

**FRACTALS IN GERTRUDE STEIN'S 'WORD-SYSTEM':
NATURAL REALITY AND/OR VERBAL REALITY**

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One of the most fascinating branches of the recent Chaos Theories is that concerning those images of complex dynamical systems known as 'fractal objects' as set out by the French mathematician Benoit Mandelbrot. Mandelbrot's fractals propose a vision of the infinite with the eye of mind focused on the dominant aspect of repetition at different scales, self-similar forms that emerge regularly out of irregularity at different levels of reality. My point is that these extremely creative natural forms can be seen in Gertrude Stein's verbal configurations set up, as M. Perloff puts it, to manifest the 'arbitrariness of discourse', the 'impossibility of arriving at the meaning even as countless possible meanings present themselves to our attention'. As indeterminacy imposes no norm of completeness at a discursive level, fractals imposes no norm of completeness at the level of form. In my opinion, the instability of the fractal geometry of some natural phenomena (snowflakes, tree-barks, etc.) parallel Stein's "word-system" or verbal reality as much as the instability of Cubism, and in a more enigmatic way, adding novelty to her yet living work.*

Gertrude Stein's texts very often elicit two opposed attitudes on the part of the reader: on the one hand a great pleasure effected by the creative impulse and power produced by her obscurity, her enigmas, her eccentric stance and geometry —understood both as transgression of the norm characteristic of the avant-gardes in general or, literally 'ex-centric': situated away from the centre or the axis, away from

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globalizations¹—; and on the other hand a refusal to go on reading as a consequence of the difficulty to extract conventional discursive meanings.

This eccentric stance is the one that Stein considered, originally in Cézanne, as the main feature of composition in those days. In this respect she tells how she was influenced by Cézanne:

Everything I have done has been influenced by Flaubert and Cézanne, and this gave me a new feeling about composition. Up to that time composition had consisted of a central idea, to which everything else was an accompaniment and separate but was not an end in itself, and Cézanne conceived the idea that *in composition one thing was as important as another*...That impressed me enormously, and it impressed me so much that I began to write *Three Lives* under this influence and this idea of composition. (Barlet Haas 1971, 15)

Relevant as well as an aesthetic referent in my study of Stein and fractals is the following Cézanne imperative, famous among the (dis)members of the Bateau Lavoisier: “All appearance is scattered..., nature is always the same ... Nature is more depth than surface, the colours are the expression on the surface of this depth, they rise up from the roots of the world” (Haftman 1965, in Sayre 1988, 21). But only later on will we return to this vision of Nature.

From there on, her aesthetic search in the field of writing was centred upon localities, upon small parts, on the fragments considered as wholes in themselves, decentralizing the composition in a way that paralleled cubist technique in its first analytical phase giving the same importance to the centre and to the corners of the canvas.² In Stein’s own words, what she wanted to do in literature was “not a composition in which there was one man in the center surrounded by a lot of other men but a composition that

¹ The term *globalization* is used here in a traditional sense, yet crucial to an understanding of this paper is the new meaning that the recent Chaos Theories have given to the concepts “local” and “global”. Specific reference to the issue appears in Petitot (1979), Hayles (1988), Guerra (1992, chap. 9).

² Cf. Dubnick (1984, 3-45) and Scobie (1988). They are both illuminating articles on the connection of the evolution of Stein’s literary texts with the two phases —analytical and synthetic— in the evolution of cubist paintings. Nevertheless, I am mainly interested in Stein’s first steps in a process of decentralization: in the complex dynamics of a verbal system where ‘repetition’ plays a fundamental role.

had *neither a beginning nor an ending*, a composition in which one corner was as important as another corner, in fact the composition of cubism." (Stein 1959, 11).

Her longing to find out what human repetition and innovation really mean and how they can be reproduced in literary texts, lead her to experiment with forms and structures that show the characteristic of self-similarity, what she called *repetition* (in paragraphs, sentences, phrases, words, and even sounds) in order to create a special perception of the object or the person rather than merely to perceive meaning; her preoccupation with 'repetition' was so extreme that it appears even in her account of her own marriage proposal to Alice B. Toklas in the collection of occasional pieces published in 1954 under the title of *As Fine as Melanctha*.³ "Didn't Nelly and Lilly Love You" repeats its title as a question throughout, referring back to past romances that had failed before Stein sympathized with Toklas. In *If I Told Him. A Completed Portrait of Picasso* she writes: "Exact resemblance to exact resemblance the exact resemblance as exact as a resemblance, exactly as resembling, exactly resembling, exactly in resemblance exactly a resemblance, exactly and resemblance. For this is so. Because."

In 'The Gradual Making of *The Making of Americans*' Stein writes a key-paragraph for the understanding of her concern about 'repetition':

I began to get enormously interested in hearing how everybody said the same thing over and over again with infinite variations but over and over again until finally if you listened with great intensity you could hear it rise and fall and tell all that there was inside them, not so much by the actual words they said or the thoughts they had but the movement of their thoughts and words endlessly the same and endlessly different. (*Lectures in America*, p. 138)⁴

³ A good discussion about the structure of repetition in Stein's texts appears in Kawin (1972, 117-31). For other scholars that discuss the aesthetics of repetition as it appears in Gertrude Stein see especially Perloff (1988), DeKoven (1983) and Gass (1979).

⁴ As Sayre (1988, 22-23) points out, "It would be easy to extend Stein's thinking here to the example of Picasso and Braque —one needs only to substitute a rhetoric of 'seeing' and 'painting' for her 'hearing' and 'saying'— especially given the fact that Picasso and Braque were painting virtually the same things in these years. Such a *rhetoric of sameness, the depiction of reality as a system of elemental likenesses repeated again and again*, extends, in fact, from Cézanne's dictum, 'Deal with nature as cylinders, spheres, cones' [Letter to Emile Bernard, 15 Apr 1904, in *Paul Cézanne: Letters*, ed. John Rewald, tr. Seymour Hacker (New York: Hacker, 1984), p. 296], to Stein's own portrait of Picasso: «This one was working and something was coming then, something was coming out of this one then. This one was one and always there was something coming out of this one and always there had been something coming out of this one. ... This one was one who was working (*Portraits & Prayers*, p.18).»"

