

NOTIONS OF THEORETICAL PHYSICS IN THE TAO TE CHING AND  
TRACTATUS LOGICO-PHILOSOPHICUS

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A thesis submitted to the

Graduate School-Camden

Rutgers, The State University of New Jersey

In partial fulfillment of the requirements

For the degree of Master of Arts

Graduate Program in English

Written under the direction of

Dr. Richard Epstein

And approved by

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Camden, New Jersey

May 2020

## THESIS ABSTRACT

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This paper discusses notions of theoretical physics in two works of philosophy. The *Tao Te Ching* by Lao Tzu and *Tractatus Logico-Philosophicus* by Ludwig Wittgenstein. Through a linguistic analysis, the paper connects each work to concepts of quantum theory. The purpose of this analysis illustrates the accessibility of these notions to students of the humanities. In academia, theoretical physics is taught to students of science and mathematics who have completed calculus. The paper argues that an interdisciplinary approach to discussions of theoretical physics would be of great value to students of the humanities. The linguistic analysis relies upon the argument of a semantic connection between the texts. This semantic connection begins from a literal translation of each title and describes the content of each text as reliant on an understanding of key concepts of theoretical physics. This paper serves to engage in a wider discussion on the value of engaging in an interdisciplinary approach to the teaching of the humanities.

The word “tao” in classical Chinese refers to *path*, *road*, or *the way*. The word “tract” in English, deriving from the latin *tractus* may refer to *course*, *path*, *way*, or *route*. The *Tao te Ching* is an ancient Chinese text dating back to the 4<sup>th</sup> century BC. The authorship is traditionally credited to 6<sup>th</sup> century Chinese sage Lao Tzu. There remains much debate about who the original author was and when the first version of the text was written. *Tractatus Logico-Philosophicus* was published in 1921 by Austrian philosopher Ludwig Wittgenstein. In this paper I argue there is a fundamental semantic connection between the title and content of the texts. Each serve as philosophical interpretations of notions of theoretical physics. This research aims to demonstrate notions of theoretical physics in texts of philosophy, and the accessibility of these notions to students of the humanities. The basic concepts of this theory may be understood in purely nonmathematical terms.

The title *Tractatus Logico-Philosophicus* is Latin, while the text itself is written in modern German. The word *Tractatus* is latin for *treatise*. The word *tract* in English, deriving from the latin *tractus* may refer to *course*, *path*, *way*, or *route*. In Latin, the word *logico* refers to the neuter, singular, dative case of the English word *logic*. In Latin, the word *philosophicus* is the masculine, singular, nominative translation of the English word *philosophic*. According to the oxford English dictionary, the word philosophic relates to that, “of persons, their faculties, etc.: knowledgeable about, skilled in, or devoted to philosophy or learning (formerly including natural philosophy); learned, intellectual.” In the context of Wittgenstein’s text, the word likely refers to the knowledge or devotion to the act of philosophy itself supported by Wittgenstein’s personal notion that philosophy is an activity. The title of Wittgenstein’s text may be translated as, “The way of logic and

philosophy,” written specifically for a devotee of truth and knowledge about the world.

The Tao Te Ching is an ancient Chinese text written in a laconic style. This means that very few characters are used to express complex ideas. With few grammatical particles, inflections of meaning are not explicit. This encourages varied and contradictory interpretations of the text. Therefore, the original nuances of intended meaning cannot be pointed to without question. The minimalistic nature of the text allows for a wide variance in how the characters are interpreted. However, the words themselves may still be translated efficiently. The word *tao* translates to the way or the path. The word “*te*” or “*de*” in ancient Chinese is etymologically linked to a verb that suggests “*to grab*” or “*to take hold of*”. *Ching* or *jing* refers to a standard book of thought, morality or behavior. It is also called a doctrine book in religion, or a monograph on a certain aspect such as a bible. The title of Lao-tzu’s text may be translated as, “The book of the way of grabbing hold of a single specialized subject.” This subject has been classified by scholars as philosophy.

