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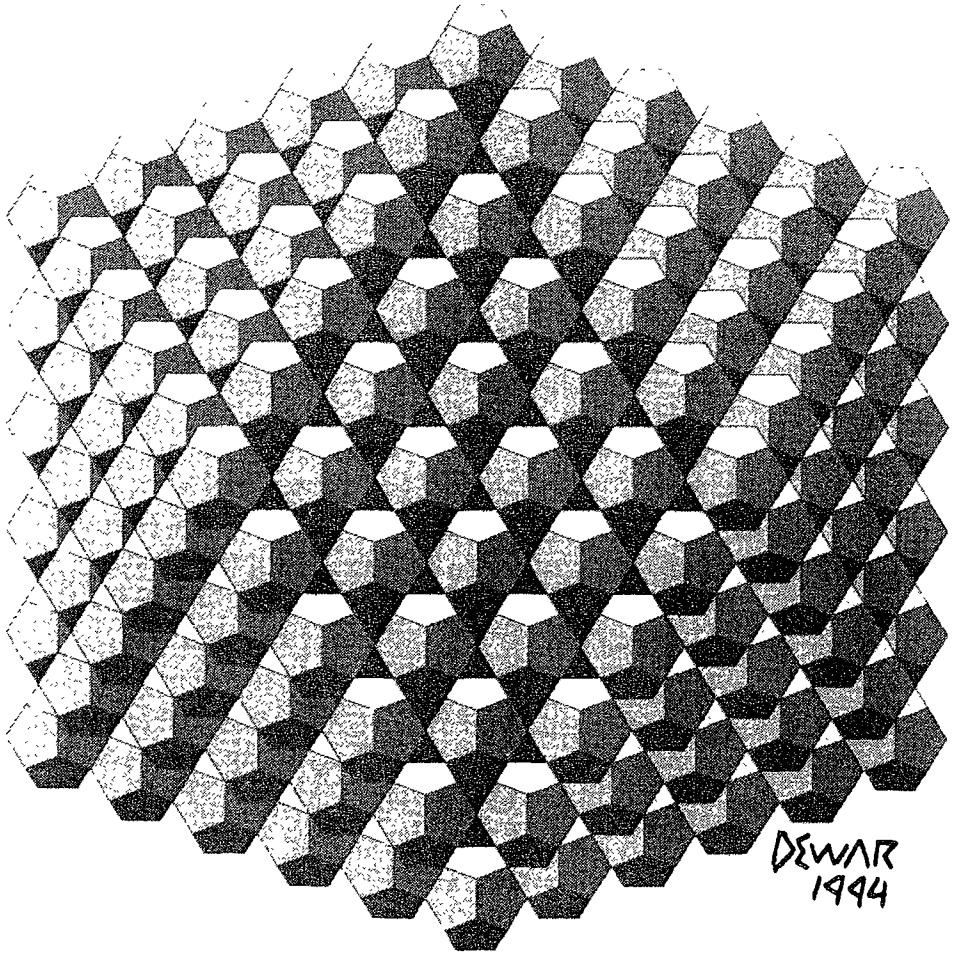

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GENERALIZED SYMMETRY OF SEMIOTIC SYSTEMS IN SCIENCE AND ART

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The possibility of application of exact science methods, the mathematical theory of symmetry for example, for qualitative analysis of art language is based on the well-known community of science and art objects and methods and on the system nature of their organization. Science and art manifest themselves as two mutual-complementary forms of cognition (in concepts and images) and of simulation and mastering of the universe. Certain community in science and art approaches is based on community of structure organization laws and functioning of polyfunctional and many-level integral systems of nature.

In addition to system's nature, art and science are linked together by the dialectic unity of concrete and abstract, the aesthetic and theoretic content in artistic and scientific information: the aesthetic side of science is reflected for instance in the beauty criterion of science theory, in the functional analogy between the theoretical model and the artistic image; the abstract side of art manifests itself in the same analogy, in typification of concrete content in the artistic pattern, in the transmission of some part of the abstract science information by the art language.

"True beauty is a deliberate, partial breaking of symmetry". This formula is considered as the aesthetic criterion of the Zen Buddhism school. Here we are going to show that this criterion has much broader field of application: "Dissymmetry creates the phenomenon if the phenomenon creates dissymmetry" in all the branches of art and science.

If perception is referred metaphorically to art and thinking to science it becomes clear their organic unity in human social life . "Visual perception is visual thinking", Rudolf Arnheim, the prominent American psychologist and art critic, said: "Elements of thinking in the perception and elements of perception in the thinking are mutually complementary. They transform the human cognition into the united process which leads inseparably from the elementary acquisition of sensorial information to the most generalized theoretical ideas".

Let us consider the joint process of visual perception-thinking in more detail. The physiological peculiarities of our eyes which scan the observed picture lead to the fact that the initial entrance flow of light information signals is accidental and disordered. In the course of transmission and active processing under the brain control this information flow undergoes many-fold qualitative and structural transformations. They are connected with selection, abstraction, grouping and amplification of the signals; with the comparison of information micro-schemes (which are appeared by fluctuations) with the patterns, the attractors, stored in memory; and with the self-organization of micro-schemes which stand the selection into the integral picture, the visual image.

The process described above is an example of a multi-stage synergetic phase transition from the microscopic disorder of the input entrance information flow into the ordered state of the appropriate sections of the brain which is corresponding to the visual image (thought). Accepting the perceptive images as messages one can follow the existing relations and transitions between the physical entropy (the measure of disorder)

and the information (the measure of ordered organization of the system and its interaction with environment), between the dissymmetry and the initial symmetry of the system which also serves as the measure of order-disorder but at the another level.

