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**EMERGENT STRUCTURES AND FUNCTIONS IN
MOLECULAR BIOLOGY AND NEUROBIOLOGY**

Dissertation Abstract

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The dissertation consists of 167 standard pages. It contains an introduction, four chapters, a conclusion and a bibliography. The used literature includes 142 titles in Bulgarian and English.

Content of the dissertation

Content

Introduction.....	2
Chapter I. Historical framework and concepts of emergence	6
1.1. British emergentism.....	6
1.2. Modern receptions	18
Chapter II. Author's consideration of the phenomenon of emergence	40
2.1. Main thesis on natural kinds and emergent properties	40
2.2. Brief specifying of the demarcation trends between natural kinds and emergent properties.....	42
2.3. An attempt to introduce an author's method of analysis that combines the two concepts	50
2.4. Redefining natural kinds, emergent properties and emergence in accordance with the introduced method	62
2.5. Relating the model to existing programs for explanation of the phenomenon of emergence	64
2.6. Results of the adoption of the proposed method	66
Chapter III. Analysis of the phenomenon of intuition as an emergence in the mind-body relation	67
3.1. Parameters and goals of the second author's method of analysis.....	69
3.2. Dispositional-behavioral definition (DBD)	77
3.3. Functional-physiological definition (FPD).....	87
3.4. Results	117
Chapter IV. Consolidation of the proposed methods for analysis.....	127
4.1. Methodological problems related to the acceptance of intuition with the status of an epistemic component and guarantor in research programs	127
4.2. Conceptual-methodological argument for accepting the functional-physiological definition of intuition.....	137
4.3. Practical consequences of the application of intuition within a given methodology	142
4.4 Conclusion and proposal for a methodological component that reduces the negative influences in the application of intuition.....	145
4.5. Summary and results.....	147
Conclusion	156
Bibliography	158

Content of the abstract of the dissertation

Content

General characteristics of the dissertation	4
Main content of the dissertation	4
Introduction.....	4
Chapter I. Historical framework and concepts of emergence	6
Chapter II. Author's consideration of the phenomenon of emergence	9
Chapter III. Analysis of the phenomenon of intuition as an emergence in the mind-body relation .	12
Chapter IV. Consolidation of the proposed methods for analysis.....	17
Conclusion	20
Contributions of the dissertation.....	22
Publications on the topic of the dissertation.....	23
Bibliography of the dissertation abstract.....	24

General characteristics of the dissertation

The motivation for writing the dissertation was originally brought about by my previous research: the problem of the epistemic status of intuition, as well as the fact that emergence as a phenomenon has not been thoroughly studied in Bulgarian philosophical and scientific literature. The same, albeit to varying degrees, applies to some of the accompanying issues and discussions. It is the study of these problems that prompted me to try to develop an author's method for analyzing the phenomenon - *the method of cluster reaction analysis* (Нечев, 2020) - which will be adequately situated in the outlined theoretically heterogeneous field.

The main thesis of the dissertation is that the conceptual understanding of emergence is highly theoretically loaded, and the positions often enter into irreconcilable contradictions. This leads to unproductive conceptual fragmentation and theoretical isolation of the varied types of interpretations. This situation is usually expressed by the attempts to develop analyzes based solely on a separate theory and methodology specific to a particular research discipline.

The research is interdisciplinary and uses as methods the inclusion of facts from general and specialized-scientific achievements in the field of emergent structures, contextual descriptions, review and analysis of the debate on the topic so far, as well as the introduction of two author's methods.

The aim of the text is to propose an authorial method for the differentiation of a new type of analysis of the phenomenon of emergence, which would unite the concepts of natural kinds and emergent properties. Thus, an attempt is made to develop an authorial conceptual non-essentialist apparatus, enabling a new interdisciplinary reading, which could give rise to a fruitful debate between the representatives of the humanities and narrowly specialized scientific disciplines.

The structure of the dissertation includes an introduction, four chapters, a conclusion and a bibliography.

Main content of the dissertation

Introduction

Generally and roughly, emergence can be demonstrated in situations where "emergent entities (properties or substances) 'arise' out of more fundamental entities and yet are 'novel' or

‘irreducible’ with respect to them." (O’Connor, 2015) The problem of the phenomenon of emergence is essential both in the philosophy of science and in the field of scientific methodology. In recent decades, there has been a resurgence of specialized interest due to the significant issues addressed by the topic: scientific explanation, causality, adequate analysis of empirical data by implementing scientific methods. This attitude follows from the revision of the reductionist and anti-reductionist attitudes, which in turn is a consequence of theoretical and technological progress within many major scientific disciplines, as well as the differentiation of new specialized ones. In the light of such developments, there is a clear attempt to legitimize the different interpretations in relation to the gradually increasing precision and "resolution" of the observations¹.

