

Preliminary note: After welcoming us, noting the presence of Sylvie Benzoni, the director of the Henri Poincaré Institute, Ms the Mayor notably recalled the place that cultural and mathematical activities occupy in her borough and which she promotes. In response, apart from the commentary devoted to the persistence of objects and the evocation of the unleashing of the elements, I made the following comments:

Ms Mayor, Ladies and Gentlemen, Dear Colleagues,

First of all, I would like to thank, personally and on behalf of ESMA and the entire mathematical community, Ms. Florence Berthout, Mayor of the V<sup>o</sup> Arrondissement of Paris and President of the Regional Fund for Contemporary Art, for offering us a once again, the possibility of presenting our exhibition in this magnificent Capitant room. This is an exhibition devoted to the relationship between mathematics and the arts, showing among other things the enrichment of creation and artistic development that, through their progress, mathematics can bring.

This year, the fractal universe is the main theme of the exhibition. Allow me, Madam, to say a word about what a fractal is.

Without in any way entering into the set of techniques involved for the realization of works pertaining to this universe, I would simply like to underline one major philosophical aspect, summarized by these words:  
"The fractal, symbol of stability »

The main property of the fractal world is self-similarity, an elementary but essential observation, guessed at by the Nobel Prize in Physics of 1926, Jean Perrin, and stated by Benoît Mandelbrot around the years 1965.

A classic and elementary fractal object is an object structured in ordered and contiguous strata, having an infinity of identical strata, except for the fact that we pass from one stratum to the next by applying a size reducing factor, fact defined by a unique formula.

The stability of the classic fractal is threefold, paradigmatic and exemplary:

- stability of the form in the first place, the strata are identical from this point of view
- stability in the method of assembling consecutive strata
- stability in their evolution, the rate of reduction in the size of the strata being defined by the same formula.

Note in passing that this definition includes tiling, for example that of the ordinary plane, characterized by the absence of reduction in the size of the patterns.

Here a fractal will be called advanced when the passage from one stratum to the next is also accompanied by controlled deformation.

This ideal and exemplary mode of constructing mathematical objects is thus based on the notion of recurrence, characteristic of an eminently stable evolutionary process.

And this method of building objects is quite significant, both in the mathematical universe and in Nature.

A single illustration, as simple as it is powerful in its meaning and in its consequences as a the way of understanding and representing the physical world, will suffice to underline the importance of the notion of stability underlying the emergence of the phenomenon of recurrence. The regular oscillating movement, that of a wave propagating in time up and down, always in the same way, is of course one of the fundamental examples of perfectly stable movement. The wave is characterized by the frequency with which the vertices and valleys of the wave appear. Our attention is drawn by the fact us that almost any movement can be reduced to the description and the ordered superposition of an infinity of these waves, remarkable for their perfect stability.

This general fact is the embodiment of a perhaps even more universal first datum of Nature, with infinite consequences, a datum according to which *every object strives to maintain its stability through space and through time.*

But let us go back to the content of the exhibition. One can wonder about the place that these works, whether fractals or works more generally inspired by mathematics, occupy on the artistic level. None of these recent works, apparently, has yet the honor of appearing in our national or private museums. I am not talking about Anglo-Saxon museums. The very rational nature of these works, very often a certain thematic poverty, let us not forget on this subject what Leon-Battista Alberti wrote in 1435 "*la copia e varietà piace*", an absence of emotional content, the unjustified reputation of mathematics and various rivalries, are today some of the obstacles to media recognition.

On the assumption that man manages to free himself from the unleashing of the elements, this situation is of course transitory. Over the days, over time,

especially across the Atlantic, the number of people versed in this new intellectual and artistic movement is increasing. In the field of painting in Europe, there was already the example of the extravagant Dali, who knew how to put the knowledge acquired by his lively intellectual curiosity, especially in mathematics, at the service of his fertile imagination. In the same vein, the astonishing Fomenko, a leading Russian mathematician, has created a set of works that are absolutely unique in their mathematical and artistic richness, expressing, among other things, his rejection of the gulag. Artists such as Raphael, Michelangelo and other Leonardo da Vinci do not appear often. There will be other Dalis, other strong personalities who will be able at times to gather the support of the public through the powerful originality of their works, thus inviting them to share in contemplating the universe teeming with mathematical forms, admiring the purity of their drawings and their contours, or the diversity and the colorful warmth of their infinite displays of light.

Thank you.