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An Orderly Chaos: Science, Literature and the World

We are “innovating heirs”, as Régis Debray said, when considering a new order imposed on the contemporary world view¹. Heirs to the cosmogonic myths of order conquering chaos, which marked, until recently, the Western tradition, as expressed in theoretical terms privileging order, stability and permanence over chaos.

Both science and literature show clear signs of that inheritance. For physicists, inquiring into the laws of nature, the search for its regular side, the continuous and the stable side was the fundamental issue. Newton, who held to the illusion of absolute space and time, dreamt of a controllable measurement process. Following him, Laplace, the 18th century philosopher–mathematician, put forward a deterministic vision of the world, linked to the idea of predictability.

Writers, in turn, seeing the book as the image of the world, following the Aristotelian canon of *mimesis*, have sought out the laws bringing order to society, in order to reach the referential *truth*, implied by its representation. This is what, in the 19th century, brought writers closer to science and led them to adapt their work to the method used by physicists in studying phenomena: observation, analysis, a rigorous and objective view of private and social experience. As a result, they came to respect the linearity of history, chronology and topology, closed and definitive, interpreting causality, and the continuous and complete knowledge underlying it.

¹ Régis Debray, *Vie et mort de l'image. Une Histoire du regard en Occident* (Paris: Éditions Gallimard, 1992), p. 388.

We are responsible for the translations from French and Portuguese into English.

However, by the end of that century, another world view had appeared to renounce linearity, continuity, the regularity of order; putting forward a discontinuous dynamic creating multiple ruptures, and establishing the principle of disorder. Despite the concept of cosmovision being defined as a historical phenomenon within collective reach, involving agents and factors from various disciplinary fields, it can be said that scientific discoveries have made major contributions towards structuring this new model for seeing the world.

Based on the idea that energy exchange is discontinuous, at the turn of the century in 1900, Max Planck proposed what is now known as the “Planck’s radiation formula” renouncing classical physics and introducing the foundations of “quantum theory”. This was a scientific revolution, which Einstein was among the first to recognise and, later, to support by his idea of the “quantization of light”, which set him apart from traditional physics even before he produced the Theory of Relativity and, through that, caused another major revolution in modern science. In this way, he would replace Newton’s Law of Universal Gravitation, by considering gravity not a force, but rather a consequence of the space-time curvature.

“As one physicist put it: Relativity eliminated the Newton illusion of absolute space and time and quantum theory eliminated the Newtonian dream of controllable measurement process. Chaos [the third scientific revolution of the 20th century, as it has been seen] eliminates the Laplacian fantasy of deterministic predictability. Of the three, the revolution in chaos applies to the universe we see and touch, to objects on human scale and everyday experience”²: to clouds and not galaxies, to the human heart and wild life population, as well as to computer research on Macintoshes.

Even though the founders of this new science, Poincaré, Lyapunov and Hadamard, were mathematicians³, their work brought together

² James Gleick, *Chaos: Making a New Science* (New York: Penguin Books, 2008), p. 6.

³ “[The] distinction between mathematics and physics is rather recent: until the middle of the 19th century, the scientists considered themselves as “geometers”, thus embracing what we call today mathematics, physics and mechanics.” Pierre Bergé, Yves Pomeau, Monique Dubois Gance, *Des rythmes au chaos* (Paris: Éditions Odile Jacob/Sciences, 1994), p. 254.

thinkers from fields that had been widely separated. Mathematicians, physicists, biologists, chemists now also examine not order but disorder in nature. In other words, its reverse side, which science had disregarded: the irregular, discontinuous and erratic side, found in the atmosphere, in turbulent seas, in the fluctuations of nomadic peoples, in the oscillations of the heart and brain.

When Chaos started expanding through the study of different systems, researchers in chaotic dynamics discovered that the disorderly behaviour of simple systems generated complexity: as a creative process of richly organised patterns, sometimes stable and sometimes unstable⁴.

