



Quantum Hermeneutics and Its Essential Questions

Guolin Wu (✉)

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

ssglwu@scut.edu.cn

Abstract

This essay for the inaugural issue of *Technology and Language* presents a research program for Quantum Hermeneutics which serves as a theory for the epistemology, methodology and ontology of quantum texts and their understanding. As opposed to the texts of classical science and in this regard more like the texts of the humanities, quantum texts require interpretation. But as opposed to the humanities, quantum text concerns trans-empirical experience of a trans-empirical world – the quantum text is written as scientific technology prompts quantum objects to reveal themselves as a readable text that requires interpretation.

Keywords: Hermeneutics; Quantum mechanics; Quantum technology; Quantum text; Trans-empiricality

Аннотация

Данное эссе для первого выпуска журнала “Технологии в инфосфере” (“*Technology and Language*”) представляет исследовательскую программу по квантовой герменевтике, которая служит теорией эпистемологии, методологии и онтологии квантовых текстов и их понимания. В отличие от текстов классической науки и в этом отношении сходно с текстам гуманитарных наук, квантовые тексты требуют интерпретации. Но в отличие от гуманитарных наук, квантовый текст касается трансэмпирического опыта трансэмпирического мира – квантовый текст написан, поскольку научная технология побуждает квантовые объекты проявлять себя как читаемый текст, требующий интерпретации.



This work is licensed under a [Creative Commons Attribution-NonCommercial 4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/)



Quantum Hermeneutics and Its Essential Questions

Contemporary quantum science and technology, represented by the theory of quantum gravity (including superstring theory, loop quantum gravity, etc.), contemporary quantum technology (including quantum information theory) and so on, has given rise to the second quantum revolution (Georgescu, 2014). However, how to understand contemporary quantum science and technology is still debated. It is imperative to understand and interpret contemporary quantum science and technology, hence, a quantum hermeneutics must be established. Quantum hermeneutics has become an academic concern, and the National Social Science Fund of China has set up the VIP project “Contemporary Quantum Hermeneutics Studies.”

Hermeneutics has developed through classical hermeneutics, universal hermeneutics, Dasein hermeneutics and then into contemporary hermeneutics. But contemporary hermeneutics still cannot interpret the quantum world, contemporary quantum theory and contemporary quantum technology. For this reason, hermeneutics itself needs to be creatively developed into quantum hermeneutics. Scientific hermeneutics as proposed by Husserl, Heidegger, etc., and the hermeneutics of quantum mechanics by Patrick Heelan (1995) and others can be considered early forms of quantum hermeneutics. Quantum hermeneutics is the study of the ontology, epistemology and methodology of quantum text and the understanding of it.

ESSENTIAL MEANING OF “TRANS-EMPIRICAL”

The quantum world is different from the classic world; the theory that describes the former is different from that for the latter. I have been recommending the concept “trans-empirical” to characterize the universality of quantum theory, and to explore issues regarding the interpretation of quantum theory. “Trans-empirical” is not the same as Kant’s transcendental and transcendent. Kant’s transcendental (*transzendental*) refers to what is prior to experience (*a priori*) and makes experience possible; if the concept is beyond experience, he uses the word “*transzendent*.” The essential meaning of “trans-empirical” is that it is beyond experience, that it is not detached from experience and that it can also make experience possible (Wu, 2019). The concept “trans-empirical” includes partial meanings of *transzendental* but also remains connected to experience, i.e. it captures the relationship between quantum theory (especially superstring theory and quantum field theory) and experience. “Trans-empirical” can qualify reality and method as well, leading to “trans-empirical reality” and “trans-empirical method,” respectively. Thus, the fundamental meanings of “trans-empirical” include the following:

- (1) It goes beyond old experience and forms new experience.
- (2) Theory *guides* experience. It is generally believed that experience is theory-laden, while in contemporary quantum theory a theoretical guidance exists at first, but then new experience will be formed.
- (3) It is not detached from experience, but also makes experience possible. Superstring theory goes beyond the experience of classical physics and that of quantum mechanics, pointing to possible new experience.



QUANTUM TEXT AND ITS CHARACTERISTICS

Hermeneutics is the theory of understanding of texts and technology of understanding. Related research of quantum theory will produce quantum texts, and the hermeneutics for exploring quantum texts will form quantum hermeneutics. Quantum hermeneutics is the theory of the epistemology, methodology and ontology of quantum texts and the comprehension of them.

