Semiotic Review 9: Images - article published June 2023
https://semioticreview.com/

The Experimental Space of the Diagram According to Peirce, Deleuze and Goodman: Concerning Composite Photography, Chronophotography, and Painting

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Abstract: In this article I examine the perspectives of Charles Sanders Peirce, Gilles Deleuze, and Nelson Goodman on diagrams in order to assess the variety of meanings of diagrammatic reasoning, form, and manipulation. I argue that diagrammatic reasoning may not only guide the understanding of the functioning of schemas, graphs, and chains of equations, but also—as I show in this article—the functioning of scientific images, photographs, and artistic paintings. More precisely, I focus on the relationship between the concept of diagram, the composite photographs by Francis Galton studied by Charles Sanders Peirce, works of art such as the paintings by Francis Bacon studied by Gilles Deleuze, and scientific images (especially aggregate images such as those of black holes), while taking account of the distinction between autographic and allographic semiotic systems.

Keywords: Diagram, Composite Photography, Painting, Scientific Images, Autography, Allography.

Introduction

This article aims to address the way in which the notion of diagrammatic reasoning may not only guide the understanding of the functioning of schemas, graphs, and chains of equations, but also the functioning of scientific images, photographs, and artistic paintings. While the latter are images that are *a priori* considered to be *autographic*—in the sense of Nelson Goodman (1968)—the former are *allographic* systems. Autographic images are characterized by their high syntactic and semantic density (every stroke is significant, and even blanks are semantically relevant), by their non-reproducibility, and by their uniqueness (think of the status of the original in painting). This description might lead one to think that autographic images are excluded from any abstract operationality, through the claim that these kinds of images are too attached to particularity and to matter. By contrast, allographic systems include mathematics and computation and have typically been considered to be the only kinds of representations capable of fully conveying abstract reasoning.[1]

My article aims to show that the images designated as autographic, characterized by a density of features producing an effect of "figurative realism," can also be instruments for *generalization*, *abstraction*, and even *experiment transposition*. I will show, through the works of Charles Sanders Peirce, Gilles Deleuze, and Nelson Goodman, that so-called autographic images, which depend on non-repeatable inscriptions,[2] can also serve as means of generalization, abstraction, and transposition of measurements.[3] This is because these images are diagrammatic in nature.

Personally, I find it regrettable that most researchers specializing in diagrams have largely limited their references to Peirce on the matter of mathematical reasoning without taking into account what is most innovative in Peircean thought, namely the idea that dense images, such as photographs or, more precisely, sets of photographs, can function diagrammatically. This is probably due to the fact that philosophers of science and mathematicians find it difficult to approach (autographic) images they deem to be dense and, therefore, unanalyzable. Such apparent density obscures the fact that images are made of lines of force, of topological schematizations produced by the orientations of the objects represented (such as upwards, downwards, to the left, to the right, towards the center, towards the periphery) as well as differences in luminous intensity, in gradients of chromatic saturation, et cetera, which are able to construct meaningful schematizations useful for artistic or scientific experimentation. While the schematizations that emerge from the forms of a painting or photograph have been studied by visual semiotics[4]—as have the schematizations that take shape throughout a chain of images which morph as the images build series of transformations[5]—it was Charles S. Peirce who was first able to see beyond the separation of singularity and generality. Peirce conceived of the

diagram as being involved in any mode of visualization allowing thought to progress throughout a process of observation, manipulation, inquiry and exploration, both in mathematics and in other areas of scientific and intellectual work.

In what follows I illustrate Peirce's theory of the diagram, showing how it allows us to de-reify the type of graphics that can be associated with the notion of diagram (in particular, series of photographs). I then focus my attention on the processes of abstraction that make it possible to identify the forces at play in visual forms as seen in the field of painting, first relying on Gilles Deleuze's theory of the diagram, and then reexamining Goodman's own solution, which makes it possible to establish a graduated scale between autographic and allographic systems. Doing so allows us to avoid unproductive binaries and thus see how diagrammatic semiosis runs across varied image types; this, in turn, provides us new theoretical purchase on how various kinds of images—from paintings to scientific imagery—come to signify.

1. The notion of Diagram in C. S. Peirce and the Composite Photography of Francis Galton

One of the fundamental reasons why I turn to Peirce is that he builds his theory of ideas and his conception of the faculty of knowledge by referring to visual experience: *"I do not think I ever reflect in words*, I employ visual diagrams firstly because this way of thinking is my natural language of self-communion, and secondly because I am convinced that it is the best system for the purpose" (Peirce 1909, manuscript 619, p. 8, unpublished, my emphasis).

Some of the visual experiments that were being developed at the time when Peirce wrote these words had a great impact on his thinking. I refer in particular to composite photography, initiated by anthropologist Francis Galton (1822–1911). Peirce's proposal consists in asserting that figurative images are at the same time something perceptible and inscribed upon a material support but that they can also, in some cases, serve in the production of generalizations. This double orientation, towards the perceptible and towards the general, characterizes the notion of the diagram as following upon the Kantian idea of schematism (Chauviré 2008). Kantian schematism was the instrument making it possible to conceive of the singularity–generality and observability–imagination dualities, finding a concrete declension when Peirce reflects upon the composite photography of Galton or on other image sets or compositions.[6]

Diagrams are defined by Peirce by their capacity to signify relations between the parts of a representation that are analogous to the constitutive relations of the objects towards which one wishes to direct one's thought and work. In other words, it is not so much

objects that diagrams give prominence to but rather to *the organization of the parts of these objects*.

This general functioning allows Peirce to include and think together objects that differ greatly on a perceptual level, such as algebraic formula and photographs (more precisely, “at least *two* photographs”). But how is this possible? Peirce, indeed, includes both algebraic formulas and photographs as kinds of *icons* (sign relations based on resemblance or similarity, here, of relations between parts). These two types, which belong to the two extreme poles of autography (photographs) and of allography (algebraic formulas), are both considered as diagrams “which represent the relations, mainly dyadic, or so regarded, of the parts of one thing by analogous relations in their own parts” (Peirce 1931–35:2.276–77).

When addressing the question of photography according to the Peircean approach, one must keep in mind that a single photograph is of little interest to Peirce, be it from a scientific point of view or from the point of view of exemplifying the category of the icon. It was Francis Galton’s famous composite photography that contributed to inspiring Peirce’s theory of the icon, the composite photograph being above all, in Galton’s view, an experimental tool, i.e., a field in which one may carry out experiments (in Galton’s case, as has been pointed out, to eugenicist and racist ends). For Peirce, the composite photograph was a device making it possible to address matters of singularity and of generality together. Let’s see how.

