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Research article

Hermeneutical Analysis of Scientific Experiments

Guolin Wu (✉) and Mian Hu (✉)

South China University of Technology, 381 Wushan Rd, Tianhe District, Guangzhou, China

ssglwu@scut.edu.cn; hmary77@163.com

Abstract

Scientific experiment provides important practical content of contemporary science, and the practical understanding of scientific experiment constitutes an important topic of contemporary philosophy of science. The practical understanding of scientific experiment calls for the clarification of the connotation and significance of scientific experiment from the perspective of hermeneutics. And the hermeneutics of scientific experiment requires both practical and textual hermeneutic. The scientific author's intention and the nature of the experimental object determine the hermeneutic meaning of the scientific experiment. The experimenter is both the author and the reader of the experimental text, and the experimenter realizes the identity of the author's original intention and the meaning of the text. Experimental text is not a fixed text, but a text completed in the process of practice. Experimental text has a dual nature which is the unity of scientific text and technical text. The hermeneutical field of scientific experiment is the fusion of theoretical and experimental horizons, which is embodied in the fusion of experimenter's horizon and laboratory context horizons, as well as the fusion of scientific and technical horizons. The hermeneutics of scientific experiments requires both scientific and technical hermeneutics, which is a unification of scientific and technical hermeneutics. The textual hermeneutics of scientific experiments offers some new ways of understanding universal knowledge and experiments having multiple lives of their own.

Keywords: Scientific experiment; Textual hermeneutics; Scientific text; Technical text; Horizon

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Научная статья

Герменевтический анализ научных экспериментов

Гуолинь Ву (✉) и Миан Ху (✉)

Южно-китайский технологический университет, 381 Вушан Роуд, район Тяньхэ, Гуанчжоу, Китай
ssglwu@scut.edu.cn; hmary77@163.com

Аннотация

Научный эксперимент составляет важное практическое содержание современной науки, а практическое осмысление научного эксперимента составляет важную тему современной философии науки. Практическое понимание научного эксперимента требует уточнения смысла и значения научного эксперимента с точки зрения герменевтики. А герменевтика научного эксперимента требует как практической, так и текстовой герменевтики. Замысел ученого и характер объекта эксперимента определяют герменевтический смысл научного эксперимента. Экспериментатор является одновременно автором и читателем экспериментального текста, и экспериментатор осознает тождество первоначального замысла автора и смысла текста. Экспериментальный текст – это не застывший текст, а текст, дорабатываемый в процессе практики. Экспериментальный текст имеет двойственную природу, которая представляет собой единство научного текста и технического текста. Герменевтическое поле научного эксперимента представляет собой слияние теоретического и экспериментального горизонтов, что воплощается в слиянии горизонта экспериментатора и горизонтов лабораторного контекста, а также слияние научного и технического горизонтов. Герменевтика научных экспериментов требует как научной, так и технической герменевтики, которая представляет собой объединение обоих. Текстуальная герменевтика научных экспериментов предлагает несколько новых способов понимания универсального знания и экспериментов, имеющих множество собственных жизней.

Ключевые слова: Научный эксперимент; текстовая герменевтика; Научный текст; Технический текст; Горизонт

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INTRODUCTION

The current hermeneutics of scientific experiments focuses on scientific practice, which is an important element of the philosophy of scientific practice. There are three approaches to the philosophy of scientific practice, including the cognitive science and the hermeneutic approach and the new experimentalism (Wu, 2005). In the hermeneutic approach, scientific experimentation as a scientific practice is local and existential (Rouse, 1987). The new experimentalism focuses on the experiment itself, and philosophically reflects on scientific experimentation and laboratory activities. Some Chinese scholars have already addressed the hermeneutics of scientific experiments in their elaboration of scientific hermeneutics. Xiaohan Huang (2002) believes that the hermeneutics of scientific experiments is to explain the status and role of scientific experiments in scientific understanding from the perspective of scientific experiments, as well as a series of problems of philosophy of science and scientific hermeneutics in scientific experiments. In a sense, hermeneutics of scientific experiments is actually a hermeneutic approach to understanding and interpreting scientific experiments, especially laboratory activities. Yanfei Shi (1991) focuses on the role and significance of scientific experimental apparatus, pointing out that in scientific experiments, scientific apparatus plays a decisive role in the discovery of new things. Other scholars like Tong Wu, Zhiping Cao, etc. have discussed Joseph Rouse's practical hermeneutics and Heelan's scientific hermeneutics which address the hermeneutic issues related to scientific experiments. In addition, technical hermeneutics also discusses the hermeneutic relationship between technology and the world involved in scientific experimental apparatus. From all of this, we can summarize that the main content of the hermeneutics of scientific experiments is practical hermeneutics which includes the hermeneutics of experimental apparatus.

