain level of awareness' just mentioned (figure 17).
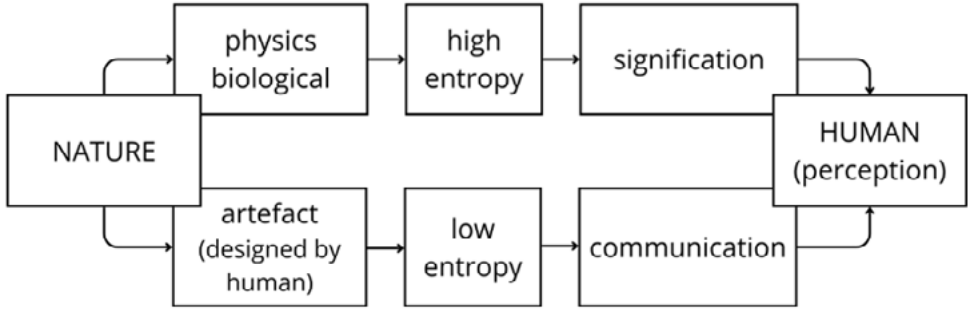
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Figure 17: *Diagram summarising the information flow of nature versus human perception*

However, this type of approach seems to be highly reductive. The interaction between two systems that results in communication is something more complex than a mere intentional interactive exchange. The receipt of a message by a receiver is subject to laws that regulate and influence the arrival of signals at the receiver.

First among these is 'perception': this process, which can take a certain amount of time but can also take place lightning-fast in a fraction of a second, is therefore not a mere passive recording of the messages that the environment sends to the sense organs, but consists of an active construction through which the sensory data is selected, analysed, and integrated with the addition of properties that cannot be directly detected but only hypothesised, deduced or anticipated, using the knowledge and intellectual capacities at my disposal (Kanizsa, 1980).

Furthermore, as specified in the closing of Anolli's definition, it is the 'reference culture' with which the possibility of communication is further restricted through common components such as experience, knowledge, and cultural background. Therefore, reducing the communication phenomenon to the sender-receiver interaction from a semiotic point of view does not allow us to analyse nature under this aspect, which would resolve itself into an infinite panorama of meanings, signs and symbols to be interpreted. Real meaning-making only takes place due to the organism's interpretative processes. Knowledge (defined as a product of semiotic learning), or rather, the constraints of semiosis, are strictly part of an extended mechanism of evolution

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(Farajova, 2021; Kull, 2022) which affects the existing on multiple levels and scales. In the cosmos of relations between humans and nature, intentionality and communication manifest themselves when the organisation of semantic information makes perception possible in terms of image (representation).

Considering the set of semantic information present in nature and represented by set (A), it manifests a sequence of sense when organised in the form given by set (B). Kanizsa's triangle represents the concept of intentionality (Figure 18).
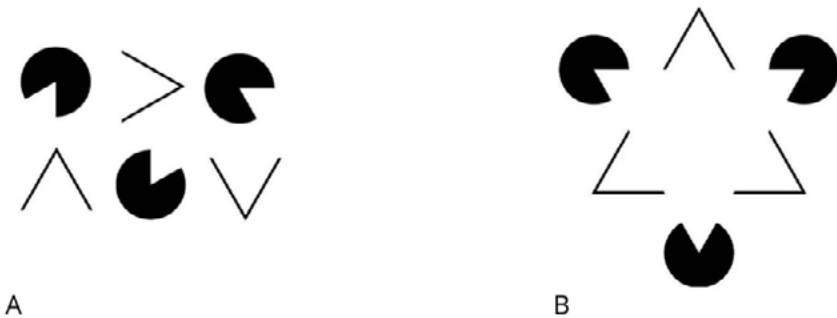


Figure 18: *Conceptual depiction of the intentionality of nature using the building blocks of the Kanizsa triangle*