Galton’s composite portraits were produced by the successive recording and exposure of images onto a single plate (superimposition) (Figure 1).

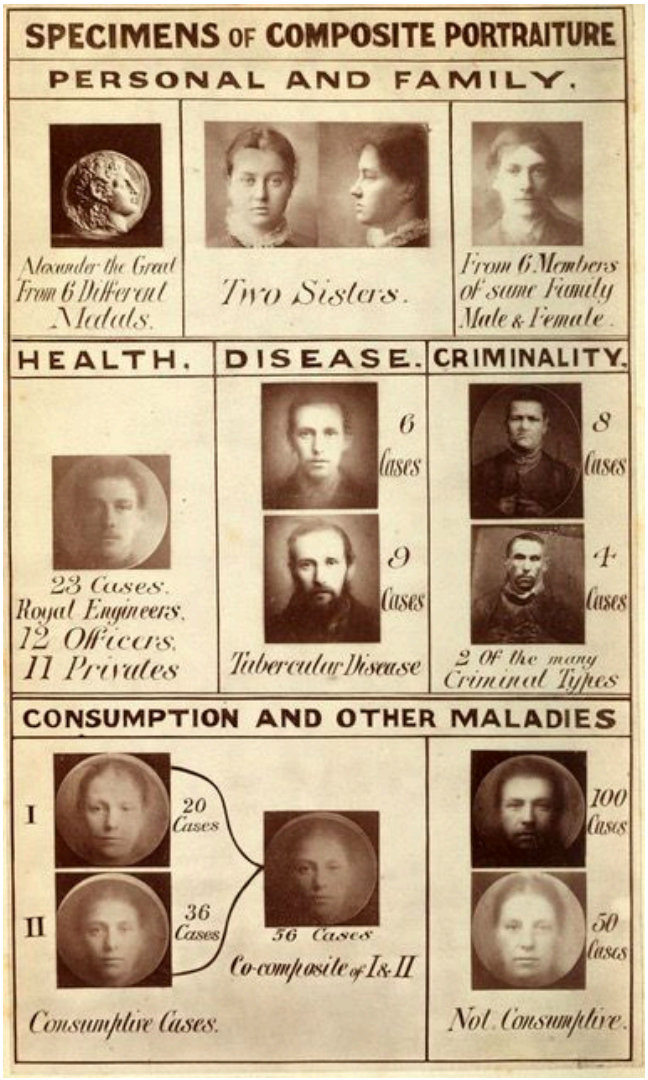

Figure 1. Francis Galton (1877), *Composite Portraits of Criminal Types*, The Galton Archive, University College London Special Collections, London.

The specific nature of these composite photographs proceeds from the fact that each face was captured using the same parameters, the same perspective, the same focal distance, and the same position with respect to a background grid. These fixed parameters were established in order to ensure photographic and figural commensurability among the faces. Galton thus sought to construct an accumulation of faces whose perfectly superimposable parts could presumably achieve generality (the so-called criminal type, the mentally ill type, etc.).[7]

What should capture our attention in these composite photos is that the central area constitutes the type, because it is where all the faces of the individuals are made to coincide,[8] whereas the blurring of the contours of the superimposed faces “measures the tendency of individuals to deviate from the central type” (Galton 1879:166).

The blurring of contours of which Galton speaks is very significant: indeed, if blurring was traditionally forbidden in portraiture (Dondero 2020), with Galton's portraits of types, we are faced with the surprising fact that *individuality emerges from blurs*, because the blur of the outlines allows us to see what *stands out* from the generality of the type, the latter being, for its part, attested in the center of the composite image, where the features of the individuals are made to coincide.

Chiara Ambrosio, in an article entitled "Composite Photographs and the Quest for Generality" (2016), argues that already in his "Short Logic" (1895), Peirce transformed Galton's method into a conceptual metaphor aimed at devising an exploratory tool for understanding the nature of ideas, which Galton called "cumulative ideas" (Galton 1883:183). Peirce had in fact transposed Galton's process of generalization from individual faces in view of understanding the operation of the faculty of judgment.[9] Ambrosio exposes the differences between the thinking of the two scholars as follows:

> Galton's composite photographs are static: they are presentations of ideal types, whose generality is validated by the reliability of the mechanical process that served for their generation. Peirce's composites, on the other hand, are inherently dynamic: they have an experiential basis (some of the yellow shades to which we compare the color of our chair may have been seen), but they also have some kind of predictive power (the composite photograph will allow us to recognize other *shades* of yellow as "yellow", and apply them to other percepts). (Ambrosio 2016:15, my emphasis)

This idea of shades is interesting because, according to Peirce, it is the shades that make it possible to understand the limits of categories and classifications, as well as to apply a category to new percepts—and one could even say, more generally, to make the category elastic, plastic. To put it another way:

> For Galton the centre of the image is the essential part of the photograph, as it is in the centre that "typical features" congregate. For Peirce, on the contrary, the interesting process happens in the periphery of the images, the areas in which shading suggests further, possibly new ways of applying the composite "template" to a new context and deriving novel relations through its application (Ambrosio 2016:16)

Indeed, composite photography constitutes an open class of photographs where new elements may spur an adjustment of which features are deemed characteristic of an idea or percept,[10] thus enabling categories to evolve.[11] It is clear that within composite photographs, accumulation makes it possible to contemplate the constitution of types,

these being subject to transformation, as what falls within or beyond the contours of the type may serve to include and exclude individuals from the definition of the type, thus providing the type with its own means of transformation. The composite photograph can thus be defined as an experimental image capable of revealing the transformations occurring in the extension of the category.[12]

The fundamental idea in Peirce, well illustrated by this example of composite photography, is that *the diagrammatic device is never encompassed within in a single image*: a diagram is produced when schematizations shared by different photographs and the objects to be represented, including theoretical or future objects, correspond. Peirce is able to develop this reflection because he considers the photograph not in its figurative density but in its *lines of force*, understood as schematizations which *emerge from* the forms. Indeed, as we will see later through the Deleuzian conception of the diagram, these lines of force allow our attention to shift away from the represented object and its figurative density, so that plastic oppositions, tensions between forces, and new mereological relations may emerge. In this same direction, Fisette (2010:7) asserts that the image must be *perforated* or that its figurativity must be *de-saturated* so that it may function as a diagram, i.e., as a device producing relations that are sufficiently abstract to be manipulated and thus be transposed to other experimental cases.[13]

The case of the iconography of black holes is quite interesting in this regard, because it works in reverse to the superimposition of the faces photographed by Galton. Images of black holes are produced by equations and theories. They acquire some degree of figurativity because they become grounds for experimentation for the values of the equations. Indeed, black holes acquired a visible form towards the end of the 1970s thanks to the connection made between the theory of special relativity and various experiments on other phenomena pertaining to cosmology, such as the collapse of stars, of which black holes would be only a hypothetical product. The existence of black holes thus being inferred, they were featured as visual forms *indirectly* obtained by means of calculations applied to other phenomena and mathematical models.