The hermeneutics of scientific experiments is not only practical hermeneutics, however, but also a textual hermeneutics. At present, the hermeneutics of scientific experiments is rarely carried out from a textual perspective, and the textual hermeneutics of science and technology will be a new research path (Wu, 2021). In this regard, this paper will conduct a hermeneutic analysis of scientific experiments from a textual perspective, specifically examining the author, meaning, and characteristics of scientific experimental texts, exploring the duality of scientific experimental texts, and revealing the characteristics of the scientific experimental field of vision.

A BRIEF EXAMINATION OF THE HERMENEUTICS OF SCIENTIFIC EXPERIMENTS

In traditional philosophy of science, scientific experiments are often associated with observation which provide observable phenomena, so as to give corroboration or falsification of scientific hypotheses or theories. The status of scientific experiments is beneath that of theories, and they are not subject of hermeneutics, but are used as hermeneutic tools to explain and illustrate scientific theories. The traditional philosophy of science is actually a philosophy of science of theoretical superiority or a primacy of theory, however, the experiment itself has its own value and significance. Scientific



experiments are not just tools but should be the subject of scientific hermeneutics. As the philosophy of science takes a practical turn, the scientific experiment as a practical activity requires hermeneutic analysis as well. The hermeneutics of scientific experiment in the philosophy of scientific practice focuses on two aspects: the hermeneutic approach to the philosophy of scientific practice, and the philosophy of scientific experiment and laboratory research of the new experimentalism. The former is mainly represented by Joseph Rouse (1987). Rouse clearly defines the relationship between scientific experiments and theories, experiments and laboratory characteristics, and the understanding and interpretation of experimental results, forming a preliminary hermeneutics of scientific experiments. The latter is mainly represented by Hacking (1983), Latour and Woolgar (1979), Knorr-Cetina (1981). The philosophy of scientific experiments seeks to provide an explanatory account of scientific experiments, and the laboratory researches focus on the laboratory itself as well as the social construction of facts in the laboratory.

Joseph Rouse critiques the “theoretical primacy” of traditional philosophy of science and establishes the primacy of scientific experimentation. In *Knowledge and Power*, Rouse points out that scientific research takes place in the practical context rather than in the context of systematic theories, which means practice has priority over theory, namely precedence. The “theoretical priority” takes experiments as the possible exemplars of the theory or theories. In Rouse's view, this understanding of the experiment undoubtedly ignores the priority of experiment as practice. Experiments must be understood in the light of their practical nature. The practical nature of experiments is mainly reflected in laboratory practice. Rouse points out that laboratory practice is characterized by isolation, intervention, and tracking of the microcosm being constructed. The laboratory constructs a microcosm of phenomena that is isolated from other influences, and through the intervention of the researcher the characteristics of this microcosm of phenomena can be observed and traced, leading to an understanding and explanation of the object of study. Laboratory practice is able to isolate, intervene and trace because of the control of the experiment in the research. The researcher is a subject in a certain cultural context and power relations, which determines that laboratory research is necessarily concerned with power relations and social contexts. Rouse absorbed Foucault's idea of “knowledge is power” and introduced power relations into laboratory research, which involves the relational context in which the laboratory is located. The power relations in the laboratory constitute the relational context of laboratory hermeneutics, and it has been pointed out that “in the hermeneutical sense, the relational context, in fact, is more important than the thing itself; it is only in the relational context that we hold the interpretation, that we can explain” (Wu, 2019). A relational context can be analogous to a hermeneutic horizon.

