Ontology and Epistemology of Basic Problems of Philosophy Based on Cognitive Neurology

Weifu Liu¹²

ABSTRACT
The rise of contemporary philosophy of cognitive neuroscience has greatly promoted the philosophical study of brain cognitive problems. While systematically reviewing and investigating the theoretical basis and research methods of cognitive neuroscience, it has pointed out the research direction for human to explore the traditional relationship between mind and brain. The development of philosophy of cognitive neuroscience is based on the philosophical cognition of brain cognitive mechanism. Its appearance has provided the most reasonable and sufficient cognitive reason for solving the long-standing dilemma of cognition and revealing the relationship between mind and brain, and it has important philosophical significance and theoretical value. The investigation of philosophical epistemology is not divorced from ontology, and any research on ontology as a mature knowledge system must make a reasonable proof for its own epistemology. By studying the relationship between ontology and epistemology of basic philosophical problems in cognitive neurology, this paper focuses on the criticism of modern epistemology philosophy by philosophy and Marx's revolutionary interpretation of the relationship between ontology and epistemology, and tries to make clear the unique research mode and great value of philosophical epistemology.

Key Words: Cognitive Neurology, Ontology and Epistemology, Basic Problems of Philosophy, Brain signal

Introduction
Cognitive neuroscience is a new academic field of scientific research on the biological basis of cognition. Its purpose is to "clarify the brain mechanism of cognitive activities, that's, how the human brain invokes its components at various levels, including molecules, cells, brain tissue area and the whole brain, to realize various cognitive activities" (Meeusen, 2013). At the end of the 20th century, the research of cognitive neuroscience has made remarkable progress, and the traditional research of psychology has also made the research of cognitive neuroscience, its rapid development and obvious trend make the 21st century recognized as "the century of brain" (Wu and Brenner, 2015). Epistemology, as a sector of philosophy, mainly studies the scope, premise and basis of knowledge and the general reliability required by knowledge, that's, the objectivity of thought. The study of philosophical epistemology is closely related to the study of knowledge theory. Epistemology begins with reflection and is a reflective investigation of the existing philosophical knowledge. This investigation is not to study how to obtain specific knowledge about the object of cognition, but to pay attention to the objectivity and reliability of the acquired specific knowledge (Primiero, 2014). The investigation of philosophical epistemology is not divorced from ontology, and any research on ontology as a mature knowledge system must make reasonable proof for its own epistemology.

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The Concerns of Cognitive Neurophilosophy

The appearance of philosophy of contemporary cognitive neuroscience is obviously encouraged and supported by cognitive neuroscience, which originates from the success of cognitive science and neuroscience. On the basis of the joint action of the two, it is possible for human to explore the brain mechanism of cognitive activity. With the increasing higher demand of intelligent information system for development of human society, many core disciplines of cognitive science, such as cognitive psychology, artificial intelligence and artificial neural networks, realize that the difficulties in their respective research fields need to be solved on a unified brain cognitive platform (Jiang and Lee, 2012). The concerns of philosophy of cognitive neuroscience are shown in Figure 1. In fully absorbing the nutrition of cognitive science, cognitive neuroscience thus born has also formed its own unique problems and theories, and the metaphysical thinking of these theories has built up the main problems of philosophical thinking of contemporary cognitive neuroscience.

Cognitive function orientation

The theory on cognitive function orientation appeared in the research of philosophy of cognitive neuroscience due to the rapid development of neuroimaging technologies in the past 20 years, among which the most representative means and methods are fMRI and PET technologies. But similar to previous researched on brain damage, neuroimaging researches have also met with challenges and questions, among which the most important is that there are many different cell groups in the cerebral cortex that are responsible for and control different bodies. However, researches on both brain damage and neuroimaging imply the assumption that there is a single cortex region and cell structure that controls and is responsible for certain constitutive functions of the organism (Michaud, 2013). But this assumption has been questioned by many neuroscience philosophers, who argue that it is too dependent on a single regional control premise. They think that brain-processing behavior should be a holistic process, with most areas of the brain involved in the cognitive behavior itself, not just in the local areas, and the previous theories on orientation have simply confused function with effect. It should be said that this interpretation is in fact consistent with the principles of theories of complexity and holism, and the complex cognitive process of the brain is not just simple accumulation and combination of various parts, so from this point of view, the theory of orientation does first show the ideas of reductionism and physicalism, but in view of the particularity of brain research, it is really necessary to restore and orient the brain properly in the actual research, so the debate on the theory of cognitive function orientation will exist in the philosophy of cognitive neuroscience for a long time.

