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The Schrödinger Equation Compatible with Classical Mechanics

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Abstract:
Replace the potential energy in the Hamiltonian operator from electromagnetic interaction potential energy to gravitational interaction potential energy. Define that the kinetic energy of a moving object is equal to its de Broglie wave's hv. Successfully obtained the Schrödinger equation describing planetary motion. The Schrödinger equation itself is a combination of classical mechanics and quantum mechanics. Quantum mechanics based on it cannot completely exclude classical mechanics. Many examples have been introduced where classical mechanics and quantum theory can be combined to describe the same object (whether it is macroscopic or microscopic). Local realism and determinism still have a market in modern physics. Quantum mechanics and classical mechanics have a compatible and complementary relationship.

Keywords: The Schrödinger equation of gravitational potential energy, a wave function tool, complements and coexists, changing the concept of quantum mechanics, local realism, and quantum classical relations.

INTRODUCTION

Can quantum mechanics and classical mechanics be compatible? This is a fascinating question. We can be certain that many people hope the answer is yes and are interested in the results of others' strong exploration of this issue. We believe that this compatibility has a certain theoretical basis and strive to find or establish such a foundation. The Ehrenfest theorem proves that 'taking the classical limit, the laws of quantum mechanics will be simplified into the laws of classical mechanics' [1,2]. This allows wave dynamics to be used to describe macroscopic objects under certain conditions in principle. When the scale of quantum systems becomes very large or quantum effects become less apparent, the description of quantum mechanics approaches the results of classical mechanics. This is the characteristic of quantum decoherence. Although there is no macroscopic object in the object it describes, there are manifestations (features) that contain macroscopic objects. If the two different behaviors of particles before and after quantum decoherence are determined by their composition, structure, and external conditions, then the two extreme cases of Ehrenfest's theorem or the starting and ending points of the quantum decoherence process are related. This connection is also the connection between classical states and quantum states. The compatibility between quantum mechanics and classical mechanics has a structural foundation. Previously, people used two methods (and the ideas and concepts determined by them) to sever this connection: the changes in microscopic particles did not conform to the law of causality; The process of quantum decoherence and other microscopic changes is an instantaneous process, and there is no causal relationship between them. It is not difficult to see that this "disconnection operation" is artificial or subjective. The deeper you delve, the less reliable you feel. The Einstein theorem can indicate that the described object is not limited by mass when using de Broglie waves. This happens to be useful for the theme of this article.

I hope the above analysis can guide people to explore the possibility of establishing local realism quantum mechanics, This expected new theory cannot completely exclude existing quantum theories, and can only seek compatibility between classical theory and quantum theory. I introduced my own established Schrödinger equation for gravitational potential energy in references [3-5]. This equation is obviously not unique to quantum theory, nor is it unique to classical theory. It can be said that local real quantum mechanics requires such equations. This equation also requires support from the application results of local realism quantum mechanics. In references [3-5], the introduction of this equation is relatively rough. This article will review the establishment process of the equation and provide a detailed introduction to its application scope, theoretical basis, application examples, and practical significance. The Schrödinger equation for the Earth's revolution also refers to this new equation. Sometimes it is also called the "Schrödinger equation for macroscopic objects" or the Schrödinger equation for classical systems (or the Schrödinger equation for local realism). For convenience, we refer to this type of equation as the "Schrödinger-Tu equation".

I have made gratifying progress in establishing local realism quantum mechanics [6-9]. I found that this research work lacks some things that I am currently unclear about in theory. After establishing the Schrödinger equation that can describe macroscopic objects, I knew that this equation was one of the things I lacked.

With the development of material structure theory, preliminary views on localized realism of the microscopic world have gradually been proposed. Its conceptual system and mathematical logic system are both obtained through the transformation of existing theoretical systems. The biggest feature of the objective of this study is the ability to simultaneously use wave mechanics and classical mechanics to describe microsystems [4-9], Recognize and apply the compatibility of wave mechanics and classical mechanics in terms of conceptual and logical thinking. The newly established gravitational potential Schrödinger equation and the original Schrödinger equation may form a system of Schrödinger equations. Under appropriate conditions, entities as small as elementary particles and as large as planets (objects of local and non local realism) can be described using this system of equations. The theoretical system of local realism (including conceptual system, explanatory system, and mathematical formal system) is relatively complete. However, prior to references [3-6], theories that are compatible with non local realism still cannot be used to describe macroscopic systems. Classical theories cannot be used to describe microscopic systems. It was only after the establishment of the Schrödinger equation for gravitational potential energy in references [3-5] and this article that the theoretical system of local real quantity mechanics was further improved [5], which put an end to this situation. That is to say, the macroscopic Schrödinger equation is an important component of the theoretical system of local realism quantum mechanics (after establishing the macroscopic or gravitational potential Schrödinger equation, we can intuitively see this). This article introduces the theoretical basis (background), application achievements, and significance of the macroscopic Schrödinger equation.

