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Cybernetics, Nature, Society

In the present article, nature is considered as a universal cybernetic system. By studying the complex connexions between the ecosystem and the sociosystem within the broader natural-human system, the article outlines the behaviour man and society must have within the inter-relations with nature for ensuring a harmonious development of nature and society. A following study would deal with cybernetics, society, economy.

As part of the policy according to which, as it is pointed out in the Programme of the Romanian Communist Party "the Party constantly starts from the consideration that science is a basic element of contemporary progress, that the multilaterally developed socialist society and communism can be built only on the basis of the most advanced gains of science and technology" [1], studies in the field of theoretical and applied cybernetics have been developed in Romania in the past few decades.

The merit of our Party, of its leadership of stimulating with an unprecedented intensity the development of science and culture, including cybernetics in Romania has once more been recognized internationally, when in December 1978, the President of the Socialist Republic of Romania had been awarded the "Norbert Wiener" golden medal of the World Organization for General Systems and Cybernetics, following the decision of the Fourth International Congress of Cybernetics and Systems, held in Amsterdam in the autumn of 1978. On that occasion, President Nicolae Ceaușescu said: "I only wish to point out that we, here in Romania, are doing our utmost for the society we are achieving through our entire people's work-and, in which science is playing an essential part — to ensure to people still better, equal working and living conditions (...) Along with many brilliant gains of mankind, cybernetics is playing an important part. It is affirmed in the concern for the establishment of a better and more righteous world in which each nation can develop freely, in which people can turn to account their knowledge and in which, both the peoples' and individual personality should assert itself" [2].

One of the basic categories cybernetics operates with is the *system*, defined as a set of interdependent elements forming an organized whole. Particular sciences outline the existence of systems in all fields, in *nature* (for example, the solar system, galaxies, the living body, etc.), in *society* (the human society, the socio-economic formation, world economy, national economies, etc.), in *knowledge:* scientific systems, mathematical, physical, chemical, philosophical, technical, technological systems, etc.

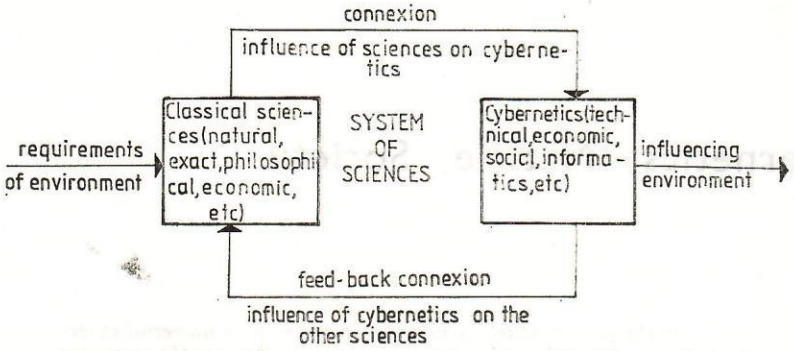

Fig. 1. Direct and feed-back connexions between cybernetics and the other sciences

Cybernetics studies one of the most important categories of systems, the selfadjustment ones.

The essential scientific gain obtained by cybernetics resides in the fact that it has discovered and proved the analogy between the functioning mechanisms in different systems (living organisms, technical, automatic social, etc.) as well as in the fact that the systems are formed of subsystems which are in an interconditioning relation, determined by the data inputs, flows, processings and outputs which, in their turn, determine a complicated and intimate network of direct and feed-back reaction causing the homeostasis processes, selfadjustment respectively, by which the functioning and finality of these systems are ensured.

Indeed, contemporary science considers the whole universe, the whole nature as a hierarchization of systems which are interpenetrating, interconditioning and outrunning each other: atoms, mollecules, macromollecules, cells, tissues, organs, organisms, beings, populations. The cybernetics systems theory has many applications in particular sciences, at present: mathematics, physics, chemistry, biology, linguistics, psychology, sociology, economics, polytology, ecology, a.s.o. [3].

CYBERNETICS AND NATURE

Ever since its birth in 1948, many definitions were given to cybernetics. Among them, we mention that given by Abraham Moles, who more than a decade before had defined it as "the general science of organisms, independent of the physical nature of each of them".