The triangle does not exist in physical reality but appears to the observer as the result of a defined organisation that reveals the transfer of new information (Parovel, 2021). The relation system emerges from the informing organisation (Johnson, 2001). In the same manner, the intentionality of nature can only be perceived as the production of a signal that establishes a communicative relationship between environment and observer. In real experience, it is very difficult to limit one's continuous and often unconscious perceptual experiences to a single sensory register. When interacting with artefacts, or living in an environment, the incoming stimuli are received by the body's sensory registers simultaneously, so the individual perceptual contributions are hardly distinguishable in the overall cognitive outcome. The sensory systems have the function of jointly and actively investigating stimuli coming from outside and inside the body and making the world present to living beings, enacting the awareness of events, phenomena. Not always locatable in a specific organ, sensations can be traced back to the stimulations of the

receptor organs, which are active systems of investigation and contribute to transmitting information to the brain with synaesthetic characteristics (Calabi, 2010).

The communication process involves the transfer of information. Relations between biological organisms are based on the exchange of information, and both organic and physical matter are organised according to a structure that is first and foremost 'informational'. According to the contemporary conception that physical matter is manifest energy, it must be noted that perceptual processes are pure energy relations with the environment. For example, when a photosensitive receptor on the retina (a rod) absorbs electromagnetic radiation from outside, it gives rise to an electrical discharge to cells at a higher level of the retinal apparatus, up to the brain.

This happens for any sensory receptor. Perceptual experience identifies a system of 'cause-and-effect' relations that explains a specific internal human relation as a function of what is outside (Gregory, 1998; Iacobini, 2009). Whoever interprets a natural clue and decodes environmental information discovers a causal connection given in nature, and the mind is the eventual - and irrelevant - locus of this mirroring (Cimatti, 2000).

## Informing artefacts

According to the mathematical model proposed by Shannon and Weaver (1949), communication can be considered first and foremost as a process of transmitting information. The focus is on the passage of a signal (or message) from a source A (transmitter) via a transmitter (e.g. voice) along a channel (e.g. telephone wire) to a receiver B (receiver) via a receptor (e.g. hearing aid). Communication occurs to the extent that this transmission is possible. Information, therefore, does not consist of what has been said by the source, but of what is likely to pass from the sender to the receiver (Anolli and Legrenzi, 2001). It should be emphasised that the model described can be regarded as the classical representation of a communication system, and as such is subject to the laws of classical physics, where the transmission of a signal in an electromagnetic field depends on intensity and distance. With the discoveries of recent decades in quantum physics, and with the definition of the concept of the 'in-formative field', the idea of non-local information, capable of being transmitted instantaneously and synchronously, was introduced. The field generated by this type of information transmission no longer depends on the intensity and distance of the signal but only on the 'form'. Fields that extend into the surrounding environment, binding humans to the objects they perceive and enabling them to act on them through intentions and attention (Sheldrake, 2003).

The scientist and ex-astronaut Edgar Mitchell, albeit with style and great cultural and scientific background, goes even further by asserting that in the process of information transmission there can be a bi-univocity between perceiver and object-target, in the sense that not only does the perceiver acquire information about the object, but that the object itself also acquires information from the perceiver! This would imply the existence of a kind of symmetry in which information is able to flow in both directions, such that the perceiver becomes the object-target and the object-target becomes perceiver (Teodorani, 2007).

The idea that an information signal can be transmitted in such a manner and in an instantaneous manner reveals the possibility of the existence of an entirely new communicative plane, a dimension unknown to humans in which nature communicates with itself. This view of communication as a process of informational transmission makes it possible to re-evaluate the concept of nature as a communicative transmitter by considering the model just described as a process of mutual informational exchange (de Vinck, 2024).

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Communicative action of nature is reflected in the notion of *feedback*: it is defined as the amount of information that returns from the receiver to the sender, allowing them to modify their subsequent messages. With the introduction of the feedback concept, communication is to be conceived as an endless recurring circular process: from *A to B* and from *B to A* in a continuous spiral. Accordingly, each message simultaneously performs three distinct functions: a) firstly, it is a response from B to A; b) secondly, it is a stimulus on the part of B towards A in order to obtain a subsequent response therefrom; c) thirdly, it is a reinforcement, since it goes to reinforce (in any case, it goes to feed) the communication pattern that exists at that moment between *A* and *B* (Anolli and Legrenzi, 2001).