This work demonstrates the compatibility between classical mechanics and wave mechanics, indicating that there is no insurmountable gap between them. And briefly explained how classical theory and quantum theory are combined in the context of this study. Define or derive the relationship between various physical quantities of macroscopic objects (such as momentum, energy, wavelength, frequency, velocity, wave function) and de Broglie waves. Replace the potential energy function in Schrödinger's equation with the gravitational potential energy

function, and then derive the Schrödinger equation under the background of gravitational potential energy. We will clarify that the equation can simultaneously or separately describe macroscopic and microscopic objects. As long as classical theory and quantum theory are compatible, we can combine them for use. We can also avoid using the mass of the described object as an important factor in choosing which method to use. If the application effect is relatively ideal, it indicates that the above "compatibility" and "composability" are basically successful in theory and practice. Readers can make judgments after reading the following chapters.

I firmly believe that all natural things are real things, and they only have real manifestations. The functions and characteristics that only gods or ghosts possess are not manifestations of real things. I believe that the correct theory is often a simple and clear theory. I believe in intuition and heartfelt thoughts. Often holding onto ideas that have spontaneously formed without external influence. I started self-learning quantum mechanics and relativity theory in 1981. The primitive ideas in the heart reject the explanation system of quantum mechanics. Therefore, while studying, strive to find the composition and structure of localized realism and determinism of atoms and molecules. We should have looked for other models only when we couldn't find locally stable hydrogen molecular ions! Therefore, I am eager to know if a localized and definite framework of hydrogen molecular ions can exist stably. According to classical electromagnetic theory, a stable hydrogen molecule ion must have a structure with one electron in the middle and two hydrogen nuclei on either side (and the middle electron must have the function of an elastic ring). This structural skeleton is like the wheels of a unicycle. Through calculations, it was found that such a structure can reach classical mechanical equilibrium. The quantitative calculation results of bond length and dissociation energy do not contradict experimental facts. I have no reason to deny the microstructure of this localized realism. The quantum mechanics method can only consider the thermodynamic stability of the system and cannot consider the dynamic stability, which makes people feel uneasy psychologically. Under this ideological concept, I continuously researched and invented a quantum chemistry method that combines quantum mechanics and classical mechanics, and proposed the theory of wave element material structure. Finally, the Schrödinger equation was established to describe the Earth's revolution - a combination of macroscopic and microscopic theories.

THEORETICAL BASIS OF THE SCHRÖDINGER EQUATION FOR GRAVITATIONAL POTENTIAL ENERGY

The existing theories of quantum mechanics and material structure cannot explain the source of electron spin magnetic moment. It cannot be answered what kind of intrinsic composition structure and motion lead to the wave particle duality of microscopic particles? What is the relationship between kinetic energy and E in the wave function? Is a moving elementary particle also a wave packet composed of multiple waves of different wavelengths? Is the interference of waves in the same material flow wave packet interference? Or monochromatic wave interference? If readers believe it is monochromatic wave interference (because interference between wave packets cannot be completed), will the intensity of the interference still match the observed facts? The wave packet will collapse when it encounters the instrument. Why can diffraction still occur after the wave packet collapses when the elementary particle flow passes through a slit? Is the frequency of de Broglie waves on Earth determined by its actual vibrations? Does an Earth have many vibrations that make up an Earth wave packet? For the sake of convenience, we refer to these questions as a set of unsolved mysteries concerning the structure and properties of matter.

Once any of these questions are clarified, it will definitely lead to a breakthrough in theoretical research in physics.

Reference [6] proposed a wave element material structure theory. That is, assuming that electrons are localized entities composed of waves. The composition method is that the wave propagates along a very small circle, and the center of gravity of the entity enclosed by the wave can be stationary while the wave is in motion. For convenience, we refer to it as Hypothesis 1. This model effectively explains the source of electron spin magnetic moment. Under this assumption, a planetary hydrogen atom model can be constructed to smoothly explain why the energy calculated results of Bohr hydrogen atoms are very close to the facts. Under this "deterministic" material structure framework, this calculation method can be extended to diatomic small molecules such as hydrogen molecular ions and hydrogen molecules. The calculation method is simple, but the results are close to the experimental values [7-10]. In the context of assumption 1, an electron is a small charged wave ring that can expand according to Huygens' principle and form a hydrogen atom with a proton. Such hydrogen atoms are particles with planetary structures. The approach of local realism is clearly the theoretical basis for directly describing macroscopic objects using quantum mechanics methods. The theory of wave element material structure and the macroscopic object Schrödinger equation are mutually necessary and mutually confirmed. Because the macroscopic Schrödinger equation is an equation that can describe the "object of local realism".

