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The Dilemma of Scientific Demarcation and Its Possible Approach

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ABSTRACT

From logicism to historicism, philosophers of science have put forward different standards of scientific demarcation according to their own scientific views. However, these standards encounter problems either in theory or in practice, and then fall into difficulties, thus moving towards relativism. Philosophy of scientific practice has reversed the previous image of science with scientific practice and pointed out the temporality, dynamics and locality of science. Therefore, the scientific boundary under this approach also has the above characteristics. Besides, the scientific boundary constructed by the scientific image is developmental and features temporary stability and effectiveness. Scientific demarcation is not a purely epistemological problem, but also a practical one.

1. Introduction

The problem of scientific demarcation is an evergreen problem in philosophy of science. Karl Popper thinks that the problem of scientific demarcation is related to all important issues of scientific logic. The so-called scientific demarcation is the boundary demarcated to distinguish science from other forms of knowledge.

The demarcation of science contains the question of "what is science". From logicism to historicism of philosophy of science, philosophers of science will inevitably face this issue for every philosopher of science has his own view of science. Starting from the logical positivism in the 19th century, various scientific demarcation standards have been put forward in the history of philosophy of science. It is in the development of scientific demarcation standards that those standards are in a dilemma after exhausting their possibilities.

2. The Summary of Scientific Demarcation Standards and Their Dilemmas

2.1 There Is No Scientific Demarcation Standards

This perspective holds that there is no absolute boundary between science and non-science and pseudoscience, which leads to the road of multi-knowledge theory. Feyerabend holds a scientific view of instrumentalism. He believes that "the separation of science and non-science is not only artificial, but also not conducive to the progress of knowledge[1] ". Feyerabend's demarcation standard was supported by Laudan and Rorty, a neo-pragmatist. Laudan believes that scientific cognition has heterogeneity, "this heterogeneity reminds us that the cognitive form to find the demarcation standard may be invalid[2] ". In addition, Rorty advocated the change from solving the demarcation problem to eliminating the scientific demarcation problem. Fine believes that there is no uniformity in the past, present and future of science. Science is constantly develop-

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ing and enriching its connotation, so there is no unified demarcation standard. He pointed out: "Science has its own history and is indeed rooted in daily thinking. However, throughout the whole history of science, there is no need for any fixed factors, and scientific development (including future planning) does not need uniformity[3] ". In a word, they all advocate the theory of elimination, believing that science cannot be separated from other ideological fields, since there is no obvious boundary between them.

Sociology of Scientific Knowledge (SSK) conducts laboratory and text research on science with sociological methods. Denying the unique nature of science as a social undertaking, it believes that science is a social construction, implying that there is no clear boundary between science and non-science or pseudoscience. SSK's argument does not show that science is completely constructed by society, since it only shows that its research approach pays more attention to social factors in scientific research. However, its research provides a new perspective to understand science and reveals the complexity of scientific demarcation.

2.2 There Are Scientific Demarcation Standards

2.2.1 One-dimensional Demarcation Standard

(1) Absolute Demarcation Standard

The standard advocates a clear and unitary boundary between science and non-science. Logical positivists, represented by Schlick and Carnap, believe that there is a clear and absolute dividing line between science and non-science such as metaphysics. Schlick, the founder of logical positivism, regards the empirical meaning confirmation standard as the demarcation standard between science and non-science. He said that "as the core of the philosophical direction of reasonable and irrefutable 'positivism', for me, the meaning of each proposition depends entirely on the confirmation given and is also determined by that confirmation[4]." However, since the principle of confirmation belongs to inductive logic in essence, there is no inevitable logical channel between the empirical facts of single statement and the scientific theories in the form of strict universal statement. Popper questioned and criticized the confirmation principle of logical positivism. Instead, he advocated a scientific demarcation standard opposite to the principle, namely the standard of falsification. He said: "The refutability or falsification of the theoretical system should be taken as the demarcation standard[5]." However, both the standard of confirmation and the standard of falsification aim to give an absolute standard to expel non-science from science.