The problem of emergence is fundamental, in particular, to the philosophical and scientific conceptual understanding of the phenomena manifested in living nature. The structures and functions it distinguishes cover many topics and issues from various philosophical disciplines, especially in philosophy of biology and philosophy of consciousness. These structures and functions are also the main subject of consideration in the present dissertation, in which emergence is perceived and analyzed mainly in relation to molecular biology and neurobiology.

Thus, the very consideration of the problem presupposes an interdisciplinary analysis². This fact is somewhat indicative, given the general trend observed in the development of modern philosophy of science. It is also reflected in the authorial models, which I will present in this dissertation

Due to the wide scope of the topic, it includes many philosophical issues that concern the representatives of philosophical practice that defend different methodological attitudes and approaches: epistemic, ontological and metaphysical. Here we can include the debates about (anti)realism, (anti)reductionism, causality, supervenience, identity and others. This provides an opportunity to present positions and argumentative conclusions that further enrich these debates on Bulgarian soil. Although the method, presented as a contribution method (cluster reaction

¹ See Chapter One.

² A situation that has been demonstrated in a number of recent collections on the subject: Bedau and Humphreys (Eds.) (2008), Clayton and Davies (Eds.) (2006), Corradini and O’Connor (Eds.) (2010), Licata and Sakaji (2008).

analysis method), remains neutral on some positions, which I accept and argue for as a contribution within the dissertation, the mentioned method should be applied and compared in the context of different theoretical interpretations.

In the dissertation I will demonstrate how the model can be relevantly applied to specific philosophical statements (for example, to the problem of the epistemic status of intuition) and their relation to scientific observations made in the practice of relevant scientific disciplines. With this I try to illustrate the possibility of such an approach to be considered useful for the conceptual clarification of vague concepts applied in the field of philosophical analysis. Here again, I use as a basis my preferred interdisciplinary interpretation, which can shed light on both the problems and the phenomena under consideration. This demonstration can be carried out by applying *a second author's method of analysis - the method of functional-behavioral analysis* (Нечев, 2020b), which will allow a comprehensive examination of a particular phenomenon - intuition. The method is aimed at conceptual clarifying of certain consequences and difficulties within the framework of strictly philosophical argumentation. In this way the specific tendency towards the categorical differentiation of the emergent phenomena will be illustrated, which is viewed as a consequence of the not always obvious tendency for their essentialization. I will consider how the two methods complement each other to give a satisfactory integrative explanation of the different conceptual levels that are present in the notion of intuition.

The dissertation's introduction sets the aim, thesis, methods and scope of the research. It also briefly discusses the basic structure of the text.

Chapter I. Historical framework and concepts of emergence

In the first chapter, I make a brief outline and analysis of the historical framework of the emergence debate, as well as the main positions that stand out in it. Against this background, the interpretative treatments that are separating strong and weak forms of emergentism stand out most clearly, which largely correspond to the distinction between epistemic and ontological emergentism. The theoretical consequences of the analyzes presented in the chapter are important for the present work, because they set the theoretical field in which I present the author's methods for combining such contradictory theses in a single and interdisciplinary integrated analysis of the phenomenon of emergence.

The problem of emergence began to be systematically themed in the middle of the 19th century. Brian McLaughlin called this period "British emergentism" (McLaughlin, 1992 (2008), p. 19), highlighting the most representative authors of the movement. The term itself was first used by J. H. Lewis, who distinguishes between *emergent*³ and *resultant effects*.

The resulting effects can be calculated by adding or subtracting the active causes. The weight of an object, for example, can be calculated (predicted) by a simple procedure of adding and summing the individual parts. In contrast, the emergent effects cannot be explained by these calculation procedures, because they are qualitatively new to the causes that give rise to them.

Discussions on the status of emergent phenomena concerning the reducing phenomena such as life, mind and chemical bonding, that is, whether they could be given a physicalistic explanation, can be highlighted as the intellectual background to the genesis of British emergentism. These questions, in turn, concern the status of the specialized sciences and whether they can be reduced to more fundamental ones (i.e. psychology to biology; biology to chemistry; chemistry to physics).

In these debates, two general and opposing positions are basically formed. On the one hand, there are *the reductionist mechanics*, who claim that the characteristics of the organism are completely resultant. From this follows the principled and practical possibility of giving a comprehensive explanation based on an analysis of the properties and interactions between the parts that differentiate an organism. On the other side are the *representatives of vitalism*, defending the position that living matter is fundamentally different from inorganic matter. They believe that it is not the constitutive physical and chemical parts that are responsible for its emergence, but some form of spirit or entelechy.