We use the new term 'noumenon of wave function', which refers to the waves of the wave function. At present, we know very little about the noumenon (ontology) of wave functions and the essence of de Broglie waves, which leaves us with enormous space for exploration and imagination. In this way, the relationship between the noumenon of the wave function and some physical quantities in the de Broglie wave (such as the relationship between the $E_{\text{wave function}}$ and the E_d, etc.) can be boldly selected based on some clues. For the relationship between the physical quantities of macroscopic and microscopic entities (such as kinetic energy, velocity, etc.) and the energy, velocity, wavelength, frequency, and momentum of the body of de Broglie waves and/or the noumenon of wave function, in addition to the agreed upon de Broglie relationships and derived relationships, we can also make the following definitions. We will try our best to remain consistent with Schrödinger's choice back then. Different places include:

$$\upsilon_{\text{centroid}} = \upsilon_{phase} = \upsilon_d = \lambda_d \nu_d. \tag{1}$$

$$2E_k = m\upsilon_d^2 = h\nu_d . \tag{2}$$

In these two equations, is the frequency of the de Broglie wave of the moving object. It does not necessarily equal the frequency of the wave function itself. The meaning of the Eq. (2) the energy relationship between the kinetic energy of a moving object, the wave energy of de Broglie, and the wave energy of the wave function itself (excluding the total energy relationship between potential energy and m_0c^2).

As long as we choose that the relationship between the wave energy and frequency of the de Broglie wave is also $h\nu$, and then according to $\lambda = h/(m\upsilon)$, we can obtain the wave energy of the de Broglie wave $E_d = h\nu = m\upsilon^2$ In references [6,8], the author points out that one of the wave forms of the wave function is essentially circularly polarized light, and its energy frequency relationship is

E=(1/2)*hv*. This provides a more in-depth explanation of the differences between waves of wave functions and de Broglie waves.

(2) The equation represents that the de Broglie wave of a moving object with non-zero stationary mass is a "kinetic wave", and the internal energy of the object (corresponding to the stationary mass of the object, m_0c^2) does not belong to the wave energy component of its de Broglie wave. When a non-zero stationary mass object is in motion, its de Broglie waves resemble a moving spring harmonic oscillator (or water waves or vibrations propagating on strings or upwards). By doing so, we can solve the problem of de Broglie phase velocities exceeding the speed of light without using the concept of group velocity. Establishing equations (1) and (2) is one of the crucial step in deriving the Schrödinger equation for gravitational potential energy. One of the Schrödinger equations for Earth's rotation established in references [3-5] is:

$$-\frac{i\hbar}{2}\frac{\partial}{\partial t}|\psi\rangle=\widehat{H}|\psi\rangle. \tag{3}$$

Compared to the initial Schrödinger equation, there is an additional "$-\frac{1}{2}$" on the left side of equation (3). How did this '$-\frac{1}{2}$' come about? Which differs by one negative sign. We will introduce it in the next section.

THE MEANINGS OF VARIOUS TERMS IN THE SCHRÖDINGER EQUATION OF GRAVITATIONAL POTENTIAL ENERGY

In mechanics, the potential energy of phase interactions is negative, while the kinetic energy is positive. Therefore, the algebraic symbol V is used to represent the potential energy of interactions, and there is no negative sign before V. If a specific potential energy calculation formula is used instead of *V*, a negative sign needs to be added before the formula. The commonly used Hamiltonian operator is $\widehat{H}=-\left[\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}-V\right]$. Considering that gravitational potential energy is negative, the Hamiltonian operator of gravitational potential energy is:

$$\widehat{H}=-\left[\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}+\frac{GMm}{R}\right]. \tag{4}$$

Equation (3) uses the gravitational potential Hamiltonian operator shown in Equation (4). One of the widely used forms of wave functions is:

$$\psi\ (x,t)=Ae^{-i2\pi(\nu t-x/\lambda)} \tag{5}$$

Among them, ψ is usually referred to as the wave function. The use of this function and the Schrödinger equation is considered one of the proofs using quantum mechanics. The reason is that macroscopic objects in motion can also be regarded as de Broglie waves; Many people believe that the wave function is a tool, and that there is no real ontology of the wave function (using the same wave function for different particles and objects seems to be a hint). The time-dependent Schrödinger equation for the gravitational potential energy obtained by combining equations (3) and (4) is:

$$-\frac{i\hbar}{2}\frac{\partial}{\partial t}\psi=-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\psi-\frac{GMm}{R}\psi=E\psi. \tag{6}$$

Conclusion: The standard orbital motion of the Earth conforms to equation (6).

In the Eq.(6), the first term from the left of the equation is written in the form of the first derivative of the wave function with respect to time (*i.e.*, written as $f(x,t)\frac{\partial}{\partial t}\psi$), which was Schrödinger's initial choice. I will continue to use this option. The specific form of $f(x,t)\frac{\partial}{\partial t}\psi$ must be derived. Let's not consider the first term for now. The above equation is a time-dependent Schrödinger equation, which is suitable for describing bound systems. The potential energy term of the equation (6) is calculated based on (GMm)/R, and its value is $-mv^2$. To ensure the validity of the Viry theorem, the energy value calculated based on the term $[-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\psi]$ must be $-(1/2)\,mv^2$. Substituting $-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\psi = (1/2)\,mv^2\psi$, $-\frac{GMm}{R} = -mv^2$, $E = -(1/2)\,mv^2$ into equation (6) yields: $f(x,t)\frac{\partial}{\partial t}\psi = -(1/2)\,mv^2\psi$. The solution is $f(x,t) = -\frac{i\hbar}{2}$. As long as the Earth's orbital motion is an ideal uniform circular motion, it conforms to equation (6). Note: The ideal orbit of the Earth's revolution is a standard circle centered on the Sun.