It is well known that ‘repetition’ is the partner of ‘difference’ in the aesthetics we are talking about. Sayre (1988, 22) reminds us that “it is not, merely, the sameness of things which interested any of the Bateau Lavoir set—not Picasso, not Braque, and certainly not Gertrude Stein. It was, rather, that, though things might seem ‘endlessly the same’, they were, as well, ‘endlessly different’.” Stein writes,

The only thing that is different from one time to another is what is seen ... In this *natural* way of creating it then that it was simply different everything being alike it was simply different, ... (*Composition as Explanation*, pp. 24 and 27)

This *repetition as a system of differences*, that in Sayre’s own words “has been the most profoundly influential element of her work” (1988, 23), is an important starting point for my eventual aim at visualizing fractal forms in Stein’s verbal-system.

Let us start by listening to some ideas Deleuze stated in *Répétition et différence* about the same topic.⁵ Deleuze sets up a kind of conclusion which will be important here not only for a specific meaning of the term ‘difference’ but for what it says about ‘intuition’. Repetition appears—in the Deleuzian sense—as difference without concept, as opposed to indefinitely sustained conceptual difference. It is said to express a power peculiar to the existing, a *stubborn pervasiveness of the existing in intuition*, which resists any specification by the concept, no matter how far-reaching it may be (p.77). At this point, Deleuze goes back to the Kantian idea of repetition that in our view could be considered as being in Stein’s mind from her first steps on thinking of resemblances. Kant says, states Deleuze, that no matter how far one deepens into a concept, one can always repeat, that is, one can always find several corresponding objects, at least two, one towards the right and another towards the left, one to the minus and another to the plus, one for the positive and another for the negative. Deleuze calls these concepts, *concepts of indefinite comprehension*, *concepts of Nature*, although they are not in Nature but in the spirit that contemplates it, that represents it to itself. Reading on along this clarifying work I feel closer to Gertrude Stein:

⁵ From here on my references to the Deleuzian thought belong to the 1972 Spanish translation of the original French edition (1969). I offer my own English translation of the relevant passages.

To such concepts correspond objects which are themselves devoid of memory, that is, they neither possess nor encompass their own moments within themselves. We might ask ourselves why Nature repeats: because it is *partes extra partes, mens momentanea*. Novelty then moves to the side of the represented spirit: because the spirit possesses a memory, or acquires habits, it is capable of forming concepts in general, and of eliciting something new, of drawing out something new from the repetition it contemplates. (p.77)

It is a dynamics that Charles Caramello (1988, 3), on explaining why G. Stein preferred 'creative thinking' over 'theorizing', defines so subtly as an "iterative process of cognition" rather than a "reiterative process of recognition".

In many of her texts, Gertrude Stein carries the Deleuzian idea of 'repetition in words' to touching extremes, thus incrementing radically the 'real power to which language raises in the writing':

we cannot doubt of the existence of words, that in a certain way are linguistic atoms. The word possesses a necessarily finite comprehension, because by its own nature it is the object of an only nominal definition. There we have a reason why the comprehension of the concept cannot reach the infinite: a word cannot be defined by more than a finite number of words. However, speech and writing, from which the word is inseparable, grant to this word an *hic et nunc* existence ... (p.77)

We could go even further by saying that her attempt to name reality in art and her reflecting on the meaning of repetition in some of her essays, denies her belonging to *the other tradition*, her *anti-symbolist* position (the one enunciated by M. Perloff in *The Poetics of Indeterminacy. Rimbaud to Cage*) only to confirm it from a different perspective, from the Deleuzian perspective of 'repetition as symbol' (p.84): Nothing repeated exists that can be isolated or abstracted from the repetition in which it is formed,⁶ and neither can it be from the repetition in which it lurks itself; therefore, Deleuze says, *repetition in its essence is symbolic, the symbol, the simulacrum, is the support of repetition*. Just now, we have the post-modernist Gertrude Stein in

⁶ Cf. also Altman (1988), where the author develops the idea that the coherence of a text depends on this characteristic of repetition.

mind: due to the fact that the nature of repetition is different from the nature of representation, the thing repeated cannot be represented, but always signified, masked by what it signifies, itself masking its meaning (Deleuze, p.85).⁷

It is evident that all this belongs to discursive aspects of repetition, those closer to the literary attempts of Stein; but our major concern here is its verbal aspects, the *how* rather than the *what*, its spatial forms.

Umberto Eco (1985, 178) states that “the strategies for matching surprise and novelty with repetition, even if they are semiotic devices in themselves aesthetically neutral, can give place to different results on the aesthetic level”.

Since our aim here is to discover possible visualizations of some verbal configurations in Stein’s texts that have the characteristics of the regular configurations of irregular natural phenomena shown by fractals, we cannot go on without at least listening to Eco’s idea that “An aesthetics of repetition requires as a premise a semiotics of the textual procedures of repetition” (1985, 179). The most important point concerning the reception of the work, as it occurs with the visualization of fractals, appears in another of Eco’s statements in the same article: “What must be enjoyed —suggests the

⁷ Sayre (1988, 28-29), explaining what Stein does in “Act so that there is no use in a center” (*Tender Buttons*), thinks that “she is in effect giving herself the authority to compose without direct reference, to free the activity of signifying from the necessity of representing the thing as if language were transparent, as if we could see behind its mask”. As we will see later on this paper, it is exactly what Mandelbrot —the father of fractals— does (changing two terms) when he proposes to look at a fractal object: ‘free the activity of *visualizing* from the necessity of representing the thing as if *mathematics* were transparent, in his famous sentence: “look at the infinite with the eye of mind”. [my translation]. Sayre distinguishes between two alternative theories of repetition, a ‘normative’ one and a another ‘post-modern’ —so characterized for having been most thoroughly articulated by the likes of Derrida, Deleuze, Baudrillard and Guy de Bord. I am interested here in this second kind of repetition in as much as it appears to correspond to our vision of Stein’s texts, both from a scientific and a philosophical point of view. This mode of repetition assumes repetition as a symbol in a Deleuzian sense, a ‘simulacrum’: “Each thing ... is unique, intrinsically different from every other thing. Similarity arises against the background of this ‘disparité du fond’. It is a world not of copies but of ... ‘simulacra’ or ‘phantasms’. These are ungrounded doublings which arise from differential interrelations among elements which are all on the same plane. This lack of ground in some paradigm or archetype means that there is something ghostly about the effects of this second kind of repetition. It seems that X repeats Y, but in fact it does not, or at least not in the firmly anchored way of the first sort of repetition.” (Sayre 1988, 29-30)

post-Modern aesthetics— is the fact that *a series of possible variations is potentially infinite*" (1985, 179).

