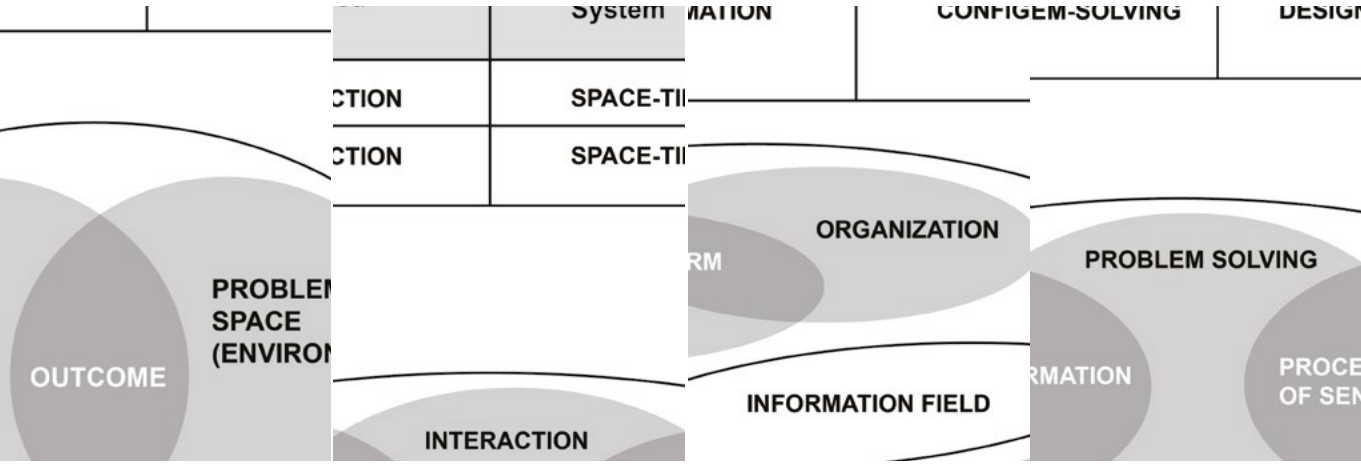
A Systemic View of Design. Heuristic Dissertation on Ontological Cross-disciplinary Entanglements

Tiziano Manna
La Scuola Open Source – Solidarity ecosystem for social, cultural and technological research and imagination, Bari, Italy



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Abstract

Currently, design activity is categorized based on the output of the process. This means that the final product delineates one boundary of "expertise" from another. It is important to consider, on a theoretical level, design as a multidisciplinary set of the visual, where it is true that there is a categorization and diversification of disciplinary areas, but it is equally true that in essence the end result of this process is something that has its own phenomenal identity.

The way in which humans modify the world and change nature, shaping substance, can take on the highest possible meanings. The result of the design process is now a building, now a car, now a chair, now a poster. Although on different levels, the designer designs symbols. The designer is not simply a specialized person but, to the contrary, a complex figure who operates in reality by shaping substance, transforming thought into a project and the project into an act. The designer is first of all a designer of intentions.

Can the reality of existing be considered a complex system in which natural and artificial merge into a constantly changing, interactive, self-configuring phenomenological world? What entanglements link design discipline to the image of the existing?

Keywords
design philosophy, design theory, non-academic approach, heuristic research, entanglement

Resumen

Actualmente, la actividad de diseño se clasifica en función del resultado del proceso. Esto significa que el producto final delinea un límite de "experiencia" de otro. Es importante considerar, a nivel teórico, el diseño como un conjunto multidisciplinario de lo visual, donde es cierto que existe una categorización y diversificación de áreas disciplinarias, pero es igualmente cierto que en esencia el resultado final de este proceso es algo que tiene su propia identidad fenoménica.

La manera en que los humanos modifican el mundo y cambian la naturaleza, dando forma a la sustancia, puede asumir los significados más altos posibles. El resultado del proceso de diseño es ahora un edificio, ahora un coche, ahora una silla, ahora un cartel. Aunque, a diferentes niveles, el diseñador diseña símbolos. El diseñador no es simplemente una persona especializada sino, por el contrario, una figura compleja que opera en la realidad dando forma a la sustancia, transformando el pensamiento en proyecto y el proyecto en acto. El diseñador es ante todo un diseñador de intenciones.

¿Se puede considerar la realidad del existir como un sistema complejo en el que lo natural y lo artificial se fusionan en un mundo fenomenológico en constante cambio, interactivo y autoconfigurado? ¿Qué enredos vinculan la disciplina del diseño con la imagen de lo existente?