Interpretation of consciousness

The issue of consciousness is an important research topic in the philosophy of mind, but recently it has appeared frequently in the philosophy of cognitive neuroscience and the research of brain cognition, especially on the essence of consciousness and the theory of consciousness equivalence. Some philosophers think that the experience of consciousness is subjective and can never be equal to objective scientific understanding. But in this way, consciousness becomes a subjective phenomenon which cannot be explained, and this is obviously out of the scope of scientific discussion, even philosophical discussion. More philosophers claim an equivalence theory, that's, consciousness is equivalent to an interpretable neurophysical attribute, and mental state can be regarded as a special physical state. But the brain processing interpretation of consciousness in this way will leave a "gap of interpretation" between brain processing and conscious experience (Scotland, 2012). In other word, although the problem of heart-object interaction is explained, it is impossible to understand why the processing process of cerebral cortex can cause the problems of consciousness complexity and consciousness experience by equating consciousness with physical state. Therefore, how to view the nature of consciousness? Whether does consciousness originate from the neural mechanism of cellular molecules in the brain? Whether is consciousness only a product of human mind or a kind of synthetic neural feedback? Such problems become important topics in the study of consciousness and receive more and more attention from philosophers and computational neuroscience has been closely linked to artificial intelligence since the 1930s. Researchers, represented by Walter Pitts, have developed the original artificial intelligence neural networks (Hu et al., 2016; Li, 2017; Wang et al., 2016). The research of Pitts and...
Table 1. The comparison of the two kinds of philosophy to the category of three pairs

<table>
<thead>
<tr>
<th>Philosophical category</th>
<th>Concept</th>
<th>Concept</th>
<th>Relationship</th>
<th>Methodological requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epistemology of dialectical materialism</td>
<td>Differences: different characteristics, traits between things</td>
<td>Same: the same characteristics and characters between things</td>
<td>There are the same in the difference and the difference in the same one.</td>
<td>Find the same from the difference</td>
</tr>
<tr>
<td></td>
<td>Individual: a specific transaction or personality of one.</td>
<td>General: all affairs or generalities</td>
<td>General in individual, individual reflection</td>
<td>Rise from individual to general</td>
</tr>
<tr>
<td></td>
<td>Phenomenon: the external, perceptible characteristics, characters of the affairs</td>
<td>Nature: the nature of the internal and ideal thinking of the affairs</td>
<td>The essence of the decision phenomenon, the phenomenon reflects the essence</td>
<td>From phenomenon to essence</td>
</tr>
</tbody>
</table>

McCarroll is based on the assumption that neurons can perform logical calculations that explain cognition and uses neurons to develop logical gates for computation. Thereafter, the cognitive and connectionist paradigms of artificial intelligence have become the objects of scientific philosophers' research and reflection. Recently, the philosophy of cognitive neuroscience has mostly adopted the way of assuming the definition of calculation based on the characterization transformation in the study of neural calculation and characterization. Therefore, most of the problems concerned with calculation and characterization are in fact related to the analysis and treatment of characterization. Although there are differences in talking about issues, the implications of these issues can be divided into three categories: issues about the structure of characterization, issues about the syntax of characterization, and issues about the semantics of characterization.

The Theory of Relation between Ontology and Epistemology

The ontology of dialectical materialism is the theory of the origin of everything based on the concept of matter. It holds that the carrier of everything in the world (or the bearer) is matter. The change of everything is the change of matter. The carrier of human consciousness and spirit is also matter (i.e., human brain) and human conscious and spiritual content is also a reflection of matter and its changes (including laws), as shown in Table 1. It studies how the objective existence turns into the cognition of human, how the cognition is formed and develops, what laws there are, and how the cognition happens to serve the purpose of human, which are the research contents of the epistemology of dialectical materialism (Wu and Brenner, 2015). First of all, the ontology and epistemology of dialectical materialism cannot avoid two basic issues, namely, the function of human consciousness and the function of practice. The ontology of dialectical materialism is based on Lenin's concept of matter, which can be succinctly summarized as the objective existence that represents with human consciousness and does not depend on human consciousness. Secondly, the epistemology of dialectical materialism emphasizes the function of practice, and holds that practice is the source of cognition, practice is the basis of cognition, and practice is the standard of testing the truth of cognition.

