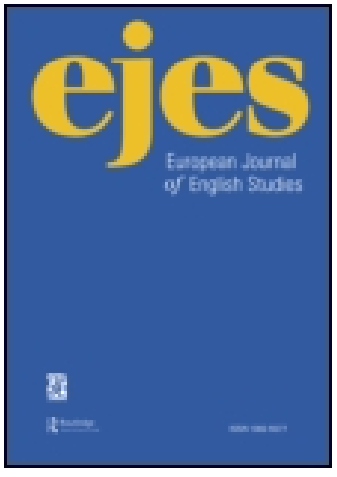

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Diagrammatic thinking in literature and mathematics

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Noëlle Batt

DIAGRAMMATIC THINKING IN LITERATURE AND MATHEMATICS

This article discusses the way both mathematics and literature share an iconic character crucial to their specific semiotic regime, which can be traced back to the implication of the diagrammatic property of both natural language and formal language. Peirce and Wittgenstein are the main references. The contribution of Gilles Châtelet is evoked.

Keywords icon; diagram; literature; mathematics; Peirce; Wittgenstein; Gilles Châtelet

> In literature, ideas, as in music and painting, are not the 'ideas of the intellect'; they are never quite detached from what the author sees; they [show through], as unchallengeable as persons, but not definable. (. . .) the writer's work is a work of language rather than of 'thought'. His task is to produce a system of signs whose internal articulation reproduces the contours of experience; the reliefs and sweeping lines of these contours in turn generate a syntax in depth, a mode of composition and of [narrative] which breaks the mold of the world and everyday language and refashions it. This new speech takes shape in the writer unnoticed, during years of apparently idle living in which he despairs of the lack of literary ideas and 'subjects' – until one day he yields to the weight of that *way of speaking* which has gradually been built up in him and he starts to say how he became a writer, creating a work from the story of the birth of that work.
>
> (M. Merleau-Ponty, 'The Problem of Speech', 25)

> The virtual requires the gesturing hand.
>
> (Gilles Châtelet, *Les Enjeux du mobile*, 15)

The reason why a literary text will always exceed a pragmatic text, whatever its refinement and subtlety may be, is, as Proust (1954: 296) declared, that: 'all great books sound as if they were written in a foreign language'. After Proust, other critics used similar formulas: Paul Valéry (1957: 1324),[1] Gilles Deleuze (1993: 15–16) quoting Proust,[2] and even narratologist Gérard Genette (1966: 220).[3] The reason why literature cannot be assimilated to philosophy or logic although it shares with these two disciplines many questions and topics, is because these questions and topics are investigated in a completely different mode than the one they practise. This mode has

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a lot to do with the way literature undoes and redoes, misshapes and reshapes the common language on which it relies. It is also a consequence of the fact that in a literary text all the levels that play a part in the composition of the work (diegetic, narrative, linguistic, rhetorical, symbolical, and so on) resonate with one another so that literary meaning is the result of the interrelation (I. A. Richards might have said the 'interinanimation') of elements or units belonging to heterogeneous levels and entailed in a connective network.

The discipline most akin to literature in this matter would probably be mathematics in so far as, like literature, it thinks about the world and the potential relations between its components in a creative way. Both literature and mathematics give birth to possible worlds, mobilize other coordinate points, imagine unknown relationships between them, move them in space and time along new trajectories. Both do it through a display of signs, deploying them in meaningful relationships which can also be deciphered as patterns, forms, with an effect on the reader which allows us to qualify this display as a performative iconic network.

Declaring an interest for literary art and choosing it as a research topic obliges us then to understand and explain what specifically takes place in this unique discourse which seems to be an anthropological necessity for any instituted society.

Let us single out three features which may appear as the signature of literary art as such. These are as follows:

- *A modelling action* which takes place thanks to appropriate technical means adequately implied in a formal structure which is guided by generic constraints and obeys conventional principles dictated by culture and history.
- *A diagrammatic inscription of this modelling structure*. The diagrammatic character of literary writing is the direct result, first of a disruption introduced by the writer in the balance between the three characters attributed by Charles Sanders Peirce (1932) to the sign ('indexical', 'symbolical', 'iconic'), to the advantage of the iconic dimension and more specifically, the diagrammatic one, then, of an intentional extension of the diagrammatic dimension to all the levels of the work implied in its composition.
- *An aesthetic effect* which derives from the diagrammatic character of literary language in so far as it has an action both on the intellect and on the senses of the subject-reader. The joined implication of the mind and the body in the aesthetic effect transforms the act of reading into a cognitive experience of a most original type.

