Symmetry of STRUCTURE

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Abstracts

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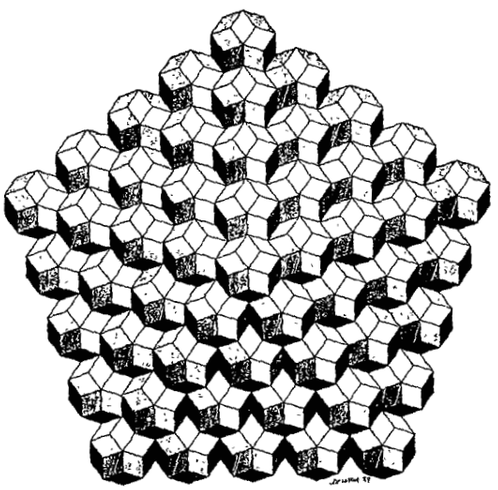

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SYMMETRY OF DEVELOPMENT

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The substance of one of the section of e v o l u t i o n i c s or the general theory of development /Urmantsev,1988a/, which has been advanced by the author within the framework of his own version of the General System Theory /GST(U)/, is presented.

S y m m e t r y. According to the law of system symmetry in GST(U), "each system is symmetrical at least in one respect". Symmetry means a property of a system "S" to coincide in features "F" after modifications "M". This definition is at the same time a difinition of an abstract equality. Therefore symmetry is equality, and equality is symmetry. The same is obvious for properties of equality relations namely "reflectivity", "symmetry", "transitivity", since these properties are equivalent to three group axioms, i.e. about the neutral element, inverse elements and closeness of a group with respect to itself. The above considerations permit us to treat the history of development of symmetry concepts as the history of discovery of non-trivial equalities and of their investigation concepts. Therefore it is not by chance that four axioms of group theory (one of the set of possible mathematical symmetry theories /Koptsik, 1988/) are at the same time statements about four different symmetries and about four different equalities. This means that any group is symmetrical. Therefore, to reveal the group nature of a system means to reveal its symmetry.

According to the GST(U) law of systemness, "any object is an object-system and any object-system belongs to at least one system of objects of its kind" and, according to the system symmetry law, any system is symmetrical. Hence reality as a whole, both objective and subjective, must obey the law of system symmetry. Reality includes all forms (kinds) of structure, all forms (kinds) of existence (space, time, motion), all forms of alteration (four basic, i.e. identical, qualitative, quantitative and relative forms plus eleven of their combinations by two, three or four), all forms of evolution /four basic, i.e. evolutionary identical (stasigenesis), evolutionary quantitative (quantigenesis), evolutionary relative (isogenesis), plus eleven of their combinations by two, three or four/, all forms of action (two, one and zero lateral) and all forms of relations /conrelative (concordant) and disrelative (discordant)/ of the matter.

This leads to various symmetries and permits one to consolidate the knowledge of different types of symmetry by means of a new general system and philosophical category - "forms of symmetry matter".

D e v e l o p m e n t. It is possible to reach essential progress in cognition of any object "sigma" if we present it as

an object-system and reveal in it all the manifestations of systemness (symmetry in particular) which are postulated by GST(U). But to represent any object as an object-system it is necessary to reveal its "primary" elements (i.e. elements which are considered as a minimal unit at the given level of investigation), relations of unity (connections among the elements which make them a whole) and the laws of composition (conditions which restrict the relations of unity).

With respect to development it is appropriate to regard the following consideration.

The primary elements of development are a) the bearers of development A, B, C, D,... which are the objects and at the same time the "results" (phases, stages) of development; b) the forms of development (see above) by means of which something is transformed into some other thing, c) the sources of development which interact positively, negatively or neutrally and act on the bearers of environmental factors. The first stage of consideration of development as a development-system answers such questions as: what develops? into what does it develop? via what evolutionary transformations does it develop? why does it develop?

The relations of unity are a) relations of synchronous and diachronous order of bearers and forms of development; b) relations of unilateral determination of the present by the past and of the future by the present (but not vice versa); c)relations of interaction, unilateral action and mutual non-action among the factors on the one hand, and of the factors and the bearers of development on the other hand; d) probabilistic relations of "polymonovariance" which involves numerous possibilities but only a single developmental form being realized at each moment. The main result of the second stage of consideration of development as a development-system is answering the question, how and in what graph form is the development realised.