Consistent with the continuum condition of existence, communication is also a recursive process. If designing therefore means modifying information in nature, then this means that we also interfere with what nature 'communicates' to itself. In other words, nature responds to human activity by returning communicative feedback generated by the interaction of the two systems. For example: in the specific case of a storage device for computer data (hard disk), although a luminous LED has been designed to inform (through its intermittence) the user of the device's activity and operation, it is actually the subtle electronic noise it produces during its use that provides reassuring confirmation of its correct state of operation. Anyone who used a hard disk (or a floppy disk) in the 1990s knows the substantial difference between the artificial signal of the indicator light and the natural signal of the noise produced during its use. After an initial cognitive experience with that natural feedback, the user relies on it as soon as the computer does not work and the illuminated LED does not flash. The same applies to the buzzing of the telephone.

Interestingly, all these sounds are natural: they have not been added by a designer or an engineer, they are natural side effects of physical equipment. It is precisely this naturalness that makes them so effective: from the noise and its slightest variations we are able to tell not only whether something is working, but also what it is doing, and whether that sound is normal or indicates a particular problem. Feedback gives us clues as to what is happening, clues as to what we should be doing. Without feedback, even simple things become difficult. Feedback is important to: reassure, provide progress and time estimates, learn, for special occasions, to confirm, manage expectations (Norman, 2007). Feedback represents the clue provided by nature that enables humans to establish a semiotic - causal - relation with the environment and the human becomes an instrument of mediation and translation of the manifest image of the world (Fossali, 2023).

Therefore, two stages of interaction with nature can be identified with regard to the reception of information signals: the first is that of '*signification*', through which a human interprets signals in an initial cognitive-perceptual experience. The second stage consists of actual '*communication*' with nature, through which a human, having understood the meaning of the perceived signals, automatically and consciously decodes their informative message, where understanding the meaning of the message means responding in a given way to a given stimulus (Céspedes and Fuentes, 2022; Eco, 1972; Moutat, 2023). Natural feedback makes reality an interactive interface, a changing image that is a continuous source of knowledge. It is precisely knowledge that delineates the boundary between the two stages of communicative interaction as it is a variable component of the receiver. In this sense, the receiver (human) complicates the information transmission operation because in the action of decoding the message, the human draws meaning from their own cognitive background that provides the tools (the code) necessary to receive and interpret the signal (Kõvamees, 2024; Zingale, 2017). The code is fundamental to the transmission of information because it allows the message to be understood and fills it with meaning. Therefore, the message, as a signifying form, is a container of meaning and can be considered an entropic source. Information also possesses, as has been said, a high level of entropy in the possibilities of message composition.

In conclusion, the source is entropic with respect to the code that limits it, but the code is entropic with respect to the message that limits it (Céspedes and Fuentes, 2022; Eco, 1972). In fact, the mathematical model of communication, despite providing very precise concepts, ignores the processes connected to the development and interpretation of meanings within a complex relational and social relationship that is instead the subject of in-depth study at the level of semiotics. Semiotics (from the Greek word σημεῖον semeion, meaning sign) is the discipline that studies signs and the way they form sense (signification). Each time a signifying relation is enacted or used, a communication process is activated but, as we have seen, the signification is subject to the interpretation of the receiver. The perceived message - and thus the information - is inevitably determined by the receiver.

It is worth emphasising three aspects about the message - understood as a source from which to generate possible meanings implemented at the level of the form of the content - studied by semiotics and over which the mathematical model does not take hold:

A) the message changes or enriches its meanings depending on the circumstance. These meanings are not only the immediate denotation of

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the message, but also the range of its connotations that various subcodes assigned to a given signifier or sequence of signifiers, plus various 'paralinguistic' elements - e.g. the intonation of the voice - (from this we deduce that there is no global semantic field or system).