A modelling action

To create a possible world in and through literary prose or poetry is one of the means men or women have at their disposal to understand creatively the world which they inhabit. They invent a model which comprises as much otherness as identity. A model which is more than a representation in so far as there is more critical distance in it. A model which proceeds from a deferred, decentred reduplication of the world, a translation on different coordinate points.

The modelling process implies the creation of a diegetic world, defined by a set of actions, characters, objects, spatial and temporal data. There is no need to insist on

that. The French structuralists (Barthes, Todorov, Greimas, Brémond) devised the necessary notions and concepts to help us map the arrangement of the diegetic data, establish correspondences, make an inventory of the play of causalities, determine the interplay of logic and chronology and all their possible distorsions.

The modelling process also implies the selection of a narrative strategy – a narrator, a focalizer, a temporal organization which convey the diegetic elements in a way which will be decisive for their reception. Anyone who has ever decided to rewrite a novel or a short story and change one of these parameters (narration, focalization or temporal organization) knows how important they are for the qualitative reception of the work, how much they determine its appreciation. The Russian formalists (Eikhenbaum, Chlovski), and narratologists – such as W. C. Booth, Mieke Bal, Dorritt Cohn or Gerald Prince – have elaborated helpful concepts to rationalize this strategy.

The modelling process finally implies the choice of a writing strategy which means an investment of lexicon and syntax, an appeal to the resources of ancient rhetoric (*elocutio*, *dispositio* and *compositio*). But as the writing strategy is referred to, the second feature mentioned above has to be considered: the diagrammatic character of literary language and composition, which requires an epistemological detour with Peirce and Wittgenstein.

A diagrammatic character

Let us first briefly recall the conceptual categories proposed by Charles Sanders Peirce in his *Collected Papers* (Pierce, 1932). This article will then examine the commentaries proposed successively by Roman Jakobson and Christiane Chauviré about the importance of diagrams in Peirce's system – Jakobson in an article entitled 'A la recherche de l'essence du langage', published in 1966; and Chauviré in an article entitled 'Perception visuelle et mathématiques chez Peirce et Wittgenstein', published in 2003.[4]

It is well known that Peirce when founding his semiotics (which was named after the antique *sêmeiôtikê*) conceived it as a continuum with the different kinds of logic elaborated in classical antiquity and in the Middle Ages. Three types of signs or *representamen* are differentiated, according to three different types of relations between the signifier and the signified. It is important to note that these categories apply to mathematical as well as to natural language. The *icon* is operative because of a similarity existing between the signifier and the signified (namely, between the representation of an animal and the animal itself). The *index* is operative because of a natural contiguity between its signifier and its signified (as is the case between smoke and fire for instance, or between a symptom and an illness). The *symbol* is operative because of an instituted contiguity between signifier and signified. This is why the conventional rule that institutes the association must be taught and learned for the symbol to be correctly deciphered. It should be recalled here that Saussure started to use the word 'symbol' in that very same way before declaring a preference for the word 'sign' instead. Peirce very soon recognizes that resemblance, contiguity and conventional association coexist in the three varieties of defined signs and that the way they are named simply emphasizes the dominance of one type of relation over the

others. For him, the most perfect sign would be the one in which all three types of relationship would be proportionately distributed.

Let us focus here on the *icon*: it is divided by Peirce into two subcategories: the *image* and the *diagram*. In the image, the signifier represents 'the simple qualities of the signified'. In the diagram the resemblance 'only concerns the relations between their parts'. The diagram is defined as 'a *representamen* which is predominantly a relational icon which conventions allow to play that part'. Peirce first illustrates his definition with the example of geometrical figures of different sizes figuring the production of oil in different countries. He continues with the example of algebra, saying that 'every algebraic equation is an icon in so far as, thanks to algebraic signs, it facilitates the perception of the existing relations between the quantities alluded to'. He continues with what has become one of his best known statements: 'algebra is but a sort of diagram and language but a sort of algebra', adding: 'for a sentence to be understood, it is necessary that the arrangement of the words within the sentence function as an icon'. Jakobson (1966: 27) illustrates Peirce's statement by showing through various examples that very often, the order in which the words appear in the sentence reflect either the existing hierarchy between the characters named ('the president and the prime minister' will be more frequently heard than 'the prime minister and the president'), or the order in which events take or took place as in Caesar's well-known slogan: '*veni, vidi, vici*'.

