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Self-organized matter: design and primitive future of the eidetic categories

Abstract: Set in the context of semiotics of (artefact) design, this contribution suggests a new frame to examine the "eidetic categories" used in the analysis of the "plastic level" of (visual) artefacts, starting from Gilbert Simondon's thesis.
Simondon traces the most essential evolutionary path in relation to the design of "inorganic" artefacts: these products tend to become increasingly "organic", made of integrated parts and bound to their environment. This evolution is not only technical, but also aesthetical, and it leads to consider the matter as something that tends to find the most metastable arrangement.
Thus, there is even an evolution in the "eidetic categories" adopted to describe an object: this is explained through the case of Turing's morphogenetic model (1952) and some examples of its recent applications to different fields, from urban studies to decoration and morphogenetic design.

Keywords: Semiotics of artefacts, Categorization, Self-organized matter, Morphogenesis, Semio-physics.

1. Next aesthetics: a primitive future according to Simondon

Gilbert Simondon (2013), in his (never shipped) letter dated July 3, 1982 and addressed to Jacques Derrida, coins the term "techno-aesthetics" pointing to many examples of artefacts which are technically effective in shaping and amplifying human sensibility by structuring it in connection to the environment. The list of these examples may seem rather trivial; it seems to largely come from stereotypes (icons) of the landscape surrounding the philosopher in the metropolis of Paris. He mentions Beauburg, Tour Eiffel, The Mona Lisa, the antennas of France Culture, the engines of the Citroën *deux chevaux*, Jaguar or Matra, etc. This is neither an idolatrous neo-Futurist view of the machine, nor a generic functionalist rationalism, even if Simondon seems to share with Le Corbusier a sort of "Vitalism", implicitly inspired by Nietzsche.
The central concept of his contribution is the notion of "effectiveness of aesthetic performance" in objects (cf. Montani 2014) according to a conception of aesthetics that the author had already outlined in the third part of *Du mode d'existence des objets techniques* (1958). In the letter of 1982 he radicalised his theses of 1958, writing the word "aesthetics" almost always in Greek (*aìsthesis*) as to mark the original meaning: "sensitivity", sensory and sensible relationship between organism and environment, between man and world. Moreover he affirms that «...The techno-aesthetic feeling seems to be a category that is more primitive than the aesthetic feeling alone, or than the technical aspect considered from the angle of functionality alone (which is an impoverishing perspective).»

He considers the techno-aesthetic category (ontologically) «… more primitive» for a fundamental reason already explained in the third part of his thesis (Simondon 1958). According to this thesis – akin to that of Leroi-Gourhan (1949, 1964) – humans give shape and amplify their *aìsthesis* – that is, their "aesthetic relationship" with the world – through artefacts, and especially (more intensively) through certain technical objects. These rich technical objects allow a more intense and vital aesthetic experience thus creating the substantial points of our sensory, semiotic and technological interface with the world. According to Simondon, they work as "magical objects" because they allow us to renew the experience of what anthropologists call "magical thinking": that is the original and primitive stage of the relationship of direct communion between organism and environment. In Simondon's conception, the original unity of our being in the world precedes the "phase shift" between the religious thought and the technical one, and then the one between ethics and science. To draw on the experience of this "magic and primitive unity" between subject and world one needs semiotically and technically advanced artefacts. The intensity of aesthetic performance in artefacts is not apart from their semiotic and technological workings. In this sense, Simondon's neo-encyclopaedist thought concerns the very notion of "idea" and "conception" (cf. spec. Simondon 2008), therefore it expresses a clear design ideology.

1.1. Evolution of artefacts

The Platonic theory of design considered the identity of an object contained in its *"eidos".* Even in Simondon's opinion – albeit a non-idealist point of view – the individuality of a technical object does not lay in the material consistency of a sample (Peirce would say "token"), but in its "Type" or "specific identity" as Prieto (1995) considers it. The identity of a technical object is the figure of the dynamic schema that is the basis of its functioning. This mechanism defines the technical object and enrols it in technical genealogies turning it into the individual of an evolution (which does not always correspond to progress), namely making it one of the "joints" of a phylogenetic artefact speciation. By analysing different genealogies of machine classes, Simondon (1958) completely overthrew the Platonic and Aristotelian conception as the imposition of a pre-existing form to inert matter (hylomorphism). Simondon's technical individual is analogous to a body, and just as organisms and environment determine each other, artefacts evolve together with their indoor and outdoor environments.

Even artefacts are subject to epigenesis and phylogeny - individual development and collective evolution – that Simondon calls with the same names: "individualization" in general and "concretization" in particular. "Concretization" in its epigenetic dimension is the invention (cf. Simondon 2008) and in its phylogenetic dimension it measures the fulfilment degree of the technical individual. Both from the epigenetic and phylogenetic point of view, the "concretization" of a technical object corresponds to its degree of technicality or development. The technical object evolves going from one abstract and analytical stage to a concrete and syntropic one, as in a transition from inorganic to organic (cf. Table 1).

