

THE PHILOSOPHICAL FRAMEWORK FOR UNDERSTANDING NEUROSCIENTIFIC RESEARCH

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ABSTRACT

New tools and methods for investigating the brain have given neuroscientists a chance to examine the working brain and placed neuroscience as the central discipline in cognitive science. My main goal in this article is to examine theoretical and philosophical assumptions on which different understandings and interpretations of neuroscientific research are based and to show why philosophical reflection on neuroscience is needed. I first discuss different roles philosophy potentially plays in cognitive science. After a short presentation of Descartes' position concerning the mind body problem and cognitive science approaches to answer his challenge, I examine different theoretical frameworks for neuroscientific research.

KEY WORDS

philosophy of cognitive science, Descartes, neurophilosophy, reduction, embodied cognition

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INTRODUCTION

Philosophy and neuroscience are two of the constitutive disciplines of an interdisciplinary field of cognitive science from its beginnings in the mid of the last century. During this relatively short history the relationships between the basic disciplines (philosophy, psychology, computer science, linguistics, neuroscience and anthropology) were changing due to the advancements in particular disciplines and to the paradigm shifts and underlying hypotheses. New tools and methods for investigating the brain have given neuroscientists opportunities to examine the working brain and have placed neuroscience as the central discipline in cognitive science. My main goal in this article¹ will be to examine theoretical and philosophical assumptions that lie behind different understandings and interpretations of neuroscientific research and show why philosophical reflection on neuroscience is needed. But let me say first a few words about cognitive science and the role of philosophers in it.

José Luis Bermúdez has given a short definition of cognitive science as “the science of the mind” [1; p.2]. Scientist from different disciplines are trying to model and explain different mental phenomena, sharing a number of basic assumptions about how to tackle those problems. The most influential assumption of cognitive science was (is) that the mind is an information system and that mental processes are information processes of some kind. Cognitive scientists are studying mental processes from different perspectives: neuroscientists study the biological machinery, psychologists specific mental processes such as perception, learning or decision-making, biologist and anthropologists research the evolutionary and cultural aspects and computer scientist simulate and model them. But in contrast to empirical science where the stress is on observation, data gathering, classification, and experimentation, philosophical approach is based mainly on thinking. That is probably the reason that many scientists describe philosophers as “armchair scientists” who are just speculating. Andrew Brook, who is positively aware of the role of philosophers (see next section), has nicely captured this kind of dismissive reasoning that usually comes in one of the following two forms. The first stresses the speculative aspect and goes like this: “Philosophers mounted some interesting speculations about the mind in times past but we are now in a position where we can get out of the armchair and do real science on these things. Philosophy, imaginative and entertaining though it can be, has been relegated to the dustbin of history. There is still something to logic and maybe ethics but the rest of philosophy has been superseded by science” [2; p.219]. The second one goes as follows: “You philosophers with your relentless pursuit of the big picture exhaust me. What are the research payoffs? What we need at this point in time is disciplined work on specific issues, not big pictures painted in broad strokes. Even those of you who try to be interdisciplinary and responsive to what is now known bite off more than any mortal can currently chew.” [2; p.219]. Brooks points out there is an important distinction between these two variants. The first takes philosophy, more exactly cognitive philosophy, as a bad rival to science, while the second acknowledges that philosophy is trying, even if premature, to integrate results in a bigger picture, something science does relatively rarely [2; p.219]. I will elaborate on this when discussing philosophy in cognitive science and neurophilosophy on the one hand and philosophy of cognitive science and philosophy of neuroscience on the other.

But are there really such dark prospects for philosophy? In contrast to such dismissive views I will point to positive and valuable roles philosophy needs to play in cognitive science. Philosophy with its long tradition has offered many different proposals how to investigate the mind. It has opened a wide space of alternatives that can potentially help to design experiments, search for new solutions and interpret results that represents hard riddles inside the existing framework. It is also not satisfactory to remain with just partial insights so cognitive science has to aim to integrate different viewpoints and the challenge of integration

is thus not only the philosophers caprice. I think philosophical reflection influences research in cognitive science (see also [3]). As I will try to show in the next section, those who believe that can escape it, are just not aware they are in reality under the influence of some (bad) philosophy.