(2) Relative Demarcation Standard

With the rise of historicism, the standard of scientific demarcation has changed from absolute to relative. Thomas Kuhn believes that scientific theory is only a "paradigm" recognized and followed by scientists[6]. Therefore, paradigm is the symbol that makes science become science. Kuhn's demarcation standard includes two main characteristics: first, the main basis for demarcation is paradigm. However, it is difficult to clearly distinguish science from metaphysics and non-science because the paradigm itself contains metaphysical beliefs and other social, psychological and value factors. Only in the problem solving activities in the stage of normal science can science and non-science be temporarily distinguished. However, in the "scientific revolution" period, there was no unified demarcation standard. Second, the demarcation between science and non-science mainly depends on the scientific community. All knowledge is the science of a certain scientific community. In each specific historical period, what the scientific community believes is scientific and reasonable is scientific and reasonable, otherwise it is unscientific.

2.2.2 Multi-dimentional Demarcation Standard

The multi-dimentional standard was put forward by Canadian philosophers Thagard and Bunge on the investigation of multiple characteristics of science. They believe that there is still a logical demarcation standard between science and non-science, but this standard should be multi-dimentional. From the perspective of the unity of logic, psychology and history, Thagard put forward a multi-dimentional demarcation standard composed of five elements for the distinction between science and pseudoscience[7]. At the same time, Bunge made an evaluation table [8] with a combination of 12 elements to distinguish science from non-science or pseudoscience. Chen Jian pointed out that those models designed by Thagard and Bunge are both static and analytical. They did not consider the changes of each element, the interrelation among those elements, and the different weighting of each element in discrimination [9].

2.3 Dilemma of Scientific Demarcation

The above part summarizes the scientific demarcation standards from logicism to historicism. It is not difficult to see that the scientific demarcation standards have moved from one-dimensional to multi-dimensional and from absolute to relative. In the discussion of scientific demarcation, there is no set of recognized fixed standards. Philosophers of science inevitably obtain or hold specific scientific demarcation views according to their own scientific

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views. The standard of "confirmation" and "falsification" of logicism are both too narrow and too wide. Based on them, astrology will be included in the field of scientific research. However, Newton's mechanics will be classified as unscientific in the precession of Mercury's perihelion. With obvious relativism tendency, the demarcation standard of historicism finally goes towards extreme scientific demarcation.

However, in the real world, the practice of scientific demarcation has never stopped. For example, in the United States, the century-long debate between creationism and evolution lasted almost throughout the 20th century. The core issue of this debate actually lies in the question of "what is science or what is not science". Another example is to classify Qigong as pseudoscience and criticize it. Scientific demarcation is a realistic activity, so the problem of scientific demarcation cannot be eliminated. Instead, from a new perspective for research, a new scientific demarcation approach that is consistent in theory and meets the requirements of practical practice, should be obtained.

3. Possible Approach to Scientific Demarcation

The issue of scientific demarcation involves the essence of science, so the change of scientific view will directly affect the related issues of scientific demarcation. Emerged in the 1990s and dominated by Joseph Rouse, the philosophy of scientific practice criticized the scientific view of "theoretical superiority" in the traditional philosophy of science. Besides, it advocated that "science should be understood as the field of practical activities[10]" and made an ontological turn of the scientific view of "practical superiority".

Secondly, the scientific demarcation under the concept of practical superiority is based on practical ontology, which unifies the opposite theory and practice of traditional philosophy of science with the concept of scientific practice. At the same time, the scientific demarcation research under this concept will also have the basic characteristics of "practical superiority", namely temporality, dynamics and locality. As a result, scientific demarcation is first of all a practical activity with a historical span and subject to local situations. In the century-long debate between creationism and evolution, the two sides of the competition did not clarify the relationship because of a certain demarcation standard. Instead, in the past 100 years, they adopted various demarcation standards and conducted many extensive social practice discussions [11]. It can be seen that the image of scientific demarcation under the concept of practical superiority is closer to the scientific demarcation activities in the real world. In addition to the theoretical significance, this perspective also has a certain degree of practical significance.