The first attempts by Jean-Pierre Luminet (1979) to depict them feature an iconography that is rather modulatable because it aims to signify a *general black hole*. The dotted line in the image digitally produced by Luminet—what he calls “virtual photograph” (Figure 2)—constitutes a model of the black hole, or even a compound of several *possible* black holes, each depending on the measurements of the accretion disk that one applies (Figures 3).[14] The dotted line in Figure 2 (i.e., the image that concludes a first experiment on the shape that the black hole can assume) functions in the same manner as the blur in Galton’s composite photographs: both constitute the vague and unstable margin of the category which allows it to be extended through new occurrences and new simulations.

In a certain way, the blur in the calculated photograph of the black hole features what one could call a zone of the incalculable or the infra-calculable.

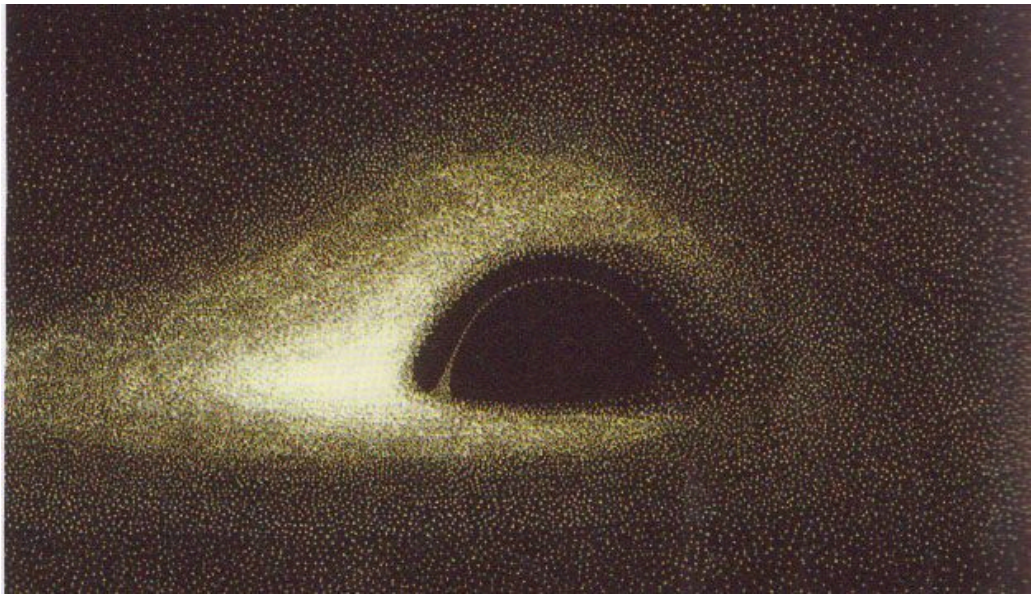

Figure 2. Distant view of a spherical black hole with a thin accretion disk. Virtual photograph of a black hole, computer simulated in 1978 (Luminet 1979:235)

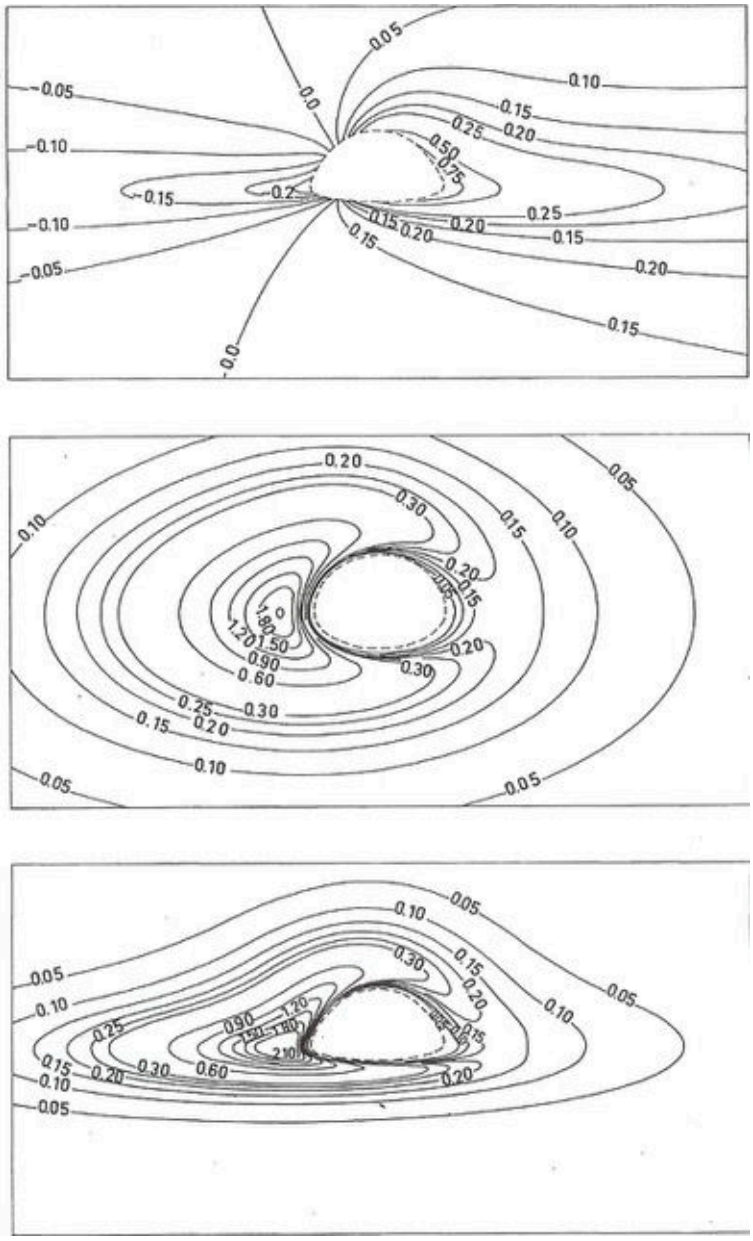

Figure 3. Isoradial curves as seen by an observer at 10° above the disk's plane. Curves of constant flux in units of Fsmax, as seen by an observer at 30° and at 10° below the disk's plane (Luminet 1979:234)

What composite photography and images of black holes have in common is the fact that they can be defined as totalities presenting dynamics between parts, central areas and peripheries that we may define, with Peirce, as diagrammatic. Further, the resulting general entity is always subjectable to new occurrences, as well as to new experiments (measurements of accretion disks, in the case of black holes) and to the redefinition of categories.