THE ROLES OF PHILOSOPHY IN COGNITIVE SCIENCE

First, we need to say something about the methods philosophers are using. Tim Van Gelder in his paper about the roles of philosophy in cognitive science argues that the best way to identify philosophers is by their methods. It is not that other scientists are not using them but philosophers are “unique in *specialising* in them” [4; p.118]. He focuses on the three basic methods every student of philosophy uses and practices during the study: argumentation, conceptual clarifications and historical perspective [4; pp.118-125]. With these basic tools in mind philosophers are playing different roles and van Gelder mentioned some of them by using metaphorical names: pioneer, building inspector, Zen monk, cartographer, archivist, cheerleader and gadfly [4].

The first one, the role of the pioneer, is quite obvious. The basic ideas and hypothesis of cognitive science were first proposed and debated by philosophers. For example, the idea that mental processes are the operations of a kind of physical system, or that thought processes are a form of symbolic computation. The role of a pioneer is not only a historical one since there are still open questions and the role of philosopher is “to tackle problems that nobody else knows how to handle yet, in the hope of transforming them into scientifically tractable questions” [4; p.126].

The second one, the building inspector, also seems quite natural. The scientific inquiry is preceded by a set of theoretical and methodological assumptions and the role of philosopher (or scientists pursuing philosophical reflection) is to inspect this foundations. This comprises of articulating the basic assumptions, inspecting them and if necessary, reconstructing them. In order to achieve the results philosophers have to have deep familiarity with the research area. In short, scientists of a particular discipline are not always aware of the presuppositions on which their research is based and it is not obvious that they are unproblematic, so they are in need of careful scrutiny. It is true that empirical success often corroborates initial assumptions. But one can not solely rely on the empirical measure. Although there are cases when failure can be explained by the need of more time and more empirical research, it is not always like this. Sometimes the reason is wrong assumptions and one needs to find out what is wrong. Here the philosophical reflection is required in order to understand and eliminate the problem [4; p.128].

The next three roles, the cartographer, the archivist and the cheerleader are closely related. Philosopher as cartographer tries to produce conceptual maps and provide an understanding how various elements fit together or why they conflict. A good example of such work is John Haugeland’s book *Artificial Intelligence: The very idea* [5] where he presents an understanding of AI in terms of a wider conceptual and historical context. Taking into account historical context, philosopher plays a role as an archivist who digs deep into the repository of the past ideas and programs. By doing so he is better equipped for predicting the future prospects, failures or successful programs. In foreseeing the promising direction he may take the role of a kind of cheerleader.

Two, somewhat self-ironic roles, are the roles of the Zen monk and the gadfly. The first one concern the philosophical work that is far from everyday work in cognitive science, but that is somehow necessary. Van Gelder compares the philosopher to the Zen monk, who is supported by the community “to ponder those imponderable issues that everyone thinks should be thought about by someone, but for which nobody else has time or patience. In

theory, the philosopher-monk eventually reaches a state of enlightenment, but unfortunately that enlightenment is necessarily incommunicable to those who have not undertaken the requisite prolonged course of meditation and asceticism.” [4; p.129]. The role of gadfly illustrates the tendency to express their statements strongly and provocatively and thus provoking others to try to challenge them.

I think that van Gelder has nicely captured the main roles philosophers play in cognitive science. Similar attempt is presented by Brook who understands methods in a broader sense, somehow combining van Gelder’s methods and roles. He analyses the following four methods:

- 1) speculative hypothesis generation,
- 2) integrative interpretation,
- 3) exploration of thought experiments,
- 4) analysis of concepts.

Brook stresses that people with philosophical training “tend to pay more attention to the conceptual toolkit of cognitive science than is common in those with other kinds of training” [2; pp.221-222].