Palabras clave
filosofía de diseño, teoría del diseño, enfoque no académico, investigación heurística, lio-enredo

Humans are designers of their contexts. The designer shapes the substance, giving it new properties of use (De Fusco, 2012; Flusser, 2003). The idea of project has always belonged to humans and it would be limiting to undertake a dissertation on the cross-disciplinary nature of design by restricting the space of the problem only to the academic idea of design. The area of discussion is much broader and includes the totality of processes triggered by design, both direct and indirect (Papanek, 1971; Potter, 2002). Newell and Simon (1972) argue that by resorting to heuristic strategies, time would be saved in reaching solutions related to what they term "problem space". This space is defined by all the possible solutions of which the person who must solve a problem is aware. In applying a heuristic strategy, one must first consider a good portion of the problem space, and then, using the relevant information obtained about the problem, narrow the search area until it becomes more manageable. The search for the *problem space* is the dissertation. So tracing a pattern of the existing related to the field of design can only proceed along a heuristic way where the research itself becomes an instrument of knowledge (Quici, 2004). It is knowledge not construed as a process of mirroring reality but an experience of symbolization (Cassirer, 1961).

The look and the analysis want to be consistent with a scientific and philosophical approach, remaining within a specific framework that investigates, in terms of "soft ontology", the systems that model groups of Agents and their relationships (Bürdek, 1971; Dorfles, 1968). It is important to analyse the design process (and therefore the system) in its components and to consider the designer as the author of an artificial world that continuously expresses its essence (alive, pulsating) in autochthonous events and phenomena (Maldonado, 1970; Manna, 2021). Recursiveness in linguistics is the phenomenon whereby a linguistic rule is applied to its result. In other words, it is a highly productive sense process that could continue infinitely. In algebra, a recursive algorithm identifies a backward process where the result of an equation is reinserted as a variable in the equation itself. This process exponentially amplifies the effect of that value. To consider nature a complex chaotic system is to conceive of the constituent events and phenomena as the variables in a recursive equation (Capra and Luisi 2014; Jakobson, 1961). Design discipline, conceived as a generator of events and phenomena, would therefore fall into the set of variables suited to the configuration of the image of nature. Design process is, in this sense, a chaotic act; we don't know where it leads but it must allow us to know where it should not lead. Design requires the simultaneous management of different levels of reality (Maldonado, 1970; Bürdek, 1971), a reality that configures itself in an autonomous way, using humans as humans use technology. The idea of having control over nature, as if it were external to humans, has become a remote, ridiculous,

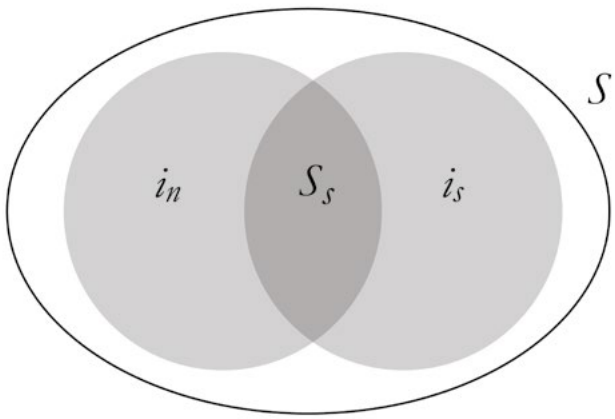
colonial vision (Dorfles, 1968). Nature, configured into landscape, is the result of infinite, messy, discontinuous, chaotic variables. To fully learn the sense of recursive nature, architect Anne Whiston Spiron's idea of human use of technology is interesting: landscape binds people to a place and includes both the shaping of the landscape by people and the shaping of people by the landscape. Landscape is not simply scenery: it is both the natural, or what is given, and the part built by humanity (on a human scale). It includes buildings as well as trees, rocks, mountains, lakes, and seas. Technology becomes a tool for shaping the landscape (Hughes, 2004). If technology is able to profoundly condition human life, in time and space, can a hypothesis that sees humans as able to profoundly alter and modify nature in terms of phenomena and events be ventured? Can recursion, then, be considered a formal property, a living force, a creative component that gives the existing a self-configuring ability?

Edgar Degas paintings can help us to match the relationship between human activity and nature in terms of a self-configured image of reality. The gestures depicted in the paintings of Degas, and the situations they portray, are photographs of a moment, an instant. The image is impressed on the canvas like a frame taken from a film. Degas has the ability to highlight the relationship between time and space by depicting scenes where humans and artifacts bend to each other. In the painting *L'absinthe*, the human element, the facial expression, the environment and the very title of the work are coordinated by the presence of the glasses and the empty bottle on the table. The result is an exceptional image aimed at portraying the saddest, most problematic aspects of the *Belle Epoque*. The artifact confers meaning to the scene depicted and Degas organizes the elements by defining a system of relationships that denounces a primarily social aspect (Argan, 1970). Similarly, in nature elements are continuously organized in a flow of images that reveals reality as it is perceived.