Table 1. Comparison of some differential features detected by Simondon on the engines evolution

Low level technical object: **ABSTRACT**	**Advanced** level technical object: **CONCRETE**
I) it has a **deterministic function** (mono function), **insensitive** to the surrounding information	I') it has an **open function** (multifunction), **sensitive** to the surrounding information
II) it is made of **similar** and **distinct** parts (as **inorganic** bodies, completed in themselves), each one has a separate function and a single	II') it is made of **differentiated** and **integrated** parts (such as interactive **organisms**), each one plays multiple functions that are integrated

functional cycle	and unified in one structure
III) it has **analytical** and homogeneous configuration	III') it has **syntropic** (differentiated and structured) configuration
IV) it works with **conflicting** side effects	IV') it works in **synergy** effects
V) it has a **determined** tailored shape based on the specific function which is built for [*hypertely*]	V') its shape is **capable of detecting multiple** (not provided) **functions** [*ex-adaptation*]
VI) it is expression of an **autographic** (**authorial**) and **artisan** competence	VI') it is expression of an **industrial** and **informational** competence belonging to a **collective author**
VII) it requires **separation** between internal and external technical environment.	VII') it requires **interaction** between the technical and the geographical environment, determining a third "**hybrid**" (**techno-geographic**) **environment**.

Simondon does not describe the "concretization" as if this was the general law of the evolution of every artefact. He describes it as a rational evolutionary trend aiming at syntropy, opposed to other different trends, which can be entropic and abstracted, as we do not (technically speaking) live in the best of all possible worlds.
The analogy between artefacts and bodies still remains an analogy, not an identification. But it is a very effective analogy to explain what we see around us and what we can reasonably hope for future design forms. Just consider the last listed (tab 1) between the aspects of the "high level (advanced) technical object". Evidently today every human environment is so irreversibly full of artefacts that it is almost impossible to distinguish a single natural component. This can be observed on the anthropomorphised and economized geographical environment, reconnected by all sorts of communication infrastructure, or simply reproduced and acted through augmented reality devices or other wearable technologies. The natural environment, subsumed in a technical system, becomes itself a functional element of this system, an integral part of a concrete technical object – an organic element – in the form of "associated environment" already given, previous to men, by now. The production of this new "associated environment" is partly conditioned by the process of "adaptation" and "concretisation" of all the technical objects rather than by the pre-existing "natural environment".
This is also a process that modifies the boundaries between the traditional categories, in terms of use of objects, together with styles and forms of life. Simondon's examples consider the existence of many hybridizations between different genres: the artwork, the scientific instrument and the tool technology. Above all, however, the geographical and social dimension of technical objects is a condition that requires new and adequate integrated forms of rational design and also suggests a redefinition of the design genres and their borders.

1.2 Evolution of morphology

The "individuation process" of technical objects discovered by Simondon denies the hylomorphic scheme supported by Platonic and Aristotelian conception theories. The evolution of technical objects cannot be explained through the intervention of demiurges who impose an external *eidos* to an inert material giving it a form. On the contrary, it's the material itself – if anything – which tends to become self-organized throughout the functioning of a technical object surrounded by its environment. Simondon considers form in terms of Aristotelian entelechy. The *eidos* is not a result of

“abstraction” but – on the contrary – a “concretion”; it is not placed beforehand, but *"a posteriori"*. Form arises from mechanisms originated by the matter itself. The technical individual and its environment are mutually determined and evolve jointly by adapting one another.
Thus, there is a “Design” which is not artificially imposed on the matter, but rather results from the same matter as well as from its interpreter. This kind of “Design” and “project” can be re-discovered (invented) and acknowledged through a heuristic, dynamic, aesthetic and retrospective approach. It is neither reverse engineering nor bionics, but rather relies on the assumption of a fundamental analogy between *naturalia* and *artificialia*, arising from the investigations that the naturalist D'Arcy Thompson summarised with the Goethian term “Morphology”, intended as the «Science of Form which deals with the forms assumed by matter under all aspects and conditions, and, in a still wider sense, with forms which are theoretically imaginable» (1945, 1026).
In this sense “morphology” is the study of the way in which forms emerge in the “entelechy” of real (or possible) bodies. This concept of “morphology”, typical of Goethe, concerns both the natural sciences and those of culture and society. In its scientific side it is above all an indivisible unit of geometry and physics of bodies. As such it gathers and correlates a wide number of mathematical, physical, chemical models (Petitot 2004), as well as models dealing with neurophysiology of perception (Petitot & Doursat 2011) and biological epigenesis. On the other side – its humanistic side – it has deeply influenced, above all, the structuralist thinking and the materialist history.
In order to understand this double adequateness of morphological patterns (they can be applied to both *naturalia* and *artificialia*) we do recall the essential features of a model that has covered an important role into the development of this specific morphological tradition.

2 Turing's morphogenetic model

Alan Turing's morphogenetic model seems particularly appropriate to show some fundamental aspects about self-organized matter.
The English mathematician and cryptographer published his model in his essay “The chemical basis of morphogenesis” (Turing 1952); his aim was to account for a series of processes that involve the transition from an initial homogeneity to a final differentiation. In particular, he wanted to explain, as he wrote to the zoologist John Young (Hodges 2015, p. 568), some natural phenomena such as gastrulation, phyllotaxis, the appearance of animal markings and the development of particular organisms like sea stars and radiolaria.
At the origin of these symmetry-breaking mechanisms, Turing assumed the primary role of the interaction between two chemical substances, called “morphogens” in his essay and later identified as “activator” and “inhibitor” (Gierer and Meinhardt 1972).
These morphogens are responsible for two different processes:
1) the reaction between them;
2) the diffusion from each cell to the adjacent ones.
Thus, in line with the global morphological tradition, Turing’s model specifically considers shape as the result of the interaction of forces residing into the matter itself, which, according to this model, is not inert and it does not require a demiurge: it can develop through self-organization. This behaviour is expressed by means of two differential equations, in which the dimensions and variation rates of the morphogens are combined throughout time and space. During the process, the initially homogeneous concentration of the two substances undergoes some changes, which can occasionally lead to sudden increases in one of the morphogens. This happens because some small local variations can be amplified by a positive feedback process, according to the typical behaviour of non-linear dynamic systems. As a consequence, the past conditions (forms) of the system are connected

with the present and the future ones, resulting in a wide range of stochastically stable configurations and global qualitative changes.