Cognitive science as interdisciplinary endeavour takes advantage of different methodologies, particularly, because it is at the crossroad of natural, technical and social sciences and humanities. It is for this reason that I take philosophical meta-thinking as indispensable, especially in exploring the potential conflicts between scientific and humanistic image. To conclude this section I would like to quote what Paul Thagard called his all-time favorite analogy for philosophy and for science. It comes from Francis Bacon’s *The New Organon and related writings* when the two enterprises had not yet been distinguished: “Those who have handled sciences have been either men of experiment or men of dogmas. The men of experiment are like the ant; they only collect and use. The reasoners resemble spiders who make cobwebs out of their own substance. But the bee takes a middle course. It gathers its material from the flowers of the garden and of the field, but transforms and digests it by a power of its own. Not unlike this is the true business of philosophy; for it neither relies solely or chiefly on the powers of the mind, nor does it take the matter which it gathers from natural history and mechanical experiments, and lay it up in the memory whole as it finds it, but lays it up in the understanding altered and digested. Therefore, from a closer and purer league between these two faculties, the experimental and the rational (such as has never yet been made), much may be hoped.” [3; p.252].

COGNITIVE SCIENCE AND DESCARTES’ LEGACY

The nature of the relation between brain and mind is an old problem and also nowadays scientists and philosophers offer different solutions. Although almost everybody would agree that the brain gives rise to perception, cognition, emotion, volition and other mental states, there remains a challenge to precisely determine how mental phenomena rise from the brain. René Descartes made the famous distinction between the mind (*res cogitans*) and physical world (*res extensa*) and set the framework for the debates about the mind body problem. He thought that non-human animals are machines that could be explained from purely mechanical perspective and according to natural laws. The same method can also be used for explaining the workings of human body and for those human functions that are independent of reason, will and conscious awareness in the reception of sensations. But where mental attention is involved, a separate “rational soul” must be posited. By treating animals as machines, Descartes relinquished the idea that animals possessed consciousness and mental states. The only exception to the mechanistic explanation is the human mind (soul). His

purely mechanical view of biology is combined with the view that conscious mind is a separate incorporeal substance. He thus adopted an interactionist dualist position concerning the mind-body relation.

There exists a disagreement among philosophers whether Descartes' denial of the possibility of purposive animal behaviour was meant as an empirical or a conceptual thesis. On the one hand, Cottingham [6; p.249] points out that the possibility of a physical realization of cognitive capacities was not absolutely ruled out and that Descartes, as a good scientist, was probably aware of that. The more "scientific" stance on the nature of the mind paved way to empirical investigations and Descartes himself was enthusiastic for physiological research. But he found the brain and nervous system much too simple to generate complexity needed to constitute genuine thought and linguistic behaviour. On the other hand Shanker stresses Descartes' repudiation of the doctrine of the 'Great Chain of Being' and his insisting "that there is a hiatus between animals and man that cannot be filled by any 'missing link'. The body may be a machine (which was itself a heretical view), but man, by his abilities to reason, to speak a language, to direct his actions and to be conscious of his cognitions, is categorically not an animal" [7; p.316]. According to this view the distinction between mechanical, reflexive behaviour and involuntary movements on the one side, and purposive behaviour and voluntary movements on the other, can not be seen by an outside observer. Voluntary and involuntary movements can look the same. Nevertheless, the humans are able to see and report on their own volitions and thus distinguish between these two types of movements, while animals lack a similar capacity.

The view of Cartesian dualism stimulated many attempts to overcome the divide between animals seen as mechanical automata on the one side and rational human beings on the other. Shanker pointed out that the defence of the continuum picture could proceed in either of two directions to show: (i) that the behaviour of animals is intelligent or (ii) that the behaviour of man is mechanical [7; p.318]. The proponents of both approaches accept the reality of mental phenomena and are inheritors of Descartes' legacy, although they proceed from different starting points. Scientists taking the first path investigate neural mechanisms in animals and humans, and try to find out how mental phenomena and rational behaviour emerge as a product of evolution. They try to blur the lines between the higher animals and human beings "via a continuum of sentience" [7; p.318]. We can characterize this path as a "bottom up" approach. The proponents of the second path seek to reduce human beings to the level of physical mechanisms "by eschewing the appeal to consciousness" [7; p.318]. We can characterize this path as a "top down" approach.