Thirdly, with the deepening understanding of the complexity of science in the academic circle, a increasing number of scholars have been studying the demarcation of science from the perspective of practice. Scientific demarcation is not a purely theoretical issue, but a concrete practical activity, with the focus not on "boundary" but on "distinguishing". In a word, researchers should delve into the specific scientific demarcation practice and analyze the demarcation subjects, objects and standards that play a role in it. From this point of view, it is in line with the development trend of the academic circle to study the scientific demarcation with the concept of practical superiority.

In the research of traditional philosophy of science, logicism regards science as the combination of "context of discovery" and "context of justification" [12]. It also holds that philosophy of science only needs to carry out logical research on "context of justification", while "context of discovery" is handed over to psychology, sociology and other disciplines for research. At the same time, historicism breaks the absolute distinction between the two contexts. Based on the investigation of the history of science, it points out another appearance of science in the real development process of science, adding social and psychological images to the image of science, and blurring the boundary between the two contexts. However, this effort of historicism does not give a unified explanation in theory and finally moves towards relativism. Neither the scientific demarcation of logicism nor the elimination of the boundary is reasonable, because the scientific boundary problem is not only a theoretical one, but also a practical one. In practical occasions such as science education, government decision-making, clinical medicine and funding for scientific research, relevant groups need to answer "what is science". The boundaries of science are outlined in these local situations for they are the results of these local constructions. Rouse's philosophy of scientific practice gives a new view of science and unifies the dichotomy contexts from the perspective of practice. Such a scientific view will not, like logicism, only consider the scientific achievements produced by the black box of science, thus defending the ideal science. Nor will it face the dilemma of relativism like historicism.

Philosophy of scientific practice provides us with a new scientific image, believing that science is not only a representation of knowledge, but also a practical interactive mode. Besides, it is not a representation system, but a practical intervention. Scientific concepts and theories can only be understood as part of broader social and material practice [13]. The purpose of the demarcation of science is to distinguish science from non-science and pseudosci-

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ence. The investigation and explanation of the label of science from the perspective of philosophy of scientific practice will undoubtedly provide a possible research approach for the current dilemma of the demarcation of science.

In today's image of science, efficiency and objectivity are its obvious labels. Historicism in traditional philosophy of science and extreme relativism in the later period have weakened these labels of science that have gone further and further away from the image of science in the real world. Under the new scientific view, Rouse gave a new explanation. He believes that the effectiveness and objectivity of science can only be situational and local. The universalism view of science, which has no situation and is above the development of society and history, can only be an illusion. The image of science is also changing with the changes of situations, since from the perspective of practice, the image of science has become that its connotation and significance can be obtained in specific situations.This can also explain why logicism's attempt to draw a boundary for the demarcation of science failed in the end, for science is already in the process of historical development and it is futile to draw an absolute boundary for what is developing. Furthermore, this can also explain why the later period of historicism moved towards eliminating the problem of scientific demarcation, for they realized the change of scientific image in the history of science and pointed out the meaninglessness of this problem.

However, based on the new perspective of science, namely the perspective of "practical superiority", we can discuss the demarcation of science, which benefits from the nature of the concept of "practice". Rouse summed up his concept of practice into ten arguments [14], which can be mainly summarized as the temporality, dynamics and locality of practice. In this way, taking scientific experiments as the starting point of science, Rouse explained the high efficiency and objectivity of science. "Scientists avoid the disordered complexity that extremely limits the natural manifestation of phenomena by constructing artificially simplified "world". There are only limited objects with known sources and strictly limited interaction modes in these microscopic worlds.[15]" The efficiency of science comes from controllable variables in the laboratory. Unlike in the real world, various accidental factors continue to participate, greatly reducing the efficiency of experiment completion. If it is in a laboratory intentionally manufactured and all kinds of variables are within the controllable range, the efficiency of scientific research will undoubtedly be greatly improved. From the genetic perspective, scientific practice is local. It is not a common practice of the whole world at a certain moment. As to how such local practice could be transformed into an objective universal practice, Rouse pointed out: "The knowledge generated in the laboratory is expanded beyond the laboratory, which is realized not by summarizing the universal laws, but by applying the practice in the local situation to the new local situation [16]." That is to say, the objective universality of science is not the generalization of super-practical theories, but the standardization of local knowledge. When the whole world uses the same experimental practice standard, science will show an objective image.

