

REVIEW

of the dissertation of *Kaloyan Ivanov Nechev* on “EMERGENT STRUCTURES AND FUNCTIONS IN MOLECULAR BIOLOGY AND NEUROBIOLOGY”, submitted for awarding educational and academic degree “doctor” in professional area 2.3. Philosophy (Philosophy of Science), made by corresponding member Anguel S. Stefanov

The dissertations subject to my review contains 166 pages and has the following structure: introduction, four chapters structured by paragraphs, conclusion and references.

Discussions about the definition, analysis and eventually the understanding of emergent properties have been on the agenda of philosophic researches during the last five decades. This makes the suggested dissertation topic both relevant and difficult for elaboration, against the background of vivid conceptual discussions about the understanding of emergence. Due to this fact, Kaloyan Nechev presents the objective of his research as a presentation of “new type of analysis of the emergence phenomenon, which would put together the concepts *natural types* and *emergent characteristics*” (page 4). The introduction of the dissertation contains succinct rationale of this objective.

I would like to make the following clarification. The argument for the choice of the topic and the elaboration of the dissertation work is based on the consideration that “the very presentation of this topic may be considered contributory, as far as the Bulgarian academic literature misses a systematic exposition” (page 3). This statement is not quite true, as in the Bulgarian specialized literature Rosen Stapov has studied the topic of emergent properties of consciousness, and Atanas Danailov has considered the different types of (anti) reductionism in biology.

In the first chapter, Kaloyan Nechev presents the main forms of emergentism as philosophic approaches to the explanation of newly formed

characteristics of systems constituted of their constituent elements. Such presentation is full and competent and also made with view of the author's choice of and preference to the research of the dissertation. To this end, on page 29 the author writes: "I consider the positions of the weak and epistemic emergentism as productive direction to the differentiation of an interdisciplinary approach for emergence analysis, which is actually the objective of the dissertation work."

My remarks to the first chapter are as follows.

According to the weak emergentism, an emergent property is foreseeable through simulation, while the epistemic emergentism expresses the inability to foresee a system in the process of its complication, i.e. the emergent properties cannot be foreseen. This is how a kind of conceptual pressure between these two forms of emergentism occurs, which is not fully explained.

The four theses at the end of the chapter are quite strong criticism to the strong emergentism and might be reduced to a lower number. For example, let's take the first thesis about the weakness of strong emergentism formulations: "These formulations are united and substantiated difficultly within the frames of the philosophic researches, as far as the postulation of no causal forces in ontological aspect causes more issues than it solves" (page 39). I will give a simple example why this thesis is quite strong, even taken from the field of inorganic matter. Free neutrons disintegrate into proton, electron, and electronic anti-neutrino after 12 minutes on average. In atomic nuclei, however, neutrons do not disintegrate at all. Therefore, there is a "causal force" originating from the emergent property stability of atomic nuclei, which affects the neutrons in there. Of course, the ontological terminology may be précised and evade the use of the expression "causal force" utilised. The fourth thesis about the formulations of strong emergentism says: "They may not suggest candidates for emergent phenomena, which meet the requirements of the strong emergentism, except for the consciousness (Chalmers, Sperry), however, there are not

satisfactory arguments that prove inability of principle to analyze the phenomenon within the frames of the interpretations, which assume weak forms of emergentism (Ibid). It is not only the human consciousness that escapes from the explanatory pretensions of epistemic emergentism but also the space-time itself, for which theoreticians of quantum gravity allege it is an emergent essence, unless we assume that space and time are illusions of the consciousness.

The content of the second chapter intends to present the author's review of the emergence phenomenon. It rests on the understanding that the strong emergentism presented in the first chapter suggests essentialisation of the emergent characteristics. K. Nechev states that he suggests his own method called "method of cluster reactionary analysis". He hopes to apply this method to successfully move his research between Scylla and Charybdis of strong emergentism and rather optimistic reductionism. To this end, he attracts the famous philosophic construct of natural types, which however brings its inherent methodological discussions with it.

