

Letter to the Editor

Local realism quantum mechanics can be established: a review of the book of quantum mechanics' return to local realism

Sir,

All the experiments that prove that Einstein is wrong and Bohr won have a serious flaw or loophole that is difficult to overcome — Have to subjectively judge the state of the system before the measurement. Undoubtedly, the establishment of quantum mechanics of local realism is a strong support for Einstein. Many people are dissatisfied with the quantum mechanics of non-local realism and want to establish the quantum mechanics of local realism. But they did not break through the bottleneck. The concept of wave function is widely used in existing quantum mechanics. However, the nature of the wave function is unanswerable. The model of "real wave curling inside the particle" determines that the wave function is the motion equation of localized real wave. The wave mechanics based on such wave functions is quantum mechanics of localized realism. The mathematical formal system of local realism quantum mechanics is the same as the existing one. Explanation of double slit diffraction can be experiment by directional quantization. The explanation system of local realism quantum mechanics is established, and it is guaranteed that this system can also be organically combined with the existing mathematical formal systems of quantum mechanics. Local realism quantum mechanics has all the elements of a valuable new theory, and its birth conforms to the law of theoretical development.

We can be sure that quantum mechanics is problematic. Weinberg once discussed the problem of quantum mechanics. In the book of *The Trouble with Physics*, the fundamental problem of quantum mechanics said by Lee Smolin is that. The meaning represented by the theory is not clear. Our correct choice is to either clarify the meaning of the theory or create a new meaningful theory. Lee Smolin proposed three solutions to this problem. My book, "Quantum Mechanics' Return to Local Realism" belongs to Lee Smolin's second scheme: Reinterpreting theory from the perspective of realism — Reinterpret the equation so that measurements and observations no longer work in the description reality.¹

What we can be sure of is that once the local realism quantum mechanics is established, its birth must be a major event in the history of science and technology. So what you have to do now is how to judge whether this theory is really established. Runsheng Tu's book, *Quantum Mechanics; Return to Local Realism*, can provide a basis for judgment.

The century debate between Einstein and Bohr is well known. Many people now believe that the discriminating experiment has proved that Einstein is wrong and Bohr won. However, such discriminatory experiments have an insurmountable defect or loophole. It is "the state of the particles before measurement is subjective judgment rather than directly proved by experiments." The theoretical basis of this subjective judgment (hereinafter referred to as the first subjective judgment. It is actually a hypothesis) is the principle of uncertainty and the principle of state superposition.² This assumption is not true. The reason is that from the electromagnetic point of view, the polarization direction of photons is the extension direction of the electric field vector (the main content of the existence form of photons). If a photon has no clear polarization direction, there is no clear electrical vector. It is not a complete and mature photon. The indirect experimental support is a double slit diffraction experiment and some projection measurement experiments. Double-slit diffraction experiments can be explained by local realism. Double-slit diffraction experiments can have local-realistic interpretations (such as directional quantization interpretation). In the process of projection measurement, the influence of the instrument is too great. The impact of the instrument is very small in the process of non-projected measurements. Their results should be more reliable (quantum inverse measurement theory lists non-projection measurement methods). The identical particles recognized by existing orthodox quantum mechanics scientists are also subjectively identical. They treat particles with different spin states (or different polarization directions) as particles whose spin state (or polarization direction) is uncertain. Thus, particles having different spin states (or polarization directions) become identical particles (this subjective judgment is the second subjective judgment). In fact, the quantum states of these particles are not identical. The non-identical particles are subjectively treated as identical particles to explain experimental phenomena, and the conclusions obtained are unreliable. The superposition principle and the uncertainty principle are derived from the experimental interpretation containing the second type of subjective judgment. It can be seen that the indirect experimental evidence on which the first subjective judgment is based is also unreliable. My work does not require these two subjective judgments.

As long as the experiment to verify Bell's inequality is still flawed, Einstein has a chance to make a comeback.

Moreover, in addition to the previously mentioned technical and logical vulnerabilities, the experiments to verify Bell's inequality have new defects or vulnerabilities as described above. The rigorous local realism theory system of quantum mechanics can be established, which also adds a lot of chips to Einstein (after the establishment of the theoretical system of quantum mechanics in local realism, there is no need for other evidence to criticize the Copenhagen School). In the long time, the loopholes in the experiment to verify Bell's inequality could not be blocked. Perhaps it is the correct reflection of Einstein's philosophy.

On September 1, 2018, Cambridge Scholars Publishing published the theoretical work — “Quantum Mechanics’ Return to Local Realism” written by Runsheng Tu.³ One of the highlights is “the idea that the wave is curled inside the material object particle” (Note: The “wave” is the wave corresponding to the wave function used in the quantum mechanics of elementary particles). The theme of the book is to establish the quantum mechanics of local realism, and succeeded by breaking through the bottleneck by the finishing touch (highlights). The mathematical logic system of local realism quantum mechanics is the same as that of the original quantum mechanics. The interpretation system of quantum mechanics is different from the original one. The local realism quantum mechanics has great advantages in application and understanding.