2. The Work of Art as a Totality: Force as an Abstraction of Form in Deleuze

Above, we saw how photographs can build a schematization of the relations between a type and new occurrences, as well as how several equations may contribute to give a visible form to theoretical objects such as black holes, albeit an unstable one due to the constant evolution of such models. In this section, I turn the idea of totality in art and, more precisely, the conception of the artwork as a mereological totality, that is, a unity consisting of wholes and their nested parts. Here, I invoke one conception of totality, that of French mathematician René Thom, before addressing the conception of the diagram as formulated by Gilles Deleuze in relation to the pictorial act.

Thom, in a fundamental article from 1983 entitled "Local et global dans l'œuvre d'art," elaborates his point of view on the work of art as a totality:

> While looking at a painting (or more generally a plastic work), the mind starts by grasping its contours; then, in an effort at analysis, there will be an endeavor to discern, within the centers of the work, subjects carrying a certain salience (*prégnance*). The total space of the work thus finds itself to be separated into partial domains, which are the zones of radiation from a center (or more generally of a local configuration of details taken individually). One could think that this division comes from a kind of proliferation of the contour towards the inside, a proliferation which intensifies when no particular detail captures one's attention. … It is essentially the conflict of these prégnances … which will ensure the unity of the work of art. (Thom 1983:5, my translation)

Thom's work involves a conception—on which we will focus our attention in the following pages—that is similar to that of Gilles Deleuze regarding the forces in painting.[15] For Thom, it is necessary to study such forces in relation to the body of the observer. He states that: "A form, in itself, always entails a mechanical interpretation, a 'force field.' This force field may be subjective in origin (according to the theory of Harry Blum, form recognition is but *the choice of an optimal motor strategy for manually grasping this form*); it may be objective, describing the forces which the object may emit or endure." (Thom 1983:7, my translation and emphasis). For Deleuze, conversely, the diagrammatic effect and the effect of totality of a painting are mostly related to the gesturality of the painter's practice (e.g., how they apply paint to the canvas) and hence to the fact of production itself.

Deleuze (2003[1981]) addresses the notion of diagram with respect to the problems of artistic representation in his 1981 book *Francis Bacon: The Logic of Sensation*. The diagram has, in this work, a capital function: it makes it possible to overcome the figurative data which already occupy the canvas before the act of painting commences as such. Before even beginning to paint, the painter must engage in a struggle with the stereotypes that have accumulated through repeated visual experiences and that virtually

invade the canvas. This can be achieved by allowing one's gesture to be guided by chance:

> make random marks (lines-traits); scrub, sweep, or wipe the canvas in order to clear out locales or zones (color-patches); throw the paint, from various angles and at various speeds. Now this act, or these acts, presuppose that there were already figurative givens on the canvas (and in the painter's head), more or less virtual, more or less actual. It is precisely these givens that will be removed by the act of painting, either by being wiped, brushed, or rubbed, or else covered over. For example, a mouth: it will be elongated, stretched from one side of the head to the other. For example, the head: part of it will be cleared away with a brush, broom, sponge, or rag. This is what Bacon calls a "graph" or a diagram: it is as if a Sahara, a zone of the Sahara, were suddenly inserted into the head; it is as if a piece of rhinoceros skin, viewed under a microscope, were stretched over it; it is as if the two halves of the head were split open by an ocean; it is as if the unit of measure were changed, and micrometric, or even cosmic, units were substituted for the figurative unit. A Sahara, a rhinoceros skin: such is the suddenly outstretched diagram. It is as if, in the midst of the figurative and probabilistic givens, a catastrophe overcame the canvas. (Deleuze 2003:99–100)

These random marks are non-figurative, non-illustrative, non-narrative, and, above all, non-predictable: they make it possible to break away from figurativity, namely from the links which cause logical and narrative inferences to arise between the represented objects. *Thrown at random*, these marks explode the narrative and the stereotypical links between parts of the painting: "These almost blind manual marks attest to the intrusion of another world into the visual world of figuration. To a certain extent, they remove the painting from the optical organization that was already reigning over it and rendering it figurative in advance" (Deleuze 2003:94).

The gesture that allows the painter to *reorient the whole* painting functions, I believe, in an analogous way to the tracing, described by Peirce, of supplementary lines on a geometrical demonstration. Such tracing enables the emergence of a (new) totality formed by a set of lines that constitute the premises of the demonstration, and whose coherence may have been, at first glance, ungraspable. The lines that for Peirce belong to the premises (and are drawn according to exclusively logical rules using general signs) correspond to the stereotypes for Deleuze. For Peirce, it is a matter of manipulating the topology of experience through an exercise of mathematical intuition and imagination. For Deleuze, it is a matter of freeing the gesture so that it may utilize chance as a disruptive event. Thereby, the manual gesture is able to take precedence over stereotyped visuality by opening onto possibilities that are not yet attested in the tradition of visual production (and of geometrical experimentation).

According to Bacon, one must manipulate chance—in the concrete sense of the word "manipulate"—to correct and adjust so that the "figure", i.e., the diagram, may emerge. The emergence of the diagram is described as a *reaction* of the canvas to this manipulative gesture guided by chance. More specifically, this emergence consists of a three-step process: 1. the perception of a pre-established, stereotyped, commonplace figurative visuality; 2. the gesture thrown at random onto the canvas; 3. the reaction of the canvas to this gesture and the consequent integration of chance into the painting. For the process to succeed, ordinary visual coordinates must collapse but somehow remain on the canvas as something virtual, as *something that functions as a tension of forces with the randomly thrown strokes, with chaos*, so that new relationships may emerge on the canvas. Indeed, the result of these gestures make us perceive the tension between the lines due to the a-pictorial gestures thrown at random and to the existence, albeit virtualized, of the domain of the stereotype of the figurative, of the narrative. It is necessary to be able to perceive this tension between modes of existence on the canvas so that the latter can function as a diagram.[16] These modes of existence—namely, potentialization, actualization, realization, and virtualization—correspond, respectively, to the refusal of the stereotype (potentialization), to the randomly thrown gesture (actualization), to the achievement of a new totality within the painting (realization), and to the possibility of integrating this new totality in the praxis of the pictorial system (virtualization).