The semantic connection between the titles extends to a semantic connection of the content of each text. The way or the path of philosophy as described by Lao Tzu and Wittgenstein is in alignment with theoretical descriptions of quantum states and affirms an intuitive knowledge of notions of theoretical physics throughout each text. The semantic connection between the titles of the texts is striking and poignant of a shared thematic commiseration on incredibly abstract concepts. Both texts have a title that directly refers to both the content of the text and the underlying theory each text gestures towards. The philosophy espoused by each text directly asserts the existence of reality beyond observable human experience. The bizarre nature of the explicit semantic

connection between the titles is an intriguing piece of evidence to suggest that each author was consciously attempting to describe the same concepts. In this paper I will connect specific passages of each text to fundamental aspects of quantum theory in order to illustrate this semantic connection.

ii.

In 1900, Max Plank discovered the first major discrepancy of classical physics. Thermodynamics is the branch of physical science that deals with the relations between heat and other forms of energy, and, by extension, of the relationships between all forms of energy. The law of the conservation of energy in classical thermodynamics states that energy can neither be created or destroyed, it can only change form. Plank studied theoretical physics at the university of Berlin and concerned himself with how heated bodies emit radiation in the form of heat and light. According to the law of conservation of energy, steel that was heated to a great extent should eventually become invisible. This was found to be not true. Rather than changing form, the small particles of heat were emitted through discrete packets of energy called quanta. These bits of quanta can be thought of as droplets of water. Plank used the letter  $h$  to describe a constant in his new law of radiation which stated that radiation energy is a product of the constant  $h$  and the frequency of the radiation. This law only described the behavior of the quanta, the problem remained that this new measurable law was inconsistent with classical thermodynamics. Plank's discovery is known as "the quantum of action" and illustrated that on the subatomic level, laws of classical physics cease to apply.

For the purpose of this paper, it is crucial to understand that at the subatomic level particles of matter do not follow the laws that govern empirical observable reality. This perplexing phenomenon is observable but completely contradicts existing laws of

classical physics. A classical state in physics may be conceptualized as a graph with an x and y axis. The location of a point within that graph may be observed, measured, and predicted mathematically. The graph of a quantum state should be conceptualized as an abstract vector space. The vector is a physical quantity that has both magnitude and direction but no location. The quantum state is a probability distribution for the possible location of vectors. The location of a physical quantity cannot be determined in a quantum state, only a probability for its possible location. The basic act of observation and measurement of particles becomes impossible at the atomic level.

The simplest quantum state is a wave function. A wave function is a mathematical description of a quantum system. The quantum system is the small portion of matter being observed. The behavior of the smallest pieces of matter provide insight into the nature of reality. The nature of reality is a fundamental concern of philosophy. Notions of truth and meaning in philosophy have been historically derived from a perspective of classical physics. Philosophical notions that do not rely on a classical perspective are often categorized as theological in nature. The strict divide between science and philosophy is necessitated by the conception of a classical state of the physical world. The following argument will demonstrate that two philosophers from different millennia clearly demonstrated their intuitive knowledge of notions of theoretical physics. The explicit semantic connection between the content of the texts is striking and serves to illustrate the accessibility of the concepts.

iii.

A fundamental principle of quantum mechanics is called *quantum superposition*.

This principle asserts that quantum states may be added together and form another

distinct quantum state. Conversely, any quantum state may be described in terms of the sum of several quantum states. This means that the notion of multiple states together acting as one distinct state presupposes the existence of any separate state. In the most abstract sense, there is simultaneously one quantum state and an infinite amount of quantum states.

In a classical state, all of the information about the state of the system is measurable, observable, and predictable. In a quantum state every “observable” or physical quantity that can be measured in the state cannot be pinpointed. A mathematical function called a probability distribution may be used to predict the general behavior of observables in a quantum state. The rules that dictate time do not apply to quantum states. The notion of time is a requirement for the mathematical function to apply. Therefore, the function quickly exhausts its use in predicting anything at all about the quantum state. This means that even though a probability about the location of an observable could be measured with a mathematical function, that mathematical function quickly becomes useless in describing anything about the state.

