

QUANTUM MECHANICS AND THE NATURE OF LIFE

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Abstract

We reexamine the original derivations of quantum mechanics, published 100 years ago, to test the accuracy of the formulations and the logic underlying them, and we find that attempts were not made to describe atomic processes continuously in time. To correct this omission we show that matrix mechanics clearly describes the continuous absorption of thermal energy that causes the hydrogen line spectra, where energy and cause follow the same path. When the same methods are used to inspect the emission process as determined by the wave function we find that energy and cause do not follow the same path. We conclude that failure to follow strict causality is the reason that the wave function is neither physical nor real. Energy-cause superposition is hypothesized to be a universal principle of nature, true not only for atomic systems but for material systems throughout the cosmos and for life as well. It is also equivalent to the action principle, $\int L dt$, which is fundamental to all of physics.

Key words: time, energy, causality, reality, life

1.0 Introduction

It has been a hundred years since quantum mechanics burst into the public consciousness. It seemed like a natural extension to proceed from classical mechanics which governs macroscopic phenomena to the microscopic properties of atoms and subatomic structure. The problem is that whereas classical mechanics is easily visualized neither its principles nor its practices can be extended to quantum mechanics. Quantum systems have quantized energy levels, momentum, and other properties, while in classical systems these quantities are measured continuously. Nevertheless we can't help but think classically so for a century we have struggled to make sense of the apparent weirdness of mathematical formulations that seem to defy rational explanation.

2.0 Matrix mechanics

The mathematics of matrix mechanics is complex, but it describes a relatively simple phenomenon, for when the hydrogen atom is heated it emits a line spectrum whose frequencies and intensities are related to electron transitions [1]. Heisenberg described his first impression of the hydrogen spectrum as follows:

“I had the feeling that, through the surface of atomic phenomena, I was looking at a strangely beautiful interior, and felt almost giddy at the thought that I now had to probe the wealth of mathematical structure nature had so generously spread out before me.”

Spectral emission is a simple process but the complete spectrum of a hydrogen atom consists of an infinite number of spectral lines that are related using the obscure mathematical formalism of matrices. The visual stimuli of the hydrogen spectrum are the basis for the mathematics so Heisenberg used them to justify his conclusion that quantum mechanics is “founded exclusively upon relationships between quantities which in principle are observable”. Thus he based his model of quantum mechanics on a complex system of observables that are interconnected mathematically and are believed to describe the structure of a single hydrogen atom.

After he had formulated his model of the simplest quantum system, a single proton and orbiting electron, he tried to use it to transition from the quantum world into the classical world. He soon realized that his theory could not be completed in this way and wrote to Pauli admitting as much [2]. “But the worst thing is that I am quite unable to clarify the transition [of matrix mechanics] to the classical theory.” He failed because he thought that nature transitions from, or in effect builds upon the microscopic world of quantum mechanics to arrive at the classical world. Instead it is the classical world that transitions to the quantum world and in fact causes it. Heat is supplied to the atom in a constant flux consisting of energy absorption from thermal sources and ending with discrete transfers of energy in the form of photon emission. Thus energy and cause follow the same path by beginning with thermal energy which then causes an electron transition. Heisenberg tried to describe the transition from the quantum world to the classical world, but he failed because the reverse is what actually happens; that is, the classical causes the quantum. Thus the physical process that matrix mechanics describes is based upon the fact that energy and cause follow the same path. We hypothesize that energy-cause superposition is universally true when applied to a material system. We base our theory upon the well-known fact that the properties of energy, equipartition and the conservation laws, are valid at all complexities and intensities and have never been known to fail.