According to Elly Vintiadis, in accordance with the demarcated and irreconcilably opposed interpretations, the early emergentists seemed to be trying to find a middle ground for systematic analysis. Against the ultimate reductionist position of the mechanics, they defend the thesis that the whole is more than its constituent parts, and in disagreement with the vitalist concept, they adopt a position that rejects the need to postulate additional entities in the explanation. That is,

³ From *ē-mergo* (Latin), as some of the uses are: "appear", "shoot forth", "come to the surface" (Войнов, ИВАНОВ, 1999).

they accept that the non-reducibility of emergent phenomena can be analyzed without imposing phenomena beyond the naturalistic framework of explanation.

This opposition to vitalism is a consequence of specific type of monism in terms of objects and substances, adopted by British emergentists, who believe that the world is made up only of matter, but, contra reductionist mechanics, they consider the latter to be organized at different levels and the higher levels of organization show new properties compared to the lower levels of organization from which they originated. (Vintiadis, *Emergence*)

Following McLaughlin, the dissertation examines the main representatives of British emergentism, so that the development of this philosophical movement can be better understood. Among them are John Stuart Mill, who, although he did not use the term emergentism, given his work *System of Logic* (1843), can rightly be called the founder of the movement called British emergentism, and Charlie Dunbar Broad, who makes an attempt to build an intermediate position between the already mentioned division between vitalists and mechanics. The dissertation also focuses on Samuel Alexander, a British philosopher of Austrian descent, who was the first to explicitly consider emergent properties as qualities, and who created an unified system aimed at uniting and explaining emergent phenomena while preserving specific ontological monism. In the study I also briefly explore the work of the British ethologist and psychologist Conley Lloyd Morgan, who linked the concept of emergence with that of evolution, seeking to give a naturalistic reading of the mind as an emergent phenomenon in the context of natural selection and physicalist monism⁴. What is particularly important for the dissertation is Morgan's understanding of the causal power of higher-level organizations. He accepts that higher-level types of realtions have an impact on the levels of organizations over which they supervene. (Ibid, p. 278) Thus, in a direct and distinct way, the understanding of downward causality is in fact required (McLaughlin, 1992 (2008), p. 33). As stated in the first chapter, the concept of downward causation is a central point of interpretations that postulate strong emergence.

The theoretical work of the British emergentists proved to be crucial in raising the issue of emergent phenomena. The attempt to make a naturalistic analysis of emergent phenomena, which avoids the postulation of mysterious forces, but is not limited to the reductionist

⁴ He maintains that every substance is made up of elementary material particles.

framework of mechanistic materialism, remains the main line followed by the modern heirs of the debate. Due to the fundamental discoveries and reconceptualizations made in the field of physics until the 1930s, as well as their application in the field of chemistry and biology, emergentism lost its popularity. During this period, it seemed that the general questions about the origin and organization of living matter would find their reductionist answer similar to those concerning the observed transformations in the field of chemistry.

The very idea of configurational forces forming a downward causality faces significant theoretical obstacles. Thus, the ontological commitment that British emergentists make seems to fail to put the debate on a completely coherent and consistent ground from a modern point of view (although there is no lack of supporters of classical forms of strong emergentism today).

However, the general desire to conduct a naturalistic detailed analysis is again shown to be adequate and relevant in the light of the ongoing strengthening and refinement of observations and theories that were thought to mark the end of the debate of the emergence. With this in mind, the heritage and continuity of the abovementioned classical interpretations have their significance and influence. Therefore, in the following subsections of this chapter I make a brief overview of the current positions and problems relevant to the present work.

Chapter II Author's consideration of the phenomenon of emergence

The specialized understanding of natural kinds has a theoretical impact on the concepts of emergent properties in particular, as well as on the overall understanding of the phenomenon of emergence. I find this tendency strongly expressed in the interpretations that postulate *strong* emergence. As noted in the historical review and analysis in Chapter One, the trend is often linked to the understanding of *ontological emergence*. This corresponds to the essentialization of the emergent properties, in which the constituents on which they supervene are distinguished. These constituents can be considered as aggregative sums of basic components, which could often be identified with natural kinds.

The problem is closely related to the tendency to their essentialization and theoretical distinction. Theoretical tension inevitably manifests itself in attempts to unite the two concepts, which are generally considered essentialist. Thus, a critique is offered not of all ontological positions, but of those postulating the essentialization of ontologically differentiated levels of explanation. For

example, scientific realism is an ontological position concerning the existence of objects independent of the observer. They can be captured and considered in the light of specific scientific methodologies and practices, but this does not necessarily mean that the objects thus distinguished are essentialized and are not subject to any other type of study than that of experimental naturalistic kind.