Albert Einstein’s famous thought experiment of Schrödinger's cat illustrates the notion of quantum superposition in physical reality and raises the question of “when does the superposition of quantum states cease to exist and collapse into one or the other?” In the case of Schrödinger's cat the state will collapse into a cat that is either dead or alive. In the quantum state of superposition, the cat is both dead and alive! The most important thing to understand about quantum superposition is that the world exists in a state of multiple possibilities and is continually collapsing into physical reality upon observation. The basketball may fall anywhere on the court. Before it falls it is in a state of

superposition that may be anywhere or everywhere. This superposition of quantum states takes place on the subatomic level. Thousands of years ago, Lao Tzu wrote about his knowledge of quantum states and quantum superposition.

**Lao Tzu:**

“Put thirty spokes together to one hub,

The original empty space makes the use of wheel.

Knead clay into vessels,

The original empty space makes the use of vessel.

Shape door and windows for a house/room,

The original empty space makes the use of house/room.

So the things that are made are only conditions,

What [we] are using is still the original empty space.” (chapter 11, Tao Te Ching)

Here, Lao Tzu is referring to the abstract vector space of a quantum state. An atom is 99.9% empty space. Physical reality is comprised of particles of energy within atoms. According to [matrixdisclosure.com](http://matrixdisclosure.com), we have to think of the particles in the atom like a bee swarm or birds, where individual movements are too fast to track them, but we can see the traces left. Within this empty space lies the energy that both creates and makes up physical reality. Lao Tzu foregrounds the fundamental nature of the empty space, a clear indication of his intuitive knowledge of the underlying nature of the physical world. From the human perspective a quantum state would look like empty space. This empty space is referred to as original and presupposes the existence of objects. The placement of objects in physical reality is a temporary condition. A human may “knead clay into vessels” as Lao Tzu says, but the object can only be of use within



the original empty space.

The example of the wheel to demonstrate this notion is particularly interesting because the visual representation of the wheel mirrors that of the Bohr model of the atom. Within the nucleus of an atom lies 99.9% empty space and great power such as that used for atomic bombs. This passage illustrates Lao Tzu's knowledge of the power within seemingly empty space. He also states that physical objects and their placement are mere temporary conditions. This indicates his understanding that the potentiality exists for any of these temporary objects to, at least theoretically, be placed anywhere in the physical world. When Wittgenstein says, "if things can occur in atomic facts, this possibility must already lie in them". (2.0121) he is referring to the notion of quantum superposition as well. The seemingly endless potentiality for the position of the observable object presupposes the existence of any single object in any specific position. Just as the notion of multiple quantum states presuppose the existence of any single quantum state, the potential existence of an object in any possible geographic position in space presupposes its actual existence in any single physical location.

The wheel serves as a literary metaphor for the atom. Wittgenstein published his text in 1921 and presumably knew of the Rutherford-Bohr model which originated in 1913. Wittgenstein refers to atomic facts continually throughout the text. Although Lao Tzu does not refer to atoms explicitly, the wheel serves for the same purpose of explanation as the word atomic does for Wittgenstein. The semantic relationship of wheel and atom is apparent. The visual similarity in form may indicate an intuitive knowledge of the physical structure of reality understood by Lao Tzu. "The original empty space makes use of the wheel" refers to the nucleus of the atom, the empty space from where all

matter and energy is derived.

**Wittgenstein:**

“5.135 In no way can an inference be made from the existence of one state of affairs to the

existence of another entirely different from it.

5.136 There is no causal nexus which justifies such an inference.

5.1361 The events of the future cannot be inferred by those of the present.

Superstition is the belief in the causal nexus.”

Wittgenstein rails against the belief of causal nexus which may be described as the belief in a direct link or bond between cause and effect. The spatial temporal relationship between a cause and effect may be measured within a classical state, but reality exists in quantum states. A measurable cause and effect is described by Wittgenstein as superstition. The Oxford English Dictionary defines superstition as, “religious belief or practice considered to be irrational, unfounded, or based on fear or ignorance.” Looking at the world through the framework of a quantum state, the belief in cause and effect becomes irrational. There is no known way of predicting the behavior of a quantum state.

