
Hermeneutic Problems in the Philosophy of Science

Keiichi NOÉ

Tohoku University

1. Acceptance of Hermeneutics in the Anglo-American Philosophy

Philosophy in the 20th century can be classified into two major streams. One is continental philosophy in German- and French-speaking areas and the other is analytical philosophy in English-speaking areas. The former is built on phenomenology and hermeneutics and the latter is divided into two different schools that focus on logical analysis and ordinary-language analysis. Generally, continental philosophy tends to be idealistic and analytical philosophy is oriented to empiricism. These two forms of philosophy are considered to constitute a stark contrast and have had little interaction. In 1958, an international symposium on analytical philosophy was held in Royaumont, France. At the conference, phenomenologist Maurice Merleau-Ponty (1908–1961) and analytical philosopher Gilbert Ryle (1900–1976) had a discussion, and Japanese philosopher Hideko Ishiguro, who listened to the discussion, published the following report.

*The dialogue between Merleau-Ponty and Gilbert Ryle, which I listened to on the outskirts of Paris ten years ago, turned out to show total differences despite some unexpected similarities in their interest, view and conclusion. The interaction was as eccentric and funny as Harold Pinter's plays, and it was completely unproductive. Observing their discussion brought home to me the importance of having common elements in the methodology of argument.*¹

At that time, the dialogue between the two philosophers was compared to a scene in an avant-garde play. Twenty years later, the foundations for productive dialogue between continental philosophy and analytical philosophy were established by way of hermeneutics. The foundations were pioneered by the paper “Interpretation and the Science of Man,” which was published in 1971 by Canadian political philosopher Charles Taylor. At the beginning of the paper, he argues, “The view that it is, that there is an unavoidably ‘hermeneutical’ component in the science of man, goes back to Dilthey.”² Taylor continues that the awareness of the question has recently come again to the fore, for example, in the works of Gadamer and Ricoeur and in the writings of Habermas.

Hermeneutics was presented by Dilthey as a form of methodology of understanding to highlight the uniqueness and originality of *Geisteswissenschaft* (science of human spirit). Hermeneutics sharply contrasts with nomothetic natural science methodology, which aims at explanation. Taylor

1 Hideko Ishiguro. 1970. “The Trend of British Philosophical Circles,” Monthly Report of *Philosophy*, No. 2, Iwanami Publisher, p. 3–4.

2 Charles Taylor. 1985. *Philosophy and the Human Sciences*, *Philosophical Papers* 2, Cambridge U.P., p. 15.

reinterpreted Dilthey's concept of *Geisteswissenschaft* (originally, the German translation of John Stuart Mill's "moral sciences") as *science of man* or *human sciences* that would be more friendly to English-speaking areas in an effort to introduce hermeneutics in the context of analytical philosophy. In fact, Taylor defined human beings as "self-interpreting animals." He considered that human sciences study human behaviors and identified this as "a text or a text-analogue"³ that needs interpreting. As described below, this perspective brought about a "hermeneutic turn" inside the philosophy of science and analytical philosophy. The following section examines the historical role that hermeneutics played in the philosophy of science in the latter half of the 20th century with a focus on Thomas Kuhn's theory of paradigms.

2. The Rise of Kuhn's Theory of Paradigms

In *The Assayer*, Galileo Galilei (1564–1642), who played a major role in developing modern science, explains the essence of science as follows, using a famous metaphor.

"Philosophy is written in this grand book, namely the universe, which stands continually open to our gaze.... This book is written in the language of mathematics, and its characters are triangles, circles, and other geometric figures without which it is humanly impossible to understand a single word of it."⁴

Of course, the word *philosophy* in this context means natural philosophy, which is now called natural science. Galileo compared a God-created universe to a grand book written in the language of mathematics. Ernst Robert Curtius (1886–1956) argues that the metaphorical expression *liber naturae* originated from the Latin medieval times and was used as the same meaning as *scientia creaturarum*.⁵ The book's author is God. It was considered that philosophers (scientists) should play a central role in clearly interpreting the intentions behind God's creation of the universe by using a dictionary called mathematics. The results of their effort were represented in the form of natural laws expressed by mathematical formula. This self-perception of science was quite consistent and could be seen, for example, in the observations of Isaac Newton, who regarded space as *sensorium Dei*. That is, it was widely believed that the objective of reading a book called space or nature was to faithfully and correctly interpret the author's intention.