De-essentialization is a rejection of metaphysical consideration. *The method of cluster reaction analysis*⁵ is not reductionist, but aims at conceptual precision and economy in the analysis of emergence. It remains neutral on the ontological status of emergencies (although it thematizes them in its current application to the specifics of a given scientific methodology). It also takes a methodological line that does not coincide with the assumptions of the representatives of strong emergentism, because it entails essentialization. Thus, *the aim of the proposed interpretation is not to reject ontological emergentism in favor of reductionism, but rather a methodological one that seeks conceptual clarity and greater comprehensiveness of the analysis.*

The concepts of natural kinds and emergent properties are theoretically established and widely used both in the field of scientific research and in the specialized literature of the humanities, including in the field of philosophy. Attempts to unify them will face methodological and theoretical problems, while the need for their essentialization is presupposed in the first place. Naturalistic methods aimed at their de-essentialization suffer from their own deficits, but the success of such an endeavor can solve many interpretive problems and will alleviate the theoretical part that accompanies research procedures. The possible differentiation of a naturalistic and non-essentialist reading could integrate the concepts of natural kinds and emergent properties into a single theoretical method, avoiding the problems of their traditional consideration. This method may prove essential as far as the general theoretical understanding of the phenomenon of emergence is concerned. This, in turn, could help for a higher degree of explanatory economy to be achieved, leading to increased theoretical efficiency in analyzes and interpretations relating to procedures applied in the field of scientific practice.

⁵ In general, the method considers natural kinds as *reaction clusters*, and emergent properties as *complexes of reaction clusters*, both of which will be directly related to the definitions of *reaction potential* and *stability*.

The argumentative part can be briefly summarized and expressed in my proposal to consider natural kinds and emergent properties as elements that can be combined into a common naturalistic framework of *fixed trends of reactions of a particular system, realized by its internal relations and interactions*. As mentioned in the introduction, this will be done by introducing one of the author's methods that I apply and argue for in the dissertation: *the method of cluster reaction analysis*. In the framework of the present research I focus on the complexes of reactions (functions) and relations of the organic systems, which are considered by the specialized scientific disciplines of molecular biology and neurobiology.

In the dissertation natural kinds are considered *as reaction clusters*, and the emergent properties - *as complexes of reaction clusters*. Both notions are directly related to the definitions of *reaction potential* and *stability* introduced in this chapter. The relations between them are defined and operationalized, explaining the interpretative result that considers the phenomenon of emergence as strengthening the reaction potential of a structure or complex system, which is proportional to its net stability. The main purpose of the method used in this text is to aid to the effectiveness of theoretical interpretations in the field of scientific methodology and procedures, as well as to provide opportunities for shared research work with relevant philosophical fields of analysis. This requires for the applied alternative to comply with current theoretical and methodological trends within the specialized scientific disciplines. Again, the method does not aim at postulating radical reductionism⁶ as the only possible alternative.

The method itself is expressed in *the implementation of the author's conceptual apparatus, against the background of which to develop a naturalistic, non-essentialist interpretation of the problem, which contributes and coheres with current attempts to analyze the phenomenon of emergence, specifically relevant to the scientific practice of specialized scientific disciplines*. In order to implement the above idea, in the chapter, I first define some basic notions and concepts, including *reaction cluster*, *reaction potential*, *stability*, *natural kinds*, *emergent properties*, as well as the *emergence* itself.

⁶ Like naturalism, reductionism has many varieties. For example, John Searle (1992) distinguishes five types of reduction: 1) ontological reduction; 2) ontological reduction of properties; 3) theoretical reduction; 4) logical or reduction of definitions; 5) causal reduction.

The successful application of the presented method would have the following advantages: **(1)** removing the question of the ontological, essentialistically interpreted status of the new (emergent) properties, resulting in a reduction in the number of theoretical problems in the specialized literature; **(2)** economy of the specialized explanations, as well as interpretive efficiency; **(3)** mitigating the problem of reduction to a more fundamental level, which in turn would help eliminate attitudes towards stagnation and abandonment of research in the relevant fields; **(4)** the possible narrowing of the so-called 'explanatory gap' in analysis in terms of theories dealing with higher levels of organization.

Chapter III Analysis of the phenomenon of intuition as an emergence in the mind-body relation

This chapter begins by highlighting the main problem that prompted me to consider the phenomenon of emergence, as well as the motivations and strategies for its critical rationalization and analysis: intuition.

Intuition is uncritically and widely regarded as a strong emergent phenomenon. Its unreflected essentialization in the field of philosophical specialized literature is commonly observed. It is expressed in the consideration of intuition as a separate phenomenon, which assumes the function of a guaranteeing and legitimizing component within a number of rational-speculative arguments (RSA). That is, such a component that has a direct impact⁷ on the adopting and justification of specific positions and theoretical statements. This is most clearly seen in the specialized fields of ethics, epistemology and metaphysics⁸.

