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# IN DEFENSE OF DIALECTICS, MULTICULTURAL MATRIX AND EXOSOMATISM: THE CONCEPT OF ROEGENIAN BIOECONOMICS

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## **Abstract**

*Dialectics, multicultural matrix and exosomatism are three major ideas marginalized by the contemporary mainstream economic thinking. Nicholas Georgescu-Roegen, through the concept of bioeconomics, argumentatively defended epistemic pillars of economic science and elaborated a revolutionary paradigm based on the evolutionary principle. This paper aims to integrate, in the UE approach of bioeconomics, the Romanian economist's original vision, epistemology and methodology of economics.*

## INTRODUCTION

In order to have a theoretical significance and practical utility, every concept must necessarily perform a typological cut in the multitude of its possible denotations. Furthermore, it must have a sectorial determination or describe to a certain degree its possible meanings. Therefore it has to be classified in a *proximate genus* denotatively and delimited by a *specific difference*.

The concept of *Roegenian bio-economy*, covering all the contributions to the economics of Nicholas Georgescu-Roegen in phase III of his economic research, is subject to these constitutive principles, as follows: the proximate genus to which it belongs is *the process of production* and the specific difference consists in its mainly dialectical analysis within the entropic paradigm – if the thesis of the differentiation between exosomatic and endosomatic instruments is accepted.

### **DIALECTICAL REASONING: AN INSTRUMENT SPECIFIC TO THE ANALYTICAL ROEGENIAN BIO- ECONOMICS**

Complementary to the arithmomorphic reasoning, but less rigorous, dialectical reasoning is considered by N. Georgescu-Roegen more suitable epistemologically for the specific of bio-analysis. The substantial argument brought by the Romanian economist is that *qualitative change* is inevitably present in the phenomenology of the production processes. Qualitative change occurs in the economic process through what the Austrian economist Joseph Alois Schumpeter called *novelty through combination* and, unfortunately, the arithmomorphic reasoning does not help to reveal this phenomenon. When operating in an arithmomorphic manner, qualitative change and consequently novelty by combination (the phenomenon of

innovation) may be omitted in the analysis (Georgescu-Roegen, 1996). When searching within arithmomorphism, there is the risk, considers N. Georgescu-Roegen, to operate with "thoughts already thought." Only dialectical analysis, accepting change and novelty by combination, allows the "thinking of new thoughts." A good example offered by Georgescu-Roegen is *time* as a universal dimension, which, although represented as a series of discretely separate points, is actually continuous.

The variety of forms and qualities specific to the production process overcomes the arithmomorphic method or it simply just does not fit mathematical analysis. In order to express accurately human behaviors during production, distribution or consumption, somehow distinct notions are not sufficient, being also required to use adjectives, concepts referring to the phenomenon's "smoothness" component and not to its "geometry". Many economical processes have to be predominantly described in depth. One cannot use arithmomorphism when defining property or market, considers Georgescu-Roegen. It is required that their essence is revealed dialectically.

The circumstance of novelty (through combination) and the existence of the multicultural matrix make Georgescu-Roegen use mainly *the historical method* of research in bio-economic analysis. This is because – he says – in social sciences (and economics is no exception) the cause-effect relationship is umbilical linked to history. Unlike exact sciences, where one can ignore the "antecedents", in social sciences this is not possible. Here, the economy, for example, brings a "dowry" from history, with its qualitative and quantitative accumulations, and uses this hereditary "dowry" to build on. Not less important is the aspect seen by N. Georgescu-Roegen's Harvard colleague – J. A. Schumpeter – that, in social sciences, the researcher himself comes with a vision partly influenced by family, school and the

society whose intellectual air he has breathed. Therefore, in the world of actual facts, which are studied by social sciences, the novelty lies at the confluence of two factors: the "material heredity" of the reality studied and the "spiritual heredity" of those who study it. Thus, history cannot be cancelled. There is also the feedback effect when the input of a process is influenced by the outputs (or a part thereof) which G. Myrdal, for example, used in order to explain the underdevelopment based on the vicious circle of circular and cumulative causality principle.

At the risk of creating disillusion regarding the confidence in the ability of economic science to anticipate and support an economic policy, N. Georgescu-Roegen argues that "novelty by combination" simply happens without logical explanation, with hazard playing a key-role. Therefore, N. Georgescu-Roegen thinks it is important that economy finds answers to the question "to what purpose?" to the detriment of "why?" In addition, and because economy doesn't exist beyond the vividness people give to it, he believes that the most appropriate action to find the aim of people's actions is not causality, but *empathy*. Only through empathy a human mind which is intuitive and open to "a complete intellectual fantasy" can find out what other people feel and what their purposes are.