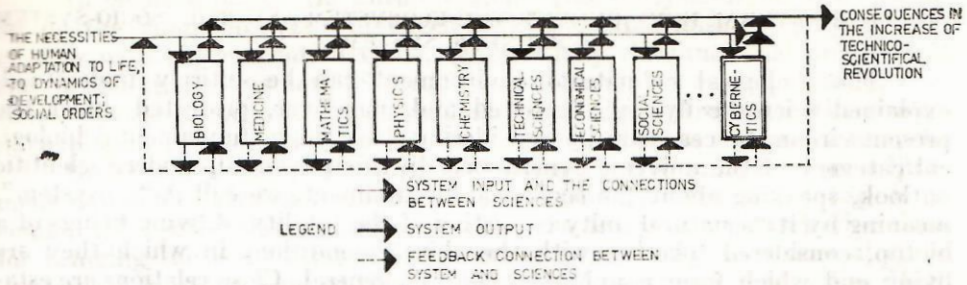

Fig. 2. Connexional diagram in the system of sciences.

According to the definition given to the system, as "a set of elements in an interdependence relation, forming an organized whole", the systems had been investigated scientifically, already in the ancient times (for example, astronomy with its investigations on "the universe system").

The selfadjustment systems theory also proves- and, this is yet another very important step made in knowledge-that within a system, its component subsystems found in an interdependence and interaction relation may be essentially different one from another*. This is what we intend to uphold in this study, considering that the infinite "universe cybernetic system" is formed of an infinite number of essentially different subsystems; of totally different natures, however found in necessarily close relations, of interaction. Thus, we can take as an example, the indissoluble relations of interdependence between "the nature subsystem" and "the social-human subsystems" within the huge system of the universe and the influence of this interdepen dence on life.

The very particular investigations on concrete systems date as far back as the 17th-18th centuries, such as for example, the investigation of mechanical systems. They were, however, substantiated by the metaphysical method. By the middle of the 19th century, the progress of particular sciences (determined by the results of Darwin's investigations connected with living nature as a system, with specific internal laws, etc.) allowed for the elaboration by Karl Marx and Friederich Engeles, within the materialistic dialectics, of the fundamental principles of the systems research, principles which they had applied in the study of the capitalist socio-economic formation as a complex and dynamic system. Nowadays, the Marxist science investigates the socialist socio-economic formations as some extremely complex dynamic systems, determining their appearance, construction and development. The interconnexion which appears between biology as a study of life, of nature and sociology as a study of society also appears between the natural system and the social systems as the very consequence of the practice of nature and society, of interdependence between nature itself and society.

* As a matter of fact, the "mixed" nature of the bigger cybernetic systems, to the effect that, they may be formed of cybernetic subsystems of different essence: biological, technical, technological, socio-economic, etc., is also evinced by the fact that the appearance of the multi-and-interdisciplinary science-cybernetics-took place upon the interference of the bio-medical, mathematical, physico-technical and social sciences, out of a happy blending of the creativeness of scientists in the respective fields. It illustrates the very interference in reality, in nature, within bigger systems or subsystems or different essence, essences explained by the aforementioned sciences.

The ecological or natural environment can be entirely understood, explained scientifically, substantiated and, moreover, protected under the present circumstances, only by considering it as a big, fundamental biological category of the universe cybernetics. In this advanced, modern scientific outlook, speaking about the ecological environment, we call it "ecosystem", meaning by it "a natural unity consisting of the totality of living beings of a biotop, considered together with the abiotic conditions in which they are living and which form a unitary whole, in general. Close relations are established in the ecosystem between organism, on the one hand and between them and the abiotic factors, on the other. On the basis of these interrelations, the circuit of the matter is developed in the ecosystems".

A definition of the thus formulated natural environment gives us a systemic and cybernetic outlook on it. Nowadays, cybernetics is playing a huge part in the conservation, protection and harmonious development of nature, of the ecosystems and of the elements forming it. This positive role resides in the very scientific explanation of the direct and feedback connexions in the ecosystems, therefore in the natural environment itself; or between them and other systems, of the perturbations undergone by the ecosystems from environment and of the possibilities of introducing control sizes capable of fighting the destructive effects of these perturbations.