As a specific example, I will use the classic positions related to intuitionism in the field of ethics, as well as the imposed attitudes in the field of analytic philosophy. Although the position is evolving and undergoing many changes, intuition often occupies a central place in the role of realizing and legitimizing factor of moral propositions. This leads to its interpretation as

⁷ According to the outlined interpretations in the previous parts of the dissertation, this influence can be considered as downward causal.

⁸ I deliberately do not extend the analysis to all possible types of intuition. For example, I do not thematize mathematical intuition, because I consider the debate and argumentative positions on the phenomenon to be outside the scope of the proposed project in the dissertation, and the issues raised in future chapters could not be directly addressed in that particular case.

independent of the physiological factors guiding the process of formation of moral propositions and the justification of a given theoretical position. On the other hand, leading to the methodological and interdisciplinary motives of the dissertation is the systematic analysis of this phenomenon with a definition from the field of a specialized scientific discipline. Accordingly, the critical analysis of philosophical intuitions will be compared with the definition given by Xiaohong Wan and colleagues (Wan et al, 2012) - "unconscious capability of quick, automatic cognitive information processing" - which corresponds for the most part to the scientific attitude within cognitive neuroscience and cognitive psychology. It should be noted that this definition is not only completely coherent with the proposed author's methods, but the latter complement it, bringing additional conceptual clarity.

Of course, such a methodology of analysis cannot ignore discussions in the field of epistemology if it seeks to achieve a comprehensive explanation. In fact, such thematization lies at the heart of the interdisciplinary platform that I am trying to propose and implement in the dissertation.

Thus, two parallel moving theoretical lines are outlined in order to implement the project proposal of the present study. On the one hand, there is a critical line that problematizes the soundness of uncritical reference to intuition within the RSA, and on the other: the interdisciplinary approach, which is justified on the basis of the author's methods. Ultimately, the goal is not limited to a self-serving "destructive" (conceptual) reduction, but to explicating the positive and productive results of systematic interdisciplinary consideration, which could reduce conceptual ambiguity for both general fields and methods of research (humanitarian and scientific).

I critically analyze the concepts of intuition mainly as far as their status as *a component of programs for the accumulation of knowledge*, which can be subsumed under the criterion of verifiability (scientific-theoretical and experimental programs), is concerned. That is, *the focus is on the epistemic role of intuition in the practices of rational-speculative argumentation*. In addition, my arguments relate to research programs that aim to comprehensively describe and explain subjective phenomena, which are also a shared goal of philosophical and scientific programs. It is noticeable that I myself use rational argumentation, and it is difficult to imagine a research program - at least one produced by a representative of the species *Homo sapiens*, which ignores these essential cognitive procedures. My criticism concerns *the possibility of reaching*

the ultimate grounds of given explanation only through rational-speculative argumentation. This is the reason why I chose the phenomenon of intuition, because it seems to express to a large extent the attitudes to legitimize the validity of such a position (classical metaphysical systems are a good example).

According to these clarifications in the dissertation, the "classical definition of intuition" concerns only the epistemic status of intuition, i.e. *intuition as an epistemologically legitimate method / component and guarantor of knowledge*⁹.

The method of analysis I have proposed does not in any way claim to be exhaustive and precise. On the contrary, it is largely speculative and abstract. Rather, my aim is to propose *a general scheme of a method for analyzing obscure language uses, integrating components that are (mostly) subject to experimental precision and verifiability*¹⁰.

Additionally: in view of the argumentative goals of the dissertation, it is sufficient to demonstrate that there is a consistent correlation between behavioral dispositions and neural activity. If the phenomenon of intuition has an immanent connection with a form of innate spontaneous irrationality, then intuition cannot be considered objective, in the sense of a neutral component that legitimizes a certain position. This is because there are no rational grounds for accepting its privileged epistemic status.

The following critical analysis seeks to demonstrate both the current interdisciplinary application of the author's methods proposed in this study¹¹ and their application in solving specific narrowly specialized philosophical problems. If successfully argued and applied, three important goals for the dissertation would be achieved: **(1)** an applied justification of the methodological claims concerning the methods; **(2)** explicating and redefining the relation between systems/ structures¹² and higher-level functions¹³; **(3)** an actual demonstration of the merits of the methods in critical examination of a specific phenomenon by a naturalist, non-essentialist and interdisciplinary position of analysis.

⁹ I will focus on the role of intuition mainly in the context of philosophical argumentation, but I will also give naturalistic descriptions to support my presentation and conclusions.

¹⁰ I refer to both types of activity: neural and behavioral.

¹¹ Analysis at the level of neurobiology, cognitive neuroscience, cognitive psychology.

¹² Presented by the method of cluster reaction analysis.

¹³ Presented by a functional-behavioral method of analysis.