Conclusion: The standard orbital motion of the Earth conforms to equation (6).

THE USAGE METHOD OF THE SCHRÖDINGER EQUATION FOR GRAVITATIONAL POTENTIAL ENERGY

It is worth noting that de Broglie waves are not of the same type as waves of wave functions (the essence of wave functions is not de Broglie matter waves). For the ontology of de Broglie waves and wave functions, the relationship between some physical quantities is inconsistent (for example, the h ν of the noumenon of the wave function is inconsistent with the h ν of the de Broglie wave. The same applies to E or E_k). The reasons behind it are still unclear and deserve further exploration. Reference [8] discussed this situation from the perspective of material structure and proposed a solution: selecting a suitable set from two sets of relationships based on different situations.

Bohr had already done the work of calculating hydrogen atoms using planetary models (*i.e.* classical mechanics methods). Now, let's first establish a planetary model of hydrogen atoms like Bohr did (this is the solid structure skeleton of hydrogen atoms, established using classical mechanics methods), and then directly calculate the energy of hydrogen atoms using the one-dimensional Schrödinger equation under the condition of constant radius. Let's take a look at the one-dimensional Schrödinger equation of the ground state hydrogen atom from the perspective of pure mathematical logic. Is there no reason to deny that the radius of a hydrogen atom remains constant? It is only by acknowledging the uncertainty of electrons in hydrogen atoms that the one-dimensional Schrödinger equation must be extended to three dimensions, and it is felt that the radius of hydrogen atoms cannot be regarded as a constant value. That is to say, the Schrödinger equation itself cannot deny that we can use both quantum mechanics and classical mechanics to describe the hydrogen atom. Directly using classical mechanics methods or planetary models to describe hydrogen atoms has many drawbacks but little gain. If someone can find the advantage of using classical mechanics models to describe hydrogen atoms, can it be a different matter? I found this method [7,10]. Establishing the structural skeleton of the microsystem within the framework of classical mechanics, and based on this skeleton, constructing the potential energy function of the system will definitely be much more accurate and convenient than before. Once the potential energy function is identified, it becomes much

easier to establish the Schrödinger equation for the system. This is how combining quantum mechanics with classical mechanics can generate new quantum chemistry computational methods (many computational examples are introduced in references [8] , [7] and [10]).

From a purely mathematical perspective, the use of the Schrödinger equation is not limited by the mass of the object being described (there are no discontinuities in the mass range). There are two lampshade balls with opposite charges, one of which rotates around the other. If someone believes that the original Schrödinger equation for electromagnetic potential energy cannot describe this bound system, what is the reason for this? Is it locality and determinacy? From a purely mathematical perspective, that's not the reason! The idea that the use of the Schrödinger equation is limited by the mass of the object being described is a subjective conclusion. It is a subjective conclusion that objects that do not belong to non local realism and non determinism cannot be described by the Schrödinger equation. Let's discuss the situation where the constraint system is scaled again. Continuously shrinking the solar system, it eventually became a microscopic system with a mass similar to that of fluorine atoms (miniature planets). Logically speaking, equation (6) can still be used to describe the miniature planets within it. By continuously amplifying a hydrogen atom (increasing its mass and charge in the same proportion) until its mass approaches that of Earth, the change in the applicability of equation (6) to it should be the same as that of the light bulb above. Can the Schrödinger equation be used to describe these two hypothetical systems, regardless of whether the system is macroscopic or microscopic. This is a general logical method for demonstrating the applicability of the Schrödinger equation for gravitational potential. Our conclusion is that 'the macroscopic system cannot be described using the Schrödinger equation' is determined based on ideological concepts rather than mathematical logic. Some people may believe that it was determined based on experimental facts. However, we have not seen any reports on determining the applicability of the Schrödinger equation through experimental methods. Can the explanatory system of quantum mechanics be used as a determining factor in selecting the applicable scope of the Schrödinger equation? Worth further discussion.