The repetitions we are dealing with abound in what has been called Stein's first style, that of *Q.E.D.*, *Three Lives*, etc. but they appear in one form or another throughout her whole *oeuvre*, including essays and lectures.⁸

Our epistemological starting point is therefore that "self-similarity" appears to be the main concept of the recently developed scientific theory of fractal objects.

Chaos Theory in general, and Fractal Theory in particular, center upon the local regions of very complex natural configurations. I shall analyze how fractals can be a parallel of Gertrude Stein's composition in as much as both propose a visualization of self-similar forms in smaller and smaller scales that at first sight seem open *ad infinitum*. I shall approach this device on the syntactical and verbal level, which increases its difficulty as Stein's work progresses from the first to the second style, that epithomized in *Tender Buttons*. I refer to the extreme device in a text defined by John Ashbery as "an open field of narrative possibilities".

I shall very briefly define what fractals are and then I shall look for parallel patterns in some repetitive texts of Gertrude Stein's; the clarity and brevity of the Encyclopaedia Britannica serves well to our purpose here: "In mathematics, they are any of a class of complex geometric shapes that commonly exhibit the property of self-similarity. Fractals are distinct from the simple figures of classical, or Euclidean, geometry—the square, the circle, the sphere, and so forth. They are capable of describing the many irregularly shaped objects or spatially nonuniform phenomena in nature that cannot be accommodated by the components of Euclidean geometry".⁹ This is a very

⁸ From the point of view of the use of metaphor or metonymy (Lodge, 1977), for instance, and from many others, these texts of her first style can be characterized as 'modernist'. But if we look at repetition structures in a spatially apparently chaotic text from the conceptual framework of fractal theory, we have to consider these objects (or texts) as 'postmodern', following Katherine Hayles' idea that Chaotics is another site within the postmodern culture.

⁹ Considering that fractals deal mainly with mathematics and geometry there are many technical books on the issue for those who don't know how to interpret formulas. For the literary thinkers I'll quote some excellent discussions to this new spatial configuration. Apart from the Mandelbrot's essays—or *manifestos* as he calls them—, listed at the end of this article, it would be of great help to look at Peitgen and Richter (1986), Gleick (1987), Stewart (1989) and Mort La Brecque (1985). Hayles (1990, 1991) provide invaluable help to the understanding of the literary possibilities of this paradigm.

simple but clear first idea we have to keep in mind before entering into the most important concepts (*fractal form, fractal dimension, scale invariance, clustering, self-similarity* and *intuition*) that may be the principal agents of a change in the visualization of some of Stein's repetition patterns in her literary texts. In *The Fractal Geometry of Nature*, Mandelbrot (1977; 1983, 4) points out that he

coined *fractal* from the latin adjective *fractus*. The corresponding Latin verb *frangere* means "to break": to create irregular fragments. It is therefore sensible —and how appropriate for our needs!— that, in addition to "fragmented" (as in *fraction* or *refraction*), *fractus* should also mean "irregular", both meanings being preserved in *fragment*.

The new system of geometry born in 1975 with the concept of fractal has had a significant impact in many fields, both in natural and in human sciences, and following Mandelbrot's statement (1977; 1983, 2) that "it reveals a totally new world of plastic beauty", it is considered today as an art form: in computer graphics, fractal algorithms have made it possible, using chromatic systems, to generate lifelike images of complicated, highly irregular natural objects.¹⁰

A *self-similar object* is one whose component parts resemble the whole. This reiteration of irregular details or patterns occurs at progressively smaller scales and can, in the case of purely abstract entities, continue indefinitely, so that each part of each part, when magnified, will look basically like the object as a whole. In effect, a similar object remains invariant under changes of scale —*i.e.* it has scaling symmetry. "The most useful fractals —writes Mandelbrot (1977; 1983, 1)— involve *chance* and both their regularities and their irregularities are statistical. Also, the shapes described here tend to be *scaling*, implying that the degree of their irregularity and/or fragmentation is identical at all scales." This means that all natural fractals of this kind, since they are stochastic or random, scale in a statistical sense. As we have seen above, because fractal objects are irregular in shape, they do not possess the translational symmetry of Euclidean figures.

A mathematical parameter called *fractal dimension* plays a central role in this new geometry. Briefly stated, it is the one characteristic of

¹⁰ See the interesting images reproduced by Peitgen and Richter (1986).

the fractal that remains the same regardless of how much the object is magnified or whether the angle of view varies.

At the time when Gertrude Stein was immersed in the creative turmoil of Paris, the mathematical structures that 'did not fit the patterns of Euclid and Newton' were regarded as "pathological" or "a gallery of monsters". In *The Fractal Geometry of Nature*, Mandelbrot quotes F. J. Dyson for having given an 'eloquent summary' of this theme. There are some words of great interest when thinking of Gertrude Stein and her relation to cubist painting and atonal music:

A great revolution of ideas separates the classical mathematics of the 19th century from the modern mathematics of the 20th. Classical mathematics had its roots in the regular geometric structures of Euclid and the continuously evolving dynamics of Newton. Modern mathematics began with Cantor's set theory and Peano's space-filling curve. Historically, the revolution was forced by the discovery of mathematical structures that did not fit the patterns of Euclid and Newton. These new structures were regarded ... as 'pathological,' ... as a 'gallery of monsters,' *kin to the cubist painting and atonal music that were upsetting established standards of taste in the arts at about the same time.* The mathematicians who created the monsters regarded them as important in showing that *the world of pure mathematics contains a richness of possibilities going far beyond the simple structures that they saw in Nature.* (Italics mine)

Marjory Perloff (1981, 71) thinks that the comparisons made again and again of Gertrude Stein's verbal art to cubist painting are not correct, as critics repeatedly speak of "non-representational" or "abstract art", "flat surface", "shifting perspective" or "interactive planes". The point is that Perloff widens her vision to other artistic manifestations with the same properties; in her opinion, "All these are slippery terms: Kandinsky was one of the first non-representational painters of the twentieth century but he was hardly a Cubist. 'Flat surface' is one of the central features of Oriental art which is nonetheless illusionist. 'Shifts in perspective' are a hallmark of the Baroque, and so on". However, we need to recapture those features as pertinent if we look at the fractal geometry of some of Stein's texts. They cease to be "slippery terms" when seen from the scientific epistemology of the fractal objects. They are simply characteristics of her art which increase the richness of possibilities on

the basis of a 'pathological' syntax or a 'word-system' which is a marvellous 'gallery of monsters'.

