What Does It Mean that Quantum Mechanics Can Be Combined with Classical Mechanics?

Runsheng Tu
Huanggang Normal University, China.

ABSTRACT
In the fundamental field of physics, there have been no major innovations for over a century. There are now three original innovations emerging: establishing the Schrödinger equation for gravitational potential energy, which can be used to describe classical planetary systems; Create wave element (non-point) material structure theory; Combining classical mechanics and quantum mechanics to solve practical problems. They are closely related and form a chain of evidence. Their theoretical value lies in their ability to change the old notion that "classical mechanics and quantum forces are incompatible" and promote the birth of new theories. In addition, the birth of the Schrödinger equation for gravitational potential energy has enabled the original Schrödinger equation to also be used to describe macroscopic systems. Their practical value lies in the birth of new methods in quantum mechanics and the simplification of quantum chemical calculations. Provided multiple successful calculation examples such as electron spin magnetic moment, "Earth's orbital motion", and hydrogen molecules.

Keywords: Schrödinger equation for gravitational potential, Quantum mechanics, Classical mechanics, Compatibility, The noumenon of wave function, Electron spin magnetic moment.

I. Introdunction

Due to the exclusion of classical mechanics in existing quantum mechanics, the Schrödinger equation with wave functions is considered a specialized equation of quantum mechanics. Therefore, for a long time, no one established the Schrödinger equation and the gravitational potential Schrödinger equation that could describe macroscopic systems, especially those related to the Earth's revolution. During the period of November 2024 to April 2025, the author of this article published papers on the Schrödinger equation for the Earth's revolution [1-5]. From the Schrödinger equation of gravitational potential energy, it can be seen that the factors hindering the use of classical mechanics in quantum mechanics are the concept of "uncertainty of microscopic objects" and the concept of quantum coherence of microscopic particles in the explanatory system of quantum mechanics. For the distance r in the potential energy function of the Schrödinger equation, as long as it is not subjectively assumed that it can only be taken from 0 to ∞, the Schrödinger equation cannot logically exclude classical mechanics and can become localized realism quantum mechanics [6].

The wave function used in the Schrödinger equation is a mathematical tool that Schrödinger intuitively employs. Why can using it obtain correct calculation results? What is the wave of the wave function? Until today, there is still no unified answer. Is it related to the composition and structure of elementary particles? This article has also made bold attempts to address this issue The viewpoint was proposed that electrons are composed of circularly polarized photons [7-10]. This electronic structure model of wave elements is an updated version of the ring electronic structure model in references [11-13]. The wave element electronic structure model can well explain the source of the spin breaking magnetic moment of electrons. In the derivation process of the Schrödinger equation applicable to macroscopic systems, including bound systems dominated by gravitational potential energy, both the macroscopic mechanical system dominated by gravitational potential energy and the Schrödinger equation and quantum mechanical wave functions were utilized. Among them, the use of Schrödinger equation and quantum mechanical wave function belongs to the thinking method of quantum mechanics. It can be seen that the Schrödinger equation of gravitational potential energy can reflect the theoretical characteristics of combining classical mechanics with quantum mechanics.

References [6,8,9,10,14,15]] provide a series of computational examples that combine classical mechanics and quantum mechanics methods. References [7-11] discussed the essence of wave functions and established a theoretical framework for wave element matter structure and local realism quantum mechanics.

At present, the real reason for the lack of disruptive new developments in scientific research is that everyone's ideas, concepts, or ways of thinking are the same. Since the existing fundamental theories of physics have never considered the possibility of combining classical mechanics with quantum mechanics, the answer to the problem referred to in the title of this article is that "the combination of quantum mechanics with classical mechanics means that the fundamental theories of physics will trigger a scientific revolution. This answer has its own chain of evidence. This evidence chain consists of three main self innovative achievements. It is the successful application example (third highlight) of the gravitational potential Schrödinger equation, the wave element structure of electrons, and these two highlights (or innovation points) mentioned above. These three highlights are not isolated but complementary. Denying any of them is not so easy. It is particularly difficult to theoretically deny the Schrödinger equation for gravitational potential energy. The first two highlights belong to theoretical innovation. The third highlight is the successful application of the first two highlights. The success of application examples is the most difficult to deny and will enhance the reliability of the first two highlights.