Since modern times, with the development of science and technology and the rapid increase of social wealth, the emerging bourgeoisie, as a new representative of the spirit of the times, cannot satisfy the rule of ecclesiastical theology based on natural economy. In exploring the "supreme principle" before modern times, philosophy ignored the inner cognitive ability and directly regarded the existence of an experience or transcendentalism as the "origin" of everything and used it to explain the whole existence of the experience world; the shift of epistemology indicates that the research of philosophy recognized that the research of the "highest
origin” and “highest principle” is under the premise that we have the ability to understand. If we cannot study the ability to understand ourselves, we cannot guarantee the objectivity and rationality of the research of "origin" and "highest principle" (Meretoja, 2014). Therefore, the research of epistemology must be placed at the center of philosophical research, and is the logical premise of ontological research. The shift of epistemology is not only the inevitable reflection of the revolution of the times, but also the necessary result of the internal development of philosophy research. It is of great significance to classify ontology into independent existence and non-independent existence. First, it is the ontological foundation of the relationship between difference and identity, personality and commonness, phenomenon and essence in epistemology, as shown in Figure 2. Second, the research on the dialectical relationship between difference and identity, personality and commonness, phenomenon and essence in epistemology can be transplanted to the relationship between independent existence and non-independent existence.

In the process of studying the natural world, science has gradually formed two methods to complement each other. First of all, the experimental method, which, through the three steps such as collection of materials, experimental observation and inductive results, finds the general rules of the experimental phenomenon; at the same time, the mathematical model plays an important role in the analysis of experimental phenomena. Through the quantitative analysis of the experiment object, the scientist transforms it into mathematical data, and deduces it according to a certain mathematical model. The quantitative conclusion obtained can ensure the validity and reliability of the experiment result. These two complementary research methods are completely opposite in methodology and thinking mode: the experimental method belongs to inductive method in methodology, and its logical thinking is from individual to general. In thinking mode, it holds that the “general rule” obtained from experiment is "abstract" of individual phenomenon, and rational logic exists independently without separating from perceptual experience. Mathematical methods adhere to deductive methods, thinking from the general to individual, holding that the rational

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**Table 2. The duality of ontology and Epistemology**

<table>
<thead>
<tr>
<th>Ontology category</th>
<th>Basic meaning</th>
<th>Epistemological category</th>
</tr>
</thead>
<tbody>
<tr>
<td>View control mode</td>
<td>A generalized pattern of observation, control, level, angle</td>
<td>cognitive style</td>
</tr>
<tr>
<td>Objectivity</td>
<td>Under certain control mode, the invariance under n personal or n view control</td>
<td>Truth</td>
</tr>
<tr>
<td>Objectivity of single leaf</td>
<td>Invariance under the specified mode of control</td>
<td>The truth of the absolute pressure</td>
</tr>
<tr>
<td>Multileaf objectivity</td>
<td>Invariance under multiple control modes</td>
<td>The truth of the relative pressure</td>
</tr>
<tr>
<td>Independent</td>
<td>In addition to their own, are independent of any other things</td>
<td>Personality, pressure difference</td>
</tr>
<tr>
<td>Non independent</td>
<td>Inability to exist in the common, the same of the existence of something</td>
<td>Essence</td>
</tr>
<tr>
<td>Historical existence</td>
<td>The existence of a certain period of time</td>
<td>Forward pushing true reason</td>
</tr>
<tr>
<td>Future existence</td>
<td>An inevitable existence after a certain period of time</td>
<td>Push the truth</td>
</tr>
<tr>
<td>Infinite existence</td>
<td>The existence of endless continuity in space or time</td>
<td>The truth of infinite extrapolation or</td>
</tr>
<tr>
<td>Virtual existence</td>
<td>Real system electronic image system</td>
<td>extrapolation</td>
</tr>
</tbody>
</table>

**Figure 2. The correspondence between ontology and epistemology**
logic exists independently without depending on perceptual experience. The experimental method can enlarge the scope of knowledge effectively, and the mathematical method can guarantee the universality and validity of knowledge content. Figure 3 shows the theories of epistemology and mapping. The two major schools of modern philosophy are respectively the philosophical expressions of these two scientific methods: empiricism agrees with the experimental method, insisting on the truth road which ascends to the general axiom through induction; rationalism adheres to mathematical methods and tries to establish a complete system of truth through deduction from general axioms. The goal of modern philosophy is to establish a system of truth that can expand its content gradually and has universal necessity. The duality of ontology and epistemology category based on the basic problems of philosophy of cognitive neurology is shown in Table 2.

