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Cybernetic Aspects in the Biostructural Conception

Living matter consists, according to the biostructurel conception, in two forms of matter, qualitatively distinct, which are in relations of functional dynamic coexistence: biostructured matter (biostructure) and coexistent molecular matter [1] — [3].

Biostructured matter is specific to life; it exists only in living arganisms; it represents a higher stage of development and organization of the matter, with respect to the physical nonliving matter; it consists only in chemical combinations, being in a state characteristic to the living, richer in energy than the usual molecular state; it is formed through assimilation of the chemical combinations deriving from the coexistent molecular matter; it is characterized by the continuity of its organization being in incessant energetic transformation (biostructism); it is in continuous development; it is the bearer of biological features whose manifestations are submitted to biological laws, qualitatively distinct from mechanical, physical and chemical laws; it is torn at the same time with the death.

Coexistent molecular matter consists in chemical combinations being in normal molecular state; it has a chemical combination specific to the living, different from the chemical combination of the environment; it is characterized by the discontinuity of its organization; it is in incessant chemical transformation (chemism); it ensures, together with the biostructured matter, the manifestation of life to the living matter of whom both are integrant parts.

The chemical processes in the coexistent molecular matter ensure, both the formation of chemical combinations, which by assimilation, can become components of the biostructured matter, and the liberation of the energy, necessary for the transformation of the molecules of the adequate chemical combinations in components of the biostructure, as well as to maintaining the existence and the normal functional state of this biological structure.

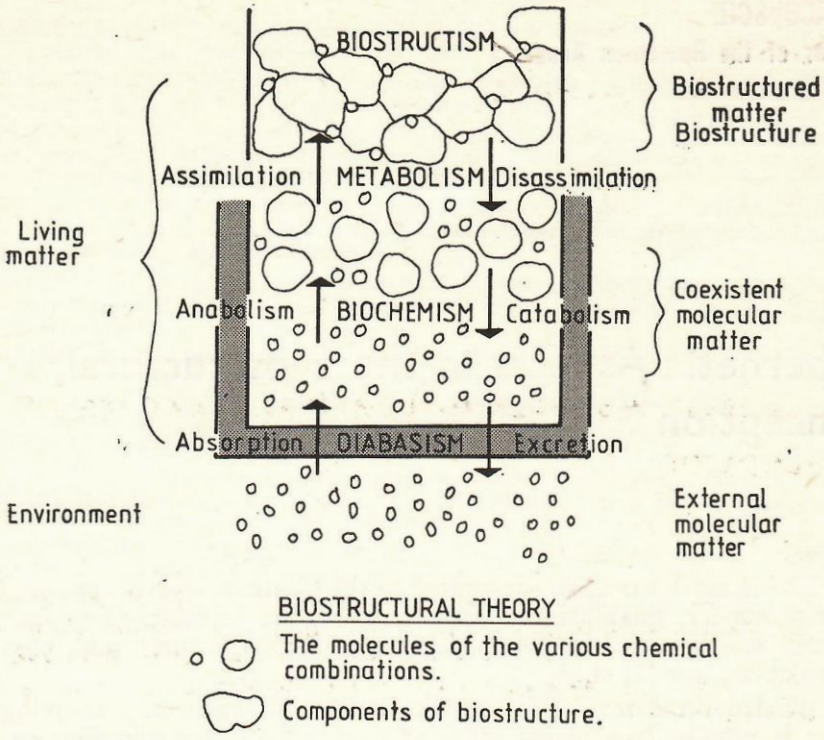

Fig. 1

The biostructured matter, in its turn, intervenes, due to its nature, properties and the behaviour, in adjusting the chemical processes from the coexistent molecular matter, and contributes to maintaining the chemical composition specific to this matter.

The aggregate of the incessant phenomena developing both in molecular matter (chemism) and in biostructured matter (biostructism, superior to chemism), and in the totality of the interactions and reciprocal perpetual transformations between biostructured matter and coexistent molecular matter, make up the functional dynamism of living matter.This dynamism is inconceivable without the participation of the control and selfcontrol, cybernetics is dealing with. As a matter of fact, cybernetics shows how such mechanisms imply the storage of the adequate information; the existence of the "operations" of information processing; the intervention of the "logical" monitoring, control and successioning of the partial aspects of the respective mechanisms; the assembling of these partial aspects in systems of control and countercontrol, with the concomitant integration of the mentioned systems in the incessant functional dynamism of living matter etc. This is why, the solving of these problems, at the level of living matter, needs contracts between biostructural conception and cybernetics. Two such contacts were established so far: one in the year 1964, the other in the year 1981.

The problems concerning the information included in biostructured matter, the cybernetic role of the components of this matter and the dimensionality of biostructure, were passed in 1964, [4] — [6].

The conclusion was drawn, as concerns the information, that biostructured matter contains, stores a huge quantity of information. Part of it is coded in components resulting from the assimilation of nucleic acids and proteins, because assimilation does not modify the primary chemical structure of these substances and consequently, does not modify the information comprised in them. Nevertheless, the information included in them gets new and various possibilities of manifestation, through the transformation of molecules in components. Another part of the information can be coded and stored, both through the interactions between components and through the reciprocal spatial distribution of the components.