The relationships between objects define a system and the recursive property is fundamental to attempting to define the system of nature. When we talk about nature we enter into an interpretive sphere that does not allow for one single definition; rather, the word itself is imbued with concepts. Generally the most common meaning of the word is as follows: nature is the universe considered in its form, in the totality of phenomena and forces that are manifested in it, from the phenomena of the physical world to those of life in general. The word derives from Latin "Natura" and literally means "that which is about to be born": in turn it derives from the Latin translation of the Greek word "Physis" (φύσις). The idea of nature as a *whole* that also encompasses the physical universe is one of the many extensions of the original concept. The best definition of nature, according to Aris-

totle, is the following: "The substance of things that have the principle of motion in themselves" (Abbagnano, 1971). All meanings of the word can be traced back to this definition. In this sense, nature is not only cause, but final cause, it is at the same time cause and effect. Identifying nature with the whole and attributing to it the synchronic property of events allows us to recognize its unity and its continuity. The levels of description may be different and therefore distinct, but not separable. The space-time continuum can be described on different levels, divided into conceptual categories, analysed in different contexts, but in its essence will always be indivisible. These assumptions enable the identification of a system according to the general theory of systems, detecting the relationships between the elements that are part of a whole. A system [S] identifies the relationships between elements that are part of a set. If we consider a structured set [is] that defines a *problem space*, thus identifying contexts of action and morphic fields (ranging from macroscopic to microscopic, from concrete to abstract, from material to psychic, from political to social, etc.) in which there interact elements that are also organized in sets [in], we can define the sub-system [Ss] as the *outcome* (the resultant) of the interactions of the constituent parts, which has itself as its objective. This interaction delineates the general concept of system (Fig. 1).

Set	Structured Set	System	Sub-System
i_n	i_s	S	S_s

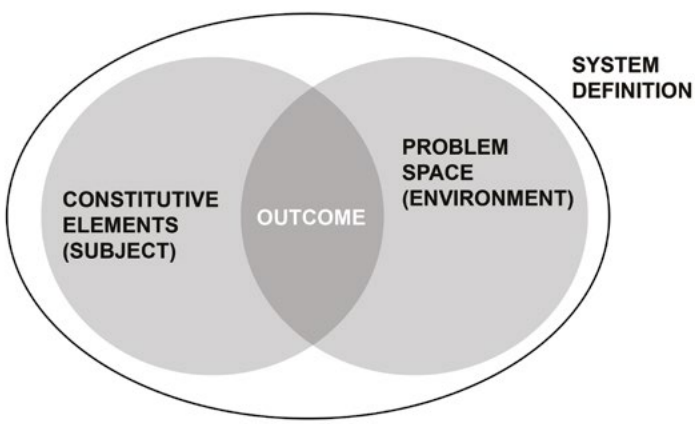


$$S_s = i_n \cap i_s$$

Nature is a living organism and every living organism is in essence an open system. It maintains itself in a continuous state of inward and outward flow, of construction by means of its components and of disintegration of this construction, without ever finding itself, for all the time in which it lives, in a state of chemical and thermodynamic equilibrium, but keeping itself in a so-called stationary state quite distinct from a state of equilibrium (Bertalanffy, 1969). Nature, configured in landscape, is the result of infinite variables, disordered, discontinuous, chaotic, organized in systems. Every natural system, in accordance with systemic theory, is considered a totality. The specific structures of each system, derive from the interactions and interdependence of their parts, and they are destroyed, or at least deeply altered, at the decomposition of the system into isolated components. It is an open system that is the result of the interaction of all existing systems that condition each other organically. A living organism or a social body is not an aggregation of elementary parts or elementary processes; it is an integrated hierarchy of autonomous subsets, consisting in turn of sub-sub-sets, and so on. Thus the functional units at each level of the hierarchy are two-sided, so to speak: they act as a totality when turned downward, and as parts when turned upward (Koestler, 1964). This conceptual model, according to which an interactive system can be placed in larger systems, enables us to consider and include those relationships - important or interesting – that are useful to analyse the contextual boundaries of the problem. These relationships, which in nature vary in time and space, contributing to the emergence and spread of phenomena and events that can be defined as "natural", can be considered system variables. They reside in social, cultural, sub-cultural, political, climatic, religious, anthropological, economic, territorial, technological and scientific spheres. Consistent with the concept of a continuum, many of these are closely related to each other, almost to the point of coinciding, mixing and blending. The social variable, for example, includes the political one, and both are incorporated into the anthropological one. This is to underline that an attempted subdivision of factors of variation in the nature system would reveal itself as a mere philosophical exercise. It is interesting to consider the relationship between the action of humans and the configuration of nature. In their action, the activity of humans is a generator of variables. But in their presence, they can be considered a *constant*. The interaction of the two systems results in a relationship primarily of dependency and problem-solving, where there is problem-solving action arising from a need or desire to be satisfied (Bloom, 2004). The two systems meet in the act, that is, in the impossibility of humans to not interact with the environment that surrounds them, and by doing so, modifying it.