Hacking (1983) proposes that “experiments have a life of their own” (p. 150) and “experiments have multiple lives of their own” (p. 165). Some experiments and observations are prior to theories, that is, experiments and observations can exist independently of theories. Also, experiments are diverse, there are not only experiments for testing theories and exploratory experiments, but also experimental practices centered on technological inventions. Hacking takes the history of thermodynamics as an example



to further point out that experiments can precede theories, and experiments not only have their own lives, but experiments themselves are constantly developed and improved in practice, gaining multiple lives of their own in practice.

Latour and Woolgar, referring to the laboratory as a site for the construction of scientific facts, point out that the laboratory, including the experimental equipment, constitutes the material environment of the experiment, and the material environment is the basis on which experimental phenomena are produced. So the laboratory practice is the process of constructing scientific facts.

Knorr-Cetina provides a detailed analysis of the laboratory, revealing four distinctive features of laboratory research that point to the contextuality of knowledge production, namely the contextuality of science. Because the scientific facts are constructed by scientists in the laboratory, the construction of knowledge in the laboratory is highly contextual. With the publication of scientific results in the form of papers, scientific knowledge undergoes a de-contextualization in which contextuality and serendipity are fixed. This is similar to the local knowledge emphasized by Rouse. Rouse's local knowledge is essentially the unification of the local and the universal, while Knorr-Cetina's contextualization is actually the unification of contextualization and de-contextualization. Both these unifications are achieved in the process of scientific experimental practice.

These above hermeneutics of scientific experiments almost all focus on the practice of scientific experiments, and the hermeneutics of scientific experiments is the same process as the practice of science. Obviously, both fail to see the textual character of scientific experiments, and fail to pay attention to the fact that theory and practice have the same fundamental position in scientific experiments. For scientific experiments, theory and practice are equally important. Firstly, the scientific experiment itself is a practical activity based on a certain theory, whether it is the design of the experiment, the operation of the experiment or the collation of the experimental results, all of which are inseparably intertwined with theory that provides guidance. Secondly, the purpose of scientific experiments, whether they are hypothesis-testing or exploratory scientific experiments, is ultimately to get a theoretical hypothesis. Finally, from the point of view of the experimenters, the experimenters have their own unique theoretical background, which plays an important role in scientific experiments. There is theory throughout the practice of scientific experiments, and practice is the entire process of specific experiments. Theory and practice are intertwined and interact in scientific experiments. It is obvious that the hermeneutics of scientific experiments only from the perspective of "practical superiority" is not sufficient.

Especially in contemporary quantum science, theory is even further ahead compared to practice, and without cutting-edge theoretical breakthroughs it is impossible to conduct experimental probes. Scientific experiments are the unity of theory and practice, both of which have a fundamental position. The hermeneutics of scientific experiments should be the unity of theoretical hermeneutics and practical hermeneutics. Theoretical hermeneutics of scientific experiments is mainly manifested as textual hermeneutics. The hermeneutic of scientific experiments is not only practical hermeneutics but also requires textual hermeneutics. The textuality of contemporary



scientific experiments is remarkable. For example, the tools and instruments involved in scientific experiments are technical texts, the experimental phenomena recorded during scientific experiments are scientific texts, and even the whole scientific laboratory can be used as a laboratory text in a broad sense, and the operational texts have been fixed when the experimental plan is made. The textual character of scientific experiments requires textual hermeneutics of scientific experiments, and textual hermeneutic involves the author and reader of scientific experimental texts, the nature of the text and the interpretive field of view, all three of which are highlighted in the process of scientific experimental practice.

AUTHOR AND READER OF SCIENTIFIC EXPERIMENTS

The experimenter is both the author and the reader. The author and the reader are two important factors in the hermeneutics of a text: the author forms the text and assigns meaning to it, and the reader understands and interprets a text. The text formed by the experimenter is restricted by the experimental objects and scientific theories. The experimental text should record the phenomena of the experimental objects as truthfully as possible. Generally, the author and the reader of a text are separated, and the reader's hermeneutics of the text requires the reader and the author to achieve a fusion of horizons in order to understand the author's original intention and the meaning of the text. The universality and objectivity of the text's meaning is ensured by achieving intersubjectivity between the author and the reader. Unlike ordinary texts, the author of a scientific experiment text is the experimenter, but there are two readers of an experimental text: the experimenter and other non-experimentalist readers (e.g., scientists, the public, etc.). The experimenter creates the scientific experiment and also needs to understand and interpret the scientific experiment as well as the results of the experiment, and the experimenter is both the author and the reader of the experimental text.