We imply, in *the first place*, the fact that manifesting in the nature system is a number of direct and feedback connexions between it and the bigger system within which it is delimited, a system from where it "imports" a number of perturbations many of which being detrimental.

Thus, if we consider X_n as inputs from the bigger "Universe" system, we can note that within these inputs, the "nature system" (the ecosystems) also receives perturbative sizes represented by: magnetic waves, cosmic radiations, destructive phenomena of universal origin (by X_n) or planetary origin (of S_1)—(earthquakes, cyclones, typhoons, hurricanes, floods, natural erosions, etc.).

In *the second place*, direct and feedback connexions and, therefore, perturbations are also manifested between the subsystems (the ecosystems) forming the considered natural system (S_2). These perturbations are often detrimental to the system as well.

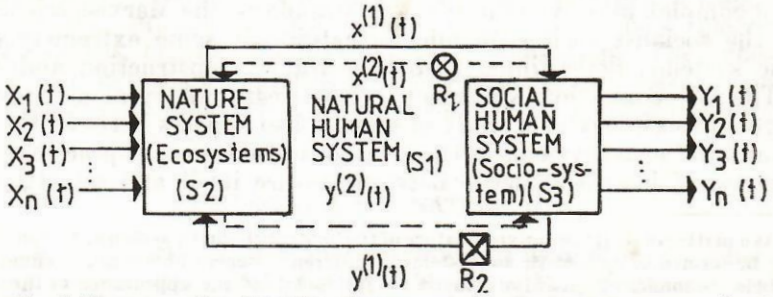

Fig. 3 The general cybernetic diagram of the "natural human system" with its two basic subsystems: "the nature system (ecosystems) and the "socio-system". The connexions of this system (X_n; Y_n) with the universe system ($t = f(t)$).

In *the third place*, "the nature system" (the ecosystems) — S_2 are affected on the connexion ($x^{[2]}$) and feed-back connexion lines ($y^{[1]}$) by a series of sizes with a perturbative value, generated by the functional processes of the "social-human system" (S_3), such as for example: water pollution, irrational deforestations with consequences in causing soil erosion, the irrational exploitation of ores and deposits, the destruction of the flora and fauna, etc.

In *the fourth place*, "the function" of the control subsystem (of adjustment and selfadjustment) of "the natural system", respectively (S_2) is to combat (by control sizes of adequate value) the destructive perturbation sizes, for bringing the ecosystems (the "nature system" — S_2) to a normal state, convenient from the point of view of its survival needs and possibilities Here, we can consider the bionatural possibilities of fighting against pollution and of remaking the quality of water and air, the capacity of nature of remaking its flora and fauna up to convenient values of survival, etc.

In *the fifth place*, in case that the control possibilities of "the natural system" in view of its adjustment and selfadjustment are outrun by the value of the pertubative sizes (no matter the cause which produced them), it appears as a sacred duty to nature ("the nature systems" S_1 and S_2), to the social-human systems (S_3) nature has created, to protect nature, the ecosystems, by supplying themselves (on the $x^{[2]}$ and $y^{[1]}$ lines), the control sizes up to the necessary values for eliminating the effects of these destructive perturbations, sizes within which one can go as far as to give up the social-human actions detrimental to nature, to the ecosystems (which introduce perturbations also on the $x^{[2]}$ and $y^{[1]}$ lines). We can take into considerations sizes, such as: the purging of industrial waters before their overflow and other water protection measures, air protection measures in the industrialized and strongly urbanized areas, the rational exploitation of ores, the flora and fauna protection, etc. In this way, the diagram of the interrelation between "the nature system" (S_2) and the "social-human system" (S_3), within the bigger "natural-human system" (S_1) can be drawn as in figure 4, appearing on the connexional lines of which are the adjustment subsystems created by man (R_1 and R_2) for the protection of nature (of S_2 and S_1), the protection of S_2 having consequences in a non-perturbative functionality of S_1 and S_3 and, consequently, in ensuring a constant growth of the human condition (in keeping with the development of the sociosystems and of the natural-human system).