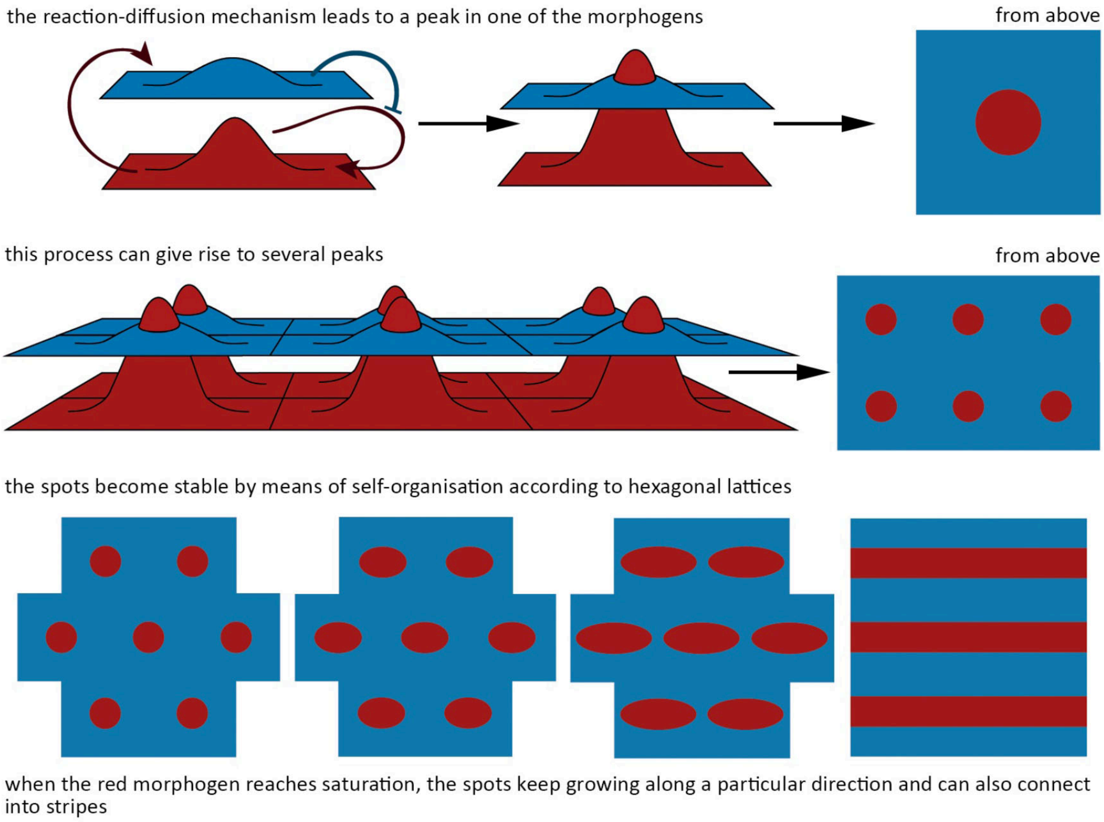

Figure 1. Spontaneous generation of Turing patterns based on a reaction-diffusion mechanism. These schemes show a particular and very simple configuration which can lead to the formation of spots or stripes. © Authors.

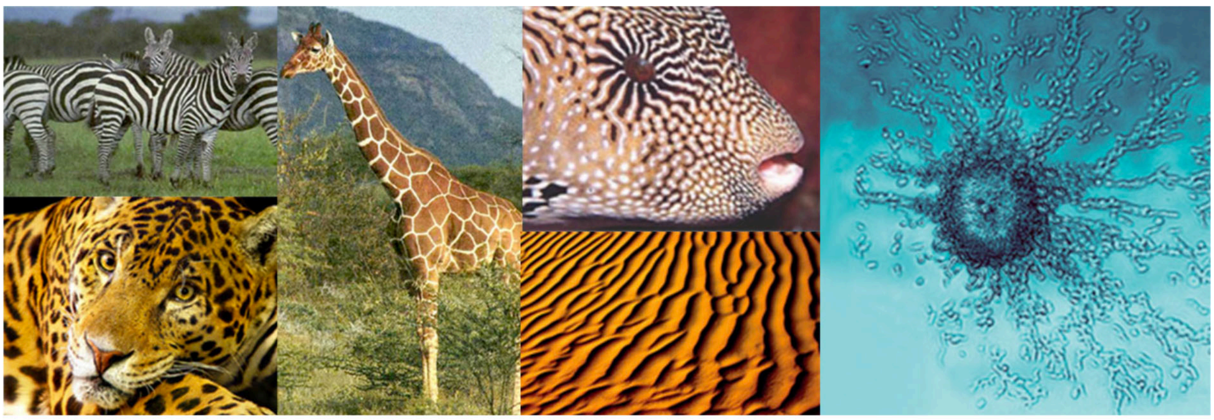

Figure 2. The pigmentation patterns found in animals like the giraffe and the jaguar (spots), the zebra (stripes), some fish (spots or stripes) are similar to those described by Turing. Even the arrangement of sand ripples, which always keep a certain distance between them, can be regarded as a Turing pattern. Another similar example is provided by the aggregation of Dictyostelium Amoebae following starvation: the self-organization is due to chemical signals. http://www.pure-spirit.com/more-animal-symbolism/306-jaguar-symbolism; http://rstb.royalsocietypublishing.org/content/370/1666/20140218; http://www.nature.com/scitable/content/29207/10.1038_422481a-f1_full.jpg; http://complex.upf.es/wet-lab/; http://www.crm.umontreal.ca/~durand/Murray-Sc.Am.pdf (Accessed December 2, 2016).