**B**) the context inflects the possible interpretations, complicating the possibilities of choice [there is no complete theory of all possible contexts].

**c**) messages are deliberately ambiguous, to such an extent that they cannot be disambiguated without losing their meaning.

On the other hand, the entropic aspect of nature reflects a continuum that cannot be fully understood by the human mind. The brain cannot contain the infinity of information that nature provides in space-time, which is why humans need to limit incoming messages to avoid cognitive overload (information overload).

Experience varies along an unlimited and continuous continuum, in an unceasing manner, but the human mind is incapable of governing such an indistinct and constant flow. It is essential for the human being to segment this continuum into a finite number of discrete and mutually separated units. This segmentation process leads to the categorisation of reality, placing the various objects, situations and events in a more or less orderly manner into the appropriate categories. In this way, our mind is able to move and manage the amount of knowledge that reality makes available to us. This process of segmentation is a conventional and culturally defined operation, as it varies from person to person depending on the climatic and geographical conditions of the country, current customs and traditions, practices and reference values (Konderak, 2021; Anolli and Legrenzi, 2001). In other words, the state of nature defines the perceptual experience, which affects the learning, knowledge (and thus culture) of an individual, and knowledge, in turn, is an incisive component of the informative interaction with nature (Figure 19).
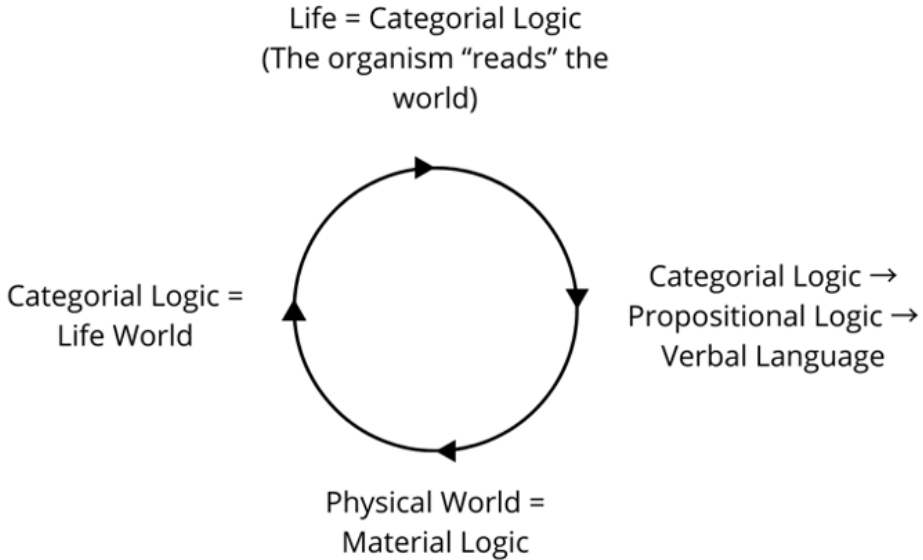
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Life = Categorial Logic
(The organism "reads" the
world)

Categorial Logic =
Life World

Categorial Logic →
Propositional Logic →
Verbal Language

Physical World =
Material Logic

Figure 19: *The natural world as a whole of relation,* Cimatti (2018).

It would seem impossible at this point to focus on the crux of the matter, namely the fact that nature 'communicates' with humans by conveying messages of meaning, since meaning is attributed by the human themselves. The fundamental fact is that perception, experience, informative interaction with something or someone generates knowledge through the phenomenon of learning (Kress, 2019). We divide objects into categories because this is necessary for learning (Bloom, 2004) and our brain receives 400 billion bits per second of information, but we are only aware of 2000 bits per second. Reality unfolds in our brain at every moment, and we receive it but it is not assimilated (Teodorani, 2007).