On the side of the author, the experimenter's intention, theoretical background, knowledge of the experimental object, knowledge of the experimental tool, and possible preconceptions of the experimental results constitute the construction of the scientific experiment. Among them, the experimenter's intention is given to the whole experiment in the form of meaning, which determines the object of the experiment, the design direction of the experiment and the control of the experimental process. The experimenter's theoretical background, knowledge of the experimental object and the experimental tools together constitute the theoretical content of the experimenter's pre-understanding, which determines the specific design of the experiment and the operational process. The experimenter's possible preconceptions about the results of the experiment determine the way in which the results are experienced and the way in which the experimenter processes the results. The experimenter is in the lifeworld, so the construction of the experiment is also in the lifeworld. The living world is the ontological foundation of Heelan's scientific hermeneutics, and the living world is actually the real world in which we live. It is the world in which people are actually given and which is experienced through perception.



On the side of the reader, the experimenter is the first and direct reader of the experimental text. The experimental text is constantly revealed to the experimenter. Therefore, what the experimenter explores in the process of reading the experimental text is the consistency of the meaning of the experimental text with the author's original intention. While the author's original intention is fixed and self-explanatory to the experimenter, for the general reader's hermeneutics of the experimental text its meaning is constantly constructed until the meaning of the experimental text agrees with the author's original intention to some extent or generates fundamental contradictions, and the reader obtains the final meaning of the text and also realizes the author's intention. Another important feature of the experimenter as a reader is that the fusion of the reader's and the author's horizons is no longer needed to establish a connection between the reader and the author, nor is it necessary to ensure the universality and objectivity of textual understanding through intersubjectivity. The reader only needs to fuse the horizon of the experimental text with the reader's former horizon of understanding to grasp the understanding and interpretation of the experimental text.

As the unity of the author and the reader, the construction of the experimental text and the hermeneutics of the experimental text are two aspects of the same practical process, which also determines that the experimental text is constantly yet-to-be-completed text.

The author's intention and the nature of the experimental object determine the meaning of the experiment. Hermeneutics seeks meaning and understanding. In scientific experiments, the meaning of the experiment is expressed in the experimenter's hermeneutics of certain scientific phenomena or instrument "readings," which are determined by the experimenter's intended purpose and the nature of the experimental object itself.

The experimenter's intended purpose is the author's intent, which is "the intention to obtain something." In scientific experiments, the author's intention is influenced by the author's theoretical background. The author's theoretical structure, the theoretical content that may be involved in the experiment, and the author's knowledge of the possible nature of the experimental object, constitute the author's theoretical background in the form of a pre-understanding which provides the theoretical basis for the author's intention. The author's intention is not entirely a subjective intention or want, but contains an intentional pointing, which is determined by the author's intentional structure. The coupling of intentional structure with the nature of things themselves produces an objective field of view that characterizes the real nature or real structure of things (Cao & Yan, 2011). The objective field of view in scientific experiments is the field of understanding the results of scientific experiments, which is constituted of the author's purpose and the nature of the experimental object. Take the famous delayed choice experiment as an example, the intention of the author of the delayed choice experiment is to test the particle and fluctuation of photons. The original scientific perception is that photons have both particle and fluctuation, physicist Wheeler designed the delayed choice experiment based on this. The author's intention and the nature of the experimental object determine the experimental operation and the hermeneutics of the experimental results, and thus the



meaning of the experiment. In a broader sense, the process of the author's intentional activity is the process of giving meaning to the experiment.

The nature of the experimental object composes part of the author's pre-understanding in the form of a theory, which in turn influences the author's intention. On the other hand, the nature of the experimental object has to be constantly revealed or tested in the experimental practice, which directly determines the appearance of the experimental results. In the actual experimental process, especially in some quantitative experiments, the experimental object itself will be disturbed by many factors, and thus the experimental results need to be screened. A typical example is the measurement of acceleration through the dot timer, when the car with a strip of paper to accelerate the form of motion, the strip of paper will appear a series of points, the distribution of these points have an approximate law, there are also individual points that do not conform to a certain law distribution, which is determined by the nature of the object, because the car in this experiment is idealized as a mass, while the actual car is not.