II. The Difference in Value (or Meaning) between the Schrödinger Equation of Earth's Revolution and the Original Schrödinger Equation

The differences referred to in the title of this section include differences in form, usage methods (and/or scope), and meanings. Schrödinger initially established the Schr ö dinger equation for hydrogen atoms. Among them, the time-dependent Schrödinger equation is

$$i\hbar\frac{\partial}{\partial t}\,\psi=-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\psi-\frac{Ze^2}{r}\psi\,. \qquad (1)$$

References [1-6] and appendix A provide the Schrödinger equation for gravitational potential energy. Taking the ideal orbital motion system of the Earth as an example, its form is

$$-\frac{i\hbar}{2}\frac{\partial}{\partial t}\,\psi=-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\psi-\frac{GMm}{R}\psi\,. \qquad (2)$$

There are significant differences between the first and third terms of Eqs. (1) and (2). Equation (2) can be used to describe the ideal orbital motion of planets such as Earth. Equation (1) cannot be used to describe the motion of planets in the solar system.

The three laws of Newtonian mechanics include the law of inertia, Newton's second law of motion, and the laws of action and reaction. The existing quantum mechanics denies that microscopic particles can be in a static state and a definite motion state, and considers them to be in an uncertain state. Therefore, Newton's laws of motion (*i.e.* classical mechanics) do not apply in quantum mechanics. The initial Schrödinger equation indeed cannot describe the inertial motion state, acceleration motion state, and the relationship between force and reaction force of an object. People have used the concept that microscopic particles have no definite state, and therefore believe that microscopic particles cannot remain stationary regardless of whether they are under force or not, which does not comply with Newton's three laws. In wave mechanics, It can only be described by the initial electromagnetic potential energy Schrödinger equation.

After using $V=-\frac{GMm}{R}$ for potential energy, it is impossible to deny the applicability of the classical mechanical formula $F=V/r=-\frac{GMm}{r^2}$ for planetary models. After using the de Broglie relationship $\lambda=h/mv$, $-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\psi=\frac{1}{2}mv^2\psi$. Among them, $-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}$ is the kinetic energy operator. The validity of the Viry theorem in macroscopic confinement systems indicates that Newton's second law of $F=ma=mv^2/r$ apply {Newton's second law can be used in conjunction with equation (2)}. As long as equation (2) does not violate Newton's second law, equation (2) does not violate Newton's first law. This indicates that equation (2) is applicable to classical mechanics. The use of Schr ö dinger equation and wave function is the foundation of quantum mechanics methods. It can be seen that equation (2) indicates that quantum forces have a compatible theoretical basis with classical mechanics. The combination of quantum mechanics and classical mechanics has a theoretical basis. This indicates that classical mechanics and quantum mechanics can be combined for use. The section on "Discussion, Debate, and significance" in this article also explains that if there is a microscopic gravitational confinement system, equation (2) can also describe it. Similarly, if the bound state of two Lamp grass ball with opposite signal charges forms a uniform circular motion system (classical mechanics system), it can also be described using the original Schrödinger equation (1). This analytical conclusion can greatly reinforce the above conclusion. This is a completely new understanding that emerged after exporting equation (2).

The simplest understanding or recognition is that "as long as the distance r in the potential energy function is selected as a certain value when solving the equation, equations (1) and (2) can be used to describe macroscopic systems applicable to classical mechanics. As long as the range of the distance r in the potential energy function is set between 0 and ∞, equations (1) and (2) can be used to describe the microscopic systems applicable to quantum mechanics. The Schrödinger equation itself cannot logically limit its application in macroscopic or classical mechanics.