It is important here not to understand the term *abstract* as strictly opposed to *concrete*. Perloff (1981) believes that the artifact and the abstraction that Stein discovered in Cézanne and mostly in painters would find its place in literature in a middle ground between the realism of, say, Galsworthy, and pure abstract art. I agree with Perloff in that both in Stein's and in Picasso's work we can find "representational traces" (for example in *Ma Jolie*). But in a fractal terminology this concept of abstraction is used in the sense that "intuition" is necessary to visualize a fractal object. Omar Calabrese is one of the few critics who insist upon this aspect when he talks about fractals and art, specifically about certain contemporary objects of art that he calls "Neo-Baroque", because they keep a "decisively Baroque form" (1987; 1989, 136).¹¹ Thus, for Calabrese, a 'fractal object' is a physical object (natural or artificial) showing *intuitively* a fractal form. He says that similar objects are very frequent in Nature (the distribution of holes in Gruyère cheese, the form of the moon craters, the famous ragged shape of a coastline, a fluvial net, etc.) So far the form of such natural objects has been considered as being due to chance and unpredictable, undescribable and impossible to calculate. The notions of traditional Euclidean geometry are not valid. How is a ragged coastline measured —says Calabrese— to reproduce it in a geographical map? Simplifying or bringing its outlines closer to some rectilinear segments depending on a certain scale, which is, as well, an aerial view taken from a useful distance for specific aims. However with those procedures we will never actually have a "real measure" of a ragged coastline: in each scale it will be evident that there exists a smaller scale (a closer view) where the ragged will always increase the value of the distance between two points with respect to the established approximation to that same scale.

I want to insist on the term *intuition*. Mandelbrot himself defines the term *fractal* literally as 'an adjective in an intuitive sense'. As Omar Calabrese has written: "In an intuitive sense, fractal is any object showing an extreme irregular and interrupted form, regardless of the scale in which we measure it". Mandelbrot says in his famous book on fractals,

¹¹ I offer my own English version of the expressions used in the Spanish translation of the original Italian edition.

The Fractal Objects, that he wants to show how these forms “have something very simple, concrete and intuitive”.¹²

My point here is that Stein's ‘word-system’, as it occurs with these natural configurations that need intuition and experience to see beyond, can be considered an abstract system in a mathematical sense.

In this respect, I understand the Steinian text as a ‘system’ in the same way as the earth, the moon, the sky and the ocean are ‘systems’ for Mandelbrot. Every natural system quoted in his *Essay*, he states, ‘system’ in as much as it is constituted by many different parts, articulated between them, and the fractal dimension describes an aspect of this rule of articulation. But the same definition can be applied to *artifacts*. Mandelbrot thinks that one distinction between the natural and the artificial systems is that a previous observation and experience is needed in order to know the former. As for the latter, the artifice-maker can help us. I have considered Stein's texts as artifact-systems and so she has helped us with her writings. In this sense we shall approach her as a *realist* writer according to the definition that Lyn Hejinian has given to the term ‘realism’ when referring to G. Stein, in “Two Stein Talks”, *Tremblor* 3:

Perhaps it was the discovery that language is an order of reality itself and not a mere mediating medium—that it is possible and even likely that one can have a confrontation with a phrase that is as significant as a confrontation with a tree, chair, cone, dog, bishop, piano, vineyard, door, or penny, etc. ... which replaced [Stein's] commitment to a medical career with a commitment to a literary career. (Perloff 1988, 97)

Reality is not in those objects language refers to: reality is in language itself. That is why Stein's art has been called *language-art* as well as *word-system*. In this respect, Donald Sutherland (1951, 17) quotes Sherwood Anderson's suggestive opinion on Stein's reality in words:

She is laying word against word, relating sound to sound, feeling for the taste, the smell, the rhythm of the individual word ... One works with words and one would like words that have a taste on the lips, that have a perfume to the nostrils, rattling words one can throw into a box and shake, making a sharp,

¹² Again, I offer my own English version of the relevant passages or expressions from the Spanish translation of the original French edition (1975/1984).

jingling sound, words that, when seen on the printed page, have a distinct arresting effect upon the eye, words that when they jump out from under the pen one may feel with the fingers as one might caress the cheeks of his beloved. And what I think is that these books of Gertrude Stein do *in a very real sense recreate life in words*. (Italics mine)

According to Shirley Newman (1988, xix), from the 70s onwards there has been a new threefold critical discourse of Stein's writing attempting to build up a conceptual framework and a terminology to name what until then had seemed unnamable; in her own words (1988, xx): "her distinction between human nature and the human mind, her refusal to write plots that go somewhere, the flagrant discontinuousness and repetitiveness of much of her writing, and the fact that the beauty of her work cannot be found in 'wholeness, harmony, and radiance'". I agree with Brady in that there will be a new critical discourse in our decade centred upon the concepts of Chaos Theory.¹³ I here attempt to give a first step towards the visualization of the possible fractal geometry of her texts, an approach proposed by Mandelbrot, i.e. the *visualization* of the possible 'regularity' —structures that repeat at different scales in a way that a fragment can be self-similar to the whole— of apparently chaotic or very irregular configurations. And I defend that it is certainly possible to find the beauty of her work in "wholeness, harmony, and radiance" if only we understand these terms as Fractal Theory does. It will help us to grasp what Stein wrote concerning Picasso's statement that he knows faces as a child knows them, eliminating memory from perception, evaluating each local perception as a whole, without organizing all of them into a conceptual whole:

A child sees the face of its mother ... in a completely different way than other people see it ... the child sees it from very near, it is a large face for the eyes of a small one, it is certain the child for a little while only sees part of the face of its mother, it knows one feature and not another, one side and not the other, and in his way Picasso knows faces as a child knows them ... No one had ever tried to express things seen not as one knows them but as they are when one sees them without remembering having looked at them.