The Romanian economist concludes that the extraordinary effectiveness of logics is limited by its own foundation, which narrows knowledge and communication to what is quantifiable and measurable. The logical algorithm and the syllogism of the theoretical science do not acknowledge the internal contradiction and reality shows that theoretical logic performs "arithmomorphic artificial cuts in a single and continuous Universe." "The number – Nicholas Georgescu-Roegen thinks – is nothing but that feature completely inactive, inert and indifferent where any

motion and process of relationship disappears" (Georgescu-Roegen, 1996). In the phenomena related to life and society, just like in the general, natural phenomena of the Universe, we are dealing with a "dialectic continuum" in which the items which the theoretical logic "individualizes" are interrelated and – to a large extent – are overlapping and interdependent.

### **THE ENDOSOMATIC AND EXOSOMATIC INSTRUMENTS: FOUNDING NOTIONS IN THE CONCEPT OF ROEGENIAN BIOECONOMICS**

The notions "endosomatic instruments" and "exosomatic instruments" were suggested to science by the American biophysicist Alfred J. Lotka and were later taken over by N. Georgescu-Roegen as a prerequisite for developing the concept of bio-economy.

The Romanian economist believes that Lotka has identified the fundamental difference between the entropic "fight" of the human race and that of the other living species: while the rest of the living species only use their organs (endosomatic instruments) to sort low entropy, human race alone uses in its activities "organs" that are not part of their biological constitution (exosomatic instruments). For a better understanding of the two terms, the American biophysicist has offered two practical examples: "When a sick person goes to see a doctor, who, let's say, examines him with a microscope, for example, the patient practically uses a pair of more powerful eyes" and "when you insert a coin in a payphone, you hire the ear in an effort to listen to the voice of your friend who is five or ten miles away" (Lotka, 1956, p. 369).

In practice, the common characteristic of the endosomatic and exosomatic instruments – essential in terms of bio-economy – is that they are indispensable for life (for subsistence), but

at the same time they are dissipative structures kept in a state of quasi-equilibrium by the capacity of "entropic production" of the natural environment. A living organism subsists at a biophysical level analog to a stable system which maintains its highly ordered structure by absorbing low entropy from the environment to compensate for the entropic degradation it goes through continuously. As surprising as it may seem for the common sense, Georgescu-Roegen postulates that life's ultimate support is not matter and energy, but low entropy.

According to N. Georgescu-Roegen, there are three important nuances between the two types of instruments:

- i. exosomatic instruments ("organs") evolve much faster than the endosomatic ones (Daly, 1991);
- ii. most exosomatic instruments ("organs") are dependent on the stocks of minerals and fossil fuels, which, on the long run, are rarer sources of low entropy than solar energy;
- iii. while the ownership of the endosomatic instruments ("organs") is egalitarian in terms of doctrine, the exosomatic instruments ("organs") are owned unequally – to the effect of exacerbating social conflict as the terrestrial sources of low entropy run low.

In human societies, the two types of instruments create, in turn, two separate forms of "metabolism": endosomatic and exosomatic. If the former refers to the energy converted from food in the human body in order to preserve and sustain its physiological activity, the latter refers to the energy converted outside the human body in order to increase its useful work output associated with human activity. An example for the exosomatic metabolism is the farmer using the tractor which, in one hour, can provide a work capacity thousands times greater than the endosomatic power provided during the same interval by manual labor.

Both terms, exosomatic and endosomatic metabolism, refer to the

energy and matter inputs processed, with the help of exosomatic and endosomatic instruments, during the production process. The flux of endosomatic metabolism is relatively constant in time and it depends on the size of the population, while the exosomatic one is highly variable and it depends on the size of the technical capital of the society. In pre-industrial societies, the exosomatic energetic metabolism was generated mainly by fire, animal power, wind power, waterfalls, rivers and geothermal resources. That is why the techniques to improve the efficiency of these resources were crucial in obtaining competitive advantages by the industrial civilizations. However, two crucial events have brought major changes in the exosomatic metabolism of human societies: the discovery of fire and the Industrial Revolution.

Humanity's consumption of exosomatic energy went through minor changes in time so that the variations in the metabolism of the exosomatic energy can be quantified by the ratio of the endosomatic and exosomatic consumption of human societies as an indicator of the processes of industrialization and capitalization of global economy. For example, in a developed economy, the consumption of endosomatic energy / capita is within the range of 10-12 mega joules / day (about 2400-3000 kcal / day), while the consumption of exosomatic energy / capita is estimated at around 500-900 mega joules / day (200-320 gigajoules / year). Therefore, the ratio of exo / endo generated by modern society is in the range 50/1-75-1, while that of the pre-industrial nations is about 5/1 (the latter including the energy used for cooking, heating and lighting, as well as the animal power and the local sources of mechanical power such as wind and water falls) (Giampietro, Mayumi, Ravetz, & Smil, 2009, p. 28).