Equation (1) itself cannot deny or limit their applicability to deterministic objects. The choice of a constant value or a range of 0- ∞ for r is determined by factors outside of this formula (mainly subjectively determined by people's lack of confidence in the understanding of the state of microscopic particles). If a certain value of r is chosen, equations (1) and (2) are both applicable to classical mechanics.

The compatibility and combination of classical mechanics and quantum mechanics can be achieved not only in theory, but also in practice References [1, 5, 8-10] list many such application examples. This greatly enhances the persuasiveness of the conclusions presented in this section. The ring electronic structure model in references [10-12] supports the combination and compatibility between local realism and determinism, as well as classical mechanics and quantum mechanics.
In the process of scientific research, anything that can change human thinking and concepts is a major event.

III. A Ring Electronic Structure Model that Can Qualitatively and Quantitatively Explain the Source of Electron Spin Magnetic Moments

For a hundred years, the specific form of electron spin explaining the source of electron spin magnetic moment has not been well done. The mystery of electron spin magnetic moment is a big dark cloud looming over physics. References [10-12] support the "solid ring electronic structure model". Reference [6,7] established a wave ring electronic structure model. After using m=E/c2, there is a logical connection between these two electronic structure models.

Based on the experimental fact that high-energy photons decay into electrons and anti electrons, I assume that electrons are composed of wave rings. Specifically, electrons are composed of circularly polarized photons with clockwise rotation. And anti electrons are composed of circularly polarized photons with anti rotation. A basic plane polarized photon is decomposed into a clockwise circularly polarized photon and an counterclockwise circularly oscillating photon. The momentum and energy of waves are also divided into two parts simultaneously: $p_e = \frac{1}{2}p_{plane}$; $h\nu_{\text{circle}} = \frac{1}{2}h\nu_{plane}$. The way waves form electrons is by transforming circularly polarized photons from linear propagation to propagation along a small circle, thus forming a particle with a stationary center of mass (in this case, the electron radius $r_e = \lambda/2\pi$). The linear momentum of a fundamental circularly polarized photon in a free electron is $p_e = m_e c$, and the energy is $E_e = m_e c = \frac{1}{2}h\nu_{plane}$. Nearby, p_{e} is the intrinsic momentum of the electron's motion, and m_{e} is the electron's rest mass. In this way, the spin angular momentum of the electron is $\vec{p}_e \times \vec{r}_e$. The size of the electron radius $\vec{r}_e$ is equal to $\lambda/2\pi$. The intrinsic motion momentum of electrons is a plane wave with a $p_e = \frac{1}{2}p_{\text{plane}}$. So, the spin magnetic moment of the electron is $\vec{L}_e = \vec{p}_e \times \vec{r}_e$.

If the magnetic moment of an electron rotating counterclockwise on a horizontal plane is considered positive, then flipping such an electron loop 180 degrees results in a negative spin magnetic moment for the electron. If only these two values are taken, then

$$\vec{L}_e = \vec{p}_e \times \vec{r}_e = \pm\frac{1}{2}\hbar. \quad (3)$$

Please note that! The direction of the electron spin magnetic moment obtained from the experiment is not exactly two opposite directions, but multiple directions.
For planar electromagnetic waves, p_{plane}=$2m_e c$

$$\hat{p} = -i\hbar\frac{\partial}{\partial x}. \quad (4)$$

For basic circularly polarized light, p_{circular}=mc. This determines that the momentum operator of the intrinsic motion of electrons has an additional coefficient of 1/2 compared to the ordinary momentum Hermitian operator.

$$\hat{p}_{\text{e}} = \hat{p} = -\frac{i\hbar}{2}\frac{\partial}{\partial x}. \quad (5)$$

The correlation functions of basic circularly polarized light and plane polarized light can both take the form of equation (6).

$$\psi\ (x,t) = Ae^{-i2\pi(\nu t - x/\lambda)}. \qquad (6)$$

However, compared to the planar polarized light before decomposition, the amplitude A, energy value h ν, and momentum value p of the decomposed circularly polarized light differ by two times. When calculating its partial derivatives, there is no difference in form between the results obtained.