![Figure 3. Epistemology and mapping related theories](image)

![Figure 4. Cerebral nerve curve under different patterns](image)

**The Ontological and Epistemological Significance of Brain Science to the Basic Philosophical Problems**

**Ontological significance of brain science to the basic philosophical problems**

1. Active existence and their relative independence of brain science and spiritual self

   From the ontological point of view, brain science demonstrates the existence and relative independence of the spiritual self from the empirical point of view. At the same time, it shows that the self is the support of all spiritual phenomena and activities. The reason why a person is a person lies in that he has his own spiritual life and spiritual world, and his knowledge, experience, personality and wisdom are his spiritual self. The self is the subject and core of human spiritual life and the manipulator of all rational activities, but before the brain science comes into being, the "spiritual self" and the activeness of consciousness can only be a metaphysical idea and dogma lacking scientific
proof (David, 2014). Modern brain scientists have demonstrated and described the independent existence of the spiritual self by using a great deal of their own research results.

(2) Brain science reveals the complex diversity of spiritual self

A very important defect of traditional epistemology is that it only talks about the object, ignores the subject, and falls into mechanical determinism. Even if it involves the subject, it is mostly biased to the rational cognition of the subject, and does not see the irrational cognition way that exists in a large number of human beings. The research results of modern brain science not only reveal the active existence and relative independence of the spiritual self, but also emphasize the rich diversity and complexity of the spiritual self. The research of the split-brain man fully verifies that the sound spiritual self should be the unity of rationality and irrationality, consciousness and unconsciousness. In science research of brain, we adopted the method of artificial neural network to stimulate the brain to record brain signal data, and by using artificial neural network method to generate three-dimensional information graph, as shown in figure 4. Figure 4 (a) is the artificial stimulation pattern, figure 4 (b) is the automatic cycle stimulus mode, the blue line shows the stimulus threshold, the green areas represent electrical stimulation interval, the red curve indicates the electrical signal data of brain activity. According to the data and three-dimensional curves, we can see that the complex diversity of brain neural activity and the basic effects on cognitive neuroscience.

Epistemological significance of brain science to basic philosophical problems

The reason why a person has rational spirit, consciousness and thinking is, from the physiological basis, because of the integration of the high-level nervous system, which is composed of the brain and various sensory organs around brain, and the high-level functions of the brain. Why and how can one know the outside world? In philosophical language, it is the question of whether or not thinking and existence are identical and how to be identical. This is a major issue of the nature of consciousness, and the achievements of brain science have fully demonstrated that the reason why people can recognize external things is that they have a well-developed brain and a sound spiritual self; but in how to recognize things, it is far from being thoroughly understood. The research of this problem will greatly promote the solution to the identity of thinking and existence. Human consciousness cannot directly grasp the objective existence, and it can only judge and reason the external objects formed in the brain, in other words, analyze and process the representation information. Brain science agrees that there is a multi-level processing system in the brain's nerve center. In addition to humans, the processing of the central nervous system in other higher animals is also multi-level. We can distinguish the levels of the information processing system of the cerebral cortex as shown in Figure 5 below:

![Figure 5. The hierarchical partition map of the information processing system of the cerebral cortex](image-url)
Conclusions
The development of the philosophy of contemporary cognitive neuroscience is promoted and supported by neuroscience as well as influenced by and related with psychology, social science, computational science and other related disciplines. Therefore, both empirical and conceptual researches on cognitive neural phenomena often occur in this field at the same time. On the solid basis of the development of modern natural science, especially brain science, it is no longer a simple problem of philosophical theory, but a major problem of science in terms of the reasons why human beings can understand external things. Brain science has made gratifying achievements in scientifically proving the active existence and complex diversity of the spiritual self, and the development of brain science will finally reveal the working principle of the brain. The investigation of philosophical epistemology is not divorced from ontology and epistemology, and any research on ontology and epistemology as mature knowledge system must also make reasonable proof on cognitive neuroscience.

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