This scientific mode of thinking was taken over by a secularized philosophy of science in the first half of the 20th century in a different form. One such example is the Vienna circle's insistence of logical positivism. This school of thinkers considered that through trial and error scientific theories would continuously progress as if they were climbing up the steps toward the one and only goal of finding the scientific truths lying within nature. Scientific truth is the secularized representation of God's intention as the author of a grand book. In addition, these thinkers argued that there should be one and only way to find the meaning of a book called nature, that is, one and only scientific way. This is nothing less than the ideal of unified science, which became a major landmark of the Vienna circle, along with the elimination of metaphysics. That is, this means that science has neither conflicts nor difference like natural science and moral science and that all forms of science, including human and social sciences, should be unified by natural science methodology. At the center of the idea was the hypothetico-deductive method based on verification

³ *Ibid.*

⁴ Galileo Galilei. 2009. *The Assayer*, Trans. Keiji Yamada and Yutaka Tani, Chuokoron-Shinsha, Inc., p.57.

⁵ E. R. Curtius. 1948. *Europäische Literatur und lateinisches Mittelalter* (Trans. Shinichi Minamioji, Zenya Nakamura and Michio Kishimoto, Misuzu Shobo Publisher, p. 464, 1971.)

and falsification, which constituted the methodology of physics that was at the very front of science at that time. Therefore, there was no room for paying attention to hermeneutics, or the methodology of human science, from the beginning. This is because it was considered that many fields of *Geisteswissenschaft* should eventually be reduced to physics.

In response to this situation, various criticisms against logical positivism-based scientific thinking came to the fore in the 1960s. It was the advent of the so-called new philosophy of science. *The Structure of Scientific Revolutions*, one of Thomas Kuhn's major books, played a leading role in promoting the new stream of philosophy. Next year (2012) will mark the 50th anniversary of the book's publication in 1962. In the book, Kuhn attempted to reconsider the historical development of scientific theories from the perspective of "intermittent change," shifting focus from the logical positivism-based approach of linear "continuous progress." In explaining his theoretical conversion in the history of science, Kuhn introduced the key concept of paradigm. He defined the term *paradigm* as "universally recognized scientific achievements that for a time provide model problems and solutions to a community of practitioners."⁶

The paradigm works as the tacit rules on which scientists who support and promote research activities called normal science should act. If recurrences of anomalies that cannot adequately be handled by an existing paradigm damage the public credit for the paradigm itself and lead to a crisis situation, you will come to the stage of scientific revolutions where multiple paradigms compete. Under such circumstances, disputes will continue for a certain period of time and a paradigm-shift will occur over time. Going through this process, scientific theories will progress to the next stage of normal science. In this stage, discontinuity rather than continuity will be highlighted. This is a significant account of why Kuhn's scientific point of view represents intermittent change.

3. Thomas Kuhn and the role of "Hermeneutic Basis"

Thomas Kuhn was originally a physicist. On one occasion, however, he was asked to lecture on the History of Science at Harvard University. In preparation for the class, he read Aristotle's *Physica*, but he found the book quite impossible to understand. He thought that the book, although written by a great philosopher, was filled with outright errors and stupid descriptions. However, one day, Kuhn realized that the term *kinesis* (motion, movement) in the context of Aristotle's book meant qualitative change in general, different from the current meaning of positional change of substances. This accidental discovery enabled him to understand the whole content of the book. In accordance with this reasoning, plants' growth was described as a form of *kinesis* in Aristotle's book. To Kuhn, this felt like a hermeneutic experience related to interpreting a past text. To borrow Gadamer's words, while interpreting the text, the American physicist was experiencing a kind of fusion of horizons within effective-historical consciousness. Subsequently, this experience led Kuhn to changing his scientific way of thinking. Looking back on his experiencing a change in attitude toward science, Kuhn describes the crucial part of the experience as follows, using the term *hermeneutics*.