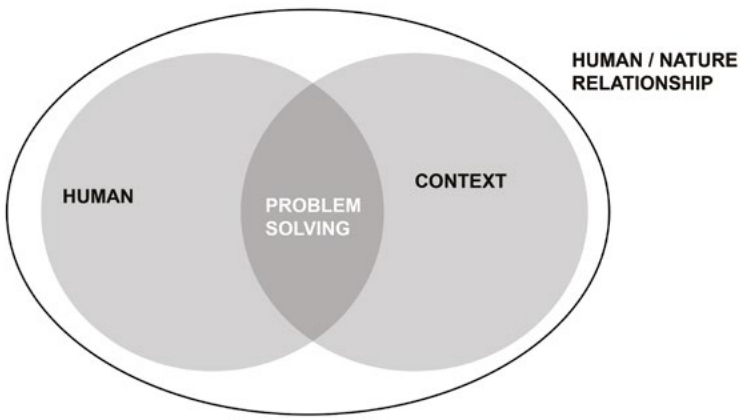
It is possible to focus and narrow the field of action of this type of relationship: the space of the problem - in this case - is represented by a field of forces (of action) that is generated between humans and the nature that includes them, in terms of context and environment. According to A. D. Hall and R. E. Fagen (1956), the environment of a given system consists of the set of all objects that are such that a change in their attributes (the properties of the objects) affects the system and also of those objects whose attributes are changed by the behaviour of the system. A set of elements (objects) defines the interaction system while the problem space is determined by a structured set (environment) which is also a sub-system. It should be noted that the relationships between objects can in turn generate infinite sub-systems. It is clear from the definition of system and environment that any given system can be further subdivided into subsystems, and objects belonging to one subsystem may well be considered to be part of the environment of another subsystem. By applying the General Theory of Systems, it is possible to trace a simple scheme of reference useful to describe the design in a systemic way, as the action of designing identifies an interaction between subject and environment (Fig. 2):

Set	Structured Set	System	Sub-System
CONSTITUTIVE ELEMENTS (SUBJECT)	PROBLEM SPACE (ENVIRONMENT)	SYSTEM DEFINITION	OUTCOME



From this, it is possible to derive that there are two elements of a single relationship inherent in the relationship between nature and human where environment and subject of perception are interconnected: it is precisely from this relationship that the different affordances arise, that is, the various practical possibilities of understanding, use and exploitation of the environment and artifacts by each organism (Calabi, 2010). It is a constant relation in which tensions that can generate force fields interact (Patella, 2005). In physics, a force field is a tensor field, such as an electromagnetic field or gravitational field. In the design system, it is necessary to imagine force fields as "places" where humans interact with their environment, transforming the context in which they operate recursively by problem-solving activities. (Fig. 3).

Set	Structured Set	System	Sub-System
HUMAN	CONTEXT	HUMAN / NATURE RELATIONSHIP	PROBLEM SOLVING



This model can be applied to the infinity of processes and sub-systems that can be obtained from the in-depth analysis of interactions. The discourse becomes more interesting if we consider the behaviour and the interaction modalities of humans as a configuring variable of the system. Defining the relationship between humans and nature in systemic terms is useful for understanding the fact that the context - *problem space* - in addition to generating and being a field of forces, is also a morphic entity identifiable with the idea of a field of form (or morphic field) in which configuring agents interact. Biologist Rupert Sheldrake (2003) has developed over

time a very interesting theory of learning and memory based on the concepts of morphic fields and morphogenetic resonance which he describes as something in and around each organism. Memory processes are due to morphic resonance. Information is transmitted through a field operating in and around a given morphic unit, which organizes its characteristic structure and mode of action (Teodorani, 2006). Can this concept be transported to artifacts, in an idea of the project as a morphic unit? Considering nature a biological organism, is it possible to combine human activity, biological nature and the process of reality-making into one information system?

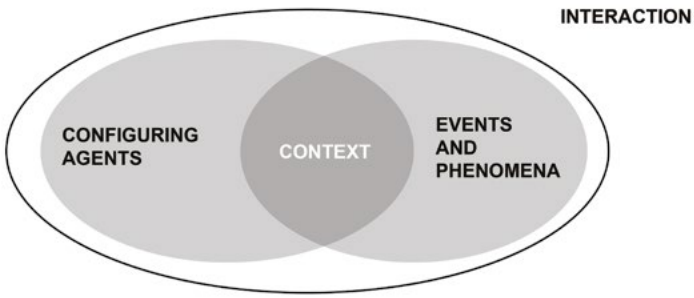
Teodorani (2007) interprets morphic fields as thin informative fields that can give the resonant infrastructure where material reality becomes manifest.

Is this a different (more technical, more scientific) way of describing the concept of "aura" expressed by Walter Benjamin in 1955? All artifacts are the sediment of social practices that they mediate and evolve through the internalization of their use (Norman 2011; Rizzo, 2000). A physical and conceptual place in which substance is organized and configures reality. In zoology and botany, the morphic fields that preside over the development and maintenance of form are called morphogenetic fields; those that deal with perception, behaviour and mental activity are called perceptual, behavioural and mental fields; those found in mineralogy are called crystalline fields; those observed in sociology are called social and cultural fields. In fact, just as a crystalline field organizes the ways in which molecules and atoms are ordered within a crystal, a social field organizes the behaviour of the individuals that compose it; for example, the way in which each bird flies within a flock. According to astrophysicist Massimo Teodorani (2007), this field has a purely informative value, and it is defined form field because only the form - or the meaning (symbol) - works as a link between the various entities. Sheldrake (2003) introduced the hypothesis that all systems existing in nature are guided and shaped by organizational fields, which he called morphic fields, which, through a process of formative causality, act through space and time. In other words, formative causality is the mechanism by which things assume their form, or organization. The work of morphic fields is accomplished at the subatomic level, functioning as schematic restrictions on the multitude of probable and indeterminate events occurring to the deepest physical systems. Such fields are regions of influence within space-time, localized in and around the systems that organize.