Now let's derive the electron spin operator. For wave functions, we are accustomed to using equation (6). However, we assume in reference [7] that electrons are composed of fundamentally circularly polarized light. Therefore, when deriving the electron spin magnetic moment operator, the intrinsic motion operator of the electron must use equation (5). Considering the relationship between basic circularly polarized light and electrons, which is represented by the operator $E_{\text{circle}} = \frac{1}{2}E_{plane} = \frac{1}{2}h\nu$, $p_e = mc$, $\lambda = h/2mc$. We replace p_e in $L_e = p_e \cdot r_e = p_e \frac{\lambda}{2\pi}$ with the operator $\hat{p}_{\text{circle}}$ in equation (5), and can obtain

$$\hat{L}_e = -\frac{\hbar^2}{2mc}\frac{\partial}{\partial x}\psi. \qquad (7)$$

We can verify equation (7) by finding $\frac{\partial}{\partial x}\psi = -i\frac{2\pi}{\lambda}\psi$. According to the relationship between the angular momentum of charge and its spin magnetic moment in classical electrodynamics, the magnitude of the electron spin magnetic moment is $\mu_e = \frac{e}{2mc}L_e$. Therefore,

$$\mu_e = \frac{e\hbar}{4mc}. \qquad (8)$$

It is not difficult to see that we have quantitatively determined the relationship between the self magnetic moment of an electron and its composition, structure, and mode of motion. That is, the rigorous logic reveals that the spin magnetic moment of electrons originates from their intrinsic motion. The method is to break through the constraints of the standard model material structure theory and the point particle material structure theory to establish the wave element material structure theory. By replacing the operator L_e in equation (7) with the operator $\mu_e = \frac{e}{2mc}L_e$, we can obtain

$$\hat{\mu}_e = -\frac{e\hbar}{4m^2c^2}\frac{\partial}{\partial x}\psi. \qquad (9)$$

In fact, the orbital magnetic moment of the extranuclear electrons of hydrogen atoms during orbital motion is 274 times that of the spin magnetic moment of free electrons [6]. This is a basic assumption. With it, it is convenient to use planetary models in atomic and molecular systems (that is, to combine classical mechanics with quantum mechanics). Based on this assumption, it can be predicted that conducting Stern Gerlach experiments using alpha particle beam, electron beam, and hydrogen atom beam will gradually increase the experimental effect. The quantitative ratio of the splitting effect is "proton (alpha particle): electron: hydrogen atom"=1:1836:1836 × 274.

IV. Chemical Calculation Examples Combining Quantum Mechanics and Classical Mechanics

We have theoretically demonstrated above (especially after deriving the Schr ö dinger equation for the Earth's revolution) that classical mechanics can be combined with quantum mechanics. Because the wave function and Schrödinger equation in the two elements of equation (2) belong to the thinking method of quantum mechanics, and the results calculated from $-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\psi$ and the gravitational potential energy function are both classical mechanical quantities. Additionally, the equation (2) is the energy relationship equation of a planetary system. The method of describing macroscopic mechanical systems using the Schr ö dinger equation is the idea-method of combining classical mechanics and quantum mechanics. We can establish a deterministic mechanical equilibrium system for microsystems. Equation (2) can be used to describe a uniform circular motion using the concept of force.

Reference [6,14,15] lists several successful computational examples that combine classical mechanics with quantum mechanics. Reference [8-10] provides a clearer explanation of the method of combining classical mechanics with quantum mechanics. The possibility of combining classical mechanics with quantum mechanics has been predicted in theory and realized in practice. This is destined to be a major event in the history of physics development.