I have argued [8, 9] that in aiming to find answers for the Descartes' challenge, cognitive science has taken both approaches. Classical cognitive science was an attempt of the top down approach using computer metaphor and functionalist representational theory of mind that offer an explanation of how there could be non-arbitrary content relations among causally related thoughts (e.g. [10]). This approach is based on the hypothesis that cognitive processes are manipulations of symbols according to the rules. The central claim of the computational-representational theory of mind states that [11; p.30] "it may be possible to construct a syntactically driven machine whose state transitions satisfy semantic criteria of coherence". Functionalist theories of mind are identifying mental states and processes independently of the neurophysiological states and processes (concrete physical realizations). The right level for explaining behaviour is on a higher, cognitive level which according to Marr [12] corresponds to the computational and algorithmic level, while neuroscience is operating on an implementational (realizational) level, specifying the biological (physical) mechanisms. In this way classical symbolic cognitive science provides a unified platform for interdisciplinary research based on the hypothesis that cognition basically consists of

information processing, more precisely, information is encoded in the form of symbolic representations with rules operating upon them. It represents the first scientific approach that seems to have tools to explain how it is possible to solve the problem of mechanical rationality. But, it also faced difficulties and criticism both from empirical research and philosophical analysis. The optimistic view that the computational properties of the brain will be enough to explain its ability to produce mental states seems to have serious limitations. John Searle, a strong critic of classical program, has quite early announced the necessary move to more biologically oriented approaches, although at that time he maintained that the brain is a digital computer: “Whatever else intentionality is, it is a biological phenomenon, and it is as likely to be as causally dependent on the specific biochemistry of its origins as lactation, photosynthesis, or any other biological phenomena. No one would suppose that we could produce milk and sugar by running a computer simulation of the formal sequences in lactation and photosynthesis, but where the mind is concerned many people are willing to believe in such a miracle because of a deep and abiding dualism: the mind they suppose is a matter of formal processes and is independent of quite specific material causes in the way that milk and sugar are not. ... Whatever it is that the brain does to produce intentionality, it cannot consist in instantiating a program since no program, by itself, is sufficient for intentionality” [13].

A TURN TO NEUROSCIENCE

Huge progress in neuroscience in recent years has brought many neuroscientists and philosophers to the conclusion that the proper framework for understanding the mind is developed by neuroscience. The reasoning goes like this: “For those who do neuroscience, it is highly effective to assume that brain events are “the” cause of mental events. There is overwhelming empirical evidence that whenever a mental event occurs, something happens in the brain. Conversely, when something happens to the brain, it frequently has an effect on the mental events of the person who possesses that brain. The omnipresence of these reciprocal causal connections has prompted the natural assumption that the mind is the brain” [14; p.54].

Although not all cognitive scientists agree that brain is identical with mind, they all agree that its presence is a *sine qua non* for it, suggesting that a successful theory explaining the mind will be neuroscientific. But it is not clear what exactly they mean by that. Ian Gold and Daniel Stolyar [15] have argued that it is not clear what this claim means and that it is ambiguous between two views: “one plausible but unsubstantive, and one substantive but highly controversial”. They characterize the first one, the so-called *trivial neuron doctrine* as: “the view that a successful theory of the mind will be a solely cognitive neuroscientific theory. According to this doctrine, to the extent that psychological phenomena will be explained at all, the science that will do so is cognitive neuroscience” [15; p.813]. This theory adheres to the thesis that mind is a biological phenomenon (potentially) explicable by science. But this is not to say that the understanding will be based on biological concepts alone – folk psychological and psychological concept may and very probably will be required. On the other hand, it is possible to construct a much more radical theory if we simply replace *cognitive* neuroscience by *biological* neuroscience. Gold and Stolyar call this the *radical neuron doctrine*. According to the radical doctrine, neurobiology *alone* will provide the necessary conceptual resources to understand the mind. Consequently, “a successful theory of mind will be a theory of brain expressed in terms of basic structural and functional properties of neurons, ensembles or structures” [15; p.814].