Being an extremely wide area of investigation, it is appropriate to focus on the level of interaction defined as "design process" in the idea of the project as a space-time

event (event/phenomenon), or solution to a problem (Kubler, 1972). Having established that a field of forces, generated from the interaction of agents, determines a context, we will try to define the interaction system (Fig. 4):

Set	Structured Set	System	Sub-System
CONFIGURING AGENTS	EVENTS AND PHENOMENA	INTERACTION	CONTEXT

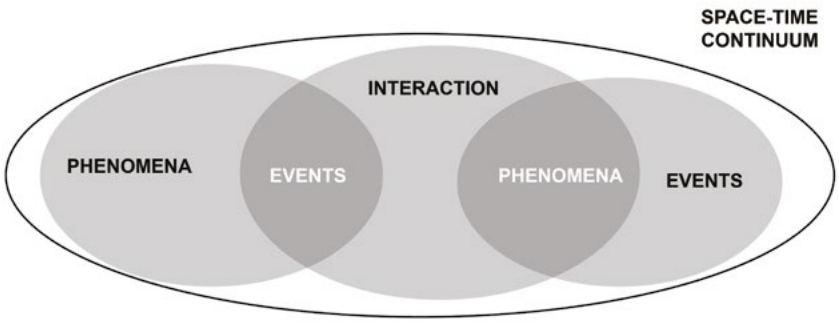


The term "interaction" denotes a phenomenon or process in which two or more objects (agents or systems) act on each other. In the concept of interaction the idea of bidirectional action, which distinguishes it from the cause-effect relationship, is essential. In order to focus on the thematic-discursive area it is appropriate to consider the interaction system as a constant information interchange capable of changing and evolving recursively, where an agent can change when the context changes and conversely, consistently with the idea of a continuum that implies the coexistence of synchronic and changing interactions. This is a direct consequence of the theory of special relativity that establishes an equivalence between space and time.

Just as in the classical view of space its three component dimensions (forward-backward, right-left and high-low) are equivalent and homogeneous with each other and relative to the observer (what is considered forward or backward by an observer can be considered right or left by another, differently disposed observer), the relativistic view also assimilates the temporal dimension (before-after) to the three spatial dimensions, making it perceivable in different ways by observers in different conditions. This means that a configuring agent can modify a context which in turn modifies the interaction of the agent itself (in relation to the same or a different

context) or of another agent belonging to the same or a different context, in an organic-retroactive systems perspective (Goodman, 1978). This is determinism, but it is a very different determinism from the Newtonian one in which causes must always precede effects: in this context causes and effects coincide. The determinism in question is not a clockwork mechanicism but a synchronized order of things, very similar to a living organism in which all its parts act in perfect harmony and where the form is the unifying character of all the intimate elements that make up the universe (Teodorani, 2007). Events and phenomena are interchangeable variables, i.e. an event can be a phenomenon within the same system or within different systems. The problem space here is represented by the interaction of events and phenomena in space-time, where everything happens in a synchronic way. It means that events and phenomena can be cause and effect simultaneously in the same system and in systems totally unrelated to each other. The external observer, who makes a measurement and decides on the parameters of reference, determines the belonging to a defined system (Fig. 5).

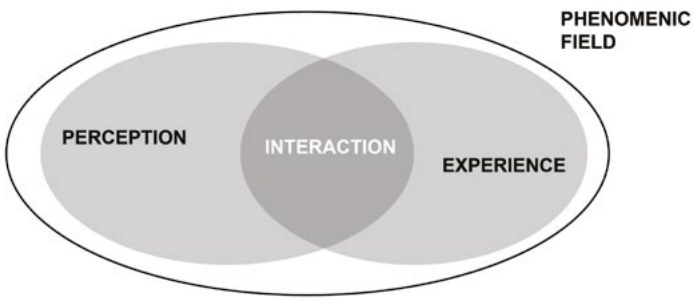
Set	Structured Set	System	Sub-System
EVENTS	INTERACTION	SPACE-TIME	PHENOMENA
PHENOMENA	INTERACTION	SPACE-TIME	EVENTS