The author's main measures are: to explain the diffraction experimental phenomena of material object particles by directional quantization; to establish the light-knot model of particles structure; and to establish the theory of quantum inverse measurement. The key to establishing a complete system of quantum mechanics of local realism is to reveal the essence of the wave function using the particle structure model of light-knot. The light-knot electronic structure model considers that the plane polarized light is decomposed into circularly polarized light and then propagates along a closed path to form a localized particle. In this model, the wave is curled inside the particle and is a real wave. The electron wave function in an atom or molecule is the functional equation of motion of such a real wave. Since the real wave propagates along a small closed path to form a particle, the whole (or entity) of the particle is localized. It is not difficult to see that such microscopic particles must be both local and real. The reason is: the wave constituting the particle and its equation of motion (wave function) are real; the wave curl is no longer discrete in a small space, and the whole does not appear in many different places at the same time. When it moves as a whole, the curled wave is moved, and its center of mass must have a certain motion path. The reality of the wave function and the locality of the particle determine that the quantum mechanics established is the quantum theory of local realism.

The establishment of the interpretation system of local realism quantum mechanics depends on the essence (locality and reality).of the wave function of the real wave mentioned above, The method of establishing mathematical form system of quantum mechanics in the background of Local Realism is that the wave function of the real wave constituting the particle is appropriately differentiated and make the appropriate linear combination. The obtained mathematical form system of local realism quantum mechanics is consistent with the existing mathematical form system of quantum mechanics in content, and it has a high degree of relevance and consistency with the interpretation system of quantum mechanics of local realism (actually, it comes from the interpretation system of quantum mechanics of local realism). The conceptual system of localized realism quantum mechanics has a high degree of logical consistency and meaning. By doing so, we can really consider abandoning the Copenhagen School's quantum mechanics interpretation system.

The application of local realism quantum mechanics in quantum chemistry has great advantages — the calculation process is greatly simplified, and the meaning of the calculation steps becomes very clear. The book introduces this application in two chapters. More than a dozen molecules and hundreds of atoms and atoms were calculated. The calculated results are in agreement with the experimental values (described in Ref.4 and Ref.5). To what extent is the calculation process of the quantum mechanics of local realism simplified? Taking the calculation of hydrogen molecules as an example, a senior middle school student can also complete the dissociation energy and bond length calculation of hydrogen molecules within half an hour. The hat of the semi-empirical method was completely removed. Until then, the same calculations cost a lot of energy for college graduates, and the must not use computers and other people's programmed and semi-empirical methods. When the Schrödinger equation begins to be used in quantum mechanical calculations, the first atom to be calculated is the simplest hydrogen atom.

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It is also provable that the concept of quantum entanglement and wave packet collapse can be avoided. Retaining these two concepts can neither destroy the established mathematical system of quantum mechanics of local realism, nor can it block the application of the established theoretical system of quantum mechanics. Those who are not willing to abandon the concepts of quantum entanglement and quantum decoherence can treat these two concepts as special cases and no longer consider them to be universal and essential.

In summary, the authors point out that the biggest flaw in verifying Bell's inequality is that "the experimental method cannot be used to confirm the state of the particles before measurement. It can only be assumed that the state of the particle before measurement is uncertain." The double slit diffraction experimental phenomenon can be explained by the direction quantization. The concept of wave function is used in existing quantum mechanics theory, but do not know the nature of the wave function. The non-locality and non-reality of existing quantum mechanics are related to the non-locality and non-reality of the wave function used. Therefore, the bottleneck of establishing local realism quantum mechanics is to reveal the localized realism nature of wave functions. The author of the book has broken through this bottleneck and deserves congratulations!

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Localized realism quantum mechanics achieves the following points. (1) contains the positive results of the old theory (the mathematical formal system is identical to the quantum mechanics of non local-realism). (2) It can solve the problem that the old theory can't solve (the theory of quantum mechanics belongs to the theory of the micro world. However, the non-local realism quantum mechanics is independent of the internal structure of the microscopic particles. The internal structure of particles is one of the basic premises of establishing local realism quantum mechanics. We are back on the right track of "structure determines nature"). (3) The new theory is much better than the old theory in terms of common sense and common sense (in the new theory, causality, locality, and reality are preserved, making it simple and easy to understand). (4) The new theory inherits the practical functions of the old theory and has convenient advantages in quantitative calculation (the quantum mechanics calculation process has been greatly simplified. other applications of the old theory have been completely inherited, and only the application of the characteristics of quantum entanglement has been denied).^{4,5} (5) The new theory can predict: if we do electron double-slit diffraction experiments in the cloud chamber, we can simultaneously see the motion paths and diffraction fringes of electrons; and if we do double-slit electron diffraction experiments in an applied magnetic

field, we can still see diffraction fringes of electrons after the electron beam to be deflected as it in the cathode ray tube. This can reveal the nature of microscopic particle diffraction phenomena, which can prove that an electron cannot appear in two different places at the same time. The old theory cannot make these two prophecies. In general, the new theory retains the positive results of the old theory and has the advantages that the old theory does not have. The new theory can reveal natural laws and explain natural phenomena more accurately.

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