"What I as a physicist had to discover for myself, most historians learn by example in the course of professional training. Consciously or not, they are all practitioners of hermeneutic method. In my case, however, the discovery of hermeneutics did more than make history seem

6 Thomas Kuhn. 1970. *The Structure of Scientific Revolutions*, Second Edition, the University of Chicago Press, p. viii. (Trans. Shigeru Nakayama, Misuzu Shobo Publisher, p. v, 1971.)

consequential. Its most immediate and decisive effects were instead on my view of science.”⁷

Kuhn’s last description of the decisive effects of hermeneutic discovery on his view of science in the above quotation refers to his shift of focus from continuous progress to intermittent change in approaching the historical development of science. Viewed from a different perspective, this can lead to approaching nature and space using the metaphor of text, not book. In the metaphor of book, the author’s intention was a privileged focus of attention, and it was an inevitable conclusion that getting to the essence of the author’s intention would be the one and only right destination. In contrast, the concept of text was relatively independent from the author’s authority. The meanings of text could be considered to be clarified through the interactions with the reader’s effort to interpret it. That is, text comprehension would not converge on the one and only truth in a particular direction but would be open to increasing the possibility of diverse truths under certain conditions. In this sense, text was not limited to the author’s exclusive use but was openly shared by the wide variety of readers.

The basis of this thinking could be observed in Kuhn’s concept of paradigm. It could be analogically expressed that paradigms played a central part as the interpretation lattice or frame of reference for approaching a text called nature. Furthermore, Kuhn’s theory of paradigms had hermeneutic structures in many ways. For example, he describes the relationship between scientific facts and theory as follows: “Scientific fact and theory are not categorically separable, except perhaps within a single tradition of normal-scientific practice.”⁸ That is, it is logical that a theoretical construction must be based on facts or data, but a theoretical category is also projected in the factual perception itself. We could express this as information that runs back and forth between facts and theory in both directions, not in one direction from facts to theory, on the actual fields of scientific research. This had already been noted by Norwood Russell Hanson (1924–1967) as the *theory-leadenness* of observation, which meant that a kind of *hermeneutic circle* was established between facts and theory, just like the chicken-or-the-egg question. This kind of circular structure had long been considered a phenomenon unique to human sciences, but Kuhn and Hanson discovered that such structure was also true of natural science.

In addition, the concept of paradigm itself involves the implications of research tradition during a particular period of time, and it is easy to see that in scientific research, it plays a significant role in promoting what is called *pre-understanding* and *prejudice* in the context of hermeneutics. In interpreting the text of nature, what is necessary is not prejudice-free, pure observation but paradigm-based pre-understanding. Without prejudice based on research tradition, scientists could not even set up their experimental equipment.

Kuhn argued that among the different paradigms established as the result of a paradigm-shift, even if the same theoretical concept was used (for example, the concept of mass in Newtonian mechanics and Einstein’s theory of relativity), communication and mutual understanding would become highly difficult because the meaning of the concept had changed. He called the difficulty *incommensurability*. This point of view received harsh criticism because of its likelihood of causing “paradigm autism” and evoked intense debates in the philosophy of science throughout the 1970s. However, it was what could precisely be called incommensurability that Kuhn confronted when he was approaching the text of Aristotle’s *Physica*. It had not been noticed in the field of natural

7 Thomas Kuhn. 1977. *The Essential Tension*, the University of Chicago Press, p. xiii. (Trans. Seiya Abiko and Masahiro Sano, Misuzu Shobo Publisher, p. xi, 1987.)