The indeterminability of this aspect is caused by the chaotic matrix of nature. Discussing events and phenomena in nature implies entering the field of the phenomenology of perception. In order to be able to continue in the dissertation, without falling into error, it is opportune to clarify that we are discussing the subject of the form on a theoretical level and it is therefore necessary to remember that the majority of the configurations possess specific properties, which cannot be traced in the

constituent elements, but can be grasped and investigated only by considering the object globally, as it appears (Parovel, 2004). This means that we investigate within a phenomenal system closely related to perceptual interactions, where organization, configuration and perception constitute a set of relationships. Sensation and perception allow and generate awareness of an event, a presence, a thing; awareness that is built through a reaction of the senses to stimuli when they appear, returning a meaningful thought, a construct that forms the experience (Calabi, 2010; Falcinelli, 2011). After all, human activity is based first of all on the senses, which act as a rudder in any living organism. In this case the shape field is a perceptual field. It is no coincidence that Sheldrake (2003) argues that morphic fields bind human to objects that, falling under his perception, make him able to act on them through intentions and attention. Thus, a problem space in perceptual experience is defined, a bridge connecting space-time - in terms of existent - and humans (Fig. 6):

Set	Structured Set	System	Sub-System
PERCEPTION	EXPERIENCE	PHENOMENIC FIELD	INTERACTION

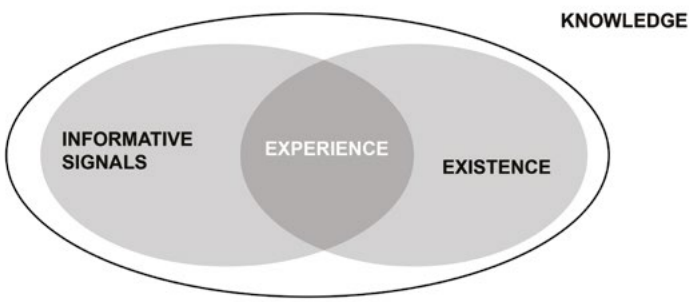


In the field of visual perception there are rules, according to which, perceptual forces influence the final perception, the knowledge. These forces, like the agents of the interaction system, influence each other, creating a perceptual continuum where variable components such as past experience, orientation in space, observer's point of view, subjective setting, objective setting and more, play a fundamental role. This passage is crucial to determine a problem space where human action is inseparable from a perceptual brain activity closely connected to the phenomenal world of the existent. The phenomenic field is generated as a result of an impact, an encounter

between the peripheral sense organs of the observer and a part of the physical world. It is an encounter between two entities, both physical: the nervous system of the observer and the physical world of which the nervous system itself is a part. From the encounter/clash between two pieces of the physical world the phenomenal world arises, as from an atomic reaction. The perceiving brain does not react to stimuli passively like a slave, but acts on them (Uttal, 1988; Massironi, 1998).

In many cases the information flow corresponds to an energy flow: thus, for example, if light waves are emitted from some objects and reach the eye or a photoelectric cell, they produce some reaction in the organism or in some device, and in this way convey a given information (Arnheim, 1959; Bertalanffy, 1969). The constituent elements of the whole that defines the knowledge system are precisely these stimuli and information signals (Fig. 7):

Set	Structured Set	System	Sub-System
INFORMATIVE SIGNALS	EXISTENCE	KNOWLEDGE	EXPERIENCE



Therefore, the relationship between perception and communication belongs to the project as a whole. At the moment of the project feedback, that is, when the configured project becomes an artifact for human use, there is always a communicative act, which is sensory, perceptual, cognitive, emotional, affecting the space in which man acts and reacts (Calabi, 2010). The act of designing is a conscious, rational operation that implies the use of the mind, a black box of interaction between the human ego and the external world. The project is by definition a rational process and you cannot discuss the design without addressing the nodal point of connec-

tion between human beings and nature, an aspect that makes the artifact an artificial entity. The idea of artificial element, in the imaginary collective, is historically linked to a conception of the artifact as a product of human rationality. Regularity and repetitiveness are defined as the main characteristics of an object whose form is justified by the performance for which it was intended, even before its actual realization. Does considering the artificial a property of matter shaped by man place humans in an artificial world?

Paul Bloom resolves this question in a cognitive discourse about essence and the human capacity to categorize nature: all categories are endowed with an essence, the exact nature of which, however, varies: for categories such as tigers it is understood as a hidden physical property, in the case of chairs it consists of the goals, beliefs and desires of the creator of the object. This approach explains some similarities between the way we see natural objects and the way we conceive of artificial objects:

> 1) The external parts and properties of animals can be explained to some extent by their internal essence, i.e., genetic structure. Similarly, the external parts and properties of artificial objects can be explained to some extent by their intentional essence, that is, by the purpose of their creation. Man has hands because of genes, clocks have hands because of the function they perform.
> 2) Appearance is relevant to the categorization of both natural types and artificial objects. There is a very reliable correlation between appearance and essence.
> 3) Essence insights can help us place unusual specimens of natural and man-made objects (new and futuristic products, transformed animals, strange hybrids) in the right category.
> 4) Both in the case of natural types and in that of artificial objects, it can sometimes be difficult to identify the hidden essence. To do so, experts are consulted: in the first case, specialists in genetics and embryology, in the second, archaeologists, anthropologists and historians. When it comes to naming artificial objects, intention plays an important role.