3.0 The wave function

The Greeks noted that continuous change is necessarily a part of nature. Water and earth allow trees to grow which are then consumed by fire. The ash disperses through the air and returns to the earth in an endless cycle. All material reality was constructed from these four interchangeable elements which evolve in continuous cycles. Yet quantum mechanics in its infinite wisdom introduces change, not as a continuous process, but by quantization and discrete exchanges of energy. What are designated as real are the events, specifically detection events. The cause of the events is then backtracked to their source, the wave function, which is assigned reality by default due to the Born rule. Thus causality is realized by beginning with the detection event and reversing time to obtain the cause, a wave function. But the wave function is neither physical nor real and at best it represents the appearances of what is physical. It is a delusion perpetrated upon the common man, hidden within the complexity of inscrutable mathematical schemes, and validated by the very illusion that it claims as the reason for its credibility, the measurement process. It barricades itself behind a web of self-imposed deception stating that any competing theory must improve upon measurements that it alone is qualified to design and verify. As a result it promotes the idea that defining a natural phenomenon does not require specifying change by means of time evolution of the type that we know and are familiar with, rather it is a property that is to be isolated and quantified, so that even life must eventually be reduced to the fundamental truths of quantum mechanics by satisfying certain conditions of inanimate masses.

Measurements performed with respect to the time variable are not possible in non-relativistic quantum mechanics [3]. However, due to the overwhelming prevalence of change in nature a scientific theory cannot completely abandon the use of time as a physical variable. As a result there is considerable speculation that time is

not fundamental, but that it arises in various ways from more “basic” phenomena [4]. We restore time to its rightful place as a fundamental variable in quantum mechanics by describing absorption in section 2.0 with the time and space variables acting in unison. Thermal energy is transmitted by particle motion in real space and real time as described by statistical mechanics and the electron decays along a real trajectory. Tracing the path that energy takes in real space and real time during the quantization process reveals that the space-time of the atom or molecule is four-dimensional. To describe the path formally we equate the physically defined energy-cause principle with the action principle, $\int L dt$, which defines the Lagrangian, or energy of the system, along a path between two points in time and is central to all of physics. The equations of motion of absorption and emission of an atomic system may then be derived by taking the integral of the Lagrangian along the path during a time period τ [5]. The equations describe quantization in real space and real time.

4.0 Conclusion

We propose an interpretation of nature based on the following fundamental principle: When energy is supplied to a material system of any type; atomic, molecular, or classical; causality evolves concurrently with it and along the same path. Classical mechanics, machines, and simple tools all adhere to this principle. We hypothesize that it is a universal truth that applies to all material systems, also life systems. For example, growth is a characteristic of life forms demonstrating that energy and cause evolve concurrently along the same path at the cellular level. A seed is an inert biological system that does not change when isolated, but when supplied with water, nutrients and a continuous supply of energy, such as sunlight; it transitions to higher energy states with properties that may be characterized as potentialities similar to the probability amplitude of a wave function since they are manifested probabilistically. Examples demonstrating that energy and cause follow the same path can be found cosmologically as well during the formation of a black hole. Gradual accumulations of mass eventually reach a critical size causing an irreversible transformation from a continuous material system to a discrete system defined by the event horizon. Examples of energy and cause acting in unison are evident in material systems throughout nature and also in human behavior.

References

- [1] A review of this topic is given in Oldani, R. “Quantum mechanics for the common man” *Blumea Journal* (2025) DOI: <https://doi.org/10.61586/4z1e0>
- [2] Letter to Pauli on October 23th, 1925; Pauli, W. *Wissenschaftlicher Briefwechsel mit Bohr, Einstein, Heisenberg*. Vol 1 Hermann, A., von Meyenn, K., & Weisskopf, V. Eds. (NY: Springer, 1979), p. 251.
- [3] Hossenfelder, S. “Is time real” <https://www.youtube.com/watch?v=PdL8CudJTcs>
- [4] “Time is an illusion”, <https://www.youtube.com/watch?v=tc7LpJswIZU>
- [5] A complete derivation appears in Oldani, R. “Galactic symmetry” preprints.org (2024) DOI:10.20944/preprints202009.0215.v8, pp. 8-14.