V. Conclusion, Controversy, and Discussion

The research work introduced in this article has formed a complete chain of evidence: firstly, theoretically, the Schr ö dinger equation for gravitational potential energy applicable to the combination of classical mechanics and quantum mechanics can be derived; Secondly, it can provide a convenient wave element electronic structure model for the combination of classical mechanics and quantum mechanics, and this model can successfully explain the source of the burst spin magnetic moment; Thirdly, many successful examples of the combination of classical mechanics and quantum mechanics have been found. The first point is the mathematical evidence of quantum mechanics. The second point is the theoretical evidence of material structure, which is also a theoretical advantage (solving the problem of the source of electron spin magnetic moment that cannot be solved by other theories). The third point is practical evidence (or theoretical application evidence). These contents are referred to as positive evidence chains.

Both theory and practice indicate (more precisely, the positive evidence chain above suggests) that quantum mechanics can be used combining with classical mechanics (*i.e.* the two are compatible) . This can change the old notion that quantum and classical mechanics are incompatible. The update of scientific concepts is inevitably accompanied by a revolution in science and technology. Therefore, the answer to the question in the title of this article is that the research results that demonstrate the combination of quantum forces with classical mechanics from both practical and theoretical perspectives can lead to a significant scientific revolution. Specifically, it involves the revolution in quantum mechanics (returning to local realism and determinism. At least the explanation of local realism and non local realism is complementary), the revolution in material structure theory (updating from point particle structure to wave element particle structure), and the shift in physics research methods from an excessive focus on "finding physical reality in mathematical methods" to an emphasis on "modeling methods of physical reality".

Many people know that the existing quantum interpretation system is based on the concept or assumption that 'free microscopic particles have no definite state (including quantum states)'. Experiments that can reflect the characteristics of quantum mechanics cannot do without utilizing this assumption. The verification of this hypothesis requires quantum mechanics experiments that are explained by this hypothesis. This is a typical logical loop. This indicates that the hypothesis of 'uncertain state of microscopic particles' has not been experimentally verified, nor can it be experimentally verified (because quantum coherent states cannot withstand the action of instruments). It is difficult to guarantee the reliability of quantum mechanics explanations. The ontology of particles does not overlap, while the superposition of particle states is impossible Gerard't Hooft also holds a similar view [16].

After the publication of the research results introduced in this article, some different opinions have emerged. Some people believe that the theory in this achievement is inconsistent with quantum field theory and the current popular concept of quantum mechanics, as well as the "Standard Model that everything originates from the Higgs boson". Many people believe that quantum field theory itself is not a perfect theory. It has deficiencies [16], one of which is that it cannot describe the internal composition and structure of elementary particles. The Higgs mechanism in the Standard Model has minimal impact on quantum mechanics and cannot explain the source of electron spin magnetic moments. Quantum field theory and the Standard Model theory are not the pillars of physics (without them, the entire physical theoretical system would not collapse), and we cannot strongly deny the "positive evidence chain" mentioned above. There is a lot of intense debate about whether quantum mechanics is perfect. Some people believe that 'all facts support the existing quantum mechanics'. Some people believe that the success of existing quantum mechanics in application mainly refers to the success of the mathematical formal system of quantum mechanics in application, rather than the success of the explanatory system of quantum mechanics in application. The Schrödinger equation of gravitational potential energy is a supplement to the existing mathematical system of quantum mechanics, rather than a negation. The existing explanation system of quantum mechanics is not satisfactory. Not long ago, a review article was published in the journal Nature (Sean Carroll, 2025), which mentioned concerns about existing explanations of quantum mechanics [17].

As mentioned above, an important factor that is favorable for positive evidence is that the approach and conclusions presented in this article do not deny the existing mathematical formal system of quantum mechanics (on the contrary, they are compatible or complementary with the existing mathematical formal system of quantum mechanics), but rather deny the existing explanatory system of quantum mechanics. In short, it is worth discussing whether existing physics theories can easily deny the "positive evidence chain" introduced above.