The artifact can be considered as the simple result of a human activity that outlines its artificiality but does not affect its belonging to nature as a substance. Activity is the fundamental factor that determines its form (Rizzo, 2000). In this sense, any material configuration is to be considered natural, regardless of its form. What is important to emphasize is the relationship that intimately binds the concepts of form, nature, design and information, because the form of matter in nature is given by

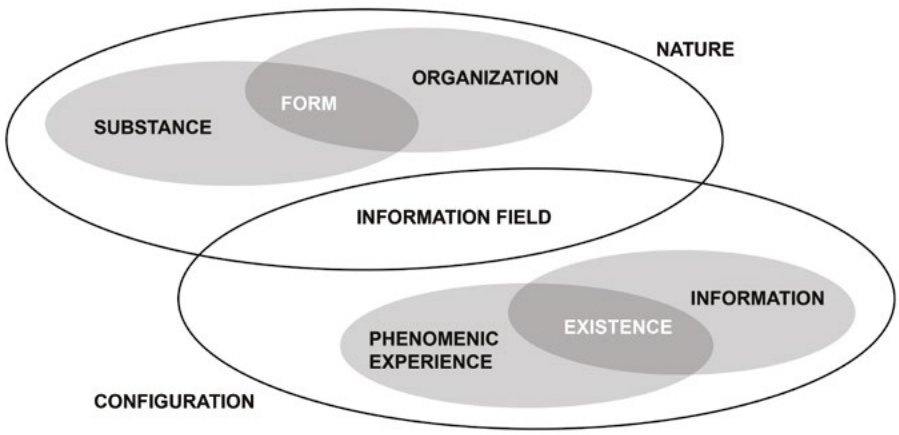
the information it contains. Throughout the history of ideas and disciplines we find different meanings of the term Substance (Abbagnano, 1998). Among these, there is the concept of Substance intended as both "receptive" and "potential" status.

We cite a number of quotations along these lines:

> – As a subject, Substance receives in itself all things but never takes any form that resembles anything because it is like wax that receives an imprint (Plato).
> – Substance is "indeterminate possibility" in which there exist, in contracted form, all things in the universe (Nicola Cusano).
> – Substance: active and creative principle of nature (Giordano Bruno).
> – "Unformed and devoid of quality", "close to nothingness" but yet existing as it is endowed with the capacity to be formed (St. Augustine).

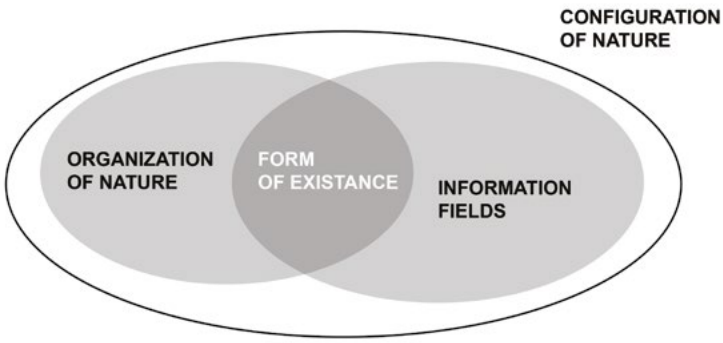
These quotations, starting from the works and the materials, point to a remote point of origin where Substance is still immaterial, a place from which infinite points of view and visual axes depart (Silvestrini, 2010). By applying general systems theory in relation to the substance-nature-form relationship, it is possible to delineate an outline of the nature system in terms of its configuration (Fig. 8):

Set	Structured Set	System	Sub-System
SUBSTANCE	ORGANITAZION	NATURE	FORM
PHENOMENIC EXPERIENCE	INFORMATION	CONFIGURATION	EXISTENCE



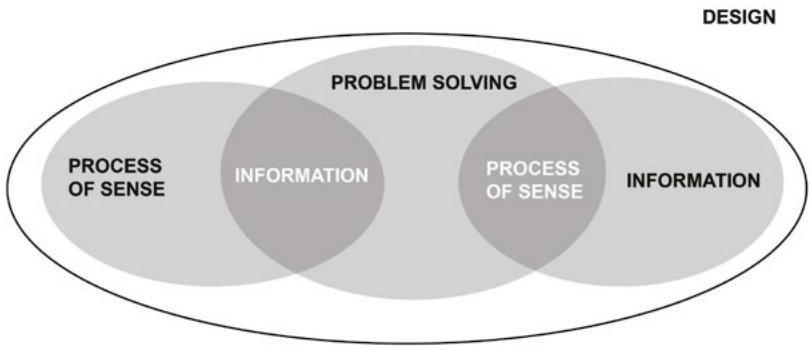
The subject of the discourse is the process of transformation of the substance (through its organization in systemic aspects) and the related transfer of information, since it reveals the human activity in relation to design. In this sense, the project will be considered a change of the existing, a sense change of information (Fig. 9).