The study of diagrams experiences a new development with the modern theory of graphs; Jakobson underlines the analogies they present with grammatical patterns, syntactic ones in particular. Jakobson notices that in morphology as well as in syntax, all relations between the parts and the whole conform to Peirce's definition of the iconic nature of diagrams. Quoting the case of comparatives and superlatives, Jakobson notes the gradual increase of the number of phonemes in the signifiers corresponding to the gradation of value in the signifieds: 'high, higher, highest'. He also comments on the fact that one does not know of a language in which the plural would be marked by a subtraction of phonemes rather than an addition of them. And to support once more Peirce's position, Jakobson (1966: 31) reminds us that Saussure finally felt obliged to nuance his notion of 'arbitrariness' and to distinguish between what is 'radically arbitrary' and what is 'relatively arbitrary'. As far as the lexicon is concerned, Jakobson gathers lexical series of terms which are semantically akin and show phonological similarities which are not due to a common etymology; for example in French: (*ami*, *ennemi*, // *père*, *mère*, *frère*); in English (father, mother, brother, sister); Jakobson seizes the opportunity to stress the importance of paronomasia in the life of language. He does not mention any other rhetorical figure although he might have. As a final approval of Peirce's position, Jakobson (1966: 36) concludes that '''the diagrammatic system'' being on the one hand manifest and compulsory in the syntactical and morphological structure of language, on the other hand latent and virtual in its lexical dimension, ruins the Saussurrian dogma of the sign as arbitrary'.

Jakobson's remark on panonomasia will not surprise any of those who know how curious about literature the former member of the Moscow Circle and the Prague Circle was throughout his life and career, and how he remained deeply concerned by the necessity to pursue his linguistic reflection both on ordinary language and on poetic language. Along that line, the different theoreticians have never stopped studying the way literary language both exploits the resources of languages and compensates for their faults, as Mallarmé (1945: 364) beautifully expressed it.[5] If the

iconic character is already very present in pragmatic language as stated by Peirce and confirmed by Jakobson, it is exacerbated and magnified in literary language to the point of becoming its signature. One might advance the hypothesis that literary language offers a quantitative and qualitative stylization of the iconic character of language at work at the phonological, morphological and syntactical levels. It is offered in the diagrammatic mode which means that abstract relations between the elements composing the signified of the work are matched to abstract relations between elements composing its signifier. In the poem 'Spring' by Gerard Manley Hopkins for instance, the alternation between sequences of three vowels possessing the distinctive features of tension and three vowels possessing the distinctive features of relaxation sketch at the phonological level the alternation between round shapes and long shapes, or between blooming motions and dashing motions which are designated as emblematic of the contradictory forces characterizing the season of spring. The space allowed for this article does not allow me to offer an extensive demonstration of the prevalence of the diagrammatic signature of literary texts but some of my works will compensate for this absence (Batt, 1994; 1996; 1999).[6]

Now let us consider what Christiane Chauviré's recent study 'Perception visuelle et mathématiques chez Peirce et Wittgenstein' (Chauviré, 2003) adds to the present state of our reflections. First, Chauviré establishes a continuum between Kant and Peirce, drawing the filiation between the Kantian schema and the Peircian diagram. Then she shows with well-chosen quotations that Peirce, after Kant, considers that the argument which is cast into a schematic or diagrammatic form and displayed for the reader to 'see', placed under his 'mind's eye', has a greater force of conviction than the one which is presented as a series of abstract propositions. What Peirce advances here is a new theory of proof and argumentation. If one remembers that literary language stylizes all the diagrammatic properties of ordinary language and uses them at their best, one can understand why Plato excluded poets from the city.