2.1 Turing's patterns

Turing is usually referred to as a mathematician, a cryptographer and a pioneer in the field of information technology, but even his theory of morphogenesis is not so far from his interests: on the one hand, he had been attracted by biology since he was a child (Hodges 2015, pp. 19-22); on the other, he used his morphogenetic model to analyse the growth of living beings by means of algorithms, trying to decipher nature as if it were cryptography (Gessler 2013, pp. 521-529). Besides, in 1951, the arrival of the Manchester Electronic Computer enhanced his studies (Hodges 2015, p. 568), in fact he could use it to simulate the results of his equations, repeatedly assessing the values for thousands of points. These were reported on a paper printout and then divided into different areas depending on the prevailing substance: thus Turing could see the first spot patterns. His simulations actually displayed a pre-pattern of the morphogen concentration containing a spatial information; the spots thus visualised could develop in real pigmentation patterns on the fur of some animals or to the peculiar features of organs or leaves.

Turing's assumption, which initially was an abstract and schematic mathematical model intended to explain biological phenomena, was supported by experimental chemical evidences only forty years later (Lengyel and Epstein 1992). Meanwhile, this model has been applied to different fields: from the production of decorative patterns to the development of cities, in a convergence between living and non-living.

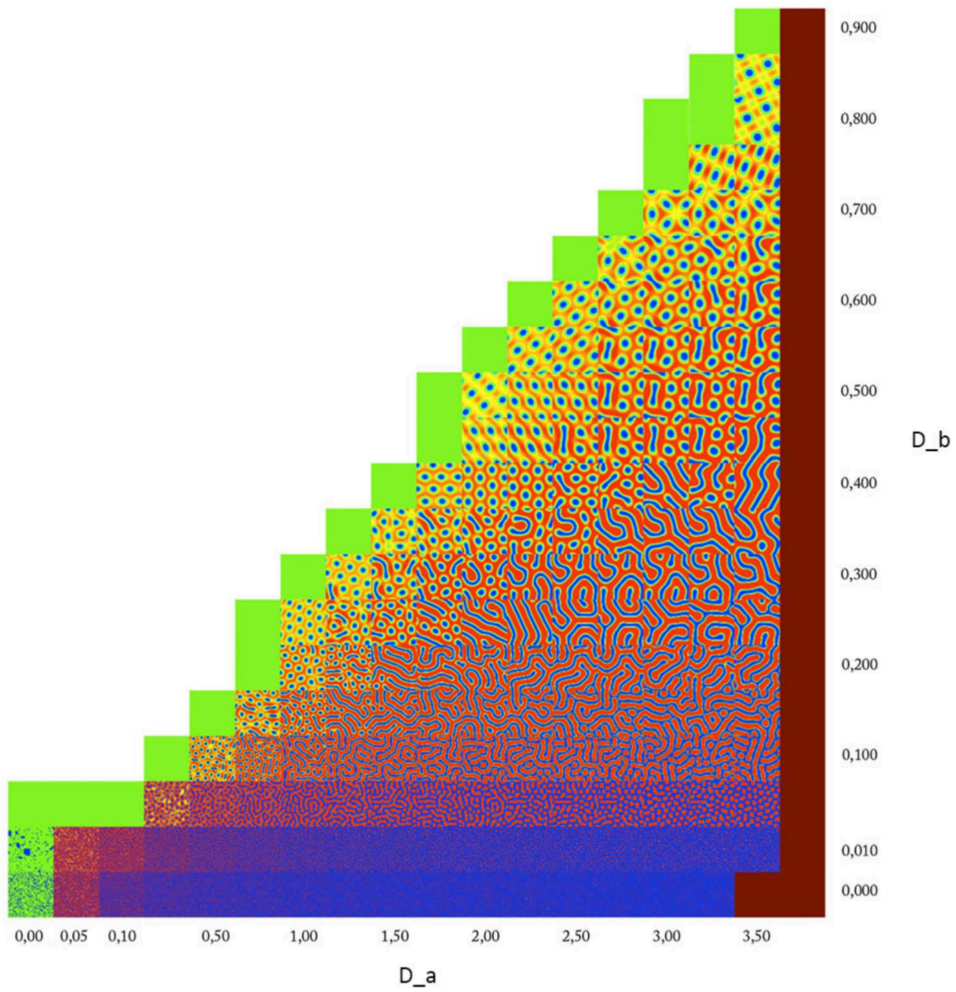

Figure 3. Turing patterns simulated with the program Ready, developed by Tim Hutton, Robert Munafo, Andrew Trevorrow, Tom Rokicki and Dan Willis. It can be downloaded from the website https://github.com/gollygang/ready (accessed December 2, 2016). This diagram shows the effects of the variation of the morphogens' diffusion rates in the simulations, resulting in the transition from spots to stripes. © Authors.