It is not difficult to see that when deriving the one-dimensional Schrödinger equation (including the later gravitational potential Schrödinger equation), "non locality" and "uncertainty" were not used. Only when using the Schrödinger equation (for example, when solving the equation, it is assumed that the radius r that determines the potential energy is uncertain, which is determined by the uncertainty of the particle's state). This indicates that strictly speaking, the Schrödinger equation is not a specialized tool for quantum mechanics (using the Schrödinger equation does not mean purely using quantum mechanics)

Using classical electrodynamics and planetary models, the structure of localized realistic hydrogen molecular ions is similar to the wheels of a unicycle [7-10]. This skeletal structure can achieve classical electrodynamic equilibrium. Merge various potential energy functions in the system (merge similar terms), and establish a Schrödinger equation using the merged potential energy function (merge the potential energy of multiple particles into similar terms to obtain a merged potential energy, equivalent to the potential energy of a virtual object). Solving this equation can yield bond length and dissociation energy data [7-10]. These references list multiple examples of simultaneously using classical mechanics and quantum mechanics to compute a microscopic object. A common feature of the calculation methods in these examples is that they first provide the composition and structural framework of the system based on the ideas and methods of local realism, then find the potential energy function, establish the Schrödinger

equation, and finally solve the established Schrödinger equation. In the process of calculating the same molecule, classical mechanics methods and quantum mechanics methods are used successively (this is a joint operation of quantum mechanics and classical mechanics). For hydrogen atoms, their skeletal structure is a planetary model. The calculation of hydrogen atoms based on planetary models and classical mechanics methods has long been done by Bohr. Later on, people felt that this was not very useful, and in the end, they had to use quantum mechanics methods for precise calculations to obtain more data. As I mentioned earlier in this article, references [7-10] can tell us that the planetary skeleton of hydrogen atoms is not very useful for calculating hydrogen atoms, but it is very helpful for calculating hydrogen molecular ions and hydrogen molecules (which can greatly simplify the calculation process and make it clearer). The planetary model Schrödinger equation (classical system Schrödinger equation) is an important component of the theoretical basis of this method.

The Schrödinger equation and the planetary model can both be used simultaneously or separately to describe macroscopic objects such as Earth. We have no strong reason to restrict the simultaneous and separate use of the Schrödinger equation and classical mechanical models. For the calculation of hydrogen molecular ions and hydrogen molecules, the combination of classical mechanics methods and quantum mechanics methods is more obvious and successful [7,8].

THE SIGNIFICANCE OF SCHRODINGER EQUATION OF GRAVITATIONAL POTENTIAL ENERGY

The second section points out that there is currently a set of unsolved mysteries in physics. (2) Formula is the bridge connecting classical mechanics and quantum mechanics. There are two such bridges: equation (2) and de Broglie relationship. Like the de Broglie relationship, equation (2) can also strengthen the connection between waves and particles (or macroscopic and microscopic). References [3-10] all acknowledge that one type of wave in the wave function is the wave that makes up electrons. This also reduces obstacles for the hybrid use of classical mechanics and quantum mechanics. The establishment and application of equation (2) further raise doubts that the de Broglie waves of non elementary particles are not real waves but tools. The noumenon of the wave function is more like a computational tool of quantum mechanics (or a tool that can be more widely applied). Because the objects of local realism and determinism can also be described using the methods of quantum mechanics. If the noumenon of the wave function is not a real wave but a tool, then in the context of the widespread application of de Broglie waves, we cannot say that de Broglie waves and Schrödinger equations cannot be used to describe macroscopic objects. When an electron is stationary, its fluctuation energy is zero (because $\upsilon = \lambda\nu,$ when υ equals zero, the frequency is zero and the fluctuation energy is zero). But the internal energy of electrons is still a non-zero constant value (m_0c^2). This fully demonstrates that the energy of the de Broglie wave of a moving electron is not the total energy of the electron, including the internal energy [m_0c^2. The phase velocity of the de Broglie wave of electrons cannot be calculated using $\upsilon = \sqrt{m^2c^4 + p^2c^2}/p$.

As mentioned earlier, the wave function and its ontology, de Broglie waves, may just be tools. Therefore, some relationships within waves and some physical quantities between these two waves are not objective. We define (or choose) equation (2) as $E_k = \frac{1}{2}m\upsilon_d^2 = h\nu_d$ not impossible.

What is the relationship between the noumenon of the wave function (wave of the wave function) and the de Broglie wave? No one dares to confidently say that the de Broglie waves of electrons

are the essence of the wave function used to describe the Schrödinger equation of electrons. What is the relationship between the noumenon of the wave function (wave of the wave function) and the de Broglie wave? No one dares to confidently say that the de Broglie waves of electrons are the essence of the wave function used to describe the Schrödinger equation of electrons. Microscopic particles are either 'complete waves' or' complete particles', which are the particle states chosen by people to choose 'methods', and are subjective choices. In fact, the state of objectively existing particles is not subject to people's subjective consciousness. Under constant external conditions, particles will not frequently jump between pure waves and pure particles. Logically speaking, the "duality" in wave particle duality should have existed from the beginning. Just like men and women, different sexual organs are displayed and used depending on the sexual partner.

The Schrödinger equation has a Hamiltonian operator. The applicability of the Schrödinger equation is strongly correlated with the applicability of the Hamiltonian. And the Hamiltonian operator is not entirely within the scope of quantum mechanics. The Hamiltonian operator, potential energy function, Viry's theorem, etc. are closely related to classical theory, while the core content of quantum mechanics - the Schrödinger equation - is closely related to the Hamiltonian operator, potential energy function, Viry's theorem, etc. The problem explained by the combination of multiple factors is also that the Schrödinger equation is not unique to quantum mechanics. The sharp contradiction between classical mechanics and quantum mechanics is not a dialectical conclusion, but a metaphysical conclusion.

