Fractality and Generative Thought

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Abstract

During the last decades, having been represented by Benoit Mandelbrot, fractal art became a very popular tool to make artistic imaging and captured the aesthetic realm of art in which the creator encounters his or her audience with wonderful complexities yet regularized and make the faced with bizarre images yet simple. This imaging is performed only on account of computers considered as an algorithmic and computer generated art. Creator artist is not able to control all the processes and tortuous calculations without the help of computer.

Fractal art preserved the parameters and created universalities to make it accessible for every scholar to carry the thought on the wings of regularity and chaosity. This paper aims at determining the examples of various convergences in science and art on fractal foundation to open the horizon of generative thought in unregular art.

1. Introduction

During the last thousand years, mathematics has attained a meaningful and close relationship with various arts which have become a common theme of many tribes and nations, regardless of their geographical location and beliefs. In the early centuries of intellectual growth of human being, mathematics, philosophy, and different kinds of natural science were interwoven together without any clear cut border. The scientists and philosophers of ancient Greece and those of middle ages of Islam mastered in various sciences and tried to combine these branches to prove the unification of universe.

The universe is a cosmos, on this view, a complex of interconnected systems, and human beings are of a piece with the rest of nature. The sciences ought to form a single web, a hierarchy of domains of inquiry. The web-like interconnection of all the

sciences simply mirrors the structural unity of the natural universe that science investigates [1].

The creativity inherited from natural thought let the scholars to express skills and abilities usually beyond the scope of worldly restrictions. Integrity, unity and comprehensibility have been considered as the growth factors of human knowledge based on mathematics. The intimacy of mathematics and number with music by Pythagoras and the presence of philosophy and wisdom in Farabi and Ave cena`s thought in Iran are obvious examples of this trend. The nature-based knowledge of these masters of Science aimed at describing a pure explanation of nature to generate the underlying relationships among the phenomena to help the science attain the explanatory adequacy. The most beautiful tiling and adornments have emerged in buildings where mathematics played a great role to transfer meaning through the chains of words, in fact, they exploited the symmetric laws of mathematics to generate a unified image of nature and belief, and the most pleasant music has linked with musical mathematics of nature while all and all the mathematics based its realm on nature. The interesting lesson the mathematics introduced was using minimality in thought and application. They believed that the main cause of separation of science and knowledge from nature was the margins and adornments imposed on them.

In the opening lines of the Meteorology Aristotle makes it very clear that the study of life belongs to the science of nature. For Aristotle the different parts of the natural world are related to one another in such a way that some of them have a determinate influence on the others and the job of the student of nature is to uncover this specific causal interconnectedness [2].

The time and thereby the rise of technology, brought uncontrollable and multiple division which turned the human into a one-dimensional being causing the subdivisions in science fields. The result was some kind of plurality in science which created different subdivisions in one single branch leading to expansion and distributed subfields. No one could believe to have so much ability and time to know two or three related subjects. This current was outstanding in modern and postmodern art which drove the creation spirit toward projection and self centeredness in which artists of postmodernism entered any field of feeling and thought uncontrollably. The last step of this path was awesome for all. No one could imagine any step further and most believed to have attained the peak of mastery in art.

In the long and tortuous path of science and knowledge in which every one tried to keep his cut, there sometimes appeared crosses and joints among schools, styles and branches which resulted in the emergence of wonderful phenomenon such as that of geometry in neoclassicism and inseparable tie of optics and color with impressionism or decent exploitation of Euclidean geometry in Cubism [3]. Different styles of calligraphy in Islamic civilization of Arabic regions are evidence of a generative approach to the link of science, nature and thought. Yet, these innovations are rare and can not be regarded as general trend dominating the movement of scientific thought. The link of music with electrical inventions leading to electrical music and the rise of computers in the second part of the twentieth century,

the first output of which showed up in the frame of plotter based imaging, were proposed as the first signs of recombination of seemingly different path of science.