Only a part of the information that reaches the brain manages to be processed and assimilated, as if among the infinite amount of information in the environment (in nature) the human decides (based on their own history) to perceive a part of it that is useful for increasing their personal cognitive background. Knowledge allows one to cognitively orient oneself in space and to organise its meanings. In this sense, nature communicates with the human by instructing them how to act within it and how to interpret messages in order to understand their meanings (Cimatti, 2000).

The concepts of inference and insight can clarify this meaningful view of learning. In semiotics, a sign is understood as an inference when it constitutes a clue from which meaning can be derived. For example, a perished plant informs us about its

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state through its image - it probably needs water, or it was watered during the day while exposed to the sun. The sign as a clue involves mental models which, on the basis of patterns drawn from logic or experience, enable us to identify missing or deficient aspects and grasp the meaning of statements. Consequently, the concept of sign as inference makes it possible to explain the variability and plasticity in the use of signs. Learning involves an influence by instinct, where instincts represent knowledge about the world handed down from one generation to the next through genes (Darley, Glucksberg, Kinchla, 1991).

The instinctive part of a human - the more natural part - influences cognitive processes, as if there were latent communication between nature and itself located in the instinctive part of the human, in that part that, as Teodorani (2007) states, becomes in tune with an information field and guides its behaviour (Champagne, 2023).

In this sense, insight identifies a form of learning and problem-solving – traceable to the idea of information transfer – that depends on complex cognitive capacities. The animal, through its experience with the context (see Wolfgang Köhler's 1925 experiment on learning by insight in chimpanzees), configures a kind of cognitive representation, through which it prepares the ground for subsequent sudden insights. Köhler emphasised that insight is not the result of a blind process of trial and error, but an intuitive 'flash' that occurs suddenly and irreversibly through which the animal reaches the solution to a problem.

Studies by Edward C. Tolman and his collaborators on latent learning demonstrate the ability of an animal to configure a cognitive map when it receives reinforcement from the environment, from nature. The map indicates a degree of knowledge that guides the animal in its actions. In the specific case of human-nature interaction, reinforcement is provided by feedback (Molinaro et al., 2024). Considering design as a process of information modification in nature means defining the image of perceived reality as an interactive, changing interface, of which the human is part and constantly influences its information configuration, messages, codes and knowledge. A set of morphic-informative fields, which resonate synchronously and to which matter is tuned and organised through the exchange of local and non-local information (Teodorani, 2006).

In this way, the manifest image of the reality (or designed world) is understood in the broadest sense, where even the mere presence of human activity alters the informational state of nature. For example, if we consider an external observer in relation to a public place (e.g. a street), the mere presence or absence of human activity in

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the place will generate different signals and information (feedback is different). A place populated with people will give different signals than the same empty place. Consequently, human activity is an expression of the phenomenal self-configuration of the state of nature, as the same information transformed by the human project returns to human (retroactively) in the form of a natural event or phenomenon. The perception is different and the experience changes accordingly.

Experience changes because the relation between object, manifest image and observer (interpreter) is different. Two experiences take place: the one inside the observer and the one outside where the observer is in turn observed by others (Kõvamees, 2024).

Can the manifest image of designed (re-organised) nature, as perceived, be considered a communicative artefact? If the nature system - as mentioned - includes the human system, then the interaction between nature and human beings resolves itself into an interaction between nature and itself. The substantial difference between the two interactions lies in the power of humans to alter the natural information landscape and make it an artefact.

While nature communicates with itself instantaneously and non-locally (Teodorani, 2007), humans communicate with nature through their actions in space-time. The design action becomes part of the informational process through which humans participate in the semiotic design of the world. In this direction, there is a semiotic circularity in which causal relations are also informative relations (Manna, 2021) where the organisation into formal classes defines the language of things (Figure 20).
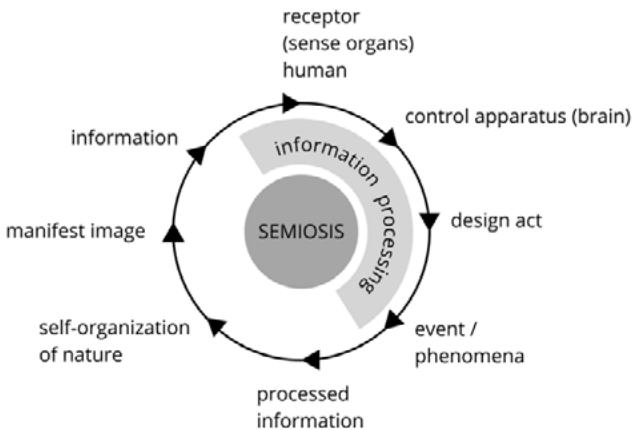