A similar radical reductionist view was expressed by the neuroscientist Francis Crick: in his famous book *The Astonishing Hypothesis* where he wrote: “The Astonishing Hypothesis is that “You,” your joys and your sorrows, your memories and your ambitions, your sense of personal identity and free will, are in fact no more than the behaviour of a vast assembly of

nerve cells and their associated molecules. As Lewis Carroll's Alice might have phrased: "You're nothing but a pack of neurons." This hypothesis is so alien to the ideas of most people today that it can truly be called astonishing" [16; p.3]. He thinks that "the scientific belief is that our minds – the behaviour of our brains – can be explained by the interaction of nerve cells (and other cells) and the molecules associated with them" [16; p.7].

Some eliminativists have advocated the elimination of folk psychological concepts, for example Paul Churchland [17] has argued that neuroscience shows that our folk psychological theory is radically wrong and thus deserves the fate of phlogiston and witches. Such view represents a radical scientific understanding according to which assumptions about the mental that we take for granted are just plain nonsense. Eliminativists see neuroscience as the only appropriate scientific approach for explaining behaviour. However, Gold and Stoljar [15] offer persuasive arguments against the radical neuron doctrine and suggest that it is false. I also suspect that there will not be a massive mismatch between concepts at the level of the mind and lower levels, or as Horgan and Woodward argued, "Folk psychology is here to stay" [18].

On the other hand, trivial neuron doctrine does not lead to radical philosophical positions. John Bickle [19, 20] has argued that we should wait for scientific psychology and neuroscience to mature and only then examine the existent intertheoretic relations between available theories and thus potential reduction or elimination. Some prominent philosophers of neuroscience [21, 22] consider the idea of intertheoretic reduction as inappropriate from the point of view of neuroscientific praxis. They argue that neuroscience is best understood as the study of neural mechanisms that help us better understand cognitive processes. The question then is if understanding neural mechanisms alone will suffice. Neuroscientist Gerald Edelman suggests that this is not the case: "even if we could accurately record and analyze the activity of millions of brain neurons as an individual formulates a sentence, we could not precisely specify the contents of that sentence by reference to neural recording alone. The idea that we might develop a "cerebroscope" capable of doing so is confuted by the complexity, degeneracy, and unique historical causal path of each brain" [23; p.66].

The viewpoint that neuroscience will in the end substitute all higher level sciences was explicitly expressed by philosopher Patricia Churchland who wrote a book *Neurophilosophy* [24], a provoking title for that time. Many but not all philosophers and scientists are using the concept neurophilosophy in an eliminativist manner as a substitution for philosophy. Patricia Churchland herself in her later book *Brain-Wise* [25] rejects such characterization and argues for a more balanced view, a kind of "co-evolution" of the disciplines. I feel that the motivation in neurophilosophy is to bring both disciplines closer together without in advance precisely specifying the relation between the mental and the physical. A good example is Henrik Walter's proposal for the core theses of minimal neurophilosophy:

- 1) *Ontology*: mental processes of biological organisms are realized by or with the aid of neuronal processes.
- 2) *Constraint*: philosophical analysis of mental processes should not contradict the best currently available brain theories.
- 3) *Heuristic Principle*: knowledge about the structure and dynamics of mental processes can be gained from knowledge about the structure and dynamics of neuronal processes. [26; p.123].

