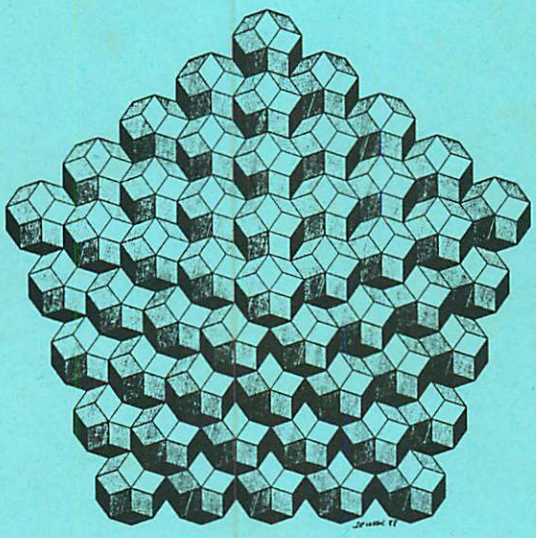
Symmetry of STRUCTURE

an interdisciplinary Symposium

Abstracts

I.



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ERWIN BAUER'S THEORETICAL BIOLOGY AND THE PROBLEM OF ASYMMETRY

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1. If there is to be some hope today - in the age of the Babel's confounding of languages - for unification or synthesis of such branches of knowledge as natural and social sciences, philosophy and the art, then it has to be connected to the principle of symmetry (and of asymmetry, as will be demonstrated later).

2. The type of a physical regularity is based on symmetry. A physical law equals symmetry i.e. a regular reproduction of the same consequences under similar conditions. Moreover, it is possible to unite physical laws based on symmetry, and thus symmetry is sometimes referred to as the law of physical laws.

3. Physical world is being described by splitting its structure into two incompatible poles: laws and initial conditions. Hence, irregularities, random events, asymmetries are being put outside the physical theory from the very beginning: they are being placed into the area of initial, or boundary, conditions. As for the theories of physics, they are only dealing with the symmetry (preservation, invariance) or its distortions.

4. Presently, the concept of distorted symmetry (a spontaneous distortion of symmetry, the thermodynamic imbalance, the irreversibility of time, etc.) draws particular attention of physicists. However, the phenomenon, that truly deserves attention and study, is hidden under the name of symmetry. Thus, asymmetry is a more significant event that just a distortion of symmetry.

5. However, asymmetry, when thrown out of the door, i.e. out of the framework of the physical theories, returns through the window, i.e. it assumes the role of the most basic principle in the theories of fundamental particles, in the cosmological models of the development of the Universe, or in the global theory of evolution.

6. It became obvious in the past few decades that physics lacks a theory of evolution towards the formation and development of increasingly complicated structures. The existing theory of evolution, expressed by the law of the growth of enthropy, describes just only destruction of structures, degradation and death.

7. The existence of two theories of evolution - Darwin's concept of the origin of species and the second principle of thermodynamics. - which describe two directly opposing tendencies and which do not have any points in common - illustrates the gap between the studies of the living and non-living matter

8. If we are going to set up a physical theory of evolution in the sence of self-organisation of systems, we have to operate with a new concept of the irreversible time, as Ilya Prigogine says now. But the asymmetry of time introduces an obvious distortion into the symmetrical physics, hopelessly complicating it.

9. Asymmetry, which is met by physics at its frontiers, belongs to the foundations of biology as a cornerstone in the study of the living matter. Trying to discover the essence of life, scientists get stuck with the problem of asymmetry: both at the level of molecules, structure, functions and at the cognitive level. The problem remains unsolved; moreover, it rests beyond the frontiers of the symmetristic science.

10. Can there be, after all, a <u>scientific</u> structuring of

biology, or "does the science of life, i.e. biology, really exist, or is it just a branch of applied physics and chemistry?" - this is how the question was put by Erwin S. Bauer, the author of "Theoretical biology", a book published in 1935.

11. Prior to explaining his own point of view, Bauer assesses mechanicism and vitalism which have existed since times immemorial. Then he formulates a principle vividly expressing the most specific feature of the phenomenon of life: "Where forces working against the equilibrium present themselves as a regular event, which is the case with the living systems, there we have to deal with new regularities. These cannot be described by amendments to the old concepts any more, since the distortions turn into new regularities."

12. Thus Bauer formulated his "principle of a persistent thermodynamic non-equilibrium", a law not yet known to the science of which physicists started to speak ten years later as if neither E. Bauer nor his "general principle of biology" had ever existed.

13. A distortion of the thermodynamic equilibrium or a deviation from symmetry persist in a living system as a self-preserving variable which may be expressed as a regularity. It can be interpreted as asymmetry being a general law of biology - a fact all the more overwhelming since Bauer could not yet correlate his law with the optical activity, which was discovered by Louis Pasteur who thus declared the molecular asymmetry to be "the only distinctive border line between the chemistry of living and non-living matter".

14. Bauer discovered and formulated the law which describes the drive of the living matter towards building all the more complicated structures, as opposed to the trend towards their distortion and decay, expressed by the second principle of thermodynamics. The new "source of life" is a peculiar principle

of preservation of asymmetry in the living nature, and it may be presented as a major principle of the science of life (then the principle of the growth of enthropy will take the second place here in terms of its significance). Bauer had conceived it as a law of science, and he had even tried to ascribe a quantitative measure to it.

15. One can argue that Bauer's concept is the most significant event in the theoretical biology after the works of Charles Darwin. However, it went unnoticed by the scientific community - probably because it is only now, over 50 years after Bauer's book was published, that asymmetry starts to be perceived as a principle shaping up structures; it begins to attract a particular attention of the physicists, though still and well it is being interpreted as the distortion of symmetry.

16. A different interpretation of the regularity of the living nature, offered by Erwin Schroedinger, was commonly accepted: as the negative enthropy, which is very unlikely from the point of view of thermodynamics. Also, it was not noticed, that the statement: "chaos taken with the negative sign is the measure of regularity" is inconsistent both in the common sence and in the scientific one, because conversion of sign of such an irreversible variable as the enthropy contradicts the second principle of thermodynamics which asserts that an irreversibly decaying system cannot return to the initial state. Thus, the science had chosen reductionism and, after closing the circle, came back to the problem as worded by E. Bauer.

17. Prior to solving this problem biology will most likely have to absorb most of the achievements of modern science and to acquire a new dimension of a dynamic synopsis of various fields of knowledge so hopelessly separated today.