Even purely using the original Schrödinger equation, it is assumed that the center of gravity of protons is relatively stationary when calculating atoms and molecules. For example, when calculating hydrogen atoms, it is assumed that the hydrogen nucleus is stationary; When calculating hydrogen molecules, only small-scale vibrations of protons are considered, and the calculation process assumes that the center of mass of the system is relatively stationary. After deriving equation (2), it cannot be denied that equation (1) used in quantum mechanics can also describe macroscopic confinement systems composed of lampshade spheres. This indicates that in quantum mechanics, there is no complete denial of the stillness of microscopic objects. This further demonstrates that the successful establishment of the Schrödinger equation for describing the gravitational potential energy of macroscopic objects indicates that the Schrödinger equation and wave function are not exclusive to microscopic objects (stationary objects, systems in uniform circular motion in bound states, and both macroscopic and microscopic can be described using appropriate Schr ö dinger equations). If there is a neutral bound system maintained by a small bound state gravitational potential energy, it can also be described by equation (2). The value of r can be taken as 0-∞ or a constant value. This description is also a description of quantum mechanics methods. That is to say, we cannot deny mathematically that equation (2) belongs to the mathematical formal system of quantum mechanics. This indicates that there is no irreconcilable contradiction between existing quantum mechanics and classical mechanics. After establishing the Schrödinger equation for macroscopic objects, the contradictions between them have become compatible and complementary.

To deny the Schrödinger equation of gravitational potential energy, one must partially deny the Hamiltonian operator and Schrödinger equation. Because the Schrödinger equation for gravitational potential energy is based on the original Schr ö dinger equation and consists of the gravitational potential energy function, Hamiltonian operator, and wave function. The strongest opposition should be the issue of application calculation accuracy regarding the third highlight. Many people are well aware that the accuracy of the calculation results established by Copernicus at the beginning of proposing the heliocentric theory is not as good as that of the repaired geocentric calculation method. It was only later improved that the accuracy of the calculation results of the heliocentric theory exceeded that of the geocentric theory. However, from a subjective and logical perspective, the subjective factors in the calculation method of heliocentric theory are always less than those in the calculation method of geocentric theory. The logical calculation method of heliocentric theory is stronger than that of geocentric theory. The difference in calculation accuracy between the old and new methods is also worth discussing.

The contradiction between quantum mechanics and relativity has two aspects: firstly, the gravity or spacetime metric that people already know cannot be quantized; Secondly, quantum mechanics does not recognize the physical reality of the spacetime metric used in general relativity. The latter can also be said to be that relativity uses the spacetime metric to eliminate the concept of force, while quantum mechanics uses wave functions to eliminate the concept of force. The birth of the Schrödinger equation for gravitational potential energy indicates an affinity between quantum mechanics and Newtonian mechanics, rather than supporting spacetime theory. This increases the difficulty of combining quantum mechanics with relativity. This will also spark strong debate.

In existing quantum mechanics, the physical meaning of the wave function is very vague. Quantum mechanics does not acknowledge that the essence of the wave function is electromagnetic waves, nor does it publicly acknowledge that the essence of the wave function is de Broglie waves. However, in the application process, it is secretly treated as a de Broglie wave. This approach is also difficult to draw a conclusion at the moment and worth discussing or debating.

REFERENCES

1. Tu, R. (2024). Establishing the Schrödinger Equation for Macroscopic Objects and Changing Human Scientific Concepts. *Advances in Theoretical & Computational Physics*, 7(4), 01-03.
2. Tu, R. (2025). Research Progress on the Schrödinger Equation of Gravitational Potential Energy. *Adv. Theo. Comp. Phy*, 8(1), 01-07.
3. 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.
4. Tu, R. (2025). A New Theoretical System Combinating Classical Mechanics and Quantum Mechanics. *Adv Theo Comp Phy*, 8(2), 01-06.
5. Tu. R. (2025). Schrödinger-Tu Equation: A Bridge Between Classical Mechanics and Quantum Mechanics. Int J Quantum Technol, 1(1), 01-09.
6. Runsheng Tu. (2018). Quantum Mechanics' Return to Local Realism, *Cambridge Scholars Publishing*.
7. Tu, Runsheng. (2024). Solving the problem of source of electron spin magneticmoment. *Physical Science International Journal*. 28(6): 105-110. DOI: https://doi.org/10.9734/psij/2024/v28i6862
8. 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.