The problem of the relation between natural environment and man, or that of the relation between the conservation of this environment and man's attitude towards it, must be seen not only from the point of view of the dialectical aspect, an aspect directly implied by the enunciation itself of the two pairs of quoted relations. The problem has also powerful cybernetic systems linked with the direct and feedback connexions, with multiple and extremely diversified-positive and especially negative effects for natural environment-which are created within the respective interrelation.

These aspects are materialized in the fact that an inadequate attitude of the "social-human system" (S_3) towards the "natural-human system" (S_1) or towards "the nature system" (S_2), on a connection line ($x^{[2]}$), determines not only a degradation of the "nature system" (the ecosystems) but, on the feed-back connexion line ($y^{[2]}$), as a reaction of the degradation of the

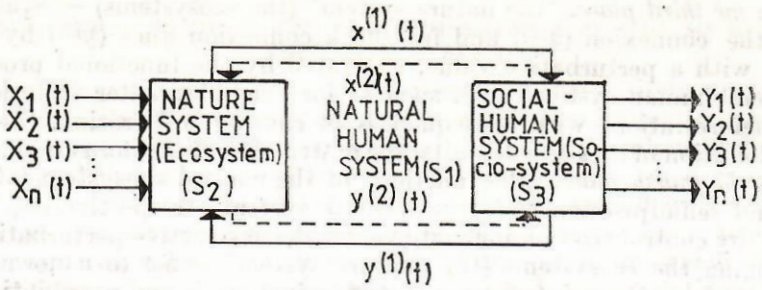

Fig. 4. The cybernetic diagram of the "natural-human system" comprising the adjustment systems by which its protection is ensured. (R_1 — "the social-human system" (S_3) is refraining from destructive actions on the "nature system (S_2) and takes measures for its protection; R_2 — "the natural-human system" adjusts "the returns" to the "nature system" "by taking measures of depollution, aforestations, protection of the flora and fauna, etc., the protection of the "ecosystems" constituting the objective need of the reliability of the "social-human system".

system, they come to a decrease and not to an increase in the quality of life, to a regress and not to a progress of the human condition, to the degradation of the "social-human" system itself.

That is why, the problem of natural environment protection (through R_1 and R_2 in Fig. 4) reflects in itself not only the respect man should have for nature but also an interest and requirement imposed by the needs of life, a social-economic need, a sure means which should lead to a socio-economic growth and not to its stagnation or decrease. For example, the desideratum of preserving natural resources materialized in energy saving expresses the interest of man- rendered conscious after a long and severe process of "learning", lying at the basis of which were the very effects of his inadequate behaviour towards nature- of steming, by improving his behaviour, its reverse relations, having a destructive character on the "social-human system" and, in the view point of development, a progress and not a regress should be obtained, now and in the future.

Likewise, it is a common knowledge that a rational, harmonious and, not a chaotic, destructive socio-economic development ensures an adequate protection of nature and, together with it, a harmonious growth of the human condition.

To make the leading bodies and the people's masses conscious of these truths, once more evinced by the applications of cybernetics to the systems of nature and society, is sure guarantee of the constant growth of the quality of life [4].

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CIBERNETIQUE; NATURE, SOCIETE

L'auteur considère la nature comme étant un système cybernétique universel. Etudiant les liaisons complexes entre ecosystème et sociosystème dans le cadre d'un système plus grand, naturel-humain, on met en évidence les comportements que l'homme et la société doivent avoir dans leur interrelations avec la nature pour pouvoir assurer un développement harmonieux de la nature et de la société. La suite de cette étuda traiteva des sujets de la cybernétique, de la société et de l'économie.

КИБЕРНЕТИКА, ПРИРОДА, ОБЩЕСТВО

В настоящей статье природа считается универсальной кибернетической системой. Рассматривая комплексные связи между системой окружающей среды и соцдосистемой в рамках более крупной системы, натурально-человеческой системы, авторы подходят к поведению человека и общества в своих связях с природой с целью обеспечения гармонического развития природы и общества.