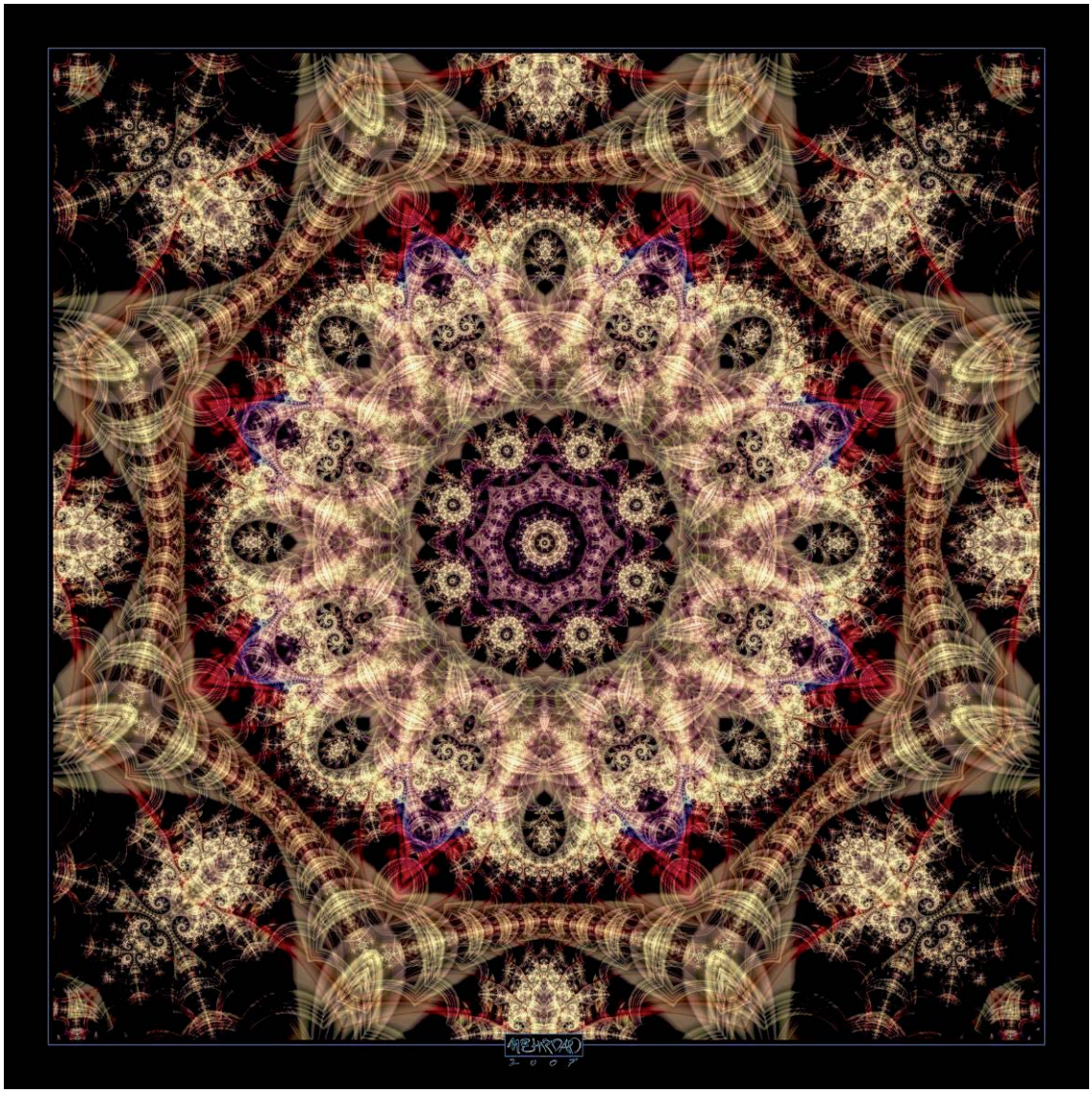

Figure 1. The Beautiful Circle of Piety (2007; © Mehrdad Garousi).

The most startling one can be attributed to Mandelbrot and his discovery in geometry named fractal geometry. Most of the realities in the natural world which were not explained with Euclidean mathematics now could be described easily. Due to the lack of adaptation between the old mathematics principle and some natural events representing as irregular, the prestige and status of mathematics went under question [4]. He used computer graphics to elucidate mathematical argumentation in juxtaposition with intricacies of art similar to what Chomsky did with language and mathematics. He postulated a generative template for geometrical studies penetrating in different branches of science. What seemed to be a gallery of chaos now turned into beautiful paradigmatic and syntagmatic of nature and mathematics. Recursiveness of natural phenomena was expressed in terms of fractional dimension and self-similarities to generate every sophisticated form in a simple and straightforward innateness. Art changed from prescription to description and separated modularity became a unified modularity. In fact, what was believed to be a

deviation from nature was shown to be another face of nature in a higher order of existence waiting to be discovered.