The introduced definitions are united in a second author's method of analysis: which is related to the already presented method of cluster reaction analysis. Thus, I try to demonstrate the specific way in which the structures and functions of the nervous system relate to the emergent aspects of the phenomenon of intuition. In fact, the new method builds on the first one. The two types of definitions of intuition that I introduce are not disjunctive, on the contrary, they complement each other.

On the one hand, the functional-physiological definition finds a referent in the dispositional-behavioral one. This avoids the postulation of superfluous entities. In this way the already mentioned prescription for economy of specialized explanations, considered to be standard within the framework of science, and in a large part - by the modern philosophy, is maintained. This allows for the reduction of irregular references, as well as verifiability in principle¹⁴. Referencing behavior also allows for precise analysis of the studied phenomena and their correlation with the observed internal processes (neural activity of a studied organism).

On the other hand, the functional-physiological definition sets a wider explanatory range of behavioral interpretations because it allows the analysis of behavioral acts in relation to their physical correlates. Thus, behavioral interpretations are protected from the usual criticism of presenting the status of behavior in a research procedure as an explanandum, without sacrificing the merits of its methodological program¹⁵.

Both aspects of concerning a given phenomenon¹⁶ can maintain a relatively clear methodological autonomy (to apply techniques that most accurately account for the observed characteristics), because *the general condition remains the experimentally observed, consistent, statistically significant correlation between neural activity and behavior*. It is of utmost importance that such an examination *does not postulate a strict causal orientation between these two dimensions*. Neither is it claimed that neural activity determines behavior, nor that the latter causally determines the activation of certain populations of neurons in the nervous system. *Both aspects affect the amount of internal interactions, as well as those with the environment, that an organism carries out within its life cycle*.

¹⁴ Publicity of the phenomena to which it refers.

¹⁵ In the text I will support the thesis that such a position does not contradict, but even resonates with the ultimate goals set by B.F. Skinner, the father of radical behaviorism.

¹⁶ In the dissertation, this is intuition.

With this in mind, my position considers both the behavior of the organism and the behavior of the nervous system as *(public) verifiable*¹⁷ *acts with the same epistemic status*. Thus, the method presented in the dissertation uses *an invariant concept of behavior*, applied for the purpose of integrative analysis of both types of acts. It follows that the latter *must be equally prioritized in research programs*.

In my opinion a large proportion of conceptual errors in a given analysis, that is trying to take into account the intersection between the two aspects of behavior, as well as the methodological difficulties they create, are due to *the attitude to interpret the both types of consideration according to two theoretically incommensurable and categorically incompatible concepts of behavior*.

As noted in the chapter, the integrative consideration of both types of behavior does not aim at giving extreme reductionist explanations, nor does it engage in reductionist programs. The goal remains strictly pragmatic and methodological - providing an opportunity for clearer and more effective analysis in the general framework of *an interdisciplinary approach, creating a fruitful debate between representatives of humanitarian research programs and those operating in the field of specialized scientific disciplines*. The integration of scientific approaches, as well as the acceptance of some of their symptomatic preconditions, should in no way be seen as simultaneously declaring them exhaustive and problem-free. If that were the case, the current project would be redundant. The assumptions and approaches themselves suffer from their own significant shortcomings, which have been, and will be, noted and rightly criticized within the framework of philosophical practice. Here, analogously to Chapter Two of the dissertation, the aim is to prepare and implement a common conceptual apparatus for analysis that can be integrated with cluster reaction analysis.

Again, it should be emphasized that one of the advantages of the method of cluster reaction analysis is its high degree of neutrality in relation to the specifics of the analyzes to which it could be applied. Its specific connection with the method of functional-behavioral analysis within the dissertation is that the latter strongly coherence with attitudes in the field of cognitive neuroscience. Thus, the method is largely representative of the trends in that specialized

¹⁷ I accept that the development of monitoring technologies, at least in practical terms, (will) neutralize objections to the (im)possibility of access to the behavior of the nervous system.

scientific discipline. Of course, I make no claim that the method completely exhausts and captures the general preconditions that play a role in the mentioned scientific practice. Although the marked vector of argumentation seems to be reductionist, the motives are again *mainly methodologically pragmatic*¹⁸. I hereby *emphasize* that I neither deny the merits nor aim at the reduction/ elimination of the various interpretative programs that appear to be alternatives to the above assumptions. I accept a naturalistic view of the existence of reality and access to it. Therefore, I take the position of scientific realism, together with its ontological and epistemic preconditions¹⁹.