Walter characterizes neurophilosophy "as a discipline that moves in on the mind-brain problem from two opposite directions. Either we begin on the empirical side and happen upon philosophical questions, or we set out with philosophical puzzles and need empirical findings to solve them. ... It is best understood as a bridge discipline between subjective experience, philosophical theorizing, and empirical research." [26; p.125]. He stresses that neuroscience and philosophy effect each other mutually: "While philosophy can provide

critical analysis of the concepts of neurophilosophy, the neurosciences can impose empirical limitations on philosophical theories ... it could – in the end – lead to revising our intuitive commonplace psychological notions. In this way neurophilosophy has the potential to change our world view.” [26; pp.125-126].

CRITICAL REFLECTIONS

We have seen that there are different views among cognitive scientists about the exact role neuroscientific research plays in explaining and understanding mental phenomena, although reductionist neuroscience seems to prevail. Neuroscientists often give “explanations” of memory, fear, love, or consciousness and “locate” them in specific brain areas, neuronal networks or molecular processes [27]. They ascribe psychological predicates to the brain or even parts of the brain. But as Bennett and Hacker [28] stress, “human beings, but not their brains, can be said to be thoughtful or thoughtless; animals, but not their brains, let alone the hemispheres of their brains, can be said to see, hear, smell and taste things; people, but not their brains, can be said to make decisions or to be indecisive” [28; p.73]. When substituting the person with the brain or parts of the brain, they commit what Daniel Dennett [29] and Bennett and Hacker [28] call mereological fallacy in neuroscience.

The reasoning behind “the natural assumption that the mind is the brain” (see the beginning of previous section) is according to Ted Rockwell due to the questionable additional assumption that pragmatic and complete causes are the same. He applies Mill’s distinction between popular idea of a cause expressed in ordinary language which he calls the pragmatic cause, and conditions, which he calls the complete cause. His explanation is as follows: since there are numerous causal connections in the brain when someone thinks or feels, neuroscience naturally assumes that brain activity is the sole cause of mentality. He acknowledges that this may be a useful assumption for neuroscientific practice, but does not prove the metaphysical fact that the mind is, in fact, the brain. This observation does not lead back to some dualistic positions. As the title of Rockwell’s book suggests, his motto is “neither brain nor ghost” [14]. He suggests that scientists are unable to understand the mind without referring to factors outside of neuroscience, such as behaviour or meaning reference. Referring to cognitive science he states: “The fact that all of these disciplines are now recognized as contributing to our understanding of the mind indicates that we can no longer understand the mind by merely understanding the brain. All of these sciences have recently been using information about the brain to varying degrees. But they use it by relating brain activity to behaviour, language, and so forth. ... These sciences study brain activity as one small part of a nexus of relations between brain, body, and world [14; p.54]. According to this view mental states do not supervene only on intrinsic brain states – the supervenience base also includes relations that bind all three key players: brain, body, and world. It would be more appropriate to assume that “the mind emerges from *all* of the various factors in the brain, body, and world that produce mental” [14; p.55].

Different versions of embodied, embedded and situated cognition (e.g. [30-33]) stress that cognition is not an activity of the brain as such, but is instead distributed across the entire interacting situation. The basic ideas were presented in the book *The Embodied Mind* by Varela, Thompson and Rosch [30] where they “introduced the concept of enaction to present and develop a framework that places strong emphasis on the idea that the experienced world is portrayed and determined by mutual interactions between the physiology of the organism, its sensorimotor circuit and the environment” [34]. Only creatures with certain features (e.g. legs, hands, eyes) can possess certain kinds of cognitive capacities and that knowledge emerges through the agent’s bodily engagement with the environment [34]. Similarly, Alva Noë describes his position as follows: “to understand consciousness – the fact that we think and feel and that

a world shows up for us – we need to look at the larger system of which the brain is only one element. Consciousness is not something the brain achieves on its own. Consciousness requires the joint operation of brain, body, and world.” [35]. In this way embodied approach suggests how to overcome one of the major deficiencies of both computational models and neural models, i.e. their inability to provide a plausible treatment of consciousness.