Yet in the very beginning of the second chapter, the author declares his theoretical objective: "The objective of this text is not to give ultimate reasons and explanations, but is to the greatest detail expressed in the strive to theoretical disessentialisation of the concepts of natural type and emergent characteristic by means of naturalistic interpretation... With view of the above, the method is not aimed at postulating radical reductionism as the single possible alternative, but at the introduction of a common theoretical framework for analysis of the relevant concepts, resulting in decrease of theoretical pressure, which is expressed in facilitating the theoretical interpretation of procedures applied in research disciplines. This is how such considerations turn out to be pragmatic, and the objective: attaining explanatory economy leading to theoretical efficiency of the analyses and interpretations related to research procedures" (pages 41-42). It is absolutely natural to expect that for the

attainment of this objective the author faces the need to introduce his own system of theoretical concepts, what he later presents to us. This system is well segmented theoretically in order to bring a solution to the problem that K. Nechev has preset, and namely, the conceptual unification between natural types and emergent characteristics.

Before I present some specific critical remarks to this chapter, I would like to explain that the dissertation author starts along his own ideological road led by the prerequisite that the metaphysical research is closely bound with the ontological expression of essences postulated within the frames of a specific cognitive and socioeconomic context. Having in mind this initial prerequisite, *the objective of his research seems totally justified and the pragmatism achieved through its realization is very welcome*. However, it seems that the author forgets that metaphysics and ontology are not overlapping philosophic concepts and, for example, traditionally we speak for ontologies of individual fundamental scientific theories. For example, his statement that the concept “reactionary potential” is ontologically neutral is valid for the mixture of metaphysics and ontology but not for the theoretical ontology of the molecular biology.

Here are my specific remarks.

On page 53 we can read: “*Reactionary cluster* means the physical arrangement that is characterised with regular reactionary characteristics that are expressed and observed in fixed qualitative features and relationships/interactions.” This is a diffuse definition, as it does not define the concept “reactionary characteristics”. It refers to concepts about properties and interactions but does not make it clear what they are – internal for the cluster or its reactions to external impacts. To this end, the author could not evade the well-known concepts of structure and system, which are clearer than the meaning of the common term “arrangement”, and furthermore, they are often used as terms in the dissertation wording.

The reader gets into semantic omissions too. For example, we read, “A *dispositional figure* means an organised arrangement of n similar complexes of reactionary clusters, which is characterised with stability of their interactions” (page 55), and right after that the author adds, “the dispositional figure is the complex of relatively fixed types of reactions” (page 56). However, one and the same thing may not be an arrangement of complexes and types of reactions simultaneously.

The reactionary cluster method, sometimes also called a model, is based on gradual complications of structures and functions, but can hardly explain the existence of DNA, which has hardly appeared along the path of gradual complication of reactions, even if we assume it has been preceded by RNA. I say this with regard to the only example given in the chapter – the mentioning of the eukaryote cell.

The lack of examples leaves the definition-abundant author’s schematization at abstract level.

On page 48, the name of the cited author Zimmerman is Цимерман in Bulgarian, and not Зимерман.

In the third chapter, K. Nechev expands his research approach by applying a second method of his own, which is alleged to build-up the one presented in the second chapter. Therefore, it is completely understandable that the author has aimed carefully at its removal from the essentialist pedestal of emergent phenomenon, which is chosen, among others, in the argument context of strong emergentism, and namely to the intuition phenomenon. The first step for attaining this objective is the introduction of a common definition of the concept of behaviour, which comprises both the activity of the nervous system and the behaviour of the body it is contained in. This step has a unification role and is also aimed at presenting a common behavioural understanding of mental terms. This is possible due to the author’s belief that “*the neuron activity and the behaviour at body level are ontologically equivalent phenomena...* and for the

purposes of the work, it is enough to demonstrate a correlation between the two types of behaviour” (page 87). Thus, the economy in ontological aspect sought by the author by eliminating autonomous mental essences stands opposite to some duplicate “ontologically equivalent phenomena”, but in this particular case, such fact is in synergy with the author’s methodological attitude and is not in conflict therewith. In terms of the assumption for the evolutionary complication of body structures and functions, K. Nechev does not forget to note that confidence in decision-making – an inevitable aspect of intuition – is treated as a product of both the higher cognitive structures in humans and their preceding, in evolutionary aspect, reflector-automatic sensomotor structures as well. Thus, he highlights the thesis that “In functional and structural aspect, *intuition may be considered as an information processing module as well the topography location of which is crucial with view of bonding the structures of the conscious higher cognitive system with those that are responsible for unconscious reflector processes*” (page 97).