The nature of the experimental object does not determine the appearance of the experimental results alone, but is influenced by the author's intention and is related to the experimental means taken by the author. The author's intention is similarly influenced by the nature of the experimental object. Both are important components of the scientific experiment, and together they constitute and determine the meaning of the scientific experiment.

THE CHARACTERISTICS OF SCIENTIFIC EXPERIMENTAL TEXTS

Experimental texts are dualistic, meaning that they are both scientific and technical texts.

There are three types of scientific texts. (1) The text “written” in mathematical language, which is different from the pure mathematical text and still contains the description of natural language. (2) The description and description of the experiment and its object, which is an empirical description of observable phenomena. (3) The text in between, which is the first two types of texts logically connected to form a fully structured text. Most scientific texts are of the third type, that is, texts that consist of formal systems as well as empirical facts (Cao, 2005). Scientific experimental texts belong to this category. (1) The design of scientific experiments is guided by certain theories that contain formal systems and empirical facts, determine the construction of experiments, and presuppose the possible empirical facts and the related mathematical forms obtained. (2) Laboratory operations are similar to the hands-on state of tools that create a practical connection between the experimenter and the experimental object, and the laboratory is the place where empirical facts and formal systems are produced. (3) The experimental results are revealed mainly by instrument readings or instrument displays, which as a “symbol” can express mathematical forms as well as empirical phenomena. The scientific experimental text is a holistic hermeneutic text that includes the laboratory, the experimenter, the experimental object and the experimental results, and is a unity of formal system and empirical facts.



In contemporary quantum science, scientific experimental texts are not only scientific texts but also technical texts, which are reflected in two aspects. (1) Microscopic objects are to be revealed through technology. In laboratory research, the laboratory is considered as the place where the microcosm is constructed and the micro-objects are constructed and thus observed and known in the laboratory. Micro-objects are entered into the experimental practice as scientific texts, which are transformed into technical texts to the experimenter through the observation instruments. (2) The experimental results should be displayed with technical artifacts as the carrier. Scientific experiments are the process of observation, observation results are often displayed through instrument “readings,” reading the results is similar to reading text, and the instrument is a typical technical artifact. Thus, the instrumental display should be the unity of the technical and the scientific text.

Scientific experimental text unifies scientific text and technical text, and both are unified in the process of experimental practice. To understand and explain scientific experiment, both texts and their characteristics must be understood and explained at the same time.

Experimental text is a text completed in practice. The general text, as an object of interpretation, has certainty. The content, structure and even meaning of the text are fixed by the author in the process of text construction. The reader reading the text to obtain the meaning of the text from the determined content as well as the structure, or to understand the original intention of the author. A scientific experimental text is a special kind of text. It is not fixed but to be completed and needs to be realized in practice.

Firstly, the experimental text is a holistic text with a certain structural level including the laboratory text, the text of the experimental object, the text of the experimental operation and the text of the experimental result. In experiments, the first thing that is formed and fixed is the object text. Once the object is determined, the object text is also determined. But when the object is quantum matter, the object text is formed in connection with the experimental operation. The experimental operation text includes instrumentation, i.e. technical artifact texts, and knowledge of instrumentation, i.e. technical knowledge texts (Wu & Liu, 2021). When the experimental instrument and experimental operation are determined, the experimental object is revealed, and the experimental operation text is fixed. The text of experimental results is the text of the experimental object revealed under the experimental operation, which is formed gradually as the experiment progresses. In addition, the experimenter's processing of the experimental result text, such as the formation of the experimental report or experimental paper, can also be included in the category of experimental text. Actually, the laboratory text is a broader text, which includes the constructed laboratory as well as the text formed in the laboratory, and in a sense, the contemporary scientific experimental text can be directly understood as the laboratory text.