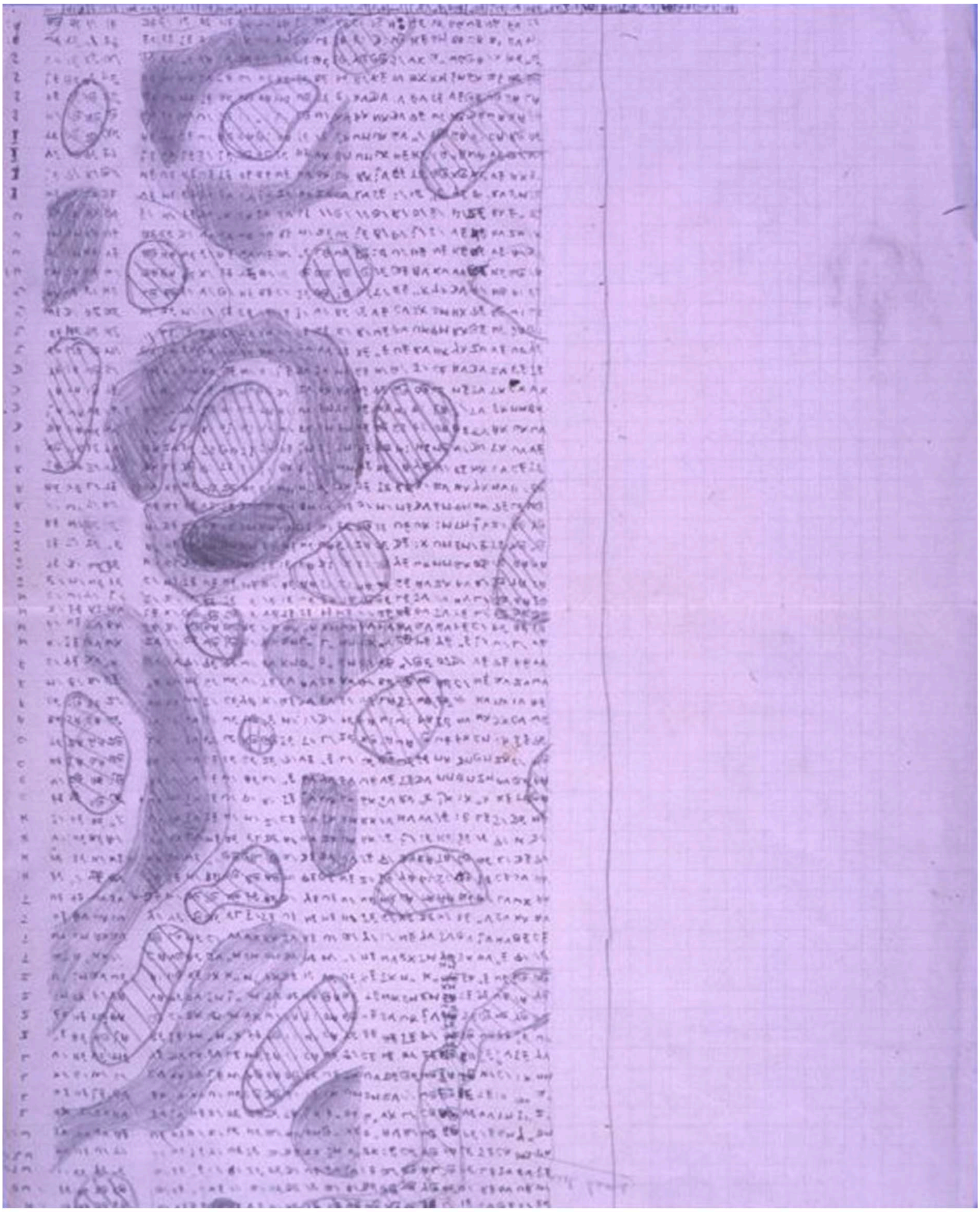

Figure 4. An example of pattern drawn by Alan Turing: he wrote the results of his equations, previously calculated with a computer, on a paper printout and then connected the points with constant concentration of the morphogen to visualize the spots. http://www.joostrekveld.net/?page_id=340 (Accessed December 2, 2016).

2.2 Explanatory analogies

In the simulations of settlement processes, the interaction between the morphogens is replaced by the relation between the economic forces involved (Allen and Sanglier 2010), leading to land-tenure arrangements which, albeit sufficiently persistent to be recognizable (Pumain 1998, p. 351), are just «a step in a running morphogenesis process» (Courtat, Gloaguen, and Douady 2011, p. 1).

These kinds of simulations are also very common according to the model of cellular automata, introduced in the 1950s by Stanislaw Ulam and John Von Neumann. Cellular automata consist of a grid of "cells" which can take a finite number of states and may vary according to a predetermined rule depending on the current state of the cell in question as well as of the surrounding ones.
An example of two-dimensional cellular automaton is John Conway's Game of Life, created in 1970: its evolution is only determined by its initial state following three rules (Gardner 1970), which decide upon the survival of a counter for each step of the simulation.
In all these different applications, we can see that the development of computational geometry and computer graphics – by abstracting from chemical-physical concepts – help describe the contradictory logic shared by self-arranged systems through algorithms (Della Volpe and Siboni 2009).