Another point of interest in Chauviré's text is that she insists on the fact that Peirce, as a logician, is very careful to address the diagrammatic properties in both formal language (here the language of mathematics) and natural language. In both cases, Peirce establishes a causal link between the visual quality of the diagrammatic form given to the language and the force of conviction it confers to the relations exposed in the argument. As Chauviré (2003: 202) says:

> The diagram, conceived as a modelling principle, a stylized figure of a state of things imagined by the mathematician is responsible for the creative power of mathematical thought as well as that of art. This is a case of elegant mentalism. Mathematical thought consists in tracing before the mind's eye figures which are distorted and reshaped, not randomly so, but according to rules, in order to achieve a final configuration, a diagram which will impose the conclusion of the argument as necessary. (. . .) This is a remarkable thesis: the diagram is not like the geometrical figure, a simple illustration, the concrete representation of an argument which takes place elsewhere, in pure and abstract thought: the shaping and distorting of diagrams according to rules is constitutive of mathematical thought which is all contained there; we should remember that thought for Peirce as later for Wittgenstein is nothing but a handling of signs (be they mental signs or external signs).

At this point, it proves necessary to bring into the discussion Gilles Châtelet's reflections on the function of diagrams in mathematics as developed in *Les Enjeux du mobile* (1993) and put this side by side with Chauviré's descriptions of Peirce's argument. Peirce's concept of diagram has not been a foundation stone for Châtelet. The only reference to Peirce's *Collected Papers* (1932: 300) in *Les Enjeux du Mobile* concerns a minor point on the indexical relation between two particles (Châtelet, 1993: 258). Châtelet mobilizes a set of bibliographical references which include Oresmus, Argand, Kant, Faraday, Grassman, Hamilton, Schelling and seems eager to anchor his reflections mainly in the *practice* of mathematics. He is obviously trying to emancipate the philosophy of mathematics from the tutoring of logic and considers with great interest the reflection on the diagram that the painter Francis Bacon inspired in Deleuze. Châtelet exchanges theorems for diagrams and explains that mathematical thought is elaborated in the process of tracing diagrams, when mind and body cooperate in the advent of the virtual. Châtelet would certainly not deny Peirce the part iconicity plays in carrying forth the conviction of the reader, and Chauviré, concluding from Peirce, emphasizes the operativity of the diagram for mathematical thought, but Châtelet goes one step further when he insists that diagrams project virtuality onto the space they seek to map. As Ken Knoespel (2004: 152) formulated it in his article 'Diagrams, Materiality and Cognition': 'it is Châtelet's accomplishment not only to have written a book rich with insights about geometric space but to have ''rediscovered operativity'' and in so doing to have defined a critical movement from diagrams to diagrammatics'. It is within this 'critical movement from diagrams to diagrammatics' *to capture the virtual* that I wish to inscribe my approach to literary texts (see Batt, 2004).

An aesthetic and cognitive effect

As was said earlier, neither Peirce nor Wittgenstein adopted a Platonistic perspective. Neither one nor the other considers that it enters the mathematician's or the writer's vocation to discover, to dig out, to reveal. On the contrary, their goal is to produce, to construct, to invent. Algebraic equations and geometrical graphs alike are diagrams. Algebra and geometry should not oppose each other but both should oppose philosophy which is doomed to convince with abstract lines of argument and discursive proofs. While discussing the respective qualities of literature and philosophy, Alain Badiou (1993) developed a parallel opposition between literature and philosophy, and showed the hard fate of philosophy, condemned to the austerity of an abstract reasoning, obliged to bring propositional proof after propositional proof to achieve its demonstration when literature is allowed to display under the eyes of the reader the most sophisticated iconic configurations and have them immediately comprehended.

Having advanced this far on the path of creative thought in mathematics, it will not be surprising to find that Peirce (1932: 383) himself made the necessary step to bridge mathematics and art:

> The work of the poet or novelist is not so utterly different from that of the scientific man. The artist introduces a fiction; but it is not an arbitrary one; it exhibits affinities to which the mind accords a certain approval in pronouncing them beautiful, which if it is not exactly the same as saying the synthesis is true, is

> something of the same general kind. The geometer draws a diagram, which if not exactly a fiction, is at least a creation, and by means of observation of that diagram he is able to synthetize and show relations between elements which before seemed to have no necessary connection.

So here we come to a Peircian definition of the third feature that I wanted to discuss here: the aesthetic effect which results from the fact of 'synthetiz[ing] and show[ing] relations between elements which before seemed to have no necessary connection' (Peirce 1932: 383), or, to use a formulation by Deleuze and Guattari (1991: 199), which is produced by the sensation which takes form on the plane of composition 'in contracting what composes it and in being composed with other sensations which it contracts in their turn'.