Secondly, the experiment is a practical process to be completed, so the experimental text is a text to be completed. The experimental object should be constantly revealed in the experimental operation, and thus the experimental text should also be formed in practice. The experimental operation acts directly on the experimental object, and the text of the experimental object is constantly formed and presented in the way the instrument



appears. The experimental result text is influenced by the experimental object as well as the experimental operation, and the experimental result text is both the text formed in practice and the result of practice. The laboratory, as the main place where the experiment takes place, is generally a place isolated from the environment, but the laboratory is a dynamic process of practice, the basic laboratory text is formed with the completion of the construction of the laboratory, and the complete laboratory text is constantly completed with the experiment. The whole laboratory text is a text to be completed. We can describe it figuratively as an object waiting to be made visible by experimental operations so that we can gain concrete knowledge about the object.

Finally, the duality of the experimental text is revealed in practice and unified in practice. The duality of experimental texts reveals that scientific experimentation is a process in which science and technology are united, and that the text of the experimental object, the text of the experimental operation, the text of the experimental result, and the text of the laboratory are both scientific and technical texts. Thus, scientific and technical texts are also texts formed in practice, and scientific practice reveals the duality of experimental texts. At the same time, the scientific and technical texts are linked by instrumental observations, and the instrumental observations in scientific experiments are not only loaded with theory, but also with technology, and the scientific and technical texts are unified in experimental practice.

CHARACTERISTICS OF THE TEXTUAL HERMENEUTICS OF SCIENTIFIC EXPERIMENTS

Scientific experiments are the fusion of theoretical and practical horizons. The characteristics of scientific experimental texts reveal that scientific experiments are both the unity of science and technology, and the unity of theory and practice. Both the textual and practical hermeneutics of scientific experiments, and the scientific hermeneutics as well as the technical hermeneutics of scientific experiments, take place in a certain field of horizon. The understanding, interpretation, and application that hermeneutics seeks is achieved within a certain field of horizon and requires a fusion. In general, the fusion of horizons means the fusion of the reader's and the author's horizon. The hermeneutics of scientific experiments also requires the fusion of horizons, but in this case the fusion of horizons takes on a new character.

The theoretical horizon of scientific experiments includes the pre-understanding horizon of the experimenter, the theory of the experimental object, the theory of the experimental apparatus, and the theoretical horizon involved in the whole laboratory situation, etc. The latter theoretical horizon is implicitly included in the pre-understanding horizon of the experimenter in the process of scientific experiments. The practical horizon of science experiments refers to the entire laboratory construction and the experimental operation. Science experiments emphasize both theoretical guidance and practical operation, and both theory and practice run through the whole process of science experiments. Theoretical and practical horizons are inextricably linked with each other. Scientific experiments should first realize the fusion of theoretical and practical horizons. Only the fusion of theoretical and practical horizons, scientific experiments can be



implemented in accordance with the experimenter's intention, to achieve the experimenter's intention. The theoretical horizon of scientific experiments implies the universality of scientific experiments, and the practical horizon implies the locality of scientific experiments. The fusion of the two horizons shows the unity of the universal and local characteristics of scientific experiments.

The hermeneutics of scientific experiments is the unity of scientific hermeneutics and technical hermeneutics. Experimental text is a text done in the process of experimental practice, which is the unity of scientific text and technical text in practice. The horizon characteristics of scientific experimental text determines that scientific experiment needs both scientific hermeneutics and technical hermeneutics.

Scientific hermeneutics takes scientific text or natural text as the object, and is a hermeneutic reflection on natural science. Heelan (1997) builds the ontological foundation of scientific hermeneutics on the lifeworld, pointing out that “our task is to give modern science an ontological and epistemological foundation in the contemporary living world.” The lifeworld constitutes the context in which experiments are formed and interpreted. The lifeworld is first of all perceptual, that is, the lifeworld can be experienced by perception, and perception is practical, and thus the lifeworld is practical. According to this understanding, scientific experiments construct their objects through the experimenter's perceptual practices and establish empirical connections between the objects and the lifeworld, while giving meaning and purpose to the lifeworld.