¹³ As Brady (1991, 43) puts it: "La théorie du chaos, la plus récente des théories scientifiques à être appliquée au domaine littéraire, ... cette théorie, adaptée à l'analyse des textes, est en train de constituer l'avantgarde de la théorie littéraire des années 1990".

Really most of the time one sees only a feature of a person ... The other features are covered by a hat, by the light, by clothes ... and everybody is accustomed to complete the whole entirely from their knowledge, but Picasso when he saw an eye, the other one did not exist for him and as a painter ... he was right, one sees what one sees, the rest is a reconstruction from memory and painters have nothing to do with reconstruction ... with memory, they concern themselves only with *visible things*". [Picasso, pp.14-15]

In an article in which she looks for the fractal repetition structures in the poetry of Wallace Stevens, Lucy Pollard-Gott (1986, 233-4) says that the best way for the non-scientist to approach fractals is by example. She poses the famous measurement of the coastline of Britain by Mandelbrot:

As a classic example consider the problem of measuring the coastline of any land-mass. Coastlines are very irregular and the length measured seems to depend on the scale at which you take your measurements. If you do your surveying from an airplane and measure to the nearest mile, for example, you will get a certain answer that follows at best it can the cragginess visible from that distance. If you imagine then getting down on the ground with a tape measure and going over just one of the miles you measured, you would find a similar amount of cragginess and you would feel the need to revise upward your estimate of the actual length of the coastline by a large factor. Now suppose you are a real masochist and decide to measure just a foot with a magnifying glass and a micrometer. Alas, the coastline does not seem any smoother; it is just as irregular and the counting of twists and turns is only limited by the materials and measuring instruments. This illustrates the property of *scale invariance*, a hallmark of fractal structure, where we find the same amount and pattern of structures no matter at what level we choose to look. (...) Self-similarity is a very precise form of scale invariance, and it is this property that makes fractals so special and interesting".

The thing is that by measuring the coastline with the traditional Euclidean geometry we will never have a *real measure*: in each scale we realize that there exists a smaller scale, a closer view.

As regards the perception of Stein's verbal reality, the possibility described by Mandelbrot of tracing the parallelism with natural reality in scales can explain, in terms different from those of contemporary literary criticism, a way to visualize it, as reproducing in art some complex forms that she intuited in the deep structure of reality, although at the beginning of the 20th century they didn't exist as we know them today —as we saw above, at about that time these objects were considered by scientists as 'mathematical monsters' or 'chimeras'.

I am thinking of that starting idea of Calabrese's when he describes some cultural objects of our age as *Neobaroque*; in his opinion, an initial problem is precisely that of defining the chosen point of view and what is pertinent to it. He posits that only through an interdefinition of the operative concepts is it possible to guarantee the control over the analysed objects. Phenomena, he says, never speak with their own voice or by evidence; they must be induced, that is, they must be constructed as theoretical objects. In other words, there is not an immediate objectivity of the facts, but only the coherence of the perspective from which we interrogate them, of the horizon inside which we stimulate them to get an answer. Systems of concepts are many. My attempt here, as that of Calabrese, is not to use one because it is better than the others; it is simply to put one at work: the system of concepts of the recent Fractal Theory.¹⁴

N. Katherine Hayles (1991, 19-20), in her introduction to *Chaos and Order. Complex Dynamics in Literature and Sciences*, poses the following fundamental questions:

What do the parallels signify? How do you explain their existence? What mechanisms do you postulate to account for them? What keeps the selection of some theoretical features and some literary texts from being capricious? What are the presuppositions of the explanations you construct, and how do they connect with what you are trying to explain? None of these questions is easy to answer. Nevertheless, if we are to arrive at a

¹⁴ It is precisely the same, although in different levels of study, as what Scobie (1988) does with cubist techniques and the literary art of Gertrude Stein. He poses that "In setting up comparisons or analogies between different arts, one fundamental technique is to use words which are established and well defined in the critical discourse of an art form and to apply them to another" (98). Scobie says that Stein is *a Cubist writer*; I wonder whether I could refer to her as *a Fractal writer* after having found out self-similar structures and fractal dimensions in the repetition patterns of some of her texts.

deeper understanding of the connections between literature and science (and hence implicitly of the underlying cultural dynamics), it is essential not to gloss over the hard issues.

One of the aims of this article is the same as that of the contributors to Hayles (1991), i.e., to grapple with some of the deeper problems in understanding “the cultural constructions that authorize changing views of chaos and order”. (1991, 20)

Umberto Eco (1985, 180) characterizes Calabrese’s neobaroque aesthetics with the following words: “Organized differentiations, polycentrism, regulated irregularity —such would be the fundamental aspects of this neobaroque aesthetic, the principal example of which is musical variations à la Bach”. Are not these the same characteristics that both post-modernist and post-structuralist criticism have made the most relevant concerning Stein’s poetics of imprecision? Is it not true that musical variations à la Bach were a springboard from which Stein jumped out into the textual-complexity pool?¹⁵

‘Of abstract works’ —we go on reading in Eco (1985, 181)— ‘there is only a “critical reading”: what is formed is of no interest, only the way it is formed is interesting.” The *way it is formed* is fundamental in seeing fractals: it would be a “critical seeing” of an abstract system. Thus, Eco’s “critical reading” needs intuition in the sense that fractal’s “critical seeing” needs intuition: to see beyond. Henceforth, the most complex texts by G. Stein are ‘a-semantic’, just as for Eco Baroque music and abstract art are a-semantic. Eco (1985, 182) discusses whether it is possible to discriminate so straightforwardly between purely “syntactic” and “semantic” arts.