9. 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.
10. Tu, R. (2024). Progress and Review of Applied Research on New Theory of Electronic Composition and Structure. *Infinite Energy*. 167:35-51.
11. Alvaro Garcia Lopez. (2020) *On an electrodynamic origin of quantum fluctuations* . arXiv：2001.07392v4.
12. The nature of the electron (2005) *Qiuhong Hu.* arXiv：physics/0512265v1.
13. An explanation of the electron and its wavefunction (2020) Jean Louis Van Belle。 arXiv：1707.08674v2 . Quantum Studies： Mathematics and Foundations. DOI: https://doi.org/10.1007/s40509-017-0152-8
14. 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).
15. 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.
16. Lee Billings. (2025) Quantum Physics Is on the Wrong Track, Says Breakthrough Prize Winner Gerard ’t Hooft. Breakthrough Prize Winner Gerard ’t Hooft Says Quantum Mechanics Is ‘Nonsense’ | Scientific American. https://www.scientificamerican.com/article/breakthrough-prize-winner-gerard-t-hooft-says-quantum-mechanics-is-nonsense/
17. Sean Carroll. (2025) Why even physicists still don’t understand quantum theory 100 years on. Nature. 638 , 31-34. doi: https://doi.org/10.1038/d41586-025-00296-9

Appendix A. Derivation of the Schrödinger Equation for Gravitational Potential Energy

There are several ways to express the momentum, kinetic energy, and potential energy of a planet in an ideal planetary motion system. As long as the values of the same physical quantities in different expressions are ensured to be the same, it is OK. Below, we have listed these relationships in a planetary system in a table.

Table S1. Several expressions of momentum of energy in planets and planetary systems

Content	**Planetary Velocity, $\boldsymbol{v}$**	**p Momentum,p**	**$\mathbf{E_k}$ Kinetic Energy, $\mathbf{E_k}$**	**V Potential Energy,V**	**Total Energy of System, $\boldsymbol{E}_{\textbf{total}}$**
Classical mechanical representation	v	mv	$\frac{1}{2}mv^2$	$-\frac{GMm}{r}=-\ mv^2$	$-\frac{1}{2}mv^2$
De Broglie wave representation	$v=\lambda v_{\mathrm{d}}=\frac{E_k}{p_d}$, $v=E_k/mv$	$\frac{h}{\lambda_d}$	$\frac{1}{2}hv_{\mathrm{d}}$	$-hv_{\mathrm{d}}$	$-\frac{1}{2}mv^2 = -\frac{1}{2}hv_{\mathrm{d}}$

From Table S1, it can be seen that the following relationship exists:

$$mv^2 = hv. \quad \text{(S1)}$$

Due to the minimal impact of removing subscripts on understanding the following content, we will omit the subscripts of physical quantity symbols below.