One can see an analogy between the emergence of what Deleuze (2003:94) calls "the Figure" (as "the improbable itself") and the method of discovery Peirce describes as the "theorematic demonstration" (Peirce CP 6.471) or "deduction" (Peirce CP 7.203, 7.224). Manipulation plays a role in Bacon's painterly works as well as in the mathematical diagram, which Peirce describes as an emergence of *unpredictable* forms via the addition of extra lines that are added to the lines traced according to logical relationships contained in the premises of the experiment. Peirce states in this regard:

> There are two possible scenarios: i) the conclusion is read directly off the initial diagram by simple inspection; in other words, the relations that make the conclusion possible are immediately perceived with no alteration to the diagram [corollarial]; ii) the diagram must be altered with additional elements [theorematic] [...]. *The addition of such elements is described as an experiment performed on the diagram, similar to one conducted in physics or chemistry on a sample* (cited in Chauviré 2008:36, my translation and emphasis).

Mathematical work, which is here conceived of as a concrete experiment as may be conducted in chemistry and physics, can be related to the experimental gesturality of pictorial production. According to Peirce, in the process of mathematical demonstration,

one starts from the premises and proceeds by means of perceptually relevant spatial manipulations until some form of totality emerges. Deleuze, for his part, states that: “It is in the manipulation, in the reaction of the manual marks on the visual whole, that chance becomes pictorial or is integrated into the act of painting” (2003:95). With Deleuze, we are first of all confronted with stereotyped figurativity, with the optical regime of the image: it is through the manual gesture, the production of non-pictorial, a-pictorial strokes, that we obtain the Figure and that we abandon the narrativity of the stereotype.

Similarities can be seen between Peirce’s and Deleuze’s models of the diagram. For Deleuze, it is necessary to get rid of the figurative links between the parts of the painting via the serendipity of the manual gesture so that the painting may be freed from repetition and from the stereotype; for Peirce, the mathematical discovery comes from subsidiary lines drawn while exceeding the limits of disembodied logic: it is necessary for the gesture of inscription and for the material spatiality of the drawing to intervene in the development of the reasoning. By adding and projecting elements that are improbable (in the sense of being difficult to predict) onto logical relations in Peirce’s case or onto figurative stereotypes in Deleuze’s case, one may cause a diagram or new totality to emerge, one which, for Deleuze, must remain unstable (the virtual and the realized must remain actual). It is, according to Deleuze, actually a question of going through two stages in order to achieve this new composition:

> A probable visual whole (first figuration) has been disorganized and deformed by free manual traits which, by being reinjected into the whole, will produce the improbable visual Figure (second figuration). The act of painting is the unity of these free manual traits and their effect upon and reinjection into the visual whole. By passing through these traits, figuration recovers and recreates, but does not resemble, the figuration from which it came. (Deleuze, 2003:97–98)

To explain the notion of the diagram, Deleuze describes it as a middle ground between the absence of sensation exhibited by Mondrian’s optical and abstract paintings and the confused sensation of action painting: at one extreme we have the fully codified painting of a later Mondrian or Kandinsky, and on the other, the fully gestural quality of abstract expressionism and of the informal art exemplified by Pollock. Indeed, Pollock’s painterly work is exclusively manual; the line no longer has a place and matter is decomposed: “the sensation, even a coloring sensation, is ephemeral and confused, lacking duration and clarity … . But the frame suffices even less: it is abstract. The geometry must be made concrete or felt, and at the same time the sensation must be given duration and clarity” (Deleuze 2003:112).

Painting must not yield to the chaos of sensation or to the order of optics and of the line: in this sense, there must be a tension in the existence of the diagram. Deleuze refers to Peirce when he explains his conception of the diagram as a clearly manifested sensation and as involving felt and concrete geometry. This leads us back to the conception of the diagram as an in-between, as a passage between perceptive density (figurativity, narrative links between the represented objects, similarity) and the desaturation of figurative features via operations capable of producing new mereological relations.

Finally, it clearly emerges from the description of Peirce's theorematic procedure and from the pictorial process explained in Deleuzian terms that temporality is a fundamental feature of diagrammatic functioning, especially because the latter produces an interactional whole between the act of tracing, the already traced image-text, and the experiment the observer can perform, through manipulation or simply by looking. We'll see that this temporality is relevant in Goodman's theory of the diagram, especially as regards the processes of reading/interpretation.

3. Nelson Goodman and the Transposability of Experience

It seems appropriate, at this point, to contrast Nelson Goodman's (1968) conception of the diagram with Deleuze's view. Both share the idea of the diagram as a third term between representational density and structure, and, to use Deleuze's words, between geometry and sensation, as well as between the build and color.

As already outlined at the beginning of this article, Goodman (1968) distinguishes between dense (autographic) and notational (allographic) symbolic systems: the dense systems are well illustrated by pictorial art whereas the notational systems, which are articulated and composed of fixed-value, disjointed and recombinable elements, concern arts such as music or architecture, in which the score or the architectural project resorts to an articulated language, namely a notational system providing unambiguous instructions for execution. Autography, unlike allography, describes the operation by which paintings are deemed non-repeatable and immutable entities. In painting, any line or space on the canvas, even if devoid of any color or shape, is relevant, and one can neither differentiate nor articulate the marks that constitute the artwork in a context where the notions of notation and "reproducibility" have no meaning. This is what we call the "syntactic density" of painting.

Goodman does not, however, assimilate diagrams (such as graphs, despite having legends and strict codifications) among the allographic arts on the basis of their opposition to the dense and autographic arts. Rather, he includes the diagrammatic among the dense and autographic systems, placing it at the extremity of a gradient of which the opposite pole corresponds to the pictorial. The pictorial and the diagrammatic

are, thus, both made to form part of the same gradient of dense systems where they occupy the two opposite extremities. They both differ from notational systems, that is to say, from articulated and differentiated systems, what Deleuze would have called pure optics and Peirce would have called symbolic systems.

Importantly, however, for Goodman, diagrammaticality and pictoriality are not reified notions; on the contrary, they depend on practices of reception and interpretation. The diagrammatic and the pictorial are thus distinguished by the relative saturation of the features that are made relevant during the act of viewing. As the density of relevant features increases, we move towards pictoriality where the correspondence between a symbol and an extension in a given system is less precise. In fact, Goodman argues that a same visual configuration is not in itself pictorial or diagrammatic, but that it can be attached to a more or less dense system. In the case of pictorial reading, the number of relevant features in the visual configuration is high, whereas in the case of diagrammatic reading, great economy must be made of the features considered to be relevant.