As showed by the figures at the end, fractal structures in the text we study —Stein’s *Melanctha*— appear at the level of syntax in a word-system. At first sight, the formal coincidences of self-similar structures at different scales seem a mystery; after resolving them with the tools of mathematics and statistics with which Fractal Theory works, as I do on the last pages, it remains a mystery due to the fact that this kind of coincidences cannot be in the mind of any writer during the creative process of a literary text. These marvellous shapes spring up unexpectedly here and there over the paper without the writer being conscious of it. We can only think of her words in *Everybody’s Autobiography* (p. 242), when she says that William James had

¹⁵ For a good introduction to the relation between Baroque and Gertrude Stein, see Donald Sutherland (1951).

taught her that ‘science is not a solution and not a problem, *it is a statement of the observation of things observed*’. My little contribution here is that since the formation of those possible worlds is an *enigma* (one of those overwhelming art-enigmas), we have got a result: we can *visualize* those self-similar forms spatially. This could be an answer to the question Eco (1985, 182) rushes into all of us at the end of his cited article: “Until what point shall we be able to enjoy as merely musical those variations that play upon “likenesses”? Can one escape from the fascination of the possible worlds that these “likenesses” outline?”. My answer is that I cannot escape from it as I cannot escape from the fascination of the possible worlds that the likenesses in a single snow-flake outline.

It’s true that G. Stein wrote again and again on the topic of self-similarity (what she called ‘repetition’) in the human experience, but the real novelty of her work was the way she reproduced it formally, spatially, in the art of literature with the linguistic tools. Hugh Kenner (1988, 723) looks for self-similar structures in Pound’s work on a discursive level. “Mandelbrot—he points out— makes claims for “the fractal geometry of nature”, “fractal” being his term for a look of irregularity that turns out to be self-similar at varying scales.” After that, he asks: “As to why that turns up in the arts: well, they imitate nature, don’t they?”. Thus he takes up the proposal put forward by Mandelbrot (1981): “consider the role of scaling in representational figurative and nonfigurative pictures”; it “could well be influenced by the role of scaling in nature.” The point is that Kenner thinks that at first Mandelbrot does not help him because his field is ‘geometry’ and that is a *visual* field.

Where Kenner says that “the premise of *The Cantos*, a ‘poem including history’, is that history’s stuff, human experience, is self-similar”, or that “*History* works toward no finale; analogously, self-similarity imposes no norm of completeness”, we have to say, in a fractal visualization of Stein’s writings, that “*Text* works toward no finale”. This is a stylistic approach centred on the visual aspect of forms in order to reveal similarities at different scales in the haphazard quality of the text.

Clustering is another fundamental term used in fractals, so we must take it into account to see how it works in our texts. In Mandelbrot words it means: (1) the capability to form hierarchical clusters, or (2) a collection of objects forming different clusters, grouped in super-clusters, super-super-clusters, etc. in an at least apparently hierarchical way.

As Lucy Pollard-Gott (1986, 236) thinks,

Fractals are a special case of hierarchical structure, and hierarchy in one form or another is an acknowledged feature of language. Across many theoretical orientations, one must consider the patterning of sounds, words, phrases, sentences, paragraphs and larger units of the text. Poetry adds its own special hierarchy which includes prosodic units, lines, stanzas or cantos, and so forth. Thus, there is a potential for self-similar structure on many levels, a potential that a gifted poet may exploit, however unconsciously.

Now it is time to see some examples of how the deep structure of the text reveals those fractal forms. In my opinion, they add more mystery to the process of creation of a text because Gertrude Stein always thought of the importance of verbal repetition in the surface structure, experimenting with the word in the same way Picasso experimented with color and texture to create indeterminacy. But I think she never realized the fact that these repetitions or self-similar forms appeared in the deep structure of the text as well. Hers is another instance of the artist's intuition of a deep structure of reality modelled by science many years later; in this case, almost a century later.

As we have said, we will consider her texts as word-systems of fractal dimension structured in progressively smaller scales: text, paragraph, sentence, word. As this is a researching work in progress, I'll just show some fractal forms that appear in *Melanctha*, a story of about 150 pages belonging to *Three Lives*, written in 1905 and published in 1909. I have chosen *Melanctha* because it is one of Stein's first full divings into the sea of repetition. Oddly enough, the words figured here were the very first cases in our attempt to bring out fractal forms in this text. It is important enough in our view of the mystery for not to think of the figures at the end as an oversimplification of the issue. The word *wander* was chosen quite as a game, for its semantic connexion with a phrase used by the French philosopher Michell Serres to describe all these chaotic-creative processes: *la création vagabonde*. At first I thought it was a mere coincidence, but as I went on with my research there appeared many other instances of fractals, especially in those radical texts where syntax appears to be destroyed showing the same 'creative disorder' as that enhanced by the Sciences of Chaos as the most beautiful feature of complex phenomena of nature. I am talking of the style of, say, *Tender Buttons* and *Stanzas in Meditation*, structured in

even smaller scales as grammatical categories, sounds, etc. (stochastic configurations of names and adjectives, for example); those verbal configurations which, as M. Perloff (1981, 76-77) has pointed out, “are set up precisely to manifest the arbitrariness of discourse, the impossibility of arriving at ‘the meaning’ even as countless possible meanings present themselves to our attention. (...) it all depends on our angle of vision”. The same as the visualization of fractal objects, “a hymn to possibility” (Ashbery 1957, 251). Although concrete forms appear again and again, this second style is more abstract because, as Dubnick (1984, 31) writes: “its words are used plastically, arbitrarily, and because it is less concerned with traditional discursive description”.

As the classical Euclidean geometry does not allow us to see the *real measure* of a ragged coastline, the traditional syntactic order does not work in these texts if we want to perceive not only conventional referents but also what has been called the *enigmatic* configurations both in form and content. Other articles considering fractal configurations in *Tender Buttons* and *Stanzas in Meditation* are in preparation.