In quantum chemistry, the Schrödinger equation for a hydrogen atom is $-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\psi-\frac{Ze^2}{r}\psi\ = E\psi$. This is the fundamental equation of quantum mechanics chosen by Schr ö dinger based on intuition. By replacing the potential energy function in this equation with the gravitational potential energy function in the bound system, the macroscopic system Schr ö dinger equation describing the planetary revolution can be obtained.

$$-\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\psi-\frac{GMm}{r}\psi = E\psi. \quad \text{(S2)}$$

The E in the equation is the energy of the bound planetary system (excluding m_0c^2. At this point, it is the same as the Schrödinger equation for hydrogen atoms — the Schrödinger equation for microscopic systems). According to classical mechanics, Viry's theorem, and the values in Table S1, equation (S2) can be calculated to obtain the total energy of the ideal bound state system in the planetary model as $E=-\frac{1}{2}mv^2$. As long as the state of such a binding system remains unchanged, its total energy will not change (still $-\frac{1}{2}mv^2$). In order to establish the steady-state Schr ö dinger equation of "time changes while the state of the system remains unchanged" (which must contain the partial derivative $\frac{\partial}{\partial t}\psi$ of the wave function with respect to time), we assume that

$$f(x,t)\frac{\partial}{\partial t}\psi = E\psi. \qquad \text{(S3)}$$

Find the specific form of the function term $f(x,t)$ and combine equations (S2) and (S3) to achieve the goal. Substituting E=$-\frac{1}{2}mv^2$ into equation (S3) and considering equation (S1) and $\frac{\partial}{\partial t}\ \psi =-\ i2\pi\nu\psi =-\ i\frac{h\nu}{\hbar}\psi$,, we can obtain:：

$$-\frac{i\hbar}{2}\frac{\partial}{\partial t}\ \psi = -\frac{\hbar^2}{2m}\frac{\partial^2}{\partial x^2}\psi - \frac{GMm}{R}\psi\ . \qquad \text{(S4)}$$

or

$$-\frac{i\hbar}{2}\frac{\partial}{\partial t}|\psi\rangle = \widehat{H}|\psi\rangle. \qquad \text{(S5)}$$

In equation (S5), $V=-\frac{GMm}{r}$. This is different from $V=-\frac{Ze^2}{r}$in the same form of the Schr ö dinger equation. The $-\frac{i\hbar}{2}$in equation (S4) is also different from $\hbar$ in the original Schrödinger equation.

Appendix B. Cover Letter

Gerard ’t Hooft, one of the most respected figures in theoretical physics, believes the foundation of modern quantum theory is built on a misconception —that belief is holding back progress in science. He also said, quantum mechanics should not stop at randomness [Details: Lee Billings. (2025) Quantum Physics Is on the Wrong Track, Says Breakthrough Prize Winner Gerard ’t Hooft. Breakthrough Prize Winner Gerard ’t Hooft Says Quantum Mechanics Is ‘Nonsense’ | Scientific American. https://www.scientificamerican.com/article/breakthrough-prize-winner-gerard-t-hooft-says-quantum-mechanics-is-nonsense/]. Gerard't Hooft is not the only one who is confused or even dissatisfied with the existing system of unexplained quantum forces. Recently, an article titled 'Why Even Physicists Still Don't Understand Quantum Theory 100 Years on' was published in the journal Nature. Expressing the same concerns [Details: Sean Carroll. (2025) Why even physicists still don’t understand quantum theory 100 years on. Nature. 638 , 31-34. doi: https://doi.org/10.1038/d41586-025-00296-9]。The research findings presented in this article, as suggested by Gerard't Hooft, "take a step back and start from scratch" and break free from the constraints of the existing interpretation system of quantum mechanics, achieving three innovative aspects: Establish the Schrödinger equation for gravitational potential energy; Establishing a wave element structure model for electrons, also known as a non-point electron structure model with internal structure and motion model (which can explain the source of electron spin magnetic moment); Simultaneously using classical mechanics and quantum mechanics to solve the calculation problems of electron spin magnetic moment, atoms, and molecules (this is also the application of the first two highlights). These three aspects of independent innovation are the three highlights and one evidence chain of the results introduced in this article. The author attempted to express quantum mechanics (describing electrons, atoms, and molecules) without the principle of superposition and without the dominance of randomness. This is a significant independent innovation. This article is a commentary and has not been published in other publications or conferences (except for preprints). Full text, approximately X pages of your publication. Especially suitable for publication in your journal.