Figure 20: *The design act in semiotic recursive circularity*

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The circular representation is necessary to indicate the recursive and retroactive nature of information processes in the nature system. Human beings, in the continuum, can make choices that influence and diversify the retroactive self-configuration of nature itself. A retroactive system, in fact, comprises a receptor (the sense organs), the message (the information), a control apparatus (the brain) that recombines incoming messages and transmits them to an effector (the design action) that responds to incoming stimuli. Finally, the functioning of the effector itself is retro-controlled on the receptor, which makes the system (nature) capable of self-regulation, i.e. guaranteeing stability or direction of action (figure 21).
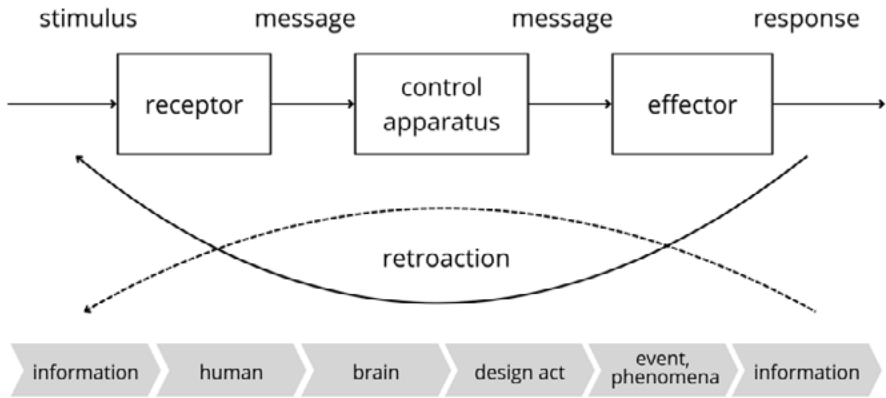


Figure 21: *Information processing based on a simple model of retroaction. Note.* von Bertalanffy (1969).

In light of the things described, it is possible to re-interpret the concept of the cognitive artefact, considering it an informing artefact. Design, as the result of an intention, presents itself in nature as a source of information, through which the designer's intentions and all that information that reveals its nature can be read (Manna, 2021). Can it be said that any artefact is a communicative artefact? Considering the transfer of information that takes place from the designer to the project, and from the project to the user (be it even simply a perceptive user), it is possible to propose the hypothesis that communication takes place, albeit at an implicit level (Sbisà, 2007), between the artefact and the perceiver at the phenomenal level (Norman, 2007). In truth, the notion of the communicative artefact first appeared in the history of thought (Anceschi, 1988) and only relatively recently did cognitivists coin the term 'cognitive artefact' (Fasoli, 2019).

The 'cognitive' artefact implies a cognitive learning process through the acquisition of information emitted by organised matter; therefore the causal relation is between

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observer and object. On the other hand, the 'communicative' artefact implies the intentional transmission of organised information in the form of a designed 'message'. In this case, the causal relation is resolved between designer and user (the artefact is the medium of communication). The notion of an 'informing' artefact aims to focus on the ability of objects to transfer information independently of the designer's intentions. A thin line of difference that semantically connects artefacts to the natural world by bringing matter back to a high level of entropy and significance. The plane of causal relations is that of matter with the surrounding cosmos, where the information transferred does not depend on the intentions of the designer but only on the form (organised matter) in relation to its environment.