Chapter IV Consolidation of the proposed methods for analysis

In this chapter I try to demonstrate the basic theoretical possibility of establishing a method for analyzing a subjective phenomenon²⁰, which will incorporate two aspects [(**A**) *argumentative-methodological* and (**B**) *naturalistic*] of its consideration [expressed through two definitions: (**a**) *dispositional-behavioral* and (**b**) *functional-physiological*], as well as to allow the consistent integration of the two research models into a single naturalistic framework, that should not suffer from the methodological deficits of the current programs that postulate categorical differences between the two types of behavior in question, when it comes to the expressing of the same two aspects.

Already in the introduction to the dissertation it was noted that in this text I strive mainly to *explicate the principled possibility for such a theoretical and methodological synthesis within a single method of analysis*. The aim is to *demonstrate the current availability of adequate methods for an accurate analysis at all levels of explanation of the phenomenon*, considered according to my interpretation framework and assumptions expressed by the abovementioned moments of the analysis, as well as their consistent integration into a single research program, as long as the preconditions and restrictions set out in this text are accepted. Thus, *the explication of theoretical and methodological consistency and coherence is a general goal and eventual positive quality of the methodological framework set out in this chapter*. I also try to demonstrate the fact that at a strictly methodological level intuition is a problematic and (internally)

¹⁸ That is, analogous to the incentives for the introduction of the method of cluster reaction analysis.

¹⁹ For a detailed reconstruction and argumentation of the positions of scientific realism, see Psillos, 1999.

²⁰ In this case, that is intuition.

contradictory component, *if the confirmation criterion, typical of scientific methodology, is to be accepted*. The critical thematization I apply is valid *strictly* in the field of a pluralistic and interdisciplinary approach and *does not aim to discredit the myriad of methodologies and results provided by systematic analyzes that do not commit to this condition*.

In this part of the dissertation, I also make a brief critique of natural language uses and quasi-theories generated in view of everyday language, which are often used to describe the phenomenon of intuition. I also demonstrate some of the logical irregularities and contradictions that lead to the integration of intuition in its role as a legitimate component and guarantor of knowledge. I highlight some practical consequences of its integration within a given methodology of this kind. Then I draw a conclusion, according to the above considerations, as I propose a methodological component that (at least) reduces the negative impact of the application of defective, argumentative components.

The problems presented in the fourth chapter aim to demonstrate that, in the end, *intuition as a component of a research process does not contain the ultimate grounds for its legitimacy in itself*. At least common sense²¹ dictates that any serious statement about the world must be confirmed in the light of the facts, and this, as I will try to argue in the next two subsections, can only be done consistently through empirical verification. It should be emphasized that the dissertation deals with statements that seem difficult to reconcile with the concept of interdisciplinary research, rather than the assumptions and current justifications of intuitionism in general. The above authorial methods aim at pluralism when it comes to conducting research programs, therefore the explicated critical moments can be considered justified only if this general and clearly stated motivation is taken into account.

In investigative-scientific aspect, intuition can be useful, but mainly as *a language marker / behavioral guideline*²² for the study of neurobiological/ cognitive processes. If the state to which the description of intuition is attributed is (a consequence of) physiological processes, then it is a

²¹ Critically tested and unintuitive one that is.

²² *Behavioral markers* are stable behavioral tendencies, the regularity of which allows the study of correlations between specific physiological states and behavioral acts.

part of the biological-functional apparatus of the representatives of our species²³, and as such, its physiological consideration as well as its role of an influencing factor, are both needed theoretical moments in the process of giving a comprehensive (scientific) explanation of cognitive processes. Thus, intuition can be theoretically integrated as *a factor involved in giving a specific answer or drawing a conclusion*²⁴ within a naturalistic explanation of rational-speculative practices. In view of this perspective, *our natural (linguistic) understanding of intuition could be seen as an example, along with all other markers of behavior in the currently proposed invariance, which can help in the pursuit of a general understanding of the processes of consciousness.*

Based on the body of evidence and considerations set out in this chapter, a legitimate conclusion can be drawn regarding *the fundamental impossibility of verifiability and sharing of intuition.* This situation, combined with the structural-physiological connection (expressed at least in partial dependence) of the rational procedures with the irrational, non-introspective components, which are part of the biological configuration of the species *Homo sapiens*, leads to the impossibility of guaranteeing *epistemic neutrality*, according to the claims made by the practices that are applying intuition in its role of a legitimate methodological component and guarantor of knowledge. Thus, it is (at least in principle) an unreliable and (internally) contradictory component in any possible program or specific theory for generating knowledge, that aims at precise analysis and verifiability of the entities it interprets and explains.

Therefore, it can be argued that *intuition is an immanently contradictory epistemic component if it is relevantly compared to the claims made, for example, in the formulations of ethical intuitionism* and its receptions in meta-ethical debates.