Pour a lot of sesame seeds into a bucket, and after calming down, the direction of the sesame seeds' extension is random. If you believe that the randomness of sesame's stretching direction is an inherent characteristic of sesame, then the laws followed by sesame contradict those followed by macroscopic objects (sesame is definitely a macroscopic object). Microscopic particles are too small and have many interfering factors, making spontaneous ordering difficult. It is extremely difficult to clarify the details of causal relationships among various small folds. So that it can give others the illusion that the randomness of sesame is an inherent characteristic of sesame. Although this is a rough analogy, it is really difficult to deny that the situation of 'we treat microscopic particles' is not like this.

In the process of deriving and applying the Schrödinger equation, both quantum mechanics methods (such as using wave functions and de Broglie relations, and solving equations using the uncertainty properties of electrons) and classical mechanics methods (such as using potential energy functions, Viry's theorem, classical interactions, mathematical logic, etc.) are used. In addition, there is a phenomenon of "you have me, I have you" in terms of methods, features, and attributes (there is modernity in classics, and modernity is also classics). These phenomena can be considered as complementary or coexisting relationships between quantum mechanics and classical mechanics, rather than a life and death contradictory relationship. For a particle with multiple manifestations (such as wave and particle properties, coherent and decoherent states), it can be considered that "external conditions can determine which state the described object presents." It can also be considered that the phenomenon just mentioned is similar to the situation of intersex people, that is, similar to the "androgynous duality" of "dual existence and single manifestation". Existence does not equal performance, and non performance does not equal non existence. It is entirely possible for microscopic particles to exhibit only a portion of their objective properties under certain conditions.

For the Schrödinger equation of gravitational potential energy, there are both classical mechanics and quantum mechanics methods for its derivation and application in quantum mechanics. The methods of quantum mechanics and classical mechanics coexist or complement each other. As mentioned earlier, there are some unsolved mysteries in quantum mechanics and material structure theory. Let's change our mindset and perhaps explain some of these mysteries. Simultaneously eliminating some contradictions and giving birth to new interpretations. The establishment of the Schrödinger equation for gravitational potential energy can promote work in this area. The Schrödinger equation of gravitational potential energy itself is a product of the combination of classical theory and quantum theory.

We are not currently pursuing more accurate results calculated solely using the Schrödinger equation of gravitational potential energy. Instead, we are using it to change some concepts (such as the opposing and contradictory concepts between classical mechanics and quantum mechanics), liberate people's minds, and develop physics theories and establish new methods. In other words, in the pursuit of computational accuracy, it is the pursuit of using classical forces in conjunction with quantum mechanics to produce good results. Furthermore, by utilizing its compatibility and complementarity with quantum mechanics, the simultaneous use of classical mechanics and quantum mechanics in quantum chemistry calculations can simplify the calculation process and even improve the accuracy of calculations. The coexistence referred to in this article refers to the complementarity between the quantum mechanical properties and classical mechanical properties of particles or other physical objects, and/or the complementarity between classical mechanical theories and methods and quantum mechanical theories and methods. Therefore, it will help to provide a more detailed explanation of why and how to combine the two without causing conflicts.

Based on the examples and analysis introduced above, we can also say that quantum mechanics and classical mechanics are compatible, complementary, and can be combined for use. The Schrödinger equation and planetary models can both be used simultaneously or separately to describe macroscopic objects such as the Earth, and there is no sufficient reason to limit the simultaneous use of the Schrödinger equation and classical mechanical models.

CONCLUSION

As mentioned above, our conclusion is that quantum mechanics and classical mechanics are compatible, and the contradiction between quantum theory and classical theory may be a misunderstanding that "these two theories are complementary and can coexist". Contradictions can disappear or transform into complementary and coexisting relationships after changing one's mindset. By combining quantum mechanics and classical mechanics to calculate microscopic systems such as hydrogen molecules, ideal results can be obtained, and the Schrödinger equation, which can describe macroscopic systems, has been established. This situation forces us to search for the essence of de Broglie waves and wave function ontology. From a theoretical (or logical) and practical perspective, the essence of the wave function and the de Broglie wave are not the same type of wave. This indicates that at least one of the ontologies of de Broglie waves and wave functions is imaginary. The difficulty in observing the volatility of macroscopic objects suggests that large moving objects are unlikely to have clear and useful de Broglie waves. Most people believe that the volatility of large objects is extremely weak. Even if one believes in the existence of de Broglie waves, people do not know how the de Broglie waves of matter and the ontology of functions fluctuate. However, the Schrödinger equation established using imaginary waves can obtain accurate calculation results. Even if one believes in the existence of de Broglie waves,

people do not know how the de Broglie waves of matter and the ontology of functions fluctuate. However, the Schrödinger equation established using imaginary waves can obtain accurate calculation results. This leads one to speculate that it may not be the peculiar properties of microscopic particles (not the mystique of the particles themselves), but rather the "mystique of the Schrödinger equation as a tool and method". Of course, it is also possible that both have a certain degree of mystery. As long as the tools of quantum mechanics have mystery (or wonderful properties), the mystery of microscopic particles is not as important as before. Cutting off the connection between quantum mechanics and classical mechanics, even putting them in opposition, is no longer as important as before. It is natural to use the appropriate form of the Schrödinger equation in both the micro and macro worlds.