It is important to emphasise the possibility of an artefact to significantly alter the image of reality through the triggering of events and phenomena even on different planes. The 'history of things' is intended to bring together ideas and things under the heading of 'visual forms', encompassing all materials worked by the human hand under the guidance of related ideas and developed in a temporal sequence. From all these things a form of time emerges, a visible portrait of collective identity is outlined (Kubler, 1972). The form of time, the manifest image of reality and the way matter self-organises are all aspects of nature determined by the way information is processed and reiterated. Design activity and the resulting artefacts are part of this flow. Humanity is involved in designing the world and influences it through its activity but, at the same time, is influenced by the world's image it observes and the information it encodes. In this cosmos of relations, design disciplines generate informing artefacts: objects that contribute interpretative substance to the worlds that we build (Corà, Fazio, Collura, 2023; Goodman, 1978; Penati, 2013; Petroni, 2016).

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## Conclusions

Writing about design in semiosis terms means, first of all, reflecting on what might be a nodal point related to the contemporary design process. Approaching a discourse with an ontological matrix generates a concatenating sequence of questions that turn out to be the point of arrival and departure for a new vision of the relation between human and artefact. It is in this place of branching possibilities that we want to focus attention, to converge reflections in order to give rise to new possible interpretations of thought. It is essential to consider nature as a cosmos of relations for which the designer is responsible and plays a decisive role. A changing continuum that constantly modifies itself. The designer is not simply a specialised person but, on the contrary, a complex figure who operates in reality by shaping matter, transforming thought into design and design into action. The designer is first and foremost a 'designer of intents'. Design coincides with a complex paradigm in which different disciplines meet and mix, and design itself frames a discipline of multi-directional configuration (Anceschi, 2003). Although on different planes, the human designs symbols. It is appropriate to consider, on a theoretical level, design as a multidisciplinary whole of the 'visual', because what is seen becomes the subject of what we design. Thus, human beings represent that interpreting part of nature which, through design action, processes existing information into artefacts. These artefacts are 'informing' in the sense that they actively participate in 'putting-into-form' the manifest image of reality.

In this sense, the focus of the dissertation is therefore not the artefact as a product of design but the design action as a variable of form.

We can therefore transpose the semiotic triangle (figure 22) as a system of relations between the elements: nature (object $O$); manifest image (sign $S$); human (interpretant $I$) where: $R_{OSI} = [O; S; I]$.
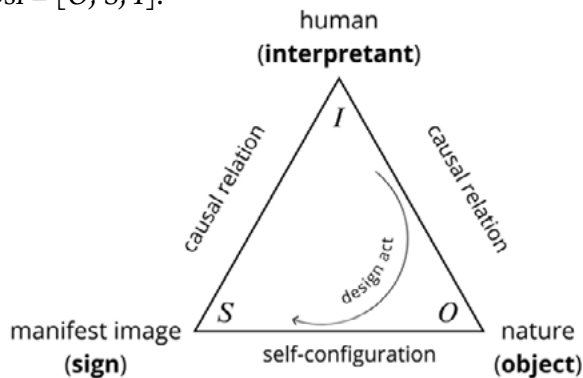


Figure 22: *Applying the semiotic triangle*

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This model opens up a spectrum of interpretative possibilities that can be applied to different planes, which in turn determine different formal classes and form field (Manna, 2021). In any case, the model indicated defines a finite, closed, non-permeable system of relations. What happens when external agents interact with the relation triad?

In light of the above, it is appropriate to open up an interpretative path that can connect the semiotic relation model to the complex human-nature system.