To sum up, it can be concluded that in the philosophy of scientific practice: (1) Science is based on scientific practice; (2) Science is local knowledge; (3) The objectivity of science originates from the standardization of laboratory practice. It can be concluded from this that if a knowledge system is considered scientific, it should at least be possible to be operated in the laboratory. If both knowledge systems are operable, we cannot tell which one is scientific or non-scientific. Instead, the two knowledge systems should be placed on the practice platform equally with a fair dialogue. Then, their efficiency determines which one should be standardized.

4. Conclusion

Scientific demarcation is not only a logical problem, but also a practical one. The scientific boundary is the result of the construction in the local situation, not the simple theoretical analysis. In the actual practice of scientific demarcation, different groups would resort to various resources to defend their claims for their own purposes. For example, in the century-long debate between creationism and evolution, not only scientists and theologians, but also philosophers, sociologists, capitalists, government personnel and the public participated in the demarcation. Although the understanding and interpretation of science have plasticity, the plasticity of interpretation does not mean that any interpretation is allowed. Relevant groups discuss the scientific boundary issue in a specific situation. When a consensus is reached, the scientific boundary is constructed. Although this boundary has only temporary stability, it is undoubtedly effective for the relevant groups in this situation.

Setting a static absolute standard for science does not conform to the practical activities of scientific demarcation in the real world. Universal norms are not innate, but precipitated in practice. Therefore, on the basis of practice, the unity of standardization and description can be achieved. In this way, the dynamic and phased boundary image of scientific demarcation is outlined, which not only meets the theoretical unity, but also conforms to the practical process of scientific demarcation in the real world.

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References

[1] Paul Fayabend. Against Method [M]. Trans. Zhou Lvzhong. Shanghai: Shanghai Translation Publishing House, 1992.

[2] Larry Laudan. The Demise of the Demarcation Problem [J]. Trans.Le Aiguo. Ziran Kexue Zhexue Wenti.1988(3): 20.

[3] Zhu Fengqing.Scientific Demarcation: From One-dimensional Standards to Multi-dimensional standards [J]. Studies in Science of Science, 2008, 26 (S1): 37-40.

[4] Hong Qian. Selected Works on Modern Western Bourgeois Philosophy [M]. Beijing: Commercial Press, 1964: 283.

[5] Karl Popper.Conjectures and Refutations [M]. Shanghai: Shanghai Translation Publishing House, 2001: 361.

[6] Thomas S. Kuhn. The Structure of Scientific Revolutions [M]. Trans. Jin Wulun and Hu Xinhe. Beijing: Peking University Press, 2003: 9-29.

[7] Wang Wei. How Do We Reject Pseudoscience?—Scientific Demarcation Standards from Absolute to Multi-dimensional [J]. Studies in Science of Science, 2004 (02): 118-123.

[8] Mario Bunge. What is False Science [J]. Scientific Research. 1987 (4): 46.

[9] Chen Jian. Multi-dimensional Standards for Scientific Demarcation [J]. Journal of Dialectics of Nature. 1996, 18 (03).

[10] Joseph Rouse. Knowledge and Power [M]. Trans. Sheng Xiaoming et al. Beijing: Peking University Press. 2004: Ⅴ.

[11] Zhang Zengyi. The Century-long Debate between Creationism and Evolution [M]. Guangzhou: Sun Yat-sen University Press, 2006: 205-226.

[12] Reichenbach H. Experience and Prediction: an Analysis of the Foundations and Structure of Knowledge [M]. Chicago: The University of Chicago Press,1938.

[13] Wu Tong et al. Returning to Scientific Practice [M]. Beijing: Tsinghua University Press, September 2010.

[14] Joseph Rouse. Engaging Science [M]. Trans. Dai Jianping. Suzhou: Suzhou University Press, 2010: 123-124.

[15] Joseph Rouse. Knowledge and Power [M]. Trans. Sheng Xiaoming et al. Beijing: Peking University Press, 2004: 106.

[16] Joseph Rouse. Knowledge and Power [M]. Trans. Sheng Xiaoming et al. Beijing: Peking University Press, 2004: 130.

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