I propose that quantum text should be narrowly defined, only the texts of quantum theory and quantum experience should be regarded. The quantum world and the world of quantum technology are two different worlds. The advantage of that division is that it relates to the original state of things. The text of quantum theory is the knowledge system of quantum theory, consisting of quantum concepts, quantum laws, quantum theorems, etc. The text of quantum experience and technology is a description of the observation and measurement experience of quantum phenomena and processes.

Quantum text is written not only in the classical form but it also uses mathematical language that reflects properties of quantum theory. Its sense and reference reveal the quantum world intrinsically. The quantum world is one of the original sources of quantum text. Quantum technology is the product of the interaction between quantum world and quantum text. The meaning of quantum text is divided into a fundamental sense, reference meaning and contextual meaning (Wu & Ye, 2018). Quantum text has the following characteristics:

(1) Uncertainty. The uncertainty of the quantum world is rooted in Heisenberg's Uncertainty Relation. Although there are corresponding mathematical equations to describe the world of superstring theory, the quantum text of superstring has the character of uncertainty due to the lack of direct empirical evidence.

(2) Certainty. The mathematical expression of Heisenberg's Uncertainty Relation is determinate. The wave function ψ completely describes the state of the quantum system and it is determined by the Schrödinger wave equation. The wave equation is determined and the revolution of the wave function ψ in the sense of the quantum world is causal and deterministic. The new Heisenberg Uncertainty Relation shows that the physical quantity which could not be determined simultaneously before can now be determined simultaneously under the influence of quantum information technology such as quantum entanglement (Berta et al., 2010). The uncertainty of quantum world is relative, not absolute (Wu, 2016).

(3) Autonomy. The autonomy of quantum text reflects the independence of the meaning of quantum text: The meaning of a quantum text exists independently, does not depend on its author, nor on those who want to understand it.

(4) Objectivity. Knowledge of the quantum world is objective independent of human consciousness. It is a description of different perspectives on the quantum world. The whole constitutes a complete quantum world. The objectivity of quantum text is rooted in the objective quantum world.

(5) Trans-empiricity. Quantum text describes a trans-empirical quantum world. Quantum theory is trans-empirical, therefore, the quantum texts must have the character of trans-empiricity. Classical scientific texts do not have that character; some texts in the humanities do.



CHARACTERISTICS OF QUANTUM INTERPRETATION

Different from the interpretations of classical science and from humanities texts, quantum interpretation exhibit the following aspects:

(1) Quantum interpretation provides a unification of certainty and uncertainty. The interpretation of classical science is not important, but when it comes to quantum mechanics, the interpretation is a must. The reason is that quantum has the character of potentiality and trans-empiricality, furthermore, there should be a formal system of quantum theory (including the antecedent conceptual system). However, it is impossible to make scientific explanations and predictions of the quantum world merely with a formal system. Three factors – observer, probability, and wave function – are also important reasons why the theory needs to be interpreted.

The interpretation of quantum mechanics is aimed at an authentic description of the world of quantum mechanics. It is a description of one aspect of the quantum world. The quantum phenomena that are easy to deal with in one version of quantum mechanics are hard to deal with in another. Each interpretation of quantum mechanics requires different concepts, theoretical presuppositions and formal systems, that bring the creativity of scientists (authors) into the theory of quantum mechanics.

(2) Understanding loops. The comprehension of quantum text unfolds in a hermeneutic cycle. In understanding a quantum text, there exists an internal loop of quantum text firstly, that is, the loop between the quantum theoretical text and the quantum empirical text. And secondly, there exist external cycles of quantum text, the first of that is the loop between quantum world and quantum text and the second is the loop between quantum text and quantum technology. The loop between quantum world, quantum text, and quantum technology actually means that the test of quantum theory requires both scientific prediction of quantum theory and the forecast of technological products, which reflects the unification of understanding, interpretation and application of hermeneutics.

(3) Truth in quantum interpretation. Under the conditions of different quantum texts (concepts, theories, etc.) and quantum technologies, certain properties of quantum systems show themselves. We cannot infer the properties of the quantum system before a measurement from the properties after the measurement. Microscopic particles are not "pre-set" into a certain, unchanging pattern (Wu, 2011). They do not have a fixed existence. The cognition on the ontological state of microscopic particles can be revealed only with the help of quantum technology, and only some truths about microscopic particles can be revealed.