The aesthetic effect is a global effect which results from the integration of multiple local constructions effected at different heterogeneous levels. An effect which spreads out on a double track. One is intellectual. The mind captures what is abstract in an interconnective configuration: a ratio of ratio. The other track is sensory. From the same interconnective configuration, the mind, through the senses, receives the form which has been drawn from dot to dot, across the different entailed levels. When the mind is doubly struck, the 'synthesis' takes place, the 'contraction' happens. The mind is caressed and persuaded. Persuasion at its best.

It is indisputable that, for Peirce, the iconic character of language (that is, the principle of similarity) is at the origin of the persuasion exercised on the mind. But Wittgenstein does not follow him completely on this line. This is the coda of Christiane Chauviré's article. Wittgenstein, in effect, brings in a nuance and defends the idea that the diagrammatic relation possesses this convincing power only because man has decided to let himself be convinced by it. Power is not attributed to a feature intrinsically lodged in the thing itself, but to man, the anthropological subject who decides to acknowledge the force acting upon him. One might then be tempted to go on with the argument and suppose that after acknowledging this acting force as such, the anthropos intended to create a place and time for it to exercise at leisure. Art would then be that marginal space-time in the form of a language maintained at a respectable distance from all social discourses, invented by man to test and freely exercise his faculty to elaborate and recognize iconic integrative configurations which help him maintain his creativity and innovative capacity, qualities which are indispensable for the survival of the species.

Notes

1 '. . . et puis ces discours si différents des discours ordinaires que sont les vers, qui sont bizarrement ordonnés, qui ne répondent à aucun besoin *si ce n'est au besoin qu'ils doivent créer eux-mêmes;* qui ne parlent jamais que de choses absentes . . . étranges discours qui semblent faits par un *autre* personnage que celui qui les dit, et s'adresser à un *autre* que celui qui les écoute. En somme, c'est un *langage dans un langage*.' (emphasis in original)

2 'Ce que fait la littérature dans la langue apparaît mieux: comme dit Proust, elle y trace précisément une sorte de langue étrangère, qui n'est pas une autre langue, ni un patois retrouvé, mais un devenir-autre de la langue, une minoration de cette langue

majeure, un délire qui l'emporte, une ligne de sorcière qui s'échappe du système dominant. Kafka fait dire au champion de nage: je parle la même langue que vous, et pourtant je ne comprends pas un mot de ce que vous dites. Création syntaxique, style, tel est ce devenir de la langue: il n'y a pas de créations de mots, il n'y a pas de néologismes qui vaillent en dehors des effets de syntaxe dans lesquels ils se développent. Si bien que la littérature présente déjà deux aspects, dans la mesure où elle opère une décomposition et une destruction de la langue maternelle, mais aussi l'invention d'une nouvelle langue dans la langue, par création de syntaxe.'

3 'Ce qu'on peut retenir de la vieille rhétorique, ce n'est donc pas son contenu, c'est son exemple, sa forme, son idée paradoxale de la Littérature comme un ordre fondé sur l'ambiguïté des signes, sur l'espace exigu, mais vertigineux, qui s'ouvre entre deux mots de même sens, deux sens d'un même mot: deux langages du même langage.'

4 See Jakobson (1966) and Chauviré (2003). The following translations from these two articles are mine.

5 '. . . mais sur l'heure, tourné à de l'esthétique, mon sens regrette que le discours défaille à exprimer les objets par des touches y répondant en coloris ou en allure, lesquelles existent dans l'instrument de la voix, parmi les langages et quelquefois chez un. A côté d'*ombre*, opaque, *ténèbres* se fonce peu; quelle déception, devant la perversité conférant à *jour* comme à *nuit*, contradictoirement des timbres obscur ici, là clair. Le souhait d'un terme de splendeur brillant, ou qu'il s'éteigne, inverse; quant à des alternatives lumineuses simples – *Seulement*, sachons, *n'existerait pas le vers*: lui, philosophiquement rémunère le défaut des langues, complètement supérieur.' (emphasis in original)

6 Examples of diagrammatic inscription in a literary text will be found in the following articles: on two poems by Emily Dickinson: Batt (1996); on a short story by John Updike: Batt (1994); on the different versions of the same short stories by Raymond Carver: Batt (1999).

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