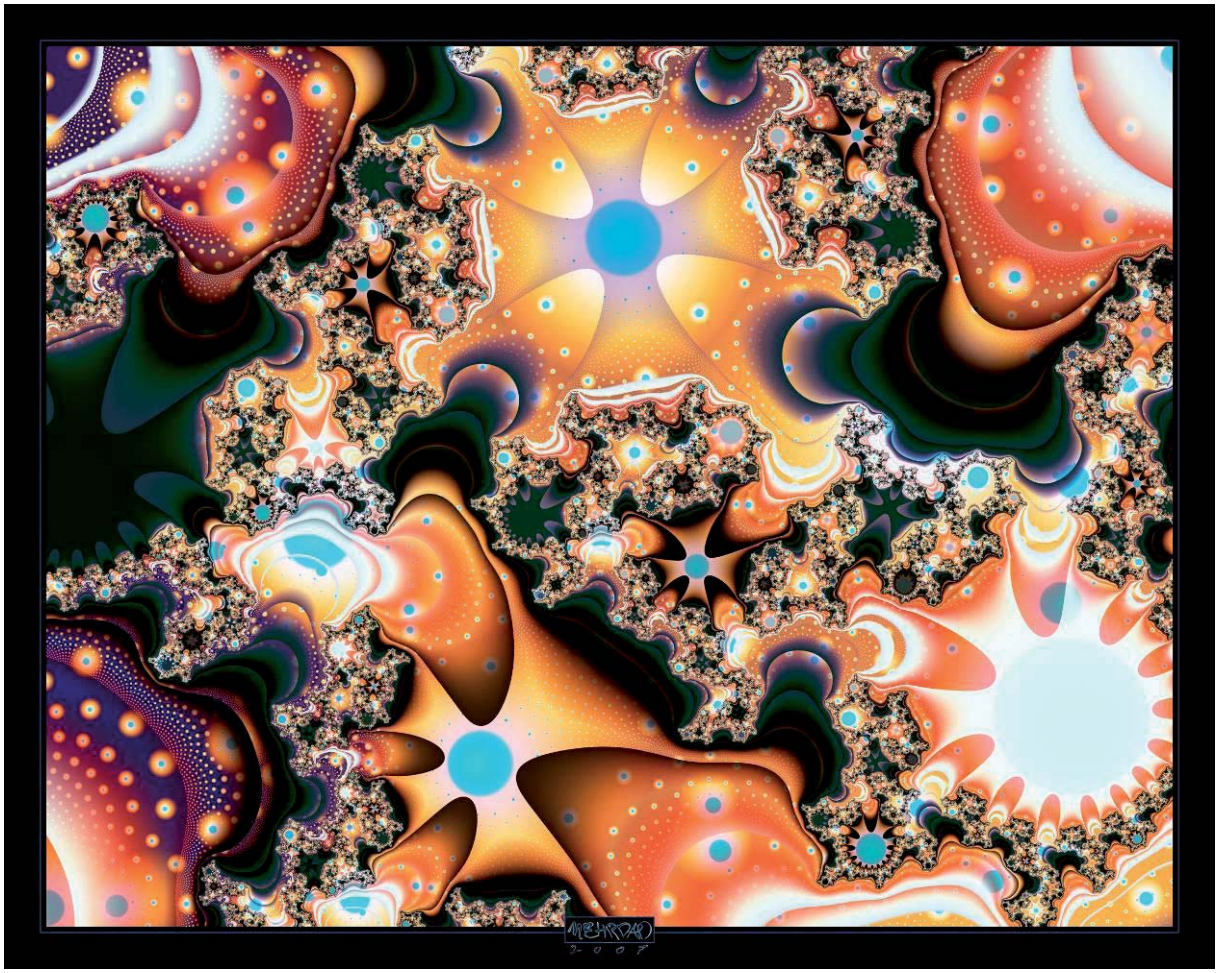

Figure 2. Galaxy of Crosses (2007; © Mehrdad Garousi).