8 Thomas Kuhn. 1970. *The Structure of Scientific Revolutions*, Second Edition, the University of Chicago Press, p. 7. (Trans. Shigeru Nakayama, Misuzu Shobo Publisher, p. 9, 1971.)

science, but it was a hermeneutic situation observed typically in cross-cultural and cross-language understanding.

In his speech entitled “the Natural and Human Sciences” in 1989, Kuhn attempted to explain the essence of paradigms by introducing the concept of *hermeneutic basis*. At the beginning of the speech, he mentioned Charles Taylor’s paper “Interpretation and the Science of Man” and highly evaluated its significance. At the same time, however, Kuhn argued against Taylor’s stance on highlighting the sharp contrast between natural and human sciences. Taylor proclaimed that human science focused on human actions, and those human actions constituted a text written by characters called behaviors. To understand the meanings of those behaviors, hermeneutic interpretation to identify their intentions was essential. Alternatively, natural phenomena were in a fundamentally different league from intentional human actions. Natural phenomena involved no intentional representations and demanded no interpretation. With regard to Taylor’s dichotomous model, Kuhn declared, “That viewpoint seems to me mistaken.”⁹ The reason for his counterargument, noting that the celestial taxonomies in natural science had varied with ages and cultures, the American historian of science explains as follows:

“My argument has so far been that the natural sciences of any period are grounded in a set of concepts that the current generation of practitioners inherit from their immediate predecessors. That set of concepts is a historical product, embedded in the culture to which current practitioners are initiated by training, and it is accessible to nonmembers only through the hermeneutic techniques by which historian and anthropologists come to understand other mode of thought. Sometimes I have spoken of it as the hermeneutic basis for the science of a particular period, and you may note that it bears a considerable resemblance to one of the senses of what I once called a paradigm.”¹⁰

As the quoted text suggests, when Kuhn elaborated on the concept of paradigm in terms of the hermeneutic basis he seemed to note Dilthey’s concept of *objektiver Geist* (objective spirit) and Gadamer’s concept of prejudice. This is because the concept of *objektiver Geist* means the common foundation for interpretation and understanding, which is shared by people in a particular age and society. This is exactly the role that a paradigm plays in scientific communities. This reasoning enables you to give positive interpretations to the puzzling state (aporia) of incommensurability, which arises from a change of hermeneutic basis that is, a paradigm shift, from hermeneutic perspectives.

Fundamentally, the term *incommensurability* meant the absence of common criteria between two particular systems. In accordance with this original definition, in Greek mathematics, with a focus on the fact that there are no common units between one side of a square and its diagonal line, that is, between rational and irrational numbers, the two systems were termed incommensurable. Using this reasoning, the incommensurability of multiple paradigms means that no neutral languages exist to translate the paradigms or no neutral criteria exist for evaluating them. That is, you cannot access universal and impartial rationality that underpins multiple paradigms independently from historical contexts. However, this caused Kuhn’s theory of paradigms to be criticized by scientific philosophers in the line of logical positivism under the stigma of relativism or irrationalism.

However, incommensurability does not directly mean unintelligibility and untranslatability. If that were the case, science history descriptions of paradigm-shifts would be impossible. As

9 Thomas Kuhn. 2000. *The Road since Structure*, The University of Chicago Press, p. 218. (Trans. Chikara Sasaki, Misuzu Shobo Publisher, p. 282, 2008.)

10 *Ibid.*, p. 221. (*Ibid.*, p. 286.)

Takashi Maruyama pointed out, when there is incommensurability among multiple paradigms, it is obviously based on the assumption that those paradigms exist in the same league of science.¹¹ The assumption that the paradigms share the same basis of science suggests that incommensurability leaves some room for partial communication among multiple paradigms, not total discontinuity among the paradigms. This is the same as the dialogue between Christianity and Buddhism and is based on the premise that both are on an equal footing with religion. It is also the case with cross-cultural communication, in which whatever different lifestyles people have, they belong to the same group, that is, human culture.