One of the important significance of establishing the Schrödinger equation of the macroscopic system is to change ideas, liberate thoughts, create more new methods and establish new theories, thereby promoting the development and progress of theory and methods.

The existing quantum mechanics is not without any problems [7,12]. This clearly leaves us with space for research and exploration. It reminds us that the existing theory of quantum mechanics cannot be used as an absolute criterion for judgment. Non local realism and local realism should be allowed to coexist and complement each other. For problems that cannot be perfectly solved by the ideas and methods of local realism, use the original Schrödinger equation and the ideas and methods of non local realism to solve them. For example, the quantization and electron spin problems, as well as the fine structure problems of hydrogen atoms that cannot be solved by planetary models, can be solved using the original Schrödinger equation and non local realism methods. It is not convenient to solve the rigorous logical calculation problem of hydrogen molecules using pure quantum mechanics methods. Therefore, a planetary model is used to solve the structural problem of hydrogen molecules and improve the accuracy of the potential energy function. Assuming that the two s-electrons of a helium atom are completely overlapping 'double electrons'. Calculate the energy of this pair of electrons using quantum mechanics methods, then use a prepared regression equation [11] to determine the interaction energy between the electrons, and finally sum them up. We can obtain the energy data of helium atoms.

Another question that needs to be explored is whether the one-dimensional Schrödinger Tu equation, which is used to describe macroscopic systems, can be extended to three-dimensional space like the original Schrödinger equation to exert magical effects and calculate quantized orbits (specific orbital radii)? If it cannot be promoted, what defects in existing quantum mechanics will be exposed? If possible, the significance of establishing the Schrödinger equation for gravitational potential energy would rapidly increase. What new ideas, methods, and theories will emerge when ideas change and thoughts are liberated?

DISCUSSION

We discuss the significance of the Schr ö dinger equation for gravitational potential energy by reducing and amplifying the system, and analyze the existing ideas and problems in quantum mechanics interpretation.

Reduce the Volume of The Solar System to The Size of a Hydrogen Atom

The concentration method is to reduce the volume without reducing the mass. Does this miniature solar system possess the quantum properties of a microscopic system? The answer is definitely negative. Because it is only a reduction in volume without a decrease in mass, we have

no reason to believe that the system will exhibit quantum properties. On the contrary, we have reason to believe that such a miniature solar system would not possess the quantum properties of hydrogen atoms. The reason is that the mass of each component in the miniature system is big. They all have strong anti-interference ability (and are deterministic and realistic, in accordance with the law of causality). They all have strong anti-interference ability (and are deterministic and realistic, in accordance with the law of causality). The preliminary conclusion is that the quantum properties of microscopic systems are not determined by their small size. But it is determined by other reasons. The overall conclusion is that the quantum properties of microscopic particles can disappear due to an increase in mass and anti-interference ability. In this way, low anti-interference ability is at least one of the determining factors of quantum properties.

Expand a Hydrogen Atom to The Size of The Solar System

The charge and mass of a hydrogen atom expand in the same proportion to be as heavy as the solar system. The formation is a macroscopic confinement system maintained by electromagnetic interactions. According to the existing interpretation of quantum mechanics and the concept of contradiction between macroscopic and microscopic systems, in this expansion process, the quantum properties of hydrogen atoms will disappear (because this expanded system is no longer a microscopic rest but a macroscopic system). The only reason for the disappearance of quantum properties is the increase in the mass of the system and its constituent elements. The conclusion is that the quantum properties of microscopic particles are formed by their anti-interference ability, which is at least one of the reasons for the quantum properties of microscopic particles.

What is the second reason for the formation of quantum properties of microscopic particles? Under the current interpretation of quantum mechanics, this second reason can only be attributed to wave particle duality (i.e., microscopic particles possess the true composition and structure of waves). This explanation supports the "wave element material structure theory" that matter is composed of waves. Those who believe that the quantum properties of microscopic systems are determined by the composition and structure of matter must believe that the quantum properties of microscopic particles are determined by their weak anti-interference ability and wave like composition and structure. This conclusion definitely denies the quantum mechanical explanation that microscopic systems or particles have ghostly properties. It is illogical to believe that there is no non local and non real composition and structure, but to believe that it has non local and non real characteristics. The current mainstream scholars of quantum mechanics deny determinism and also deny that 'properties are determined by composition and structure'. This seems to have gone to extremes.