As concerns the cybernetic role of the biostructured matter components, this can be deduced starting from the relations between structure and function. It is difficult to admit that the various cybernetic functions could be ensured, in living matter, by components resulting from a single chemical combination. It is more probable that various cybernetic functions are carried out by components resulting from different chemical combinations. The molecules of these combinations, becoming components of the biostructure, start to take part in fulfilling cybernetic functions they have not, when usual molecules are present in the coexisting molecular matter.

As concerns the dimensionality, we have to mention that the biostructured matter differs fundamentally from any chemical and physical, molecular or supramolecular structure. The difference is due, not only to the continuity of structure in the spatial tridimensional distribution of the components, but also to the specific dynamism comprising the time dimension reflected in the rhytmicity of cybernetic processes. Thus, biostructured matter presents itself as a quadridimensional biological system which: conditions the biorhytmical activity of the organism; is an informational system which stores and processes a huge quantity of information (incomparably larger than the hereditary one, included in the molecules of desoxyribonucleic acid) is a cybernetic assamblage which controls and selfcontrols the functions of the organism and is the bearer of the genetic program, being at the same time, a system quantified from the point of view of its activity [7].

The problem of cybernetic interpretation of the main concepts, principles and formulations of biostructural conception was posed in 1981. The problem was approached and solved by Eugeniu Niculescu-Mizil [8] who, in the vision of biostructural conception, drew up both the cybernetic equation of living matter:

$$MB + MM_c = MV \rightarrow MV - MB = MN \rightarrow MN = MM$$

where:

MB — represents biostructured matter;

MM_c — coexistent molecular matter;

MV — living matter;

MN — non-living matter;

MM — molecular matter;

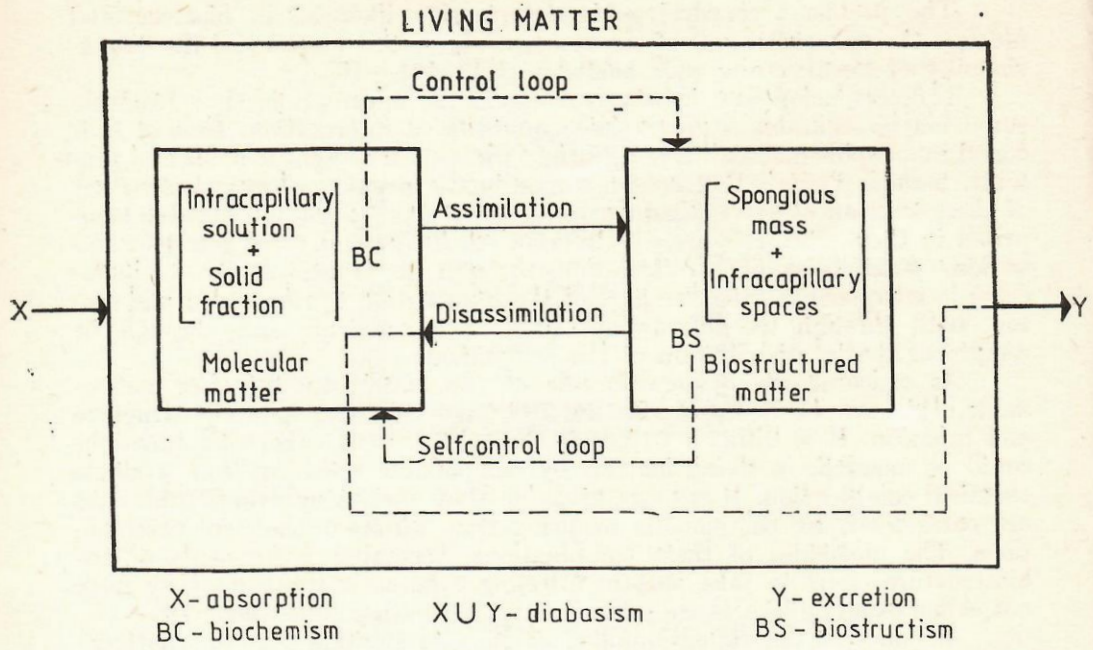

Fig. 2

and the cybernetic formalization of the constitutive elements of this matter and of the processes occurring in it. Thus, it came to the "cybernetic biostructural scheme of living matter", which contains: living matter; component subsystems (coexistent molecular matter and biostructural matter); component parts of the subsystems (intracellular solution and solid fraction, or spongious mass and infracapillary spaces, respectively; inputs and outputs in and from the system, through which diabasism i.e. exchanges with the environment is achieved; processes in the subsystems (biochemism and biostructism) and those between subsystems (assimilation and disassimiltation, making up metabolism or metabolic exchange of substances); connections of the subsystems (represented from the metabolic exchange); control and selfcontrol, loops, ensuring the functionality and the normal undisturbed exchanges of the system and of its subsystems.

The identification of the coincidence of the thought included in the biostructural conception with the concepts of cybernetics is "a step forward in the scientific substantiation of the mentioned conception". Thus, a new criterion of appreciation of the validity of the new theories, the "systemic criterion" appeared. This was added to the five criteria, previously used to apreciate the validity of the biostructural conception, i.e.: the criteria of prevision, revaluation, proliferation, extension and reciprocity [9].

The two contacts between the biostructural conception and cybernetics established in 1964 and 1981 and presented essentially in this paper, make out

only a beginning. They arise numerous problems which will form the object of future researches. As examples can serve: the problem of deciphering the role of the biostructural components in cybernetic mechanisms and the problem of extending cybernetic formalization on higher forms of development of living matter: noesics, enisics and others.

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