Let's look at a quantum proposition: "atoms were rearranged to spell the letters IBM." In 1990, IBM scientists used quantum technology – the scanning tunneling microscope (STM) – to move with its tip xenon atoms on the surface of nickel, and after a long period of operation, 35 xenon atoms spelled IBM. Obviously, the proposition is true – to display atoms with quantum technology, and then to manipulate atoms to rearrange them into an IBM shape. Here, the displaying or revealing by quantum technology is to bring out the atoms, that is the truth of practical ontology, i.e., the subject's cognition of the arrangement shape is consistent with the actual shape of the atoms.



Revealing the truth of the quantum text "atoms were rearranged to spell the letters IBM" belongs to the hermeneutical truth of quantum text. It is the combination of the truth of practical ontology and the truth of practical epistemology. Through practice, the objective reality of the quantum world is revealed; through epistemological comparison, the subject's cognition is compared with objective reality. Therefore, hermeneutical truth = truth of practical ontology + truth of practical epistemology = practical truth (Wu, 2019).

Practice of quantum technology enables the existence of microscopic things to be presented, but different quantum concept systems will have different interpretations of quantum mechanics. That is:

Truth of practical ontology + different description systems of quantum mechanics (truths of different practical epistemologies) → different interpretations of quantum mechanics.

RESEARCH PLANS IN THE FUTURE

The meanings of the study of quantum hermeneutics include: (1) To construct a new contemporary quantum hermeneutics research program from the perspective of the interaction between scientific and technological hermeneutics (including hermeneutics) and contemporary quantum science and technology, to break through the original research paradigm of hermeneutics, and to expand hermeneutics from text to micro (quantum) domains. Some new hermeneutic concepts will be put forward, such as quantum text, quantum distance, quantum horizon, quantum understanding, quantum effect history, etc.

(2) The original research objects of hermeneutics are macroscopic or classical objects. Quantum hermeneutics will form new concepts, new categories and new philosophical systems of scientific and technological hermeneutics (including hermeneutics), that will give rise to a quantum turn of hermeneutics.

The main problems to be solved by quantum hermeneutics are (1) Hermeneutical analysis of quantum text. The relationship between quantum text, quantum world and quantum technology. Can hermeneutical analysis be brought to quantum objects?

(2) Reality of contemporary quantum hermeneutics. Is this reality objective or constructed? What is the difference between a hermeneutical realism analysis of quantum objects and the general scientific realism?

(3) What is the understanding structure – of laypeople or of experts – of quantum text? What is the understanding standard of quantum text? How are quantum understanding, interpretation and application related? Horizon fusion of quantum text: Can quantum and classical visions be integrated?

(4) Post-truth in quantum hermeneutics – what is the relationship between post-truth and practical truth?

Guolin Wu



Acknowledgments

This work was supported by the VIP project "contemporary quantum Hermeneutics Studies" of National Social Science Foundation of China in 2019 (No. 19ZDA038).

REFERENCES

- Berta, M., Christandl, M., Colbeck, R., Renes, J. M., & Renner, R. (2010). The uncertainty principle in the presence of quantum memory. *Nature Physics*, 6, 659-662. <https://doi.org/10.1038/nphys1734>
- Georgescu, J. (2014). Foundations of quantum mechanics, *Nature Physics*, 10, 253. <https://doi.org/10.1038/nphys2934>
- Heelan, P. (1995). Quantum mechanics and the social sciences after hermeneutics. *Science and Education*, 5, 127-136.
- Wu, G. (2011). *Liàngzǐ Xīnxī Zhéxué* [Quantum Information Philosophy]. China Social Sciences Press.
- Wu, G. (2016). *Liàngzǐ Jìshù Zhéxué* [Philosophy of Quantum Technology]. Guangzhou: South China University of Technology Press.
- Wu, G. (2019). Chāo Yàn Yǔ Liàngzǐ Quánshì [Trans-empirical and Quantum Interpretation]. *Zhōngguó Shèhuì Kēxué*, 2, 38-48.
- Wu, G., & Ye, H. (2018). Liàngzǐ Quánshì Xué Lùn Gāng [An Outline of Quantum Hermeneutics]. *Xuéshù Yánjiū*, 3, 9-19.