If intuition, according to the empirical evidence presented in the dissertation, should be considered as a sum of computational unconscious cognitive processes, its direct epistemic connection with theoretical systems of purely rational-speculative nature²⁵ seems conceptually

²³ I.e. considering intuition as a process, being a consequence of many evolutionary adaptations. For a more recent reading of the adaptationist concept (blind process of Research & Development), see Dennett, 2017.

²⁴ That is, to be seen as a behavioral trend based on a biological basis that can influence decision-making.

²⁵ For example, “armchair” projects, that are carried out as metaphysical programs with a strict logical-deductive nature.

unclear. These programs are legitimized by their claim to objectivity²⁶, which would be significantly compromised if the direct influence of a component that is not subject to subjectively explicit rational control is recognized. Such a situation seems even more unfavorable in the light of experimental research showing the direct relationship between the moment of decision-making and the accompanying, unconsciously perceived stimuli (Cleeremans, Destrebecqz, Boyer 1998: 406-416). Given the body of empirical evidence cited and analyzed in this dissertation, the application of a certain amount of skepticism to the established practice of invoking rational intuition in its role as an epistemic guarantor seems reasonable.

In view of the above considerations, the possible usefulness of purely speculative procedures in the scope of a naturalistic reading can be adequately protected, as long as **(1)** they are limited in their cognitive claims and **(2)** they are methodologically consistent with the practico-theoretical frames of the empirical disciplines. I reiterate that these requirements apply only in so far as the pragmatic aim of establishing an interdisciplinary method of analysis proposed in this text is accepted.

Conclusion

The task set before this dissertation was to present the main concepts and problems for the adequate understanding and further analysis of the phenomenon of emergence.

With this in mind, the thesis I have tried to defend is that the phenomenon of emergence is a complex and theoretically burdened problem, the precise analysis of which requires ever-increasing interdisciplinary reading. Only overcoming a number of deep-rooted theoretical distinctions between research disciplines could lead to possible progress in analysis. This may be solely achieved in the context of widely shared debates, which are as free as possible from conceptual prejudices.

The present dissertation aims to contribute in this direction, offering an interdisciplinary method, which is to present an author's conceptual apparatus, seeking to clarify rather than eliminate terms available in current research practices. Speaking of possible reconceptualization, I do not

²⁶ Neutrality to the contingency of experience.

aim to deny the phenomenon, but call for careful analysis conducted between different disciplines. I believe that such an approach can only increase theoretical productivity in all relevant forms of analysis.

The philosophical understanding of emergence has its significant place in this program, but I perceive it as shared in principle with the field of scientific practice. The differences between philosophical and scientific methodology and theorizing are significant, but this does not mean favoring one field at the expense of another. Empirical data, as well as attempts to bring systematic conceptual clarity, must be taken into account responsibly.

I firmly believe that problems such as that of emergence confront us with conceptual boundaries where neither the most accurately collected and systematized empirical evidence, taken by itself, nor the most coherent and argumentatively consistent theory could make significant progress. Only collective, accompanied by mutual respect and attention, interdisciplinary work could achieve some form of success.

Although this is the conclusion of the dissertation, in reality the research and discussions on emergence should not end. Therefore, the current problem should be a constant subject of analysis and discussion in order to be further updated and enriched. The possible contributions of this text can be sought precisely in the effort of laying the grounds of a practical and adequate support for the realization of this research cooperation.

Contributions of the dissertation

1. The dissertation multi-layeredly traces and analyzes the development of the concept of emergence, as well as the consequences of this development in the field of specialized sciences and philosophy.
2. The text relates the progress and application of this phenomenon with the need for perpetually updating discussions on the topic.
3. The study reviews the main issues, falling within the scope of the emergence, as well as analyzes the advantages and disadvantages of currently developed research programs, arguing the need for an interdisciplinary approach.
4. The dissertation introduces author's definitions, which could contribute to the enrichment of the philosophical and scientific discussion on the problem of emergent properties.
5. Two author's methods are presented, analyzed and argued: *method of cluster reaction analysis* and *method of functional-behavioral analysis*, aiming at **(1)** applied justification of the methodological aims; **(2)** explicating and redefining the relationship between systems/structures²⁷ and higher-level functions²⁸; **(3)** current demonstration of the merits of the methods in critical examination of a specific phenomenon by a naturalist, non-essentialist and interdisciplinary position of analysis.

²⁷ Presented by the method of cluster reaction analysis.

²⁸ Presented by the functional-behavioral method of analysis.

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1. Нечев, К. (2020) Естествени видове и емергентни характеристики. Натуралистски опит за консолидиране на двата концепта. Във: *Философия*, София, НИ: „Аз-буки“, 1 (29), 39-51.
2. Нечев, К. (2020) Феноменът интуиция в невробиологична перспектива. Във: *Философски алтернативи*, София: ИФС, 6, 102-118.

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