My remarks on this chapter are as follows.

On page 73 we read, “A *definition of behavior* is a reactive, discrete act (or a sum of discrete acts) realized by modifiable substrate that enables gradual generation of systematic changes at each functional level/ degree of the act generation”. This is quite abstract and not enough clear definition. What kind of link is the link between “generation of systematic changes” and “the generation of the act” exactly?

On the next page, the author explains: “Even though the highlighted argumentation vector seems reductionist, once again, the motives are *mainly methodologically pragmatic: economy of expressed terms and essences*”. Similar clarification of the perceived view of representations is made on page 107 too, which view “*takes advantage of the analysis and results of reductionist interpretations of brain correlates, without engaging their final conclusions and positions.*” However, the guarantee that no implicit reduction is made when

“economizing” the terms referring to emergent mental characteristics, together with the prerequisite for physical monism, is not clearly expressed.

It would be better to use the functional-physiological definition of the concept of intuition on page 89 as a conclusive summary of the text that comes next and not to leave it behind.

Strongly highlighted coherences of the author’s approach with the theoretical schemes of other authors are not a direct argument for its validity, as others’ theoretical schemes are confined in their own private-scientific conceptualization.

Page 121 reads, “at least from biological-evolutionary perspective, *our rationality, understood with view of natural linguistic use, is rather a by-product, and not optimally calibrated mean for generation of universal cognitive procedures spreading beyond spontaneous needs of the body.*” The thesis that human rationality is not an optimally calibrated mean for generation of universal cognitive procedures is hardly true. The author himself relies on rationality for the purposes of his own analysis, doesn’t he? The negative reply would belittle the philosophic theoretisation as whole, because it is not directly related to human survival in the world of nature. However, even if I would agree with the author’s formulation, I would like to note that the origination of human reason and mind has adverse effect on human lifestyle as a social being. The numerous references of the analysis to cortical structures and functions are not credible, as the higher the organism is, the same or similar brain activations become reasons for different reactions and cognitive expressions, the mentalist relevance of which the author rules out.

The heading of the fourth chapter – “Unifying the Analysis Work Methods” is left aside as a declaration because its theoretical focus “to enable the self-consistent integration of two research models in a common naturalistic framework” (page 127), offers its place to the widely presented critics of the use of the term “intuition” as taken from the practice of its everyday use. In terms of

the integration of explained methods, the disposition-behavioral and functional-physiological definitions of intuition already presented in the previous chapter are reiterated at the end of this chapter as well, even though in better systemized way. As far as the author's critic to the leisurely use of the word "intuition" is concerned, I do not have any remarks and welcome these critics. I welcome this especially in that part presented in subparagraphs 4.2.2 and 4.2.3 dealing with non-reflected and uncritical trust in obvious things and arguments of common sense.

I have the following remark. On page 138, the author says that intuition has physical substrate. On the other hand, in terms of rational intuition, on page 150, he states, "According to the empirical evidence and interpretations described in the previous sections, it is possible to consider the intuition itself as a *cognitive prejudice*." Therefore, it is possible for a phenomenon, having physical substrate, to be a pure prejudice. This formulation needs further clarification at least with view of the requirement to differentiate the subjective phenomena, which are or are not prejudices, irrespective of their underlying substrate basis.

The abstract of the dissertation adequately reflects its content.

I accept the contributions declared by the author of the dissertation on page 26 of the abstract.

I agree with the originality verification report for the dissertation work made by Prof. Sergey Gerdzhikov and presented in Annex No 1 to the defense documentation.

I do not have any co-author's publications with the author of the dissertation.

In conclusion, I will vote "FOR" the awarding of educational and academic degree "doctor" in professional area 2.3. Philosophy (Philosophy of Science) to Kaloyan Ivanov Nechev.

Sofia, 22.07.2022.