This newly discovered branch of science penetrated in to language and art due to its dependency on computer imaging and endowing a perfect creativity power to artists to depict complexities of the universe in their fractal works of art. "Existence and being are united but represented in different orders". Language as the most important medium with a web of irregularities now can be imagined as the most primitive tool to be reconstructed. Natural languages are most often characterized as a combination of rule-based generalization and lexical idiosyncrasy. The English past tense is a familiar case, in which the irregular form *went* replaces the expected +ed construction **goed*. Baker (1979) notes that this is a relatively benign example for learners, since irregular forms are frequently encountered in the course of their linguistic experience. The experience of the form *went* may block **goed*, if the learner assumes that verbs typically have a single past tense form_ thus, an observed alternative form can serve as evidence that an absent regular form is not allowed in the language . Much more troubling are cases where an apparently legal construction is idiosyncratically absent, without any alternative. The dative shift in English is a well-documented example [5]:

(1) *John gave/donated a book to the library*

(2) *John gave/*donated the library a book*

Another example is more remarkable. Self-similarity in language appears in the guise of stories within stories, or sentences within sentences (”I know what I know”), and has been represented in the form of recursive grammar rules by Chomsky .There is a case study of how biolinguists go about studying the mechanisms of language and at the same time try to learn something about the question of language design. In a work on phrase movement over the past few decades based on a variety of languages, including English, Spanish, Irish, Japanese, Chinese, Palauan, Chamorro, Ewe, etc, the traces of symmetry and recursiveness is clearly seen. An example from English follows:

Who do [you think [that John believes [that Mary said [that Tom saw _] ?

Here, the question phrase *who* has moved to the front of the sentence from the object position after *saw*. The question is, does *who* move in one fell swoop to the beginning of the sentence or does it move step-wise ("successive-cyclically" is the technical term) to the front; i.e., through the position of *that* at the beginning of each clause. Chomsky originally presented evidence for the step wise hypothesis, and supporting evidence was subsequently discovered in a number of other languages in favor of this idea. One might ask why language is designed with "short movement" rather than "long movement?" Some of the evidence for this comes from languages where the position corresponding to *that* in the above example is morphologically marked (Irish) or syntactically distinguished (Spanish) at the beginning of each clause, so that one can, so to speak, follow "a trail" of markers from the moved item *who*, down to the position where it originated. However, Lasnik cites research on other languages where no such markers are found (English), or even where there is no visible phrase movement whatsoever, although the interpretation of the sentence is the same as if certain "movement" constraints had applied.

In the words of the great Russian poet Alexander Blok, "Erase the accidental traits and thou shalt see: the world is beautiful." Diffraction experiments give us information about atomic positions averaged over time and space, thus "erasing accidental traits." We can, of course, obtain information about the thermal motions of atoms in crystals; in fact, the very same diffraction experiments enable us to find so-called temperature factors, which are measures of average displacements of atoms from their average positions. But for most crystallographers, instantaneous "snapshots" are ephemeral and irrelevant, and the only images of crystals that concern them are the averaged idealized structures with their beautiful symmetry and periodicity [6].

Malenkov goes on to show the "beauty of disorder," that even "structures which are in principle irregular and disordered, such as are found in liquids and in some amorphous solids, can also be very elegant and beautiful" [7].