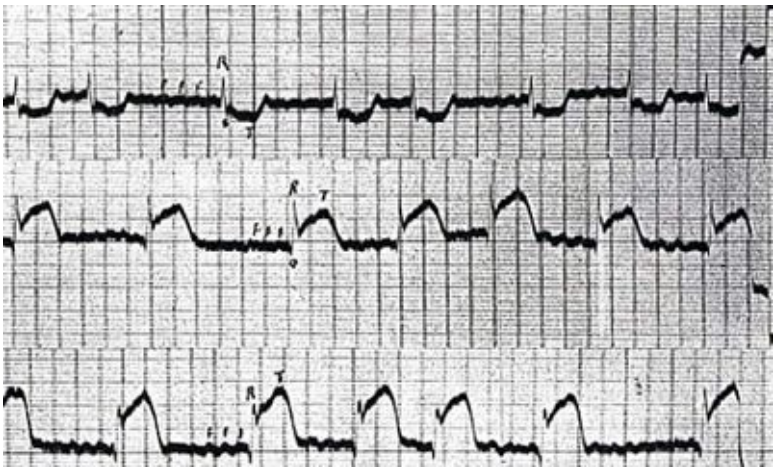

Figure 4. Electrocardiogram

Figure 5. Hokusai Katsushika, *The Inume Pass in Kai Province*, "Thirty-six Views of Mount Fuji" series, 9th view, circa 1829–1833. Source: BNF.

The example Goodman uses is the comparison between an electrocardiogram (Figure 4) and a drawing of Mount Fujiyama by Hokusai (Figure 5). Despite being hypothetically identical (i.e., not very different, graphically speaking, from one another), these representations differ by their degree of saturation, that is, by their number of contingent/relevant syntactic features. This comparison shows that the segmented black lines on a background can be the same in both cases. However, one is a diagram, the other is a drawing. How are we to understand this? Goodman writes:

> The answer does not lie in what is symbolized; mountains can be diagrammed and heartbeats pictured. The difference is syntactic: the constitutive aspects of the diagrammatic as compared with the pictorial character are expressly and narrowly restricted. The only relevant features of the diagram are the ordinate and abscissa of each of the points the center of the line passes through. The thickness of the line, its color and intensity, the absolute size of the diagram, etc. do not matter; whether a purported duplicate of the symbol belongs to the same character of the diagrammatic scheme depends not at all upon such features. For the sketch, this is not true. Any thickening or thinning of the line, its color, its contrast with the background, its size, even the qualities of the paper—none of these is ruled out, none can be ignored. Through the pictorial and diagrammatic schemes are alike in not being articulate, some features that are constitutive in the pictorial scheme are dismissed as contingent in the diagrammatic scheme; the symbols in the pictorial scheme are relatively *replete*. (1968:229–30)

The passage from the pictorial to the diagrammatic is thus achieved through the restriction of the salient syntactic aspects. What Goodman teaches us is that the autographic, diagrammatic, and notational pictorial regimes are distinguished from one

another by the relative saturation/sparseness of the features that must be made relevant according to the domains of interpretation in which one is situated.

In previous work (Basso Fossali and Dondero 2011), I tested this view of the diagram by examining photography, which, as such, is already in a hybrid position between an autographic regime (the shot is embodied, unique, and non-repeatable) and an allographic regime (the photographic negative is repeatable and reproducible through the production of prints), and is thus characterized by autographic sets of generatively associated objects.

Generally, photography appears as a mechanical device which would only allow the construction of local and singular relations between a piece of reality and a representation, or between a particular element and another particular element. With the chronophotography of J.-E. Marey, however, everything changes. Chronophotography "compacts" two kinds of information into one image: (i) the visual imprint of a body in motion and (ii) an analysis of the time intervals between the visual stages of the movement, using the "graphic method", in Marey's terms. Chronophotography illustrates the coexistence of two kinds of imprints in a single visual medium: the figurative imprint of a body (a photographic process) and the figural imprint of that imprint's measurements (the graphic method). In short, it represents the relation between local, recordable data and mathematically manipulable information. Consider in this regard, Marey's *Study of a Man's Walk with a White Rod along His Spinal Column* (Figure 6).

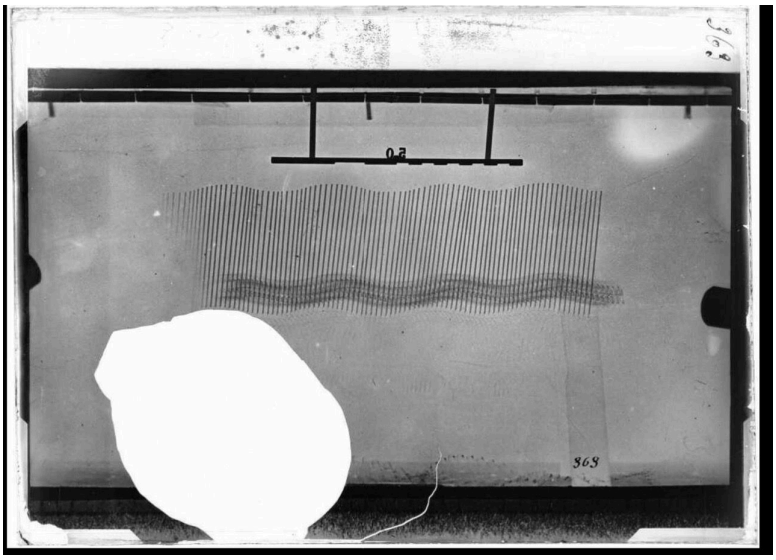

Figure 6. J.-E. Marey, *Study of a Man's Walk with a White Rod along His Spinal Column*, 1886. Chronophotography, Paris, French Film Library, camera collection.

The chronophotograph has coupled the local camera shot (the recording of the imprint: the continuous walk, in this case) with the measuring of that very imprint (the trajectory

formed by the repetition of the rod in movement). This measuring process is already a translation tool, used to reproduce and transmit data. The chronophotograph keeps the imprint of singular figurative details, but also of the discontinuities within this imprint. These discontinuities are what give each chronophotograph the ability to *surpass itself*: using a notation system derived from the graphical part that encodes spatio-temporal relations, it can become a *set of instructions* for investigating and comparing *other* spatio-temporal phenomena apart from those of the singular movement photographed in this instance. The power of abstraction this kind of photography has is purely related to its composite nature, i.e., to the inalienable interaction between the figurative imprint and the figural notation, which makes it a potential tool for comparing, generalizing, or modeling.

Our analysis is confirmed by another of Marey's chronophotographs, *Study of Trotting Horse (Black Horse with White Marks on its Joints)* (Figure 7).