This reasoning shows that incommensurability does not mean communication discontinuity. It is significant to reconsider incommensurability as a positive catalyst for integrating the horizons among different paradigms with a focus on the fact that rational and irrational numbers not sharing a common scale eventually led to inventing the new concept of real number. That is, encountering a different paradigm and becoming well aware of the fact that your paradigm does not share the same scale and criteria as that can lead to looking at your paradigm in a relative manner, making a change in your attitude toward the paradigm and developing such new perception. Therefore, incommensurability is nothing less than a hermeneutic experience. It does not have a negative effect on scientific development. Instead, incommensurability can play a positive role in refining perception of existing paradigms and in preparing yourself for new paradigms.

In the late stages of his life, Kuhn claimed that he was positioned in the historical philosophy of science. As noted above, in the sense that scientific activities themselves were incorporated into the historical tradition of paradigms and, therefore, needed interpreting, this suggested the possibility of heading to the direction of the hermeneutic philosophy of science.

4. The Possibility of Hermeneutic Reason

For the last subject of this study, this section concludes the above discussion by comparing scientific reason with hermeneutic reason.¹² What Thomas Kuhn found in the concept of hermeneutic basis was that you could open up the path to understand discourses in the line of different paradigms only by being part of one particular paradigm, that is, one particular research tradition. This means that to understand other people is also to understand yourself and that both are inseparable. If a scientist who belongs in a given paradigm tries to understand a different paradigm, that person will gain a perspective to approach his or her own paradigm in a relative manner with the result of becoming aware that his or her paradigm is not the only and absolute one. That is, to understand other people will inevitably lead to understanding yourself.

This can also be expressed that you usually see and think about things in a particular historical context and you cannot gain the transcendent viewpoint of neutrally comparing many different paradigms by breaking away from the historical context. Yasutomo Morigiwa clearly pointed to that in a different context. Criticizing the subject-object model in the theory of knowledge, he argues that you cannot command a bird's-eye or God's view of the matching between the proposition and the reality from a transcendent perspective. He goes on to say as follows:

“You are unable to do such a thing, precisely because you are not a bird in this imaginary situation or a god. You are not outside the world, but inside it. Your vision is limited to that of

11 Takashi Maruyama. 1993. “Hermeneutic Reason,” *Contemporary Thought: Phenomenological Movement*, Vol. 6, Iwanami Publisher, p. 302.

12 The term *hermeneutic reason* is based on Maruyama's paper mentioned in the above Note 11.

knowing subject.”¹³

What Kuhn intended to express by the concept of incommensurability was that you were neither a bird nor a god and that you were not outside history but inside it. Therefore, to borrow Heidegger’s well-known words of “being-in-the-world,” you are nothing other than a “being-in-the-history.” Precisely because you are nothing other than a being-in-the-history, you cannot understand foreign cultures from a historically transcendent, transparent perspective. This can typically be seen in the work of translation. As you have probably experienced before, you cannot avoid modifying Japanese vocabulary according to foreign language structures and restructuring grammatical construction in the process of translation. However, such translation processes will provide you with revelations about Japanese possibilities that you have not been conscious of before, which results in your acquiring new expressions. This can be termed a hermeneutic experience in which understanding others lead to better understanding yourself.

For example, when I introduced Morigiwa’s quotes in the above context, I deliberately translated the second-person plural expression “You” in English into the first-person plural expression “We” in Japanese. This is because the second-person plural expression “You” is seldom used in Japanese academic papers; even if it is used, the expression gives an unnatural, translation-sounding impression. However, the process of translation made me aware of the differences between Japanese and English personal pronouns and the different cultural backgrounds behind the two languages. That is, the cross-cultural filter of translation jolted the self-evidently clear nature of the familiar language and culture that I am constantly immersed in and made me explicitly conscious of it. The ability exercised in the process of translation is nothing other than what should be called *hermeneutic reason*, not simply scientific reason.