The idea that human beings are part of a cosmos that also transfers responsibility for its image into the actions of humanity is the assumption on which the entire dissertation is based. It is therefore necessary to imagine the semiotic triad as part of a much more complex network in which the vertices may coincide with the vertices of other systems, external to the one considered, but somehow bound to it by means of the possible relations (Kōvamees, 2024). (figure 23)
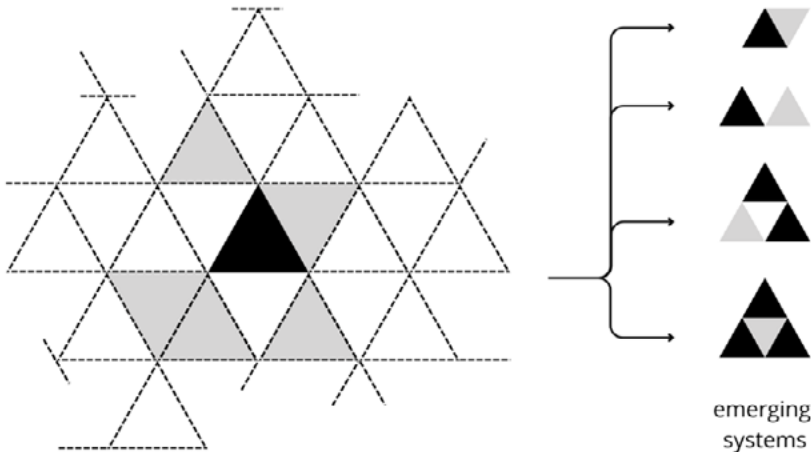


Figure 23: *Conceptual illustration of the semiotic triangle as an emergent system of semiosis relations*

Only in this way is it possible to describe the design act as a component of the modification of reality, where the artefact (the object produced) becomes a kind of resonance of the design intention. This representation hypothesis makes it possible to explore new systems of relations and new ways of studying design processes, where the mechanisms of systems emergence act on different planes of reality and can be scaled and reiterated (figure 24, on the left). In this direction of thought, the complex system could be represented with a sphere, where within it is a core of systemic constraints (figure 24, on the right side). The vertices of the mesh are the information

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determining the relations (sub-systems). Changing one value of the information - a vertex of the triad - would mean altering all connected relations and thus the entire system, in a chain reiterative mode. A kind of transformative propagation leading to a new state of things. A denser mesh means going deeper into the study of system relations.
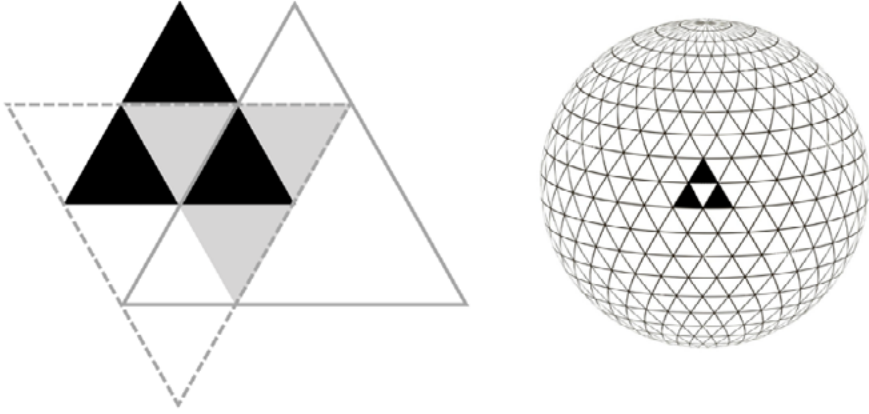
Figure 24: *Conceptual illustration of the semiotic triangle as a scalable self-modifying system*

Continuing to investigate the ontologies of design and asking questions about design as a tool for innovation is the goal. Can we talk about design in terms of right or wrong? What relations are established between human beings and the artefact? What events and phenomena are propagated by design over time, changing '*action*' into '*transformation*'? (Jullien, 2005).

The studies of semiotics, as a *sui generis* discipline, can articulate philosophy and science from a specific perspective, one whereby a semiotic critique of thought can be considered with a critical thinking of mediations. Recent technological developments, linked to the use of AI and quantum computers, may enable the design of complex models and systems of investigation capable of peering into the cosmos of semiosis relations of the world around us. This is certainly an unexplored research method with interesting multidisciplinary application possibilities.

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