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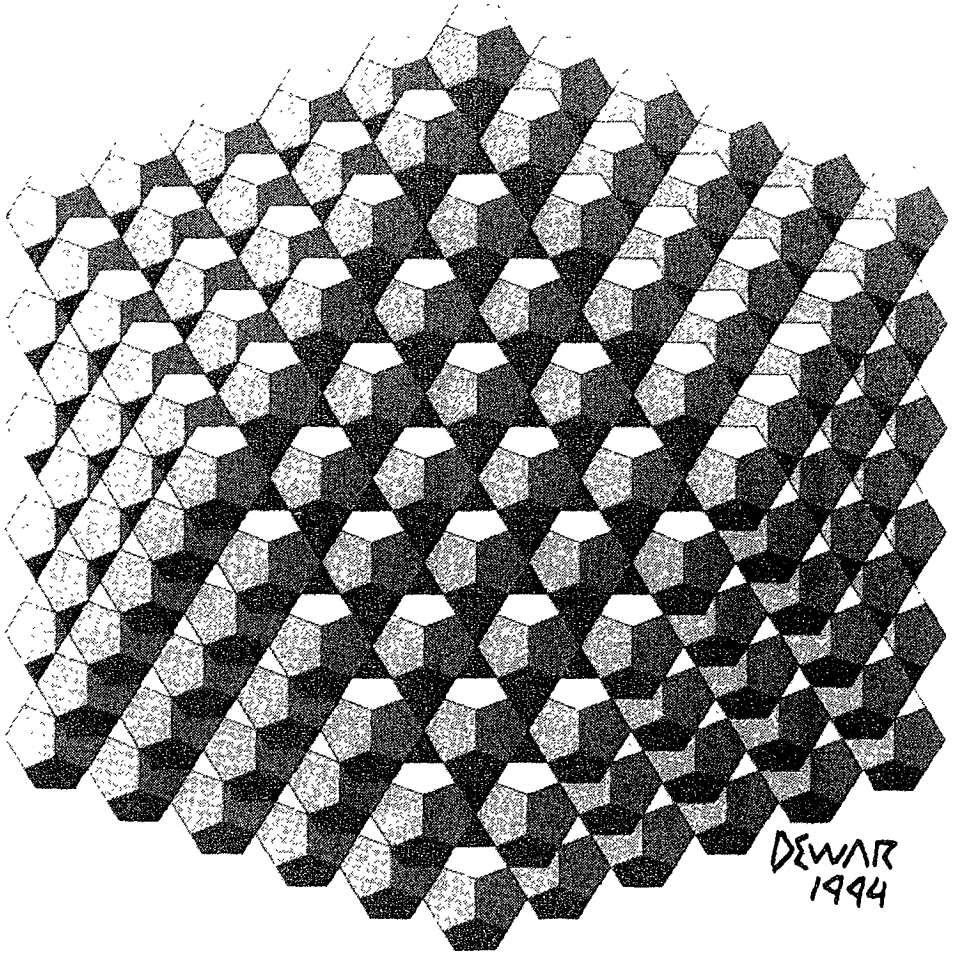

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DISSYMMETRY AS THE SOURCE OF MOVEMENT AND PROGRESS

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According to Louis Pasteur, the Universe is a dissymmetric system and the life, as being recognized, is a function of this dissymmetry. This extremely deep sentence will have far rich consequences, if applied to some aspects of human activity, except pure mathematical research of symmetry, where only the existence of symmetry groups has been examined.

The thesis of the presented talk consists in proving the great role played by symmetry violation in creation of progress of such branches as economy, engineering, social phenomena and so on, by providing some examples of changes caused by dissymmetry as well as by sketching their origin and nature.

The talk presented is addressed to people who are interested in some non-formal approach rather than to ones who used to deal with sophisticated mathematical description of symmetry, using methods of the group theory. However, a more formal language seems to be possible, too, and some efforts will be done in applying such constructive methods.

Let us start from the ancient Greeks, who used to introduce some small asymmetrical elements into the symmetric patterns. It seems that the real inspiring value of the dissymmetry had been known for a long time before the group theory was invented.

It is well known that a sail yacht is a symmetric object. The mirror reflection of its layout (excluding characters) is the same picture. Also the general view of the yacht as well as its destination to sail in every direction indicates its mirror symmetry through the longitudal (diagonal) axis. The symmetry group is then C_2. The perfectly symmetric yacht would not be able to sail – it would drift only. The capability of sailing is achievable by a certain dissymmetrization of the placement

of a sail, what means that the sail have to be placed either on left, or on right, depending on the wind direction.

A petrol engine looks like a quite symmetric object. It is obvious that the perfectly symmetric engine would not work at all. The dissymmetry is commonly introduced with the rotational movement of a flywheel. In this case the complex statical – dynamical symmetry should be taken into account.

The theoretical basis of these phenomena is included in Newton's laws. The understanding of them requires not only the symmetry between the action, written down at the left-hand side of the equation, compared to the reaction at the right-hand side, but also imaging of implications of essentially small perturbations of this 'perfect' symmetry.

The Nature provides us quite frequently with some hints, what to do as that to exploit practically the phenomenon of 'symmetry – dissymmetry' treated as a whole. Physicists of condensed matter as well as field theory are used to the term 'spontaneous symmetry breaking' that occurs *eg.* in a system of given symmetry interacting with the external forces. Jahn-Teller effect can serve as a beautiful illustrating example. A spontaneous vibrational movement of a molecule that lowers the energy is related to lowering of the symmetry group of the system.

Another examples of the inspiring role of the dissymmetry have 'social' meaning. The first one concerns pisciculture and is known to fish breeders in the part of Europe that the author comes from. Breeding of carp (*Cyprinus Carpio L.*) requires that the fish should move themselves as much as possible in order to eat a lot and to increase in weight. It is not easy to achieve it, since the carp used to be rather lazy by their nature. The method sometimes applied consists in slightly violating symmetry within a shoal of the fish, which are almost the same and thus pretty symmetric. The breeder places one hungry pike (*Esox lucius L.*) which forces the carp to move significantly more fast in average, so the carp have to eat more. As it has been checked experimentally, the total increase in weight of the carp population is much bigger than the loss caused by the pike.

The second example concerns the major changes in the Middle-Eastern Europe and is such obvious that it does not require even any explanation. It is enough to say that the unified, thus 'symmetric', population of people who were not allowed to exhibit their personal differences of both thinking and acting, was not able to

create the development in country economy. The well known events introduced even relatively small perturbations into the common uniformity, so one had not to wait for a long time as that to observe the 'avalanche effect'.

It seems that the investigation of the symmetry goes paralelly into two directions. First, the discovering of new and new symmetries presented in the Nature, and predicting the new phenomena. Here the example of the *top* quark is classical now. The second direction is, anyway, related to the role of dissymmetry. This direction is now represented widely by other than physics branches of science, too. Both – symmetry and dissymmetry – investigation directions have long-time tradition coming from ancient ages.