David Chalmers has famously proposed that problems of consciousness can be divided into two groups: the “easy” problems and the “hard” one [36; p.200]. According to him, only the hard problem seems to resist methods of cognitive science because it is “not a problem about the performance of the function” [36; p.202]. It concerns the question “how something feels” or what Thomas Nagel famously expresses as “what is it like to be” [37]. In the words of Joe Levine, there is the so-called “explanatory gap” [38] between causal explanation from the third person perspective and the first person experience of how it feels. The methodological proposal how to bridge this gap, called neurophenomenology, was proposed by Francisco Varela [39] who suggests that “only a balanced and disciplined account of both the external and experiential side of an issue can make us move one step closer to bridging the biological mind – experiential mind gap:” [39; p.343]. Although this is relatively new approach there have been attempts to implement neurophilosophical method in studying various cognitive processes like emotions [40], metacognition [41] and thinking [42].

I agree with those (e.g. [27]) who take methodological reductionism as an essential experimental tool for the natural science (e.g. neuroscience) but stress the inadequacy when its explanatory power is over-extended. Humans are social beings and it is necessary to take into account both human biology and human culture and even religion [43], so new subfields of social and cultural neuroscience have just begun to investigate the influence of cultural backgrounds on cognition. Although this may bring interesting results one has to be careful not to jump to the conclusions too quickly. Nowadays, researchers are becoming more and more aware of the rhetoric around neuroscience and begin to analyse the allure of the “neurotalk” in the broader popular, social and political contexts. The proponents of the so called “critical neuroscience” aim to make contribution from human sciences to neuroscience and as Jan Slaby and Suparna Choudhury suggest “to demonstrate the contingencies of neuroscientific findings and, at the same time, to open up new experimental and interpretive possibilities” [44; p.46]. It is not only one way traffic from neuroscience to higher level sciences but also vice versa.

CONCLUSION

Neuroscientists are mostly occupied with empirical research and are often not paying enough attention to the theoretical and philosophical assumptions. In this article I have tried to show that philosophical reflection has an important role in the interdisciplinary field of cognitive science. On the one hand, particular standpoints on mind body relation significantly influence interpretations of empirical investigations and we have to carefully examine often not clearly stated presuppositions. On the other, we have to think about the possible consequences of neuroscientific results and their potentials to change the view about ourselves. This is perhaps one of the main reasons why there is so much interest for cognitive science, particularly neuroscience, also in general public. As Dennett says, “It is worth remembering that the main reason everybody – really, just about everybody – is fascinated with, and troubled by, work in cognitive science is that it so manifestly promises or threatens to introduce alien substitutes for the everyday terms in which we conduct our moral lives. Will we still have free will? Will we still be conscious, thinking agents who might be held responsible? Does suffering really exist? It is because we truly need good, philosophically sound, scientific answers to these

questions and not to any substitutes, that philosophers have a very substantial job to do in the ongoing progress of cognitive science.” [45; p.235].

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REMARK

¹The article is partly based on material from [8, 10].

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FILOZOFSKI OKVIR RAZUMIJEVANJA NEUROZNA NSTVENIH ISTRAŽIVANJA

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SAŽETAK

Nova sredstva i metode istraživanja mozga omogućile su neuroznanstvenicima ispitivanja rada mozga te postavile neuroznanost kao središnju disciplinu kognitivne znanosti. Glavni cilj ovog rada je propitati teorijske i filozofske pretpostavke na kojima se temelje različita razumijevanja i interpretacije neuroznanstvenih istraživanja radi pokazivanja zašto je potrebno filozofsko razmatranje neuroznanosti. Prvo razmatram različite potencijalne uloge filozofije u kognitivnoj znanosti. Zatim ukratko predstavljam Descartesovo stajalište o problemu uma i tijela kao i pristupe odgovoru na taj problem u okviru kognitivne znanosti. Naposljetku ispitujem različite teorijske okvire neuroznanstvenih istraživanja.

KLJUČNE RIJEČI

filozofija kognitivne znanosti, Descartes, neurofilozofija, redukcija, ugniježđena kognicija