This way, Gertrude Stein offers us a ‘free-play’, a true freedom¹⁶ to select—in Perloff’s (1981, 85) own words, “*a way of looking* rather than a description of how things look”. The way of looking we have chosen is the same one Katherine Hayles refers to when she claims for the chaotic new way of seeing reality both in natural and human sciences:

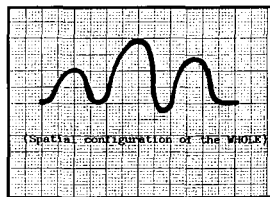
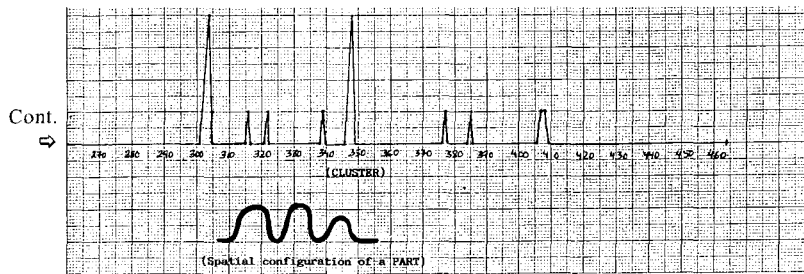
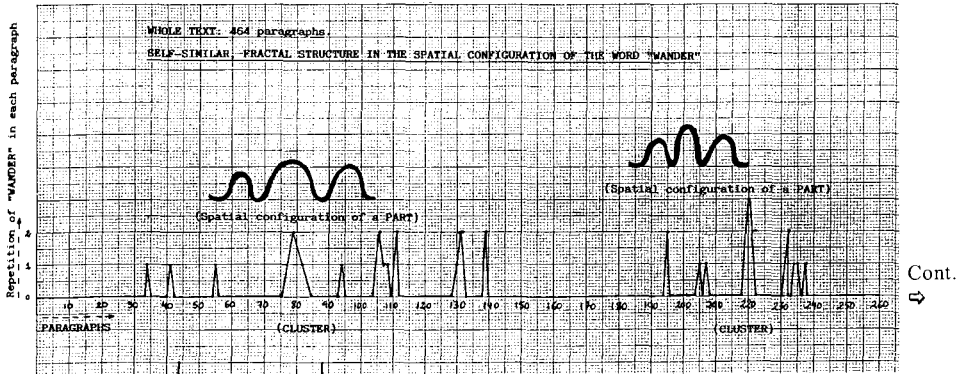
The science of chaos is new not in the sense of having no antecedents in the scientific tradition, but of having only recently coalesced sufficiently to articulate a vision of the world. It is no accident that this vision has deep affinities with other articulations that have emerged from the postmodern context. (Hayles 1991, 5)

The change is not in how the world actually is—neither clocks nor waterfalls are anything new— but in how it is seen. The broadest implications of chaotics derive from this change in vision. (Hayles 1991, 8)

Springing also from the paradox of subjectivity in science, we here assume a “paradigm shift from global to local theorizing, from modernity to postmodernity” (see Weissert 1991).

¹⁶ Cf. Argyros (1992, 665), where he talks about ‘true freedom’.

FIGURE 1
Gertrude Stein: "Melanctha" (464 paragraphs)
Self-similar fractal structure in the spatial configuration of the word *wander*