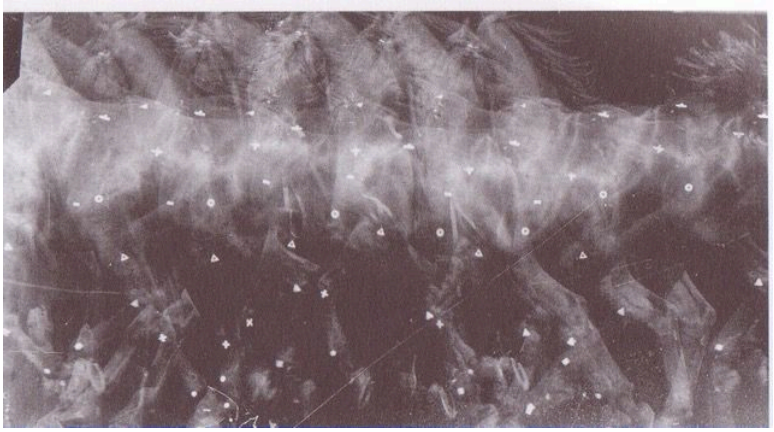

Figure 7. J.-E. Marey, *Study of Trotting Horse (Black Horse with White Marks on its Joints)*, 1886, Chronophotograph, Paris, Collège de France.

The photo shows both the imprint of the specific movement of a singular horse (and the technical limitations of shooting the photo: the movement is blurred) and the graphical aspect (shown as alignments of white dots) obtained by measuring the relation between the space covered and the duration of the movement. This tool makes it possible to parameterize movement over time; consequently, the movement has two referents of unequal status which are superimposed in the same image. On the one hand is a deictic referent specific to a singular camera shot (the autographic system) and, on the other, an objectivized referent established via measurements and comparisons of measurements (the allographic system). In this case, comparing measurements is, in fact, what makes it possible to objectivize the allographic referent, to disengage it from the agent of the photo shoot and to open to a commensurability of the imprint with other, future experiments on walking or trotting. And this is why a chronophotograph is not just an image of something but also a set of commensurable relations and, as such, a possible arena for

commutations and permutations, i.e., for *manipulating parameters*. In short, it is an arena for experiments whose aim is to understand movement in general.

With a chronophotograph, one perceives an indissoluble montage and a graphical configuration "contained" within the photographic imprint, neither of which can be interpreted or used without at least knowing about the other. The same data are shown in two different ways: there is the figurative density of the imprint, on the one hand (autography), and the figural abstraction of measurable spatiotemporal relations, on the other (allography). And the tension between the two modes of manifestation is what constitutes the heuristic value of the *diagram*. Further, what Goodman underlines is how the contingency and dynamism of the diagram—as theorized by Peirce and Deleuze—is something that emerges *out of* a set of practices of engaging with and using, indeed, experimenting with images; that, in short, images are not allographic or autographic per se, not stereotyped or stochastic, not pictorial or scientific as such (i.e., not essentially), but rather that these features emerge as parts of totalities in temporalized semiotic processes in which their mode of existence is potentialized, actualized, realized, and virtualized.

To Conclude

Our course has allowed us to bring together and differentiate three notions of the diagram according to three different authors.

By examining the case of composite photography, we have seen that figurative images that are very "close" to the localism of the imprint, such as photographs, can function, when associated with other images of the same family, as a form of generalization, or even as types, types which can, moreover, always be manipulated so that the categories can become more precise, differentiated, and expanded. For Peirce, the tension between the center of a category and its periphery is incorporated in the distinction, perceptible in the composite photography, between the coincidence of several faces at the center of the image and the blurred effect in its outlines (the emergence of the particularity of each face). This tension represents the process of thinking, which is made of composition, exclusion, inclusion, division, and comparison operations.

The appeal to Peirce's theory is also useful for understanding that the production of a diagrammatic operation always involves a perceptual and sensorimotor act leading to a form, that is, to a unifying whole. This form can be fixed and stabilized in a mathematical demonstration but remains unstable in a composite photograph (new occurrences can modify the type) as well as in art, as shown by the Deleuzian theory of the emergence of the diagram in the painting of Francis Bacon. The role of sensorimotricity in the pictorial may seem banal. However, what the Deleuzian theory regarding sensorimotricity teaches

us is that the gesturality must be entrusted to chance, to what is not probable, in order to be able to innovate in terms of figuration and of what is figuratively imaginable. In this sense, the diagram according to Deleuze is an unstable form, as it is in Peirce's case, for whom a perceptive totality is the ephemeral result of the stabilization of a tension of forces within an experimentation process. In Deleuze's case as well, it is necessary to stand between the two, between the stereotype and the unforeseeability of chance, between the virtualization of the stereotype and the insertion of chance within the stereotype. This position can be compared specifically with Peirce's conception of the theorematic deductions through diagrams. The latter are seen as forms of experimentation, which always involve processes of abduction, generators of chance and possibility that exceed purely deductive processes of necessary conclusion. The necessity of deduction, considered by Peirce as something to overcome so as to extend reasoning, is developed in a similar manner by Deleuze: the overcoming of necessity in Peirce corresponds in Deleuze to a removal of the figurative and narrative stereotypes from the canvas through the appeal to chance.

Goodman's diagram is a device that lies between rarefaction and saturation, between the grammaticalization of features, on the one hand, and saturation, on the other. The diagrammatic view at the same time involves the dissolution of density and the densification of notation. It may be compared, in Deleuze, to the oscillation between the rules of the optical code characterizing Mondrian's paintings and the act of specifying the wild sensation of Pollock's expressionism, which corresponds to a selection of features in Goodman (desaturation through the elimination of irrelevant features). Whereas for Deleuze, the diagram is obtained through a gesture that follows chance and breaks away from that which is stable and predictable (the figurative), Goodman's gesture is rather to be understood as a gesture of selection of the features relevant to the chosen regime of visibility.

Finally, the diagram is a device that is profoundly triadic and dynamic. Goodman's diagram lies at the interstice between the desaturation of density and the organization of the selection of features into stabilized forms. In this sense, it is an instrument for the transferability of experience. In Peirce, the diagrammatic process can be described through three stages: the set of premises, the manipulation moment, and the opening to a transformation of the established knowledge (or, in the case of composite photography, the operations of the superposing faces, the emergence of the non-coincidence effect, and the evolution of the type). In Deleuze's thinking this triadic moment corresponds to the refusal of the narrative figuration, the appeal to chance and the restructuration of pictorial space. In all these cases, images are at the center of a manipulation process which leads to a renovated economy of knowing which includes generalization and the transferability of experiences.