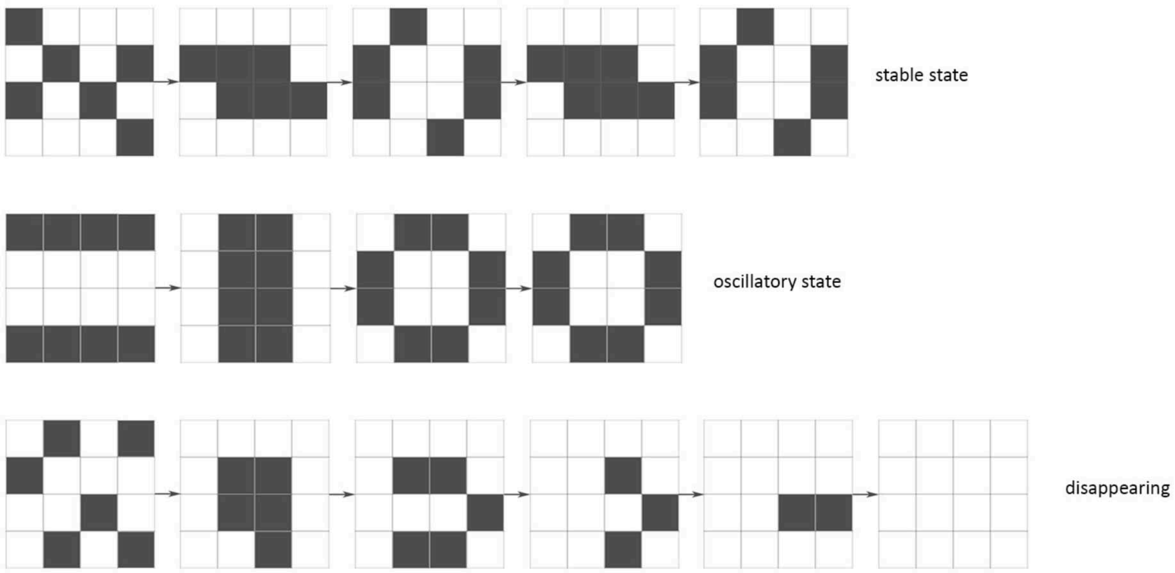

Figure 5. John Conway's Game of Life is a two-dimensional cellular automaton created in 1970. Its evolution is only determined by its initial state, following three rules (Gardner 1970):
Each counter with two or three neighbouring counters survives for the next generation;
Each counter with more than three or less than two neighbours dies (is removed);
A new counter is placed, at the next move, on each empty cell adjacent to exactly three neighbours.
This image shows three different schemes that lead respectively to a stable state, an oscillatory state and the disappearing of all the counters. © Authors.

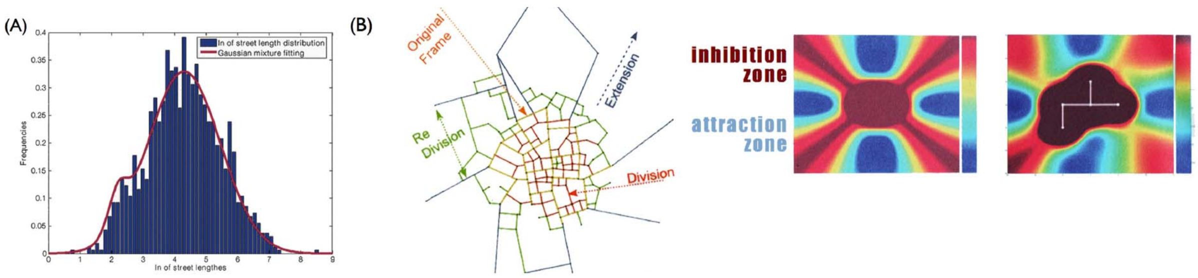

Figure 6. Application of two algorithms aiming at converting each map of urban streets into a general geometric graph representing the network that generates the city shape.
A distribution of the logarithm of street lengths in Amiens (France): the red curve indicates the fitting of this distribution by means of a mixture of two Gaussians. This phenomenon leads to assume that a city is shaped by a logic of extension of street and division of space.
The algorithm produces the morphological segmentations of the maps. The behaviour of the street lengths leads to consider the city as the result of a morphogenetic process based on the (contradictory) duality: extension/division. The function of the system is directly related to the structure (catalyst-inhibitor) of the network (By Douady, Courtat, Douady, Bonnin 2016, pp.186-7).

2.3 Morphogenetic design

In this framework, morphogenetic design is becoming more and more relevant. Even in this case, materiality is not a passive property, but it becomes an active generator, which allows the growth of a "complex performative structure", close to the Deleuzian concept of *objectile* (Cache 1995) and developed by means of a constant feedback between computational design, simulation, fabrication and external influences. Thus materiality becomes the starting point of an "open-ended design process", involving design and architectural research (Menges 2012) and leading to mass customisation (Roudavski 2009), a technique that combines mass production with flexibility.
This process is usually expressed by a range of possible pattern formations that reminds us the recent advancement in genetics, which states that, even if there are various different paths in the development of an organism, not everything is possible (Ball 2012).
Computation allows for integration at different levels, from micro-scale (the composition of the material) to macro-scale (the behaviour of the system): these two levels influence each other and are subject to external forces.
Beyond these constants, there are various approaches in the field of morphogenetic design, each one emphasizing the topological, isomorphic, metamorphic, parametric or evolutionary dimension of these processes (Kolarevic 2000).
Achim Menges works for example with wooden structures, which can be a kind of performative architecture based on the physical (hygroscopic, anisotropic, elastic) properties of the material, without the use of sophisticated technologies (see for example the ICD/ITKE Pavilion at Stuttgart University, or the FAZ pavilion in Frankfurt). Along with Sean Ahlquist, he also works with tension-driven material systems, such as the pre-tensioned membrane structures, defined by some changing parameters that give rise to many equilibrium states which are not deterministically predictable. These structures, originated by the action of a force at the moment of the formal conception, remind us even the researches conducted by Greg Lynn since the 1990s (Lynn 1999, Kolarevic 2000).
Many of these structures behave according to a principle of "aggregation", which arises not only from a connection between already formed items, but also from an interaction between these parts, which are subject to continuous reconfiguring over the time (Dierichs and Menges, 2012).
The research goes even further with Neri Oxman, who designs material properties according to living organisms, or with Ferdinand Ludwig, Hannes Schwertfeger and Oliver Storz, who design the physical conformation of trees in order to develop certain material characteristics.
Moreover, the open-ended design leads to the use of robots instead of simple computers, to customize the machine protocol – and therefore the manufacturing process – as much as possible (Menges 2012).