The law of composition are prohibitions and permissions connected with a) fundamental physical laws, general and particular system laws (including the laws of conservation), b) action of natural selection at all stages of evolution of all forms of the matter; c) specific "construction" of developing systems ("environment"; "bearers of development"; two, one and zero lateral connections among them), that permits only a limited set of mutual transformations; d) an achieved level of development which although is altered by the new generation of development bearers in turn affects the conditions of existence and routes of modifications of this generation; e) limited set of modifications and developmental forms and an even more limited set of conditions of their realisation at each moment. The main result of the third stage of representation of development as a development-system is the answering of the question, according to what laws does the development occur.

S y m m e t r y o f d e v e l o p m e n t. As applied

to development, the system symmetry law transforms into a law of evolutionary system symmetry according to which "any developmental system is symmetrical at least in one relation".

The correctness of this assertion is proved by the construction of the following Caylay mathematical groups: 1) symmetry of developmental bearers of different orders; 2) forms of development and modification (or evolutionary and non-evolutionary system transformation) in both cases of the 8th, 16th or 64th order; 3) evolutional and non-evolutional system antitransformations (i.e. "+" and "-" types of system transformations); in each case they are of the 27th, 81th, or 729th order; 4) progressive, isogressive (one level), regressive transformations of 3rd order; 5) progressive, isogressive antitransformations; in each of three cases - 3rd order; 6) inner and outer sources of development; in both cases the 3rd order; 7) actions (two, one and zero lateral actions among bearers, among factors or among bearers and factors) and relationships (con- and disrelative realized in the course of two, one or zero actions); in both cases the 9th order.

It is remarkable that groups, subgroups, invariants of non-evolutionary system transformations and antitransformations (modificational forms) are isomorphic with respect to the groups, subgroups, invariants of evolutionary system transformations and antitransformations (developmental forms). This permits any form of modification to be adequate only to a corresponding particular form of development: stasigenesis to the identical form, isogenesis to the relative form and so on. Each form of modification and the modification in general may be considered as limit in a case of reduction or "embryo" of the corresponding developmental forms and of develop ment in general. It can be said that development in general consists of the embryos.

From the law of evolutionary system symmetry the following laws are inevitable:

a) the law of system contradictioness of development, according to which "any system of development has a subsystem of contradiction-systems, i.e. the subsystem of relations of unity and "struggle of opposites";

b) the law of system non-contradictioness of development, according to which "any developmental system has a subsystem of noncontradiction-systems";

c) the symmetry of the subsystems themselves in at least one relation.

Both laws trivially follow from the recognition of obligatory symmetry of the group nature of any developmental system at least in one relation and also from the obligatory presence in such systems of n contradictional relations between mutually opposite elements (postulated by the first law) and m non-contradictional relations between mutually non-opposite elements (postulated by the second law) of its mathematical group.

Moreover the group considerations prove that in general case

$m \gg n$, i.e. the number of non-contradicting relations is far greater than that of contradicting ones.

What is the contribution of non-contradicting relations to the objective reality? Like contradicting relations the non-contradicting relations play the role of sources or driving forces of development sources. All the considerations mentioned above are obviously confirmed by the history of scientific, esthetical and philosophical knowledge, the progress of which has been achieved not only due to (but often even in spite of) gnoseological contradictions, but also to gnoseological non-contradictions, i.e. the collaboration and unity of supporters of various paradigms. Relations of non-contradictioness are of a fundamental significance also for the working out of logically non-contradictory theories of natural objects, of society and thinking.

The last assertion (c) is proved by the author by building some relevant mathematical groups, namely of non-contradictory relations of 2nd and 3rd order, of contradictory relations of 2nd and 3rd order, as well as of contradictory and non-contradictory relations of 3rd order. In its turn these conclusions have led to the concept of mutually opposite and mutually non-opposite contradictions and non-contradictions, but under certain conditions identity or intertransformations of such contradictions may occur.

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