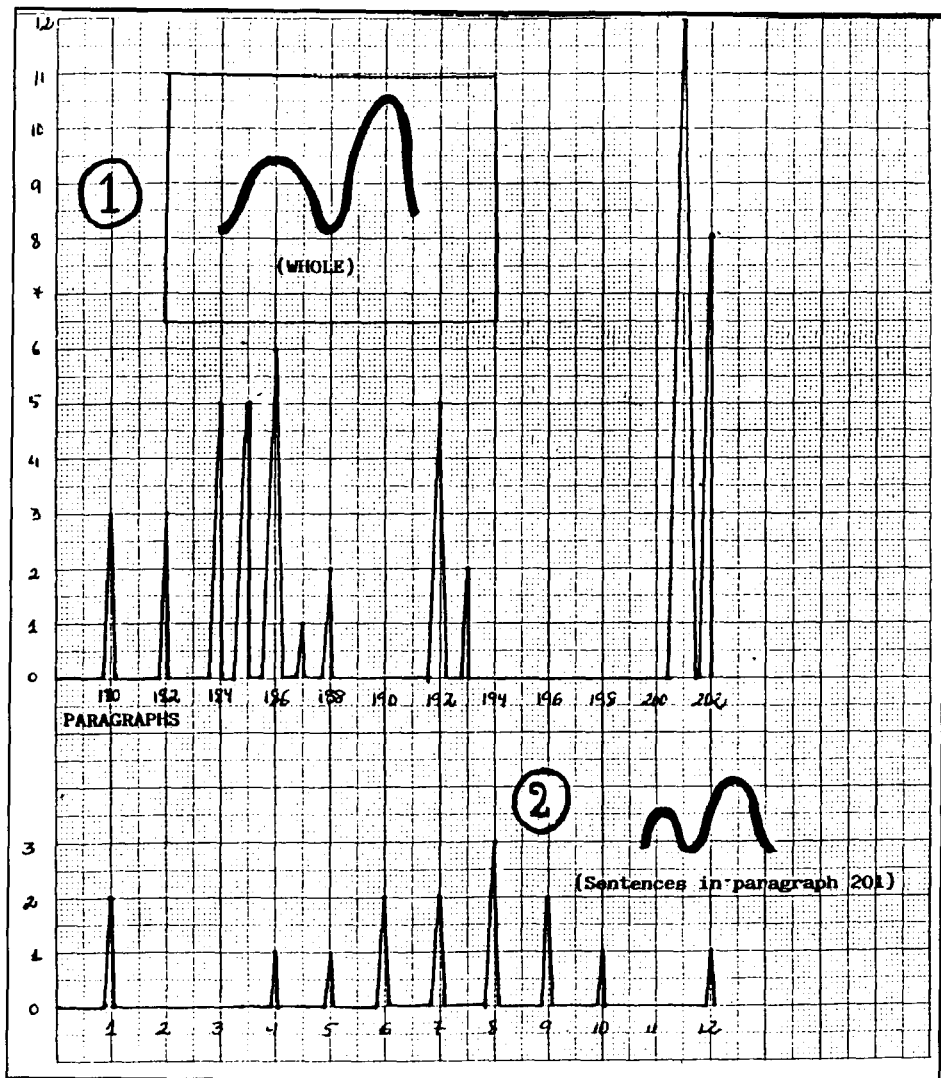


This is a first approach to the visualizations of the repetition-patterns of the word *wander* as represented by curves. In figure 1 you can see the spatial configuration of the word *wander* depending on where and how many times it appears throughout the 464 paragraphs of the whole text of *Melanctha*. For each paragraph, the number of occurrences of the word *wander* is shown; this, together with the number of paragraphs with an occurrence of 0 (remember that blank spaces in between the clusters are very important), gives a clear picture of the distribution of the repetitive patterns of the word *wander* resulting in a fractal configuration at different scales. The characteristic of clustering is essential for visualizing fractals and as a consequence the existence of blank spaces in between the clusters. Here we have clearly three clusters, one from paragraph 34 to paragraph 139, the another from paragraph 195 to paragraph 238, and the last one from paragraph 304 to paragraph 398. Although we are at two different scales, that of the text and that of the paragraph, the self-similar forms or curves tracing the spatial form of the word *wander* show that it has scale invariance. The visualization of these curves on the picture serves to a better understanding of what fractals are. Thus we have here a fractal geometry in as much as the curves of the component parts (on the scale of paragraphs) “resemble” those of the whole (scale of text) represented at the bottom of the page in the right corner. Of course these drawings have been done statistically. As I have said before, because fractal objects are irregular in shape, they do not possess the translational symmetry of Euclidean figures.

After posing the second example, we will be back to the basic traits of this kind of visualization.

In figure 2, I have studied the spatial forms that result from looking at the recurrence of the word *certainly* first in a macroscopic scale represented by those paragraphs from 178 to 202, as you can see in spatial configuration number 1. After that, number 2 shows another component part smaller in scale, that of the sentence, because in this case it is only one paragraph (201) and what we count are the twelve sentences that complete this paragraph. Before going on it is important that you notice that in this case the spaces between sentences are bigger than those between paragraphs in order to facilitate a general view. In your imagination you have to widen spatial configuration number 1 along the horizontal axis in the same progression as spatial configuration number 2. Again you can see that shapes imitate one another regardless of how much the object is magnified.

FIGURE 2
Gertrude Stein: "Melanctha"
Fractal structure in the spatial appearance of the word *certainly*
from paragraphs 180 to 202



In order to avoid misunderstandings I shall come back to the first instance. Our interpretation in the form of curves involves the basic qualitative characteristics of the textual repetition patterns we are attempting to model in this article. There is an initial blank space consisting of about 30 paragraphs before the occurrence of the first cluster in the spatial configuration of the word *wander*. The recurrence of this word before the next blank space consisting again of about 30 paragraph is such as to coincide in our way of interpreting it with an ascending and descending line tracing a curve. The next important step, the blank space just cited above has a similar general configuration —although not exactly the same measures— that the one occurring after the second cluster; furthermore, this second cluster is represented —or visualized— with another ascending and descending curve a bit wider due to a certain bigger concentration of the word. The third curve corresponds to a third similar concentration at the scale of the paragraph in the space of the text. All this happens in the first 140 paragraphs. In fractal geometry approximations are made that in our case should correspond to the following sequence, considering the first occurrence of the word *wander* as the starting point: CLUSTER (curve) – BLANK SPACE (± 20 paragraphs) – CLUSTER (curve) – BLANK SPACE (± 20 paragraphs) – CLUSTER (curve).

Qualitatively, the other two sets of three curves in the occurrence of *wander* at the scale of the paragraph, are self-similar in as much as they repeat themselves in terms of fractals. At a higher scale, that of the text, the representation by curves reveals the same basic configuration as those three at the scale of the paragraph: CLUSTER (curve) – BLANK SPACE (± 50 paragraphs) – CLUSTER (curve) – BLANK SPACE (± 50 paragraphs) – CLUSTER (curve). Here, the central cluster (our central curve) also has a certain bigger concentration in the spatial occurrence of *wander*.

All forms or curves in these two figures present a more immediate visual approximation to the *unconscious* structuring process of creation of this literary text. With these drawings it is my intention to bring the reader closer to the visualization of fractal forms and, as I have said before, to unveil one of those myriads of little mysteries in the literary creation.

At this point, my question is: Is this complex verbal reality a mirror of a complex natural reality? But more important than the answer itself is the fact that all this throws us back to the *enigmas* of the creative-writing process, to the mystery of creativity in Nature and in *Language-*

Art; and as astonishment sometimes leaves us paralyzed and we don't know what to say, the only thing I can think of is that statement of Gertrude Stein's: "exact resemblance as exact as a resemblance, ... For this is so. Because." Answers are open *ad infinitum*. Ten years after Umberto Eco (1985, 184), I also think "that we still know very little about the role of repetition in the universe of art."

Mariann DeKoven (1983, 10-11) points out that in Stein's later work she shares with some postmodernists

a vision of extreme fragmentation, abstraction, non-selectiveness, open-endedness, randomness, flux. She also shares the preoccupation of the *nouveau roman* and of American postmodernists such as William Burroughs with the question of literary mediation: the way in which conventional writing, through its familiarity, prevents instead of enables vision. Stein understood *matte* or 'zero-degree' writing half a century before Sarraute or Robbe-Grillet, and her verbal collages anticipate Burroughs' efforts to scramble habitual verbal associations by means of what he calls 'cut-up' or 'fold-in'. No writer's work is more relevant to twentieth-century developments in music and the plastic arts than Stein's: I need only say 'atonal', 'Cage', 'cubism', 'abstract expressionism' to make my point, though many other words could be said as well. Stein herself compares the 'successional' structure of her writing to the structure of film, defending her form by linking it to the representative genre of the twentieth century. And her notion of drama as static spectacle and as pure movement through time and space puts her at the centre of the avant-garde theatre (Italics mine)

I go even further as regards the universality —as Chaotics understands this term— of this great woman, adding a new vision of her *natural-verbal reality* through the recent fractal theory and the scientific epistemology contained in it: a structure of self-similarity that she unconsciously discovered on thinking or intuiting so much about the new possibilities in the spatial configurations of literary texts.

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