

The Double Slit and Aspect Experiments ©

Schrödinger's Wave Equation is not the Problem

Abstract

The act of observation in the Double Slit Experiment (DSE) is the unavoidable introduction of interference in the process. The diffraction interference pattern appears on the screen when the physics experimenters do not try to observe the particle's interaction along the path at any point. Schrödinger's Equation (SE) accurately describes the action of particles for the standard model. It confirms, with the complex number, that Universe is the critical participant in the experiment. The SE shows Universe is a participant in the DSE. Attempts to observe where the particle is results in the hand of Universe dropping out. The Aspect experiment adds another perspective on the observer.

Energy from the Vacuum of Space

Universe's hidden action of work is confirmed by the complex number. Imaginary numbers are the real numbers for Universe.

Freeman Dyson: "That square root of minus one means that nature works with complex numbers and not with real numbers." ¹

History has consistently shown that any attempt to observe that action always interferes with the process and erases the participation of Universe, resulting in not seeing the interference pattern. The detailed graphic math analysis done by Welch lab¹ makes clear that the 'i' in the equation is the critical factor defining the final outcome.

When light interacts with objects that have mass, it displays particle qualities for that interaction; it is a photon. When light is interacting with Space it acts like a wave. It has no mass and has the unique necessary quality to be at home dealing with objects or with Space. It is exempt from the Pauli Exclusion Rule. It is exclusively the carrier, transfer agent, transporter of energy in discrete packets from objects to Space and from Space to objects. All objects with mass still have some inherent wave quality since a complete separation of the energy wave from particle is not possible.

Whether an experiment involves particles with mass or photons, Space is always a part of the process even when physics ignores it. There are no hidden particles. This is participation of another aspect of Universe that is not seen. Space is an important part of the experiment, and its energy contribution is hidden, unseen, and undetected because that happens through the complex number noted in Schrödinger's equation under Universe's unseen control.

The operator is Universe controlling the unique energy of Space that interacts with objects that also are unique manifestations of energy. Objects with mass still have a wave characteristic that cannot be separated. Particles remain connected to Space.

Schrödinger's equation shows that the wave function is real if it is accepted that Universe does somehow work with the unique energy field type of Space that is described correctly with complex numbers. In the DSE, the complex number displays the manipulation of Space energy by the artistry of Universe hand over linear first order Time to effect and explain accurately the final outcome observed in the Double Slit experiment. He shows the complex number does have 'real' significance to Universe. The underlying harmony constraining the chaos is Universe at work.

Schrödinger's equation shows that the complex number 'i' is how Universe dances with any particle with mass, like an electron, or one without mass, like a photon, is hidden from us, and any attempt to "observe" that dance can only result in interference with it, whether done before, at, or anywhere after the double slit. Physics should acknowledge the full participation of the energy fields of Space interacting with the energy fields of objects in the DSE.

Wheeler's delayed choice experiment exposes physics misunderstanding of Schrödinger's linear wave function based on de Broglie's matter waves for the double slit, as it assumes that there is some way for the experimenters to be a part of the process at some point without effecting the outcome. Schrödinger's equation shows in the Welch lab work that Universe participation via the rotating complex plane effecting the matter wave happens as a step in the process changing over time. Not one specific time, but different times. The experimenter has still interfered in the process if he participates at any time or place.

The experiment is a complex system where Universe, as the critical participant, rejects any additional participation at any point. We do not need a theory going back in time. Schrödinger's wave equation shows the complex plane rotation has a phase changing effect that is responsible for interference without effecting the square of the modulus.

Paul Dirac: "there is a phase, a number of modulus unity which we can modify without affecting the square of the modulus. And this phase is all important because it is the source of all interference phenomena, but its physical significance is obscure." ¹

The spatial derivatives are pushing the complex plane around on a curved or circular path. Welch Lab says, "The action of wave functions to interfere like this is critical to the wave like properties of matter we see in situations like the double slit experiment."

Physics claims the problem with the conflict between Relativity and Schrödinger compatibility is due to quantum theory not accounting for Relativity. Perhaps the problem is that Relativity is not compatible with Schrödinger's equation which gives Space a second order over a linear first Time.

Schrödinger claimed that the physicists Copenhagen interpretation misunderstood his equation when squaring the modulus for the probability. "You fire an electron at a detector screen, and it lands in one spot". That experiment is an immediate step of process interference and misses any possible direct observation without realizing it. His objection was dismissed.

This is not the same as the Rutherford experiment; the experiment that led to the Bohr model. Recall what happens when the single electron or photon went through the DBL Slit first. “Rutherford experiment with alpha particles shot at a thin gold foil resulted in the Rutherford model of the atom.”² This experiment needs to be repeated with a single (best, if possible) alpha particle going through a DBL Slit, then through the gold foil to the detector. Let's see what that result is.

Dirac wanted to incorporate relativity into the wave equation. He found that it was necessary to have both space and time as linear first order. Relativity was second order in space and time. He introduced matrices to use complex numbers for the coefficients in the terms to maintain the symmetry Einstein required. This equation led to a world that included antimatter which was verified a few years later.

Schrödinger is more correct on Space and Time than Einstein. Dirac's work is an expansion of Schrödinger, not a validation of Einstein. So, Einstein's theory needs to be changed.

Entanglement and Spooky Action at distance

The Aspect Experiments³ are another where the observer being part of the experiment confuses the understanding. Experimental evidence has confirmed that the two entangled particles are connected and has confirmed at the end of the experiment that somehow have both arrived at their correct end state faster than light communication would permit.

In the Aspect experiment the two photons are mathematically part of the same quantum state. They would have the same polarization state at the end, regardless of what state is chosen for one first. They are one but incomplete and inseparable. Their polarization has yet to be determined but they have to agree. The measurement chosen to perform at the end forced the only possible end state compatible with that choice and nature's rules. Spooky action, even at great distances is an expected requirement, and that is what was found. Einstein's light speed limit is the one easiest rule to let go of.

Nature is part of the experiment again but unlike the DSE, interference from completion was established at the start of the experiment run and it was the

observation that ended the interference and the two particles could only be individually completed according to Nature's rules. Universe's actions are not limited to light speed.

Physics still holding onto the Copenhagen interpretation of the probability of all possibilities still denies an understanding that Schrödinger had of his equation. The one electron at a detector is not the same as the Rutherford experiment; the experiment that led to the Bohr model.

*"Rutherford experiment with alpha particles shot at a thin gold foil resulted in the Rutherford model of the atom."*² This experiment needs to be repeated with a single (best, if possible) alpha particle going through a DBL Slit first, then the gold foil, and on to the detector.

Conclusion

The desire to observe the particle's position in the Double Slit Experiment leads to an unnecessary confusing mystery that physics currently believes might be explained with the Multi-Verse approach to understand what happens to the Wave Function when it collapses. Schrödinger's perspective on his equation has been dismissed but needs to be reexamined. Redoing the Rutherford experiment with the double slits would be a good starting point.

The Aspect's experiments "corroborated entanglement as the distinctive quantum signature". This is more evidence of the hidden, unseen, misunderstood hand of Universe at work. Schrödinger's wave equation tells us the observer collapses the wave function because that action is an interference in the process and the process has been changed. This is not about some unique perspective involving Universe and the nature of consciousness. It is about an awareness that the observer can unknowingly interfere with the experiment when Space's participation is hidden via real complex numbers.

References:

- 1 <https://www.youtube.com/watch?v=uVKMY-WTrVo>
- 2 <https://www.britannica.com/science/Rutherford-model>
- 3 <https://arxiv.org/pdf/2212.05535>