N. Georgescu-Roegen's conviction is that the endosomatic evolution, at a

phenomenological level, is a progress of the entropic efficiency of all biological organisms and that life develops within an environment with "moderate" entropy. In an environment with "very low" entropy, writes Roegen, a living organism could not resist the "massacre" of the "free" energy, while in an environment with "very high" entropy there would not be enough "free energy" in order for the sorting of energy to be achieved in a short time (Georgescu-Roegen, 1996).

As for the exosomatic evolution, the Romanian researcher says that exosomatic instruments enable man to gain the same amount of low entropy while consuming less of their own "free" energy than if they were to use only their endosomatic instruments. Therefore, exosomatic evolution represents the progress of "entropic efficiency" and (industrial) productivity indicates the development level of the exosomatic instruments. But, says resignedly N. Georgescu-Roegen, the man has become dependent to its exosomatic instruments, like a "flying fish which became addicted to the atmosphere" (Iancu, 2006). Because of this dependence, he thinks, while suggesting the term of bio-economy, the survival of humanity presents a completely different challenge from any other species because it is neither exclusively biological, nor exclusively economical. It is bio-economical. Grosso modo, the duration of the entropic survival depends on the six asymmetries between the two sources of low economic entropy: terrestrial energy and solar energy:

- terrestrial energy is a stock, while solar energy is a flux (Iancu, 2006), the first being usable both now and in the future, while current solar flux cannot be used in the future;

- unlike the terrestrial energy, a generation cannot influence the portion of the flux of solar radiation afferent to the next terrestrial generation because of the psychological priority of the present over the future;

- the flux of solar radiation cannot be determined in an anthropogenic manner. It is determined by cosmic conditions or the size of the planet it is reaching to;

- from the point of view of industrial use, solar energy has a disadvantage compared to terrestrial energy. If the latter is available in concentrated forms, in some cases too concentrated, solar energy reaches the Earth at a very low intensity, almost like a microscopic cloud;

- solar energy has a unique and immeasurable advantage: it does not cause pollution, while using any type of terrestrial energy inherently produces a certain amount of pollution that accumulates;

- the survival of all species on Earth depends directly or indirectly on solar radiation. Only man, because of his exosomatic addiction, depends on other mineral resources. To use these resources, man competes with no other species, but their use endangers most life forms, including his own.

These asymmetries were presented by N. Georgescu-Roegen in his work *Energy and Economic Myths* (Georgescu-Roegen, *Energy and Economic Myths*, 1975), a scientific article critical to those who claim that there is no limit to the economic growth and who base themselves on the price mechanism or on a sophisticated technology allowing the replacement of the scarce resources of entropy. Even with the substitution between different types of resources and the discovery of new resources, the Romanian economist rejected the possibility of a continuous exponential growth in the absence of the discovery of new sources of energy meant to be part of man's "Promethean destiny". "Prometheus I", he says, has enabled man in the Wood Age to discover that burning wood is a source of energy. "Prometheus II" came as the invention of the steam engine. The depletion of the reserves of coal and other natural reserves creates an expectation for the occurrence of "Prometheus III".

## CONCLUSIONS

Nicholas Georgescu-Roegen was certain that the qualitative change in the production process – novelty through combination – manifests analogous to biological evolution and this phenomenon can only be described, represented and analyzed based on Hegel's finding that there are dialectical concepts. Moreover, he thought that dialectical notions are indispensable to the advancement of knowledge in economics (be it just) because they cause new thoughts and not thoughts already thought. Complex realities such as the production process with all its components (organization, value, etc.) are better understood dialectically than in an arithmomorphic manner since they cannot be always and fully quantified. In this context, he focused on the German school historical method of economic research since it offers the possibility of descriptive approaches lacking the analytical rigor imposed by logic and mathematics.

The Romanian economist only supports the use of arithmomorphic concepts as an analytical instrument useful in avoiding errors of judgment or in ordering ideas or in theoretically isolating the production process in order to study its dynamics and internal logic. But always, the economist suggests, arithmomorphic judgments require verification through a dialectical reasoning. Having in common, on a fundamental level, the "sorting" of the entropy necessary for subsistence, the two types of instruments bring economics

closer to biology towards one ideal: the survival of the human species by trying to preserve as much as possible the current 'stock' of natural resources until the discovery of a new "Promethean" technology meant to provide opportunities for the development of a maximum number of "next generations".

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