Some people may argue that the quantum properties of microscopic particles do not require a reason, but are inherent properties of microscopic particles. However, all materialists believe that the characteristics of matter are determined by its composition and structure. Not searching for the composition and structure that determine the quantum properties of microscopic particles is masking ignorance. In a hundred years, physics has not made significant progress, perhaps due to the lack of attention paid to exploring the composition and structure that determine the quantum properties of microscopic particles. As long as the exploration of the quantum properties of microscopic particles determined by their composition and structure is strengthened, it will definitely lead to significant breakthroughs in physics research.

Previously, many people have considered the issue of the origin of quantum properties of microscopic particles. However, the answer from representatives of the existing scientific community is that quantum properties are inherent to microscopic particles. Unfortunately, this approach has become the mainstream ideological line. Many people feel that modern physics is facing unprecedented challenges. To break free from this dilemma, it is necessary to pay attention to the exploration of the idea that "the properties of matter come from their composition and structure". Or rather, it is necessary to conduct various explorations (especially the ones introduced in this article). The author of this article explored the research results of nearly 40 years alone according to this idea (explaining the source of electron spin magnetic moment, establishing the Schrödinger equation of gravitational potential energy, and Combining classical mechanics and quantum mechanics to use).

The existing interpretation system of quantum mechanics lacks the material and theoretical basis that "composition and structure determine quantum properties," and cannot serve as a reliable basis for judging the correctness of new theories Providing an explanation for a phenomenon that cannot be explained by conventional experiments does not necessarily indicate that the phenomenon in question has a solid experimental foundation. In the context of the existing quantum mechanics interpretation system, the source of electron spin magnetic moment has still not been explained clearly. In theory, new quantum mechanical explanations and mathematical logics that can explain the source of electron spin magnetic moments are worth discussing. The research work introduced in this article has two innovative points: the first innovative point (highlight) is to incorporate gravitational potential energy into the Schrödinger equation. The second innovation point (highlight) is the first use of the Schrödinger equation to describe the ideal orbital motion of the Earth, calculating the energy characteristic values of the ideal orbital motion of the Earth, changing the old concept that the Schrödinger equation has been limited to describing microscopic objects for many years. The significance or value of this work lies in improving the theoretical system of local realism quantum mechanics.

This article is an extended version of a preprint by the same author. All the work in this manuscript was completed solely by the corresponding author, with no conflicts of interest with others. The preprint file can be obtained through the following link: 2501.0094v1.pdf (vixra.org) https://vixra.org/abs/2411.0133. If you encounter comprehension problems while reading reference [13], please compare it with this article.

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REFERENCES

1. Richard Fitzpatrick. (2022). Ehrenfest theorem-Physics, Libre Texts. 360 library; Available: https://wenku.so.com/d/f52024150628c200c04ba98a1b1c2d0a
2. Ehrenfest P. (1927). Bemerkung über die angenälte Gültig keit der klassischen Mechanik Innerhalb Quantenmeehanik. *Z. Phys*. 45:455-457.

3. Runsheng Tu. (2024). A review of research achievements and their applications on the essence of electron spin. *Advances in Theoretical & Computational Physics*.7(4): 01-19.

4. Tu, R. (2024). Establishing the Schrödinger Equation for Macroscopic Objects and Changing Human Scientific Concepts. *Advances in Theoretical & Computational Physics*, 7(4), 01-03.

5. Tu, R. (2025). Research Progress on the Schrödinger Equation of Gravitational Potential Energy. *Adv. Theo. Comp. Phy*, 8(1), 01-07.

6. Tu, Runsheng. (2024). Solving the problem of source of electron spin magnetic moment. *Physical Science International Journal*. 28(6): 105-110. DOI: https://doi.org/10.9734/psij/2024/v28i6862

7. Runsheng Tu. (2018). Quantum Mechanics' Return to Local Realism, *Cambridge Scholars Publishing*.

8. Tu, R. (2024). A Wave-Based Model of Electron Spin: Bridging Classical and Quantum Perspectives on Magnetic Moment. *Adv. Theo. Comp. Phy*, 7(4), 01-10.

9. Tu, R. (2024). Progress and Review of Applied Research on New Theory of Electronic Composition and Structure. *Infinite Energy*. 167:35-51.

10. Runsheng Tu. (2014). Some Successful Applications for Local-Realism Quantum Mechanics: Nature of Covalent-Bond Revealed and Quantitative Analysis of Mechanical Equilibrium for Several Molecules. *Journal of modern physics*. 5(6).

11. Tu, Runsheng. (2016). Principle and application of experimental method for measuring the interaction energy of electrons in atoms. *International Academic Research Report*. 2(8): 187-200.

12. Runsheng Tu. (2019). If the wave function collapse absolutely in the interaction, how can the weird nature of particles are born in the interaction: A Discussion on Quantum Entanglement Experiments, *Indian Journal of Science and Technology*.12(8):1-10.

13. Runsheng Tu. (2025). Research Progress on the Schrödinger Equation that Can Describe the Earth's Revolution and its Applications, London Journal of Research in Science: Natural & Formal. 25(1): 27-38.