From the perspective of scientific hermeneutics, the hermeneutics of scientific experiments also involves pre-understandings, scientific texts, the fusion of horizons, and the meaning and truth. However, it differs from general scientific interpretation in that: (1) The hermeneutics of scientific experiments involves a wider range of pre-understandings and horizons, including the different pre-understandings and different horizons of the experimenter as author and reader, as well as the pre-understandings and horizons of the general reader, who may also acquire new pre-understandings and horizons of understanding by conducting repeated experiments. (2) Experimental texts are not fixed texts in the same way as general scientific texts, but as texts generated in practice. According to Heelan (1989), experimental objects are prepared, formed, and revealed in the laboratory. This process is also the process of formation of experimental texts, and the hermeneutics of experimental texts should take into account both the hermeneutics of scientific texts that have already been formed and the hermeneutics of texts that are in the process of formation. (3) The problem of meaning and truth is an important topic in hermeneutics. The meaning of general scientific hermeneutics contains three elements: the scientific text as the carrier of meaning, the object to which the meaning refers, and the reader of the meaning (Cao, 2005). The meaning carrier and the object to which the meaning refers are the experiment itself, and the reader of the meaning is the experimenter himself in the first place, from which it can be inferred that the interpretative meaning of a scientific experiment is, to a certain extent, fixed, i.e., the intention of the experimenter. The truth in hermeneutics is a kind of practical truth, in the hermeneutics of scientific experiments this practical truth is expressed as the unity of scientific truth and technical truth. Among them, scientific truth is the conformity of empirical facts to nature in experiments, and technical truth is an indication of the validity



and reliability of the technical operation in an experiment that is consistent with the experimenter's purpose. Scientific hermeneutics is a dynamic practical process, especially the hermeneutics of scientific experiments, in which the reader, the hermeneutical text, the hermeneutics meaning and the hermeneutics truth are all constructed and formed in practice.

Technical hermeneutics takes technical texts as the object of study, and studies the understanding and interpretation of the meaning of technical texts. In scientific experiments, technical texts are mainly carried by instruments and their operation, and most of the existing technical hermeneutics studies are related to instruments. Don Ihde (1990) understands hermeneutics as “a particular kind of interpretive activity in a technical context. This activity requires a particular mode of behavior and perception that is similar to the process of reading.” The direct perception obtained by the experimenter with the help of the apparatus is actually the text of the apparatus, and the meaning of this text can be known only with the help of hermeneutics. Thus, the technical text in scientific experiments is mainly carried by the apparatus and its operation. The experimental apparatus as a technical element constructs the connection between the experimenter and the experimental object, and at the same time establishes the connection between the experimenter and the world. Thus, there are three types of technical hermeneutic relations in scientific experiments as follows:

- (1) Experimenter → (experimental apparatus – experimental object)
- (2) The particular experimenter → (this laboratory – the living world)
- (3) Reader → (experimental text – (experimenter – world))

Scientific experiments are both theoretically loaded and technically loaded, therefore, the hermeneutics of scientific experiments should have both scientific and technical hermeneutics. Scientific experiments exemplify both “theoretical superiority” and “practical superiority,” therefore scientific experiments should have both textual and practical hermeneutics. Scientific experiments are a kind of scientific practice since both the formation of the experimental text and the hermeneutics of the experimental text are practices. Therefore, the hermeneutics of scientific experiments is the unity of scientific and technical hermeneutics, textual and practical hermeneutics in practice.

A BRIEF RESPONSE OF TEXTUAL HERMENEUTICS TO PRACTICAL HERMENEUTICS

The practical hermeneutics of scientific experiments reveals the local character of scientific experiments. The knowledge of locality in the philosophy of scientific practice is built on the local characteristics of scientific experiments. The key to understanding the concept of locality is to understand contextuality, and practice itself is characterized by contextuality. Different scientific experimental practices are based on different experimental contexts and thus have locality. Scientific experiments not only need practical hermeneutics, but also need textual hermeneutics. The textual hermeneutics of scientific experiments reveals that scientific experiments are the fusion of theoretical and practical horizons. The theoretical horizon is a universal horizon, while the practical horizon is a local horizon, thus scientific experiments are the fusion of universality and



locality, the unity of universal knowledge and local knowledge. The textual hermeneutics of scientific experiments does not agree that scientific knowledge is only local, but goes beyond local knowledge to seek universal knowledge.