Endnotes

1. Contrary to autographic systems, allography is characterized by a two-step process of functioning: notation and its executions, with notation constituting a very precise and controlled text laying out the instructions for performances (executions) to come. An example of notation, deeply studied by Goodman (1968), is classical musical notation, which is to be executed while respecting an exact correspondence with the sequences of markings, spaces, and punctuation signs (its orthographic identity).↩

2. Generalization, abstraction and transposability characterize what nowadays Johanna Drucker (2020), following Goodman, calls *mathesis*, i.e., a form of knowledge which, in contrast to knowledge by *graphesis* (inscription), exclusively uses unambiguous signs. *Mathesis* and *graphesis* are concepts having inherited the characteristics of allography and of autography, respectively.↩

3. I have sought to show this functioning of photography in Basso Fossali and Dondero 2011 as well as in Dondero 2010, 2012. ↩

4. The foundations of plastic semiotics are contained in Greimas 1984 and in Floch 1985. Greimas and Floch were the first to study images through categorial oppositions (chromatic, eidetic, topological) and plastic dynamics (orientations of objects, intensity, light, and so on). The developments of this semiotics can be found in the tensive approach to the image (Dondero 2020), as well as in the mereological approach defended by Bordron (2011, 2013). See also the works of René Thom (1983) and of Jean Petitot (2004) on pictorial composition and on non-genericity as a form of aesthetic salience.↩

5. See Dondero and Fontanille 2012 regarding the diagram and scientific chains of images. ↩

6. It is in fact always a series of images that Peirce takes into consideration: “at least two photographs serving to draw a map” (Brunet 2012, my translation). With this formula, Peirce aims to assert that the relations between several photographs—by projection, translation, mirroring, et cetera—enable not only to trace relationships between parts of the territory within the map in question, but also to reveal unexpected ones. This means that a combination of photographs allows us not only to build a new totality made of new relations through plastic (topological, chromatic, and eidetic) perspectives and orientations, but that these relations can also help us to discover something new, this being the ultimate objective, for Peirce, of all diagrammatical devices. ↩

7. The composite photography of statistician Francis Galton has been discussed in political terms by a great number of important scholars and intellectuals of various periods. Let’s consider what may be the most famous example: Allan Sekula’s essay, “The Body and the Archive” (1986). Sekula frames such photography within the new moral, medical and juridical photographic realism of mid-nineteenth century

Great Britain and notably in the context of the regulation of the growing urban presence of proletarians and immigrants. This was a period which saw, with Talbot and other users of photography, the emergence of "the truth of an indexical rather than textual inventory." Photographic portraiture could, according to Sekula, have an honorific purpose but also a repressive function. The repressive function (the function that has been ascribed to composite photography) had for its objective the identification and typification of the criminal body in order to predict crimes: "Criminal identification photographs are a case in point, since they are designed quite literally to facilitate the *arrest* of their referent" (Sekula 1986:7). Some other scholars (see, for instance, Tagg 1988) even went so far as to say that this kind of police photography was equivalent to a prison such as has been described in panoptical terms by Bentham and Foucault. On the relation between fingerprints and statistical photography produced in view of the typification of the "Other" (e.g., criminalized, medicalized, and racialized others) outside of the Occidental world, and particularly in India, see Pinney 1997. For semiotic considerations regarding faces and hands in forensics, see Leone 2021. ↩

8. As noticed by Sekula (1986:17), photography "was a medium from which exact mathematical data could be extracted" and the photographic universal archive was able "to reduce all possible sights to a single code of equivalence … grounded in the metrical accuracy of the camera." In other terms, at the time, there was an illusion that photography could work as an allographic system, fully measurable and reproducible. ↩

9. For a more in-depth examination of the relationship between Galton and Peirce, see Dondero 2021. ↩

10. Galton's conception of photography was also forward-looking, as the establishment of a type of man by superimposing individual faces was to permit the identification of future criminals, pathological individuals, and so on. In a way, the generalization achieved by the type could serve as a schematization, i.e., be made into a device that could govern new occurrences of faces. ↩

11. In his definition of meaning according to Peirce, Fisette (2010:1) asserts that: "He [Peirce] defines meaning as a movement or a progression of the mind along open paths leading to something new and of which the outcome was initially, in large part, unforeseen" (my translation).↩

12. This dynamic function of composite photography is a semiotic interpretation of mine that probably neither Ambrosio nor Sekula would accept. Ambrosio wishes to stress the difference between Galton and Peirce so as to value Peirce's translation of the process of composite photography into mental terms. Sekula does not take into account the idea of the evolution of the type because his focus is on the critics of Galton's problematic eugenicist ideas of the "average man" and of the betterment of society through the reproduction of the "fit" and the prevention of the "unfit." In my view, composite photography can be usefully seen analytically through the notion of "enunciative praxis" constituted by the four operations that

are actualization, realization, potentialization, and virtualization (see Fontanille 2006). Composite photography may, through the analytical tool of enunciative praxis, become an observational device for understanding the historical transformation of typification classes. ↩

13. This characteristic of "transportability" of the Peircean diagram is shared by another concept, developed in linguistic anthropology, of entextualization. This notion, developed by Silverstein and Urban (1996), is used by Nakassis to describe the production of a *cohering whole* through a "dialectical process of evenemential unfolding of textures and their *constitution-as-text* [as] the cohering of various temporally emergent signs such that they are, through their metapragmatic mediation (co-textual, interdiscursive, and ideological), construed as some *de-/re-contextualizable text*" (Nakassis 2023:4, my emphasis). The diagrammatical functioning emerges through the correspondence between the expression plane's organization of this "interactional text" and its content plane, in a similar process as in the constitution of *semi-symbolic* functioning in Greimas 1989 and in Floch 1985. ↩

14. See in this respect Dondero 2010 and Dondero and Fontanille 2012.↩

15. Concerning the work of art as a totality of morphogenetic transformations, see Petitot (2009), who traces a history of the notion of dynamic structure from Goethe and D'Arcy Thompson to contemporary neuro-aesthetics. The analysis of Poussin's painting *Eliezer and Rebecca* (1648, Louvre) is in this respect exemplary of the organization of the composition across three levels (that of the figures, of the groups of figures, and of the painting as a whole).↩

16. The theory of modes of existence in semiotics is born from the observation that in the same discourse, enunciative voices having different intensities of presence co-habit: all discourses are characterized by various equilibria between modes of existence: the virtualized, the actualized, the realized, and the potentialized. These modes constitute the discursive thickness enabling us to describe each utterance in relation to cultural practices that are undergoing transformations and being translated into one another. The modes of existence make the notion of "enunciative praxis" (Fontanille 2006) methodologically operational. See note 12 *infra*.↩

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