3. (semiotic) **Conclusions**

The importance of morphogenetic models in the field of design does not lie only in their use in algorithms for parametric modelling softwares employed in drawing and digital prototyping. Their importance is not in producing automatisms to generate forms, but in the ability to explore new cultural categories concerning the form of the objects and their living environments (Groupe μ 2015). Turing's morphogenetic model's success in natural and artificial pattern simulation is important because it affects the emergence of forms. It is a specific technical object that owns "aesthetic adequacy", if we consider "aesthetics" in the sense given by Simondon (here recalled in § 1). Namely, on the one hand, Turing's model explains and shows the emergence of objective "natural forms", on the other hand it contributes to the rise of new "cultural categories" of form, explaining it as a dynamic of forces. It is adequate as it concerns both sides of the interface between subject and object. But in order to better understand this kind of aesthetic adequacy we have to specify what we exactly mean by considering the term “form of an object”.

3.1 “Form” and “pattern” between expression and content: analogue/mereological [*iconic/plastic* and *figural*] relationships

What in the common sense is meant by “form of an object” in Hjelmslev, Greimas, Fontanille and Bordron's semiotic tradition, corresponds to what is defined “substance of the expression”. From this “substance” the process of signification draws a “form of the expression” putting it in relation to a “form of the content”. “Form” [visually perceived as “shape” or “pattern”] emerges from this border between interoception and exteroception.

Even if the concept of “form” used in semiotics is quite different from – and more complicated than – the concept used in common sense, the semiotic study of the emergence of “forms” [shape] in perception is one of the most important contributions of this discipline to the study of visual artefacts and arts. The semiotic point of view is very useful especially to understand what it brings to the topic of abstraction and iconicity in arts and to “categorical perception”.

It is worth mentioning that, in this field, the essay *Sémiotique figurative et sémiotique plastique* (Greimas 1984) identified two layers within the visual text analysis, i.e. a “plastic” and an “iconic” layer, intended as the two points of view corresponding (in psychology) – this is our thesis – to two different modes of “categorization” of objects. The “plastic” [abstract] point of view is a mereological (gestaltic) aspect of the perceived object, included exclusively in the rhythmic, oppositive, topological, eidetic, chromatic, haptic... values of the perceived object. Conversely, the “iconic” aspect is an analogical and extensive point of view. However they must not be regarded as two distinct textual categories (genres) (abstract vs. figurative). “Abstract” and “Iconic“ are described as the two ends of the gradation within the semantic category [*semantic axis*] of “figurative”; they indicate, respectively, the minimum (from the Latin ab-traho ≈ “take off”) and the maximum density of the iconifying (exteroceptive) features of a visual object.

However, in the light of its recent developments, the semiotics of art and perception tries to consider also the emerging sense of the limit conditions of perceptibility and categorization, conditions that are intensively exploited by various artistic fields. More specifically, visual arts such as design, architecture and cinema often emphasise the perception of the transparency as well as of the dullness of the means of expression, including the support material – based on the phenomenological experience of recognition and evanescence of the perceptible object, as well as on the minimum expression of acknowledgment. In short, what “is shown” and what “is supposedly shown” in the aesthetic experience are facts relating to scientific theories, art theory and semiotics of perception (ex. Fontanille 1995).

From a semiotic-perceptive point of view, in order to describe the initial dynamics underlying the meaning in the “experience of images”, the sole use of the category of “Figurative” is not enough. Thus, the representation of the semantic category [*axis*] of “Figurative” with respect to the semiotic square (fig. 7) shows that the relating sememe is the “complex term”, i.e. the opposite of a “neutral term” which may be referred to as “the Indiscernible”. In other words: « The indiscernible is nothing but the power of the matter aiming at meeting its form » (Magli 2011, p. 42).