I would also like to note Quine’s theory of *radical translation*. American logician and philosopher Willard Van Orman Quine (1908–2000) conducted a thought experiment of a situation in which a field linguist chooses a totally unknown language whose vocabulary and grammar are quite different from those of his native language and tries to translate the language into English on the basis of only behavioristic information. As a result of the experiment, Quine reached the surprising conclusion that there were many different conceivable patterns of the manual comprised of a dictionary and grammar for translation and the patterns would not be limited to just one particular one. This was called the *indeterminacy of translation*. However, as something supplementary to such indeterminacy, he presented the maxim that assertions startlingly false on the face of them are likely to turn on hidden difference of language.¹⁴ In his paper “Radical Interpretation” in 1973, American philosopher Donald Davidson (1917–2003) argued, “The principle of charity counsels us quite generally to prefer theories of interpretation that minimize disagreement.”¹⁵ That is, this is the principle that you should choose theories of interpretation that minimize disagreement or maximize agreement in interpreting an unknown language. Hermeneutic reason will work particularly effectively when you practice such interpretation.

It is hardly imaginable that Quine and Davidson made reference to Dilthey and Gadamer, but what should be called hermeneutic thought can be clearly observed here. The philosophy of science and analytical philosophy in English-speaking areas, including Charles Taylor and Thomas Kuhn,

13 Morigiwa Yasutomo. 2011. “Interpretation by Another Name: The Function of *Rechtsfindung* in the Modern State,” Yasutomo Morigiwa et al. (eds.) *Interpretation of Law in the Age of Enlightenment*, Springer, p. 128f.

14 W. V. Quine. 1960. *Word and Object*, the M.I.T. Press, p. 59. (Trans. Akira Oide and Satoshi Miyadate, Keiso Shobo Publisher, p. 93, 1894.)

15 D. Davidson. 1984. *Inquiries into Truth and Interpretation*, Clarendon Press, p. xvii (Trans. Kazuyuki Nomoto et al., Keiso Shobo Publisher, p. x, 1991.)

developed their self-understanding through an encounter with hermeneutics in German-speaking areas. The experience helped expand and refine the concept of rationality concerning science more than anything else. In the logical positivism-based philosophy of science, scientific rationality boiled down to logical algorithm. That is, the truthfulness and objectivity of scientific theories are guaranteed by a set of logical reasoning methods and demonstrative methods, such as one-dimensional verification and falsification.

In the meantime, the new stream of philosophy of science, which was pioneered by Kuhn, made it clear that the rationality that works in theoretical change and choice could not simply be reduced to logical processes. Scientists in the age of the scientific revolution are engaged in a modification and change of paradigms by putting the multi-faceted potentials of reason, as well as logical analytical ability, to their utmost use. This suggests the function of thought that can be called *situation logic* by analogy with *situation ethics* in the sense that it means a judgment in a particular context of history. Kuhn clarified this in accordance with specific cases in the history of science. In this sense, Kuhn used hermeneutics as the conceptual tool to approach the possibility of reason that works in historical dynamism, that is, hermeneutic reason by introducing historical perspectives in the field of the philosophy of science.

Of course, hermeneutic reason and scientific reason do not contradict each other. As long as the philosophy of science focuses on science as the subject of observation, not literature and art, it is inseparable from logics and rationality. However, the philosophy of science also needs to utilize the multi-faceted potentials of reason. Therefore, both of those factors should function in a complementary or reciprocal manner. The stream of hermeneutics that originated from German-speaking areas was presented as the method of social and human sciences (*Geisteswissenschaften*) by Dilthey and was further refined as philosophical hermeneutics by Gadamer. It is widely known that hermeneutics produced many remarkable achievements in the fields of literature and art. Alternatively, unexpectedly, the hermeneutics that was introduced into Anglo-American philosophy showed the possibility of working as the methodology of natural science as well. This trend of hermeneutic turnaround is now underway among the contemporary philosophers of science called the post-Kuhn generation and the post-post-Kuhn generation. In the future, you can expect the possibility of a bridge being built between continental philosophy and analytical philosophy, which have not had mutual exchanges for so long, and the possibility of eventually the horizons between them being integrated (*fusion of horizons*).