By seeking connections between different kinds of irregularity, chaos becomes “a science of the global nature of the systems”, as James Gleick remarked. A science of process, rather than state, not just theory but also a method of creating a (new) science⁵. Technical resources are therefore employed, supported by fractal language, which uses images as characters; and also the computer, the tool which allows this language to develop. “If the tool makes the man”, it is no less true that “the instrument makes science”, according to Mandelbrot, the mathematician at the origin of that new geometrical orientation. He goes on to say: “the new geometrical tendency is the result of the appearance of a new tool which is, evidently, the computer, and the forceful return of an ancient but underused instrument: the human eye”⁶. Applying both, this geometry without a geometrical object and without using the elementary shapes of the circle or triangle can now teach, as Mandelbrot has wisely recognised, engineers and, particularly, artists (including writers), to see the world in a different way.

With the computer replacing laboratories, mathematics has become an experimental science for which graphic images are the main support. Sometimes they are surprising realistic images, as many supposed representations of mountains, clouds and trees; sometimes they become abstract conformations remitting the imaginary to the fantastic and

⁴ Cf. James Gleick, *op. cit.*, p. 43.

⁵ We follow here James Gleick, *op. cit.*, p. 38.

⁶ Benoît Mandelbrot, *Objectos Fractais*, translation (French-Portuguese) by Carlos Fiolhais and José Luís Malaquias Lima (Lisboa: Gradiva/Ciência Aberta, 1998), p. 216.

invoking deep feelings and emotions. Such images are able to call the attention not only of artists but also of writers. Quoting Mandelbrot:

We might well say that these esthetical and mathematical aspects of the fractal language are the result of two forms of poetry; while the novelty of its aspect arises from history, its practical aspect arises from an utilitarian prose and its theoretical one proceeds from the great prose as much as from the poetry, all these aspects allowing us to find here several roles of a language.⁷

How, mathematically, do you describe, calculate and think about shapes that are irregular and fragmented, jagged and broken-up shapes from the contours of the land, clouds, a coastline or a river, to the dust of the galaxies? Mandelbrot looked to answer this question through the new language of shapes defined by the complexification of infinite curves which are the fractals. It's important to note that a fractal curve, as James Gleick explains⁸, implies an organizing structure that lies hidden among the hideous complication of such shapes. The idea that an unstable system implies that its irregularity, discontinuity, sinuosity are alien to order, enables the new science to think of a new paradigm of orderly disorder, the so called *orderly chaos*, as Mandelbrot puts it. According to him, what defines the fractal is its “self-similarity”, the fact that any part of a fractal is an image of the whole, always reduced and deformed.

The idea that can be taken from this concept of chaos seems to have been suggested by Lyotard, in 1979, when he argues in *The Postmodern Condition*:

the pre-eminence of the continuous function, as a paradigm of knowledge and prediction, is disappearing: in its interest in undecidables, the limits of the precision of control, quanta, “fracta”, catastrophes⁹, and pragmatic paradoxes,

⁷ *Ibidem*, p. 215.

⁸ See James Gleick, *op. cit.*, p. 114.

⁹ This meaning the scientific language used by René Thom to support his theoretical view of chaos. See on this question: René Thom, *Modèles mathématiques de la morphogénèse – Recueil de textes sur la théorie des catastrophes et ses applications* (Paris: Union Générale d'Éditions, 1974); Peter Timothy Saunders, *An Introduction*

postmodern science makes the theory of its own evolution discontinuous, catastrophic, non-rectifiable, paradoxical; it changes the sense of the word knowledge, and says how that change can happen [...]. [Thus it] suggests a model of legitimation which is not that of the best performance, but of difference understood as paralogy.¹⁰

In other words, a rupture in the pragmatics of knowledge.

At this point, we should consider the reception of chaos in the contemporary literary system, which is all the more plausible as it is a travelling concept breaking the boundaries that separate scientific disciplines.

This very question has indeed been asked by literary critics and theorists, among them Katherine Hayles, Vladimir Tasic and Linn Mackey. Hayles, in her approach to the parallels between chaos theory, literature and postmodernism¹¹, argues that chaos science is modern rather than postmodern, in that it stays within traditional Western cultural sensibility by privileging order over chaos, unlike postmodernism, which embraces the reversal of chaos over order¹².

It seems to me, however, that postmodern literature does not entirely reject order, in precisely embracing the concept of new science understood as “orderly chaos”. Here is the issue I wish to address, guided by René Thom’s conviction that science gives the structure but not the meaning, which literature searches for, both for itself and the world.

to the Catastrophe Theory (Cambridge – England: Cambridge University Press, 1980); Tim Poston and Ian Stewart, *Catastrophe: Theory and its Applications* (New York: Dover, 1998).