Set	Structured Set	System	Sub-System
ORGANIZATION OF NATURE	INFORMATION FIELDS	CONFIGURATION OF NATURE	FORM OF EXISTANCE



Could it be said, at this point, that humans design nature? Can meaning, in the complex system of nature, be considered a variable constant, through which the system re-organizes itself to configure itself? Additionally, can it vary in time and space, changing the interactions of the system? In the past it "made sense" to design in a specific way, today many aspects of design have changed, as if there were a continuous updating of the procedures of sense making. The word sense itself is polysemous. It expresses different but related concepts: sensation, sensoriality, feeling, resentment, sensuality, sensitiveness, sensism. It indicates a certain faculty of participating, learning and assenting through experience and intellect and again, it can indicate spatial direction and orientation. Sense, in its philosophical meaning, is essential to justify man's action in the environment. Sense guides human activity and influences the course of processes in history. Therefore, the project is first a solution to a need, a desire. It is a human reaction to a pre-existing configuration. This means that the problem space in which to locate the system of design is the subsystem of the nature/human relationship. One will therefore have (Fig. 10):

Set	Structured Set	System	Sub-System
PROCESS OF SENSE	PROBLEM-SOLVING	DESIGN	INFORMATION
INFORMATION	PROBLEM-SOLVING	DESIGN	PROCESS OF SENSE



The processes of sense are both cause and effect. The output of the design process considered here is the relationship with the recipient user, who in the interaction with the artifact feels, perceives and interprets. This aspect implies the unavoidable respect of the sense codes and characteristics: during the interactions humans make the autonomous experience of the world in the constant of the common physiological characteristics and in the difference of their individual socio-cultural heritage (Calabi 2010). All the objects that surround us certainly have at their origin a need, old or new, that justifies them. This is a self-evident truth that, like the others, explains only a fraction of reality. 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 discarding.

In this dissertation, an attempt has been made to make manifest an intricate and intimate relationship of interactions that involve the variables of a system as complex as it is mutable. The properties of these systems are termed "emergent" and are considered one of the characteristics that make a system complex. Emergent properties identify systems in which constituent local parts cause global properties that return a causal effect due to the interactions of the parts (Moon and LaRock, 2021). The emerging world – in the vision of a performative continuum – is not to be considered as the result of a coordinated and conscious action but instead as the product of a decentralized micro-organization that returns a constant and mutable phenomenal image.

There are multiple components acting in the conformation of the visual at the local level. Recursiveness is a property that does permit analysis of a system without considering its close relationship with a whole, which affects its state in a synchronic, instantaneous, continuous way. Considering the design system (the production of artifacts and the resulting interactions) a subsystem of the nature system implies applying the same recursive property to it and related systems. The observation and analysis of artifacts (and interactions with them) allow us to read reality as the result of configuring agents that create self-organizing emergent systems. Therefore, the design system has in its genetic make-up the co-responsibility of the existing as a local morphic activity that generates emerging properties. Local activities consist of interactions that are acting locally but in their collective action they produce a global behaviour (Johnson, 2001). The use of the artifact transforms the activity for which it was designed, the transformation concerns both the reorganization of the perceptual-motor modalities of interaction with the environment and the modalities of planning actions and social relations. If we reread the history of creation and evolution of artifacts, it is possible to notice how human activity is the fundamental object of the representation that is created. The object of design is the interaction (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 of information and a consequent change in the configuration of nature, independently from the will of the designer. These changes (or mutations) in turn have effects in time and space generating events and phenomena in a recursive way.

The relationship of local events and global phenomena - in terms of cause and effect - opens the door to the vision of the design as a complex system of transformation of existing where local interactions generate global phenomena.
The rules governing global agent computation are independent from the rules governing the individual constituents. This open frontier to the knowledge of the emergent represents physics' most proactive point of view in the vision and exploration of new philosophical and interdisciplinary foundations (Anderson, 1995).
It is a task of research to investigate human responsibilities in providing existing systems with the information on which emerging systems organize themselves and generate phenomenal responses. The relationship of cause and effect, first at the local level and then at the global level, frames an ontological topic of research that can connect different disciplines and requires cross-disciplinary approaches. In this direction we have the perfect conditions to develop and test new research methods oriented to unify what has been studied separately until now, moving beyond known categorizations and practices.

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Tiziano Manna
Associate designer at La Scuola Open Source – Solidarity ecosystem for social, cultural and technological research and imagination, Bari, Italy

Degree in Communication and Visual Design at the University of Campania Luigi Vanvitelli and postgraduate degree in Theories and Methods of Industrial Design at IUAV University of Venice. Independent researcher and expert in the management of non-profit organizations. He focuses his practice and research on the theory of design processes in a systemic and cross-disciplinary vision. He explores design philosophy with a critical approach to discover and inspire new perspectives in academic research. His interest lies in design ethics, social innovation practices, informal education, art dissemination and nonprofit culture. Teacher for the Italian Ministry of Education and associate designer at La Scuola Open Source – Solidarity ecosystem for social, cultural and technological research and imagination, Bari, Italy (SOS). President at ShowDesk ODV.