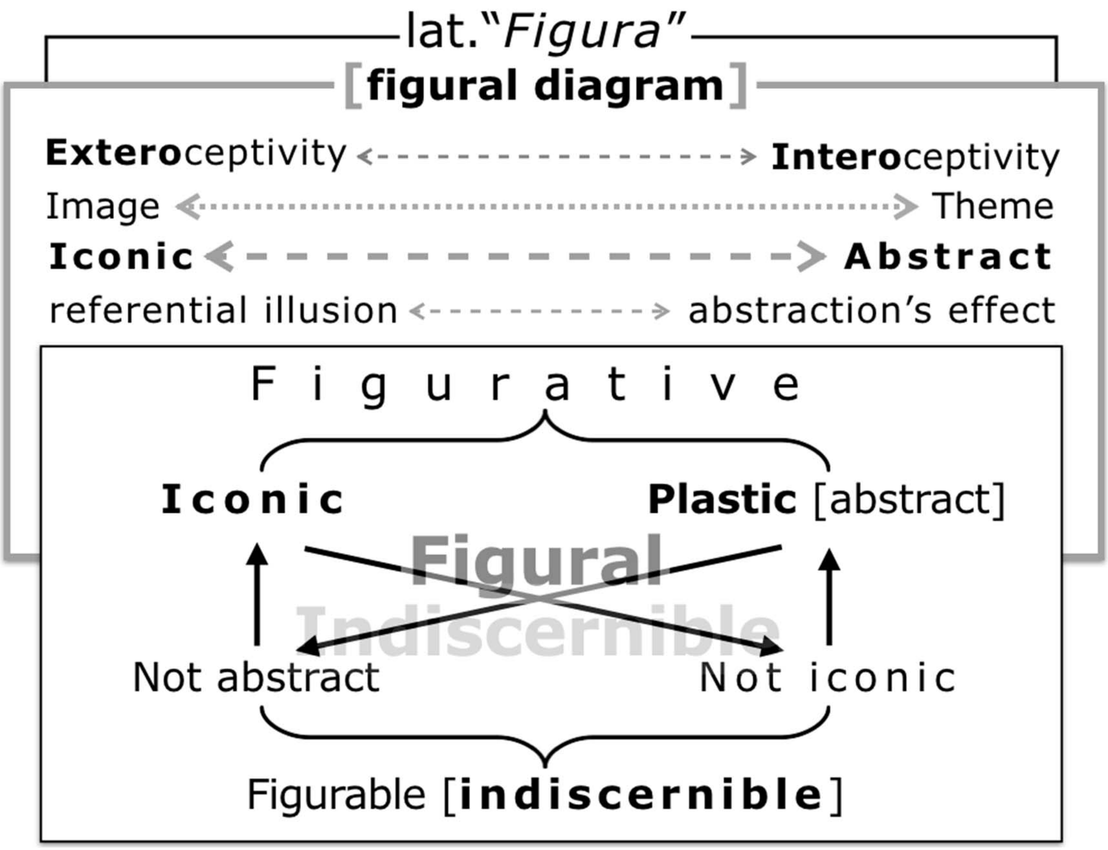

Figure 7. Semiotic Square that aims to analyse the semantic category of the "Figural" (by Magli 2011). This Semiotic Square is formed by a binary relationship between two contrary terms: "abstract" [plastic] and "iconic" – extreme terms of the category of "figurative" – considered as the two levels of semiotic analysis of a same visual text. Their projection in the sub-contraries ("not-iconic", "not-abstract") results in the "neutral term" of the square («neither abstract + nor iconic», that is, «neither figurative nor plastic») which can be lexicalised by the word "Indiscernible" or by "Figurable", or another existing word or expression in standard usage or technical neologism. When using the greimassian square in the syntagmatic analysis, we examine the successive positions occupied by semantic objects on a square, abandoning the Aristotelian principle of non-contradiction. Along the diagonal of the square the operations of "denial" – the contradictions between iconic→not iconic and abstract→not abstract – are held and the category of "Figural" emerges as the "meta-term".

3.2 Between a physics of sense and the sense of the objects

This semiotic point of view accepts the gestalt thesis (related to psychology of perception) according to which form emerges as a bet on the sense of a percept. Form is the result of the interaction of our sensory apparatus with the world and sense physically emerges from the matter we are made of.
This interactional materialism (Groupe μ 2015) creates a real "physics of sense". And a semiotics intended as "physics of sense" is the one initially sketched out by René Thom – the greatest author of a general theory of morphogenetic models – in his *Esquisse d'une sémiophysique* (1988) and, in other respects, developed today by Jean Petitot, especially in his *Neurogeometry of vision* (2008) where the cognitive semiotics makes a complete equivalence between mathematical models and neuronal substrate.
Even Simondon's thought is not far from this interactional materialism between subject and object; however he considers morphogenetic patterns as technical objects. As such, these models are not true in themselves, but are just more or less adequate. Compared to the realism of Petitot and Thom, Simondon stands for that strongly figurative, analogue and concrete character that makes his thought even a clear design ideology. According to him, the physics of sense is not a postulate of a mathematical theory, but it emerges from the concrete description of artefacts and natural objects. For example the following short description appeared in the letter of July 3, 1982 cited earlier.

> « Electricity is not an object. It can only be detected and manipulated through objects and possibly also through natural environments: lightning passes through and structures itself through corridors of air that have already been ionized. There is a moment when lightning is being prepared, before the discharge that leads to the impact. One can pick up this ionization with an antenna, because it is spread out through minimal discharges and preliminary energizing. The lightning that leads to a proper impact is simply a brutal conclusion, high in energy – a conclusion to the plural melody of the preparatory discharges. The final lightning follows paths that have already been made. And this swelling melody traces paths of weak resistance that become linked to each other at the moment of the final impact.»

We can read these lines as a semiotic analogy: the creation of a semiosis – the "lightning" – from the unfolding of the sense – "electricity" – gathering «... paths that have already been made ». But this literally dazzling figure can be read and considered through the aesthetic performance of a technical object: «… for a galvanometer or an oscilloscope... ».

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