European Society for Mathematics and the Arts

Newsletter

Volume 003 issue 06 June 2012

Dear Colleagues,

Among the exposés presented at the Brussels meeting, those of Radmila Sazdanovic and Xavier De Clipperleir merit attention, not only for the high artistic quality of the paintings or of the objects shown, but also they demonstrate how art as can be used as a tool leading to make progress in mathematics. Radmila will explains this in her future paper. (Cf the preliminary article (1) on http://www.mdpi.com/2073-8994/4/2/285*)*
The simple trick used by the designer Xavier De Clipperleir permit the contraction of a given polyhedron by internal folding into a new polyhedron : that physical contraction should interest the physicist and the biologist, while the local unfolding or blowing up of some faces of the contracted polyhedron should attract the attention of the mathematician.

Some other exposés were devoted to some forms of visualisation and so-called popularization of mathematics. This topic will be examined in the next Newsletter.

The Brussels' paper Les Raisons d'Être de l'ESMA (cf the Recent Documents on our website) presents a few testimonies justifying that «ESMA exhibitions also help to reconcile the public with beauty». That is a strong argument in favour of ESMA's existence and publicity for its exhibitions, particularly since beauty might be useful to overcome the painful disorders that mankind will soon encounter.

The paper evokes the creation of decoration, characterized by the repetition of some motives. This is one the most ancient artistic activities. A general characteristic of decoration includes visible symmetries, whose presence is deeply linked with the emergence of the feeling of beauty, I shall explain this elsewhere.

The most simple symmetrical objects are created by doubling a given sub-one, which may present itself properties of stability. The process of symmetrization contributes to stabilizing the given sub-object inside a more collective object. Of course, the physical process giving rise to the new object supposes the existence of possibilities of creating a physical stable bond between any two sub-objects.

Doubling, a fundamental process in ancient Egyptian mathematics, is the first step of the more general similar process which is repetition leading to the representation of larger stable objects. This process of repetition appears in mathematics first through the operation of addition, and can lead to a notion of expanded symmetry. The simplest formal repetition appears in $1 + 1 + 1 + ... + 1 + ...$ *Sometimes it is possible to replace* $1 + 1$ *by* $(1 + 1) = 2$, *etc, and to consider* $1 + 2 + 3 + ...$ *If one considers* $a_{n+1}x_{n+1}$ *as a kind of regular, stable transformation of* $a_n x_n$, *we get through repetition mathematical representations called series.*

A large part of Mathematics is devoted to the representation of physical phenomena and objects whose presence is due to their more or less local stability, thus containing a lot of more or less hidden and expanded symmetries. We may be able to appeal to our senses to try to define some significant representations.

Associated with light or sound, the pure or fundamental vibration, represented by a sinusoid, is a physical example of a stable phenomenon with repetition of a stable movement and of a stable mathematical shape, an undulation.

Given any mathematical shape, we may suppose it can be materialized. We then get a physical object. The properties, colours, sounds that it can emit under a local or global shock, depend of course on the material of which the object is constituted. These properties are characterized by sets of fundamental vibrations called frequential spectra, whether local or more global.

Thus the shape of an object is the common intrinsic feature which allows us to establish the correspondence between the «visual» spectra associated with light and the «auditive» spectra associated with sound, between the painter and the musician.

It is not obvious for us to associate convenient spectra with our other senses. With touch, we can have a local knowledge of an object. We may first feel the spaces tangent to the object. The bundle of all these tangent spaces form the classical geometric dual of the shape, which we should rather call the polynomial spectrum of the shape of first order. Touch allows also us to feel the local curvature of the object. In some sense these local curvatures are an example of what can be named the polynomial spectrum of second order. We can go further, considering either the list of the successive derivatives of movements on the shape, or the list of the successive bundles of homogeneous algebraic surfaces tangent at each point of the shape. We thus get the notion of the «polynomial spectrum» of the shape.

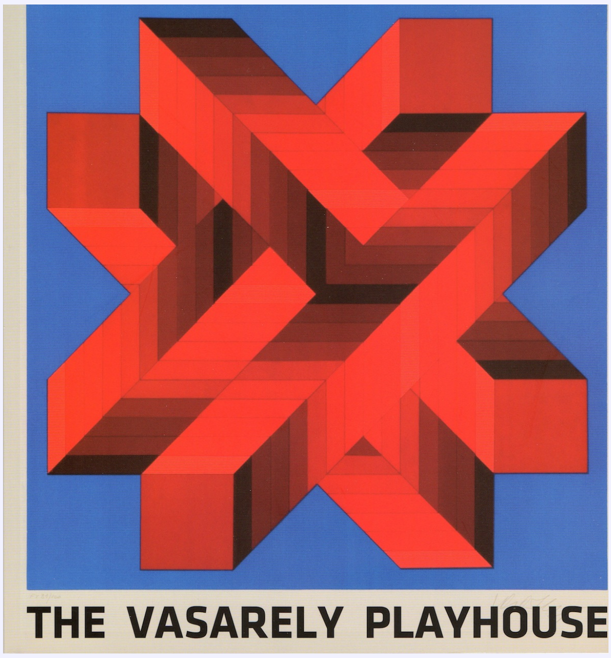
As we know from Shakespeare, spectra are highly significant ...

Best wishes.
Claude

PS : Please note these references :

(1) R. SAZDANOVIC, **Diagrammatics in Art and Mathematics**, *Symmetry*, **2012**, 4(2), 285-301

(2) Slavik JABLAN- Ljiljana RADOVIC, **The Vasarely Playhouse**, Association for South Pannon Museums, hu ISBN 978-963-08-1786-8



Claude Bruter, Publisher. Contributors : Sharon Breit-Giraud, Francesco De Comite, Richard Denner, Jos Leys. Website : http://www.math-art.eu