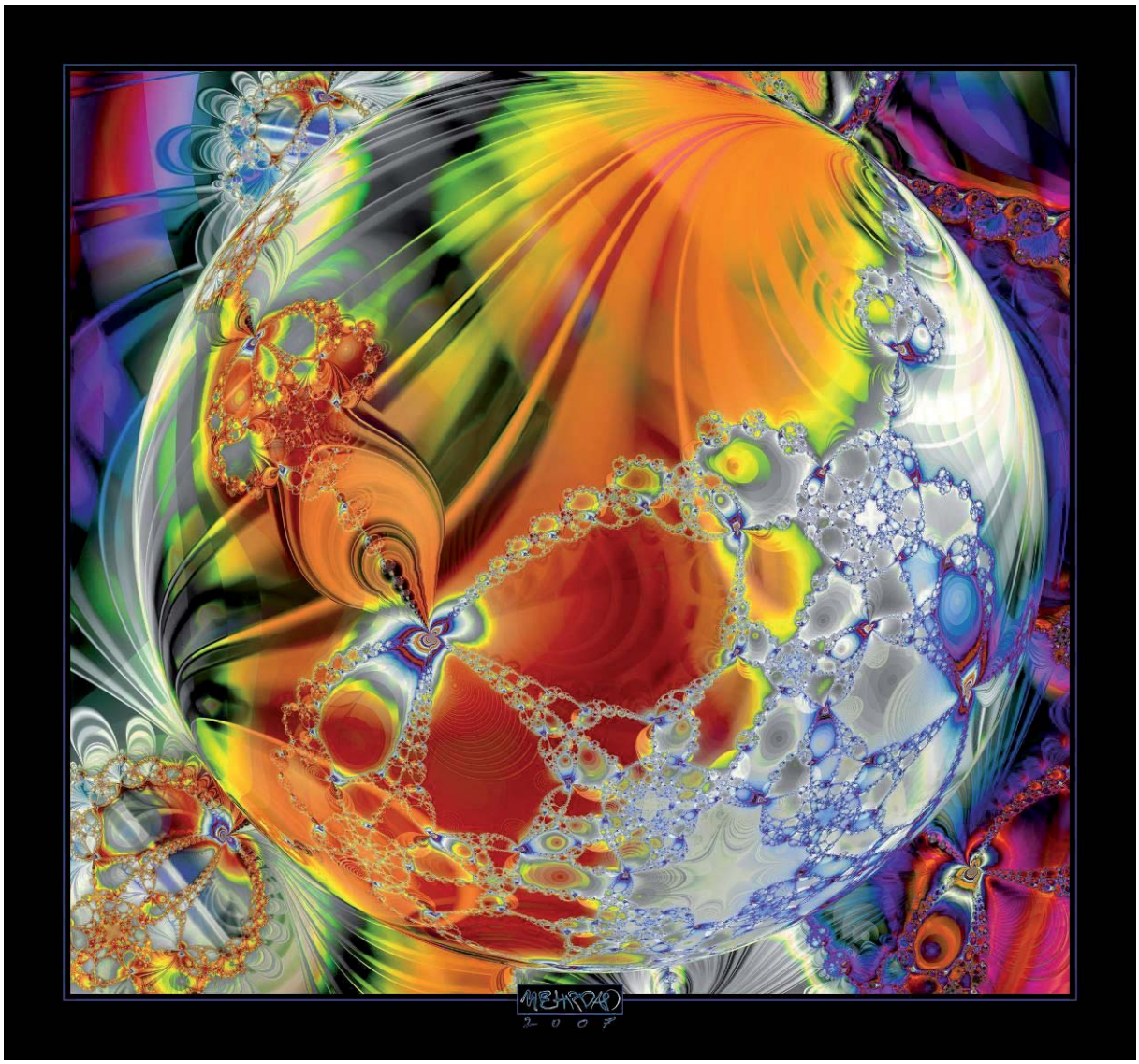

Figure 3. Incredible Globe (2007; © Mehrdad Garousi).

One of the remarkable discoveries is examining the fractal dimensions of Jackson Pollock`s and fractal patterns in his works in addition to the works of Davinci, Dali and Hokusai [8]. These artists use these themes significantly in their works long before the invention of fractal mathematics. These investigations show that these artists were aware of this knowledge and applied it in their works to trace the essence of existence. Neglecting the apparent fame, these artists tried to capture the nature behaviour with an aesthetic vision.

In fact fractal mathematics is the inflection point of recombination of various sciences to reveal the unknowns. In art, there has been spanned a vast realm of innovation and creativity for artists to propose new theories. Fractal art preserved the parameters and created universalities to make it accessible for every scholar to carry the thought on the wings of regularity and chaosity.

2. Conclusion

Today science has set off to help art and the borders of these two have been so interwoven that there is not clear cut line in postmodernism. The frame work of nature representation in science by the use of fractal art practically changed the irregular patterns toward the regular simplifications in the most complex phenomena from the patterns of a leaf to the arrangement of words and sentences. Multi-layer property of fractal images and their reflection in human being's thought has led us to focus on chaos behaviour as an underlying feature of nature to create the beauties concealed in a complex architecture. The infinity of structures with finite materials has been regarded eternal in linguistics, architecture and even music to the extent that mind has found another rival in thinking and organizing words to express the thought.

3. References

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