¹⁰ Jean-François Lyotard, *La Condition postmoderne* (Paris: Éditions de Minuit, 1979), p. 97.

¹¹ N. Katherine Hayles, *Chaos Bound: Orderly Disorder in Contemporary Literature and Science* (Ithaca: Cornell University Press, 1990).

¹² Following Linn Mackey, in addition it must be said: “[...] as Hayles and Tasic indicate, chaos science is modern rather than postmodern. But contrary to Tasic and like Hayles, chaos science does have parallels to literature and postmodernism in that its representations show the unusual, the unpredictable, and the uncertain.” (Linn Mackey, “Is Chaos Theory Postmodern Science?>”: <www.Reconstruction.eserver.org/044/mackey.htm>).

I shall consider literature from the 1980s onwards in particular, which had already distanced itself from the tendency of the first postmodern period to turn textual discourse into a purely aesthetic game, based on the arbitrariness of *anything goes*. Indeed, the novel, as a privileged genre, then began to show the complexity of the world, through a polyphony structuring its dense network of meanings; where, however, there were no clearly defined answers but rather a multiplication of questions. Founded on uncertainty, which marked the thinking of Nietzsche, Heidegger and Derrida, postmodern writing has developed into a process of endless questioning; unable, therefore, to come to a single interpretation but rather multiple ones of a sought-after identity, always deconstructed and fragmented nonetheless. It is the identity of Man and the world, as well as the literary system that shapes them, as it joins this search.

Preferring true hermeneutics to those of the “illusion of the referent”, the postmodern narrative has adopted a status of knowledge and meaning divergent from that of the previous period, as a relation, which allows it to find in analogy a new way of “joining” what is not similar, without hiding but even displaying the disorder of its structure. It is a process of knowledge that breaks with the Western logocentric model, through which the text repeatedly reveals the forms of its representations of spaces and times, of discourses and discursive instances, as well as approaching the images of the first and third person, of the past, the present and the future in its interpretative demonstration implying the passage from the identical to the alterity, so as to free the senses and reach meaning.

It is this disorderly behaviour deconstructing time and space, man and world, the fictional discourse and the genre of the novel, which generates the complexity of a creative process, embodying the unusual, the unpredictable and the uncertain. In other words, what appears in scientific representations of chaos as the result of an anti-Cartesian move taken with iterative resequencing.

The narrative, in the repetition of its equations too, returns to themes, adjusting their dimensions through the logic of the sense of their new questioning consciousness, which appeals differently to the memory of the self and the others, of the world and texts, in accordance

with the functioning of the computer. It is no longer for escaping into the past, but for rethinking the present based on it and facing the possibilities of the future. It is, basically, for trying to find an alternative meaning for history, collective, individual and also literary. A project remitting the text to the context of great issues that have appeared in our age: the third world, ecology, the right to asylum, the rights of man and woman, feminism, and post-colonialism; issues that are linked to interculturality, allied to multiculturalism, and have intensified with the great migratory movements in the framework of our globalised world. Without centres and borders, geographical and temporal or ethical, aesthetic and disciplinary frontiers, it represents disorder; invoking the idea of the monster conceived in relational terms by postmodern thought, going back to Nietzsche and developed by Foucault, Deleuze and Derrida. Taken by this cultural vision as a rupture and transgression of the supposed natural order, the monster is the Other, unnatural, deformed; and thus may also acquire an aesthetic dimension, related to the (monstrous) “counter-discourse” (Foucault) of contemporary literature. If this, after the 1980s, no longer seems so tempted to be silent; it has brought to the field of the text, nevertheless, through the disorder and destructuring of its discourse, not the organising logos of the world, but a kind of logorrhoea, returning to the scientific language of chaos: that of the shapes defined by the complexification of infinite curves which are the fractals, written by the image. Returning to the ambiguous voice of Umberto Eco, the theorist mixed with the fiction writer in *The Island of the Day Before*, we could also say that in literary language

Perhaps a secret order existed, presiding over the constant change of orders and perspectives, but we were destined never to discover it, to follow instead the shifting play of those appearances of order that were recorded at every new experience.¹³

¹³ Umberto Eco, *The Island of the Day Before*, translated from the Italian by William Weaver (Milano: Vintage, 1998).