It is worth to determine the power of order of the object in the direct correlation with the order of its symmetry group. In this case both the maximal entropy and the highest group of combinatorial symmetry will correspond to chaos. And the spontaneous generation of order in chaos will be connected with the lowering of combinatorial symmetry of the system and with the appearance of new symmetries at the levels of groups, semigroups or grouppoids of isometric, affine, projective, conformal, scale transformations, etc. at the same time. This assertion is known as the principle of nondecreasing of the "total sum" of symmetries for the isolated physical systems.

One may notice a remarkable analogy between the processes of physical measurement and human perception. Both processes include the interaction between the device and the object and in both cases some uncertainty or ambiguity arise. A kind of a universal principle of uncertainty or ambiguity does work in human culture as well as in the nature.

The generalized uncertainty principle, the aspect of proximity and relativity, manifests in that the science and art truth always have the approximate and relativistic character, that in any developing science theory or art school there always arise collisions between the conflicting models and opinions and that the choice of solutions is always accompanied by the volitional overcoming of doubts when other possibilities become exhausted.

According to the epistemology theory by Nobel prize winner I. Prigogine, the object could not be known by the "detached eyes"; it demands to link up a man with the cognizable being in the capacity of objective recognizable system. This statement does not deprive science of objectiveness of course. It is necessary to remember that objectiveness is an invariant of mediated subjective transformations both at the levels of personal and social life.

A remarkable correspondence exists between the basic principles of natural sciences: principle of restoration of broken symmetry in the theory of generalized coloured symmetry; principle of partial coincidence of contents of the successive communications which leads to the maximization of the information in cybernetics; principle of subordination of a new system's structure which is self-organized during the phase transitions to the order parameter in synergetics; principle of organic correspondence between the structure and function, the integral (organic) unity of the form and the content in the structural semiotics; principle of aspiration of living organism for equilibrium and homeostasis breaking at the same time in psychophysiology etc. In the unity of these principles there is the guarantee of unity of the sciences about human beings in its specific approaches to the art phenomena.

Now we shall proceed to the symmetry analysis of semiotic systems and give the definition of the basic notions. A text is the universal example of a semiotic system. According to Yu.M. Lotman, the text is not only the realization of communication at the level of any fixed language but a complicated device which keeps the variety of codes and has the possibility to transform the obtained messages and generate new ones; it serves as the information generator having the features of intellectual personality in the broad context of culture.

It is possible to consider the semiotic universe as a set of different texts and closed languages. But the more fruitful is the opposite approach: the whole semiotic continuum

may be considered as a single mechanism(if not the organism). Then this semiotic space or Lotman's semio-sphere will be primary big system quite analogous to the notion of bio-sphere introduced by V.I. Vernadsky.

According to A.I. Leont'ev, the material world besides space-time dimensions has the fifth (or **5+*n***) dimension. In this dimensions the objective world is represented for a man as the system of meanings.

In aesthetics and semiotics the question is discussed as to whether it is possible to consider art as a semiotic system. The reason is that the element of an artistic form (whether it will be a melodic phrase, an architectural detail or a separately viewed element of a painting) has four properties of sign: (1) it has a meaning; (2) it gives information about something different from itself; (3) it is used to store and transfer information; (4) it functions in a semiotic situation during the process of perception.

But the other properties differentiate an "artistic sign" from the conventional ones: (1) each expressive means in art has many meanings, whereas the ordinary sign has a unique and invariant meaning. The meaning in language of an art object is in many respects determined by society and is relatively independent of the individual; (2) "an artistic sign" cannot be separated from the given context and transferred into a different context without changing its meanings; (3) the form of an "artistic sign" is intrinsically connected to its content: even a slight change in the form breaks the previous context's meaning and aesthetic impression.

The analogy between the language of art as a system and ordinary semiotic systems is also limited. The language of art has three properties of a semiotic systems: (1) the existing signs are interconnected: (2) new signs are introduced into the system in accordance with the rules; (3) the meaning of a sign depends on its position in the system.

The other properties of semiotic systems do not belong to "artistic systems": (1) it is impossible to compile a "dictionary" of artistic means applied in one particular art: every artist has his own individual language; (2) works of fine art cannot be adequately translated; (3) the ideas of one work of art can inspire another but the latter will be an independent masterpiece.

From this analysis of the problem S.T. Machlina arrives at the conclusion that the notion of an "artistic sign" is a metaphor and that the language of art is a phenomenon similar to semiotic systems but not equivalent to them. In practice the language of art is a social code to denote generally accepted "meanings" of a certain culture.

Metaphorically speaking, artistic systems are not a perfect semiotic systems. It does not follow from this statement that group-theoretical symmetry techniques cannot be applied to the analysis of their structures. It may be done in terms of generalized colour symmetry groups in high-dimensional spaces by analogy to the study of the partial order in chaos or such complicated objects as dissipative structures, incommensurate crystalline phases, liquid crystals, imperfect crystals or quasicrystals. The broken symmetry of such objects can be restored!

One can get an idea how it may be done by considering the examples of adequate translations of different scientific, artistic or ordinary texts or making transformations of active expressions into passive ones, or trying to perform grammar, vocabulary, synonimic, stylistic etc. transformations or fulfill the formal geometrical transformation of self-similarity or deformation of the sign's forms which preserve the sense. The more complicated examples of symmetry-dissymmetry relations in science and art are considered in the report.