The textual hermeneutics of scientific experiments shows that experiments have multiple lives of their own. The text of a scientific experiment is a text to be completed in practice, and each practice or each stage of practice gives a life to the scientific experiment. Whether it is an exploratory experiment ahead of the theory or a theory-oriented test experiment, once the experiment or even the laboratory is formed, it gains its own life as an independent body, the experiment has its own growth and development cycle, the development of the experiment is the extension of the experimental life, and the experimental practice is the process of dealing with the world. The textual hermeneutics of scientific experiments also shows that scientific experiments have a complex meaning structure, i.e., different experimenters and scientists will have different understandings, and the choice and support of scientific theories are not unique. The textual hermeneutics of scientific experiments provides additional interpretive vectors for the practical interpretation of scientific experiments.

REFERENCES

- Cao, Z. & Yan, M. (2011). Heelan dē Kēxué Quánshìxué shízàilùn [Heelan's Hermeneutical Realism of Science], *Shehui kexue*, 8, 107-115.
- Cao, Z. (2005). *Lijiě yǔ Kēxūe Jiěshì: Jiěshìxué Shìyě Zhōngdě Kēxué Jiěshì Yánjiū* [Understanding and Scientific Explanation]. Social Sciences Academic Press.
- Hacking, I. (1983). *Representing and Intervening: Introductory Topics in the Philosophy of Natural Science*. Cambridge University Press.
- Heelan, P. (1989). After Experiment: Realism and Research. *American Philosophical Quarterly*, 26(4), 297-308.
- Heelan, P. (1997). Why a Hermeneutical Philosophy of the Natural Sciences? *Continental Philosophy Review*, 30(3), 271–298. <https://doi.org/10.1023/A:1004203402228>
- Huang, X. (2002). *Zìrán zhīshū jiědǔ: Kēxué Quánshìxué* [Through the Book of Nature: Scientific Hermeneutics]. Shanghai Translation Publishing.
- Ihde, D. (1990). *Technology and the Lifeworld: from Garden to Earth*. Indiana University Press.
- Knorr-Cetina, K. D. (1981). *The Manufacture of Knowledge: An essay on the constructive and contextual nature of science*. Pergamon Press.
- Latour, B. & Woolgar, S. (1979). *Laboratory Life: The Social Construction of Scientific Facts*. Princeton University Press.
- Rouse, J. (1987). *Knowledge and Power, Toward a Political Philosophy of Science*. Cornell University Press.
- Shi, Y. (1991). *Kēxué Jiěshìxué* [Hermeneutics of Science]. Hunan People's Publishing.
- Wu, G. & Liu, X. (2021). Jìshù Réngōngwù dē Quánshìxué Fēnxī [Analysis on Hermeneutics of Technical Artifacts]. *Xúeshù Yánjiū*, 2, 22-29.



- Wu, G. (2021). Lùn Jìshù Quánshìxué de Wénběn Zhuǎnxiàng [On the Text Turn of Hermeneutics of Technology]. *Social Science Edition of Shanxi Normal University Journal*, 48(5), 48-57.
- Wu, T. (2005). Zǒuxiàng Shíjiàn Yōuwèi de Kēxué Zhéxué—Kēxué Shíjiàn Zhéxué Fāzhǎn Shùpíng [Toward the Practice-dominated Philosophy of Science—Review of the Developing Philosophy of Scientific Practice]. *Zhéxué Yánjiū*, 5, 86-93.
- Wu, T. (2019). Shíjiàn yǔ Quǎnshì: Cóng Kēxué Shíjiàn zhéxué de shìjiào kàn [Practice and Interpretation: From the View of Philosophy of Scientific Practice]. *Zìrán biànzhèngfǎ Tōngxùn*, 41(9), 1-6.
https://caod.oriprobe.com/articles/57031039/Practice_and_Interpretation_From_the_View_of_Phil.htm

СВЕДЕНИЯ ОБ АВТОРАХ / THE AUTHORS

Гоулинь Ву, ssglwu@scut.edu.cn

Миан Ху, hmary77@163.com

Guolin Wu, ssglwu@scut.edu.cn

Mian Hu, hmary77@163.com

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