Within the larger theoretical discussion of quantum mechanics, the Copenhagen interpretation states that quantum theory will finally put an end to the notion of causality from classical theory having any legitimacy in physics. The Copenhagen interpretation is attributed to Niels Bohr and Werner Heisenberg. The collection of principles referred to as the Copenhagen interpretation includes the “observer effect” in which the entire wave function of probable locations collapses into an observable bit that can be measured. This

means that the inner workings of the subatomic world cannot be observed as they are directly affected by the act of observation itself. A very clear limit to the human perspective presents itself here.

The nucleus is the center of the atom and is made up of 99.9% empty space. Within this empty space lies great energy. The nucleus is made-up of protons and neutrons but is comprised mainly of nuclear energy that holds these particles together. This nuclear energy lies in what physicists would describe as an abstract vector space. When lao tzu says, “what we are using is still the original empty space” he is referring to the concept that all physical objects are comprised of the energy of this abstract empty space, and the existence of and use of all objects happens within this space.

iv.

In proposition 5 of *Tractatus Logico-Philosophicus* Wittgenstein states, “5.5561 Empirical reality is limited by the totality of objects. The boundary appears again in the totality of elementary propositions. The hierarchies are and must be independent of reality.” Here, Wittgenstein explicitly asserts the limitations of observable reality. The limited nature of the human perspective gives rise to an illusion of measurable and predictable reality. The classical state in physics is a mere representation of this illusion. In chapter 14 of the *Tao Te Ching* Lao Tzu writes, “That which is looked at and never seen is known as invisible, that which is listened to but never heard is known as soundless, and that which is grasped but never touched is known as intangible. The origin of these three cannot be observed, so mix them and form a unity.” Here, Lao Tzu is pointing out the same notion as Wittgenstein. The human perspective has clear limitations, and reality exists far beyond the scope of human observation. The origin cannot be observed. In modern science the laws of quantum mechanics have risen in the

scientific community through experiments involving the measurement of particles in atoms. It is incredibly interesting that prior to these findings, an explicit display of the intuitive knowledge of these concepts existed in the *Tao Te Ching*. For Lao Tzu and Wittgenstein, the path to philosophy exists in the humble acceptance of the certain limitations of human observation.

Proposition 7 of *Tractatus Logico-Philosophicus* states, “7 Whereof one cannot speak, thereof one must be silent.” The first two lines of *Tao Te Ching* are, “The Dao (that) can be stated, is not the eternal Dao; The name (that) can be named, is not the eternal name.” The location of both passages at the beginning and end suggest the importance to the overall meaning of the text. Wittgenstein asserts that reality is not confined to human language. In this view, language can only express a limited amount of truth about the nature of reality from the human perspective which is filtered through the sense organs. Lao Tzu expresses the same sentiment. If a name that can be named with language cannot be eternal, the underlying truth cannot be pinpointed through language alone. Empirical observation of that which may be reported through language, measured, and determined is not a representation of the fundamental nature of reality.

v.

In academia, any formal instruction or introduction to quantum theory is reserved for students of mathematics and science. This instruction will generally take place after several years of coursework on the underlying mathematics. The conversation of these two texts is a small example of connectivity between works of philosophy and concepts of theoretical physics. Foregrounding the semantic connection between philosophy and

physics demonstrates the accessibility of the theory to students of the humanities. An interdisciplinary approach on instruction of the topic may prove to be advantageous. The strict divide between science and philosophy does not serve philosophers in any meaningful way; it severely limits the scope of conversation. This is not to say that students of philosophy should be expected to assume authority over topics of mathematics, but their instruction should be widened to include theoretical concepts of quantum physics. Philosophy concerns itself with questions of the world, the nature of truth, meaning, and reality. Those inquiries should be pursued through a perspective that considers the implications of theoretical physics. Looking beyond differences of language, culture, and grammar; the meaning of both texts points towards a shared understanding of theoretical notions of quantum states.

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