Entanglement and Quantum Mechanics

by

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Abstract

Starting with the general nature of all particles, the rational and logical defects in the theory of Quantum Mechanics are presented. Issues treated include: quantum superposition of states and their collapse, entanglement, uncertainty, and the principles of locality and local realism.

Roger Ellman, The-Origin Foundation, Inc.
1401 Fountaingrove Pkwy, Santa Rosa, CA 95403, USA
RogerEllman@The-Origin.org
http://www.The-Origin.org

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1 - The Fundamental Nature of Particles

The fundamentals of particle physics is fully developed in *The Origin and Its Meaning*[1] and in depth in the book *On the Nature of Matter*.[11] The following develop the concepts.

Electric Field

- Nothing can travel faster than the speed of light, c. Given two static electric charges separated and with the usual Coulomb force between them, if one of the charges is moved the change can produce no effect on the other charge until a time equal to the distance between them divided by c has elapsed.
- For that time delay to happen there must be something flowing from the one charge to the other at speed c and the electric charge must be the source of that flow.
- The Coulomb effect is radially outward from the charge, therefore every charge must be propagating such a flow radially outward in all directions from itself, which flow must be the "electric field".

Unification of Fields

- Except for the kind of field, all of the preceding applies in the same way and with the same conclusions for gravitational field as for electric field.
- Therefore, either a particle that exhibits both fields, as for example a proton or an electron, is a source of two separate and distinct such flows, one for each field, or there is only a single flow which produces both effects: electric and gravitational.
- The only reasonable conclusion is that there is only a single "flow" which produces both effects and that electric and gravitational field are different effects of the same sole flow from the source particles.

The Beginning

- Before the universe began there was no universe, there was only nothing. Immediately afterward there was something. How can one get from the former to the latter while: (1) not involving an infinite rate of change, and (2) maintaining conservation ?
- The only form that can accommodate the change from nothing to something in a smooth transition without an infinite rate of change is the oscillatory form of equation *(1a)*.[3]

(1a) $U_0 \cdot [1 - \cos(2\pi \cdot f \cdot t)]$

- The only way that such an oscillation can have come into existence without violating conservation is for there simultaneously to have come into existence a second oscillation, the negative of equation *(1a)* as in equation *(1b)*.

(1b) $-U_0 \cdot [1 - \cos(2\pi \cdot f \cdot t)]$

- That is, the two simultaneous oscillations must have been such as to yield a net of nothing, the prior starting point, when taken together.

- That initial pair was so unstable that it immediately exploded into a multitude of particles, the Big Bang.[4]

That Which is Flowing

- Contemporary particles are Big Bang successors of the original oscillations with which the universe began. Therefore the outward flow of the original oscillations is a property of contemporary particles. Then, that which is flowing is the same original primal *medium*, the substance of the original oscillations at the beginning of the universe.

- Since it is flowing outward from the myriad particles of the universe simultaneously and that flow is interacting with myriad others of those particles without untoward interference, the "medium" must be extremely intangible for all of that to take place, any one particle's flow flowing largely freely through that of other particles, as intangible as – well – "field".[2]

The Oscillatory Medium Flow [5]

- The initial medium supply of the universe, oscillating per equations (1), came into existence at the Big Bang. Therefore the initial medium supply of each particle, each being a direct "descendant" of the original oscillation at the universe's beginning, must be oscillatory in form per equations *(1)*. Therefore the radially outward flow from each particle is likewise an oscillatory medium flow of the form of equations *(1)*.

- The flow is radially outward from the particle, therefore, the oscillation of the medium supply of each particle is a spherical oscillation. The particle can also be termed a *center-of-oscillation*, which term will also be used here.

- The amplitude, U_0, of the *[1 - Cosine]* form oscillation is the amplitude of the flow emitted from the source particle, which flow corresponds to its electric field. Thus the oscillation amplitude must be the charge magnitude of the source particle – the fundamental electric charge, q, in the case of the fundamental particles, the electron and the proton.

- Then, the conservation-maintaining distinction of amplitude $+U_0$ versus amplitude $-U_0$ must be the positive / negative charge distinction.

- The frequency, f, of the *[1 - Cosine]* form oscillation must then correspond to the energy and mass of the source particle, that is the energy of the oscillation is

(2) $E = h \cdot f$

and the mass is

(3) $m = {}^{h \cdot f}/_{c^2}$

from which the frequency is

(4) $f = {}^{m \cdot c^2}/_{h}$

- Particle motion affects its pattern of medium propagation in the forward and rearward directions because the flow must be at the speed of light regardless of the motion of the propagation's source.[6]

2 - Categories of Particles

All four fundamental particles [protons, electrons, anti-protons, and anti-electrons also called positrons] are *centers-of-oscillation*, oscillating spherically in a pure, simple, single frequency per equation *(4)* and of *[1 – Cosine]* form and propagating that waveform spherically outward.

The only difference between particles and their anti-particles is that their oscillations are the negative of each other. That is, the oscillation of the proton is of the $+[1 - Cosine]$ form and that of the anti-proton is of the $-[1 - Cosine]$ form resulting in the two forms being 180^o out of phase with each other and similarly for the positron and the electron.

The other particles are of several types:

- Composite particles = the neutron, anti-neutron, atomic nuclei and their anti-particles.[7,8]

  · These are all various combinations of the above fundamental particles in complex, composite *centers-of-oscillation*, spherically oscillating in a complex composite waveform; and propagating a complex, composite wave field.

- Non-rest mass [pure propagating wave] particles = photons and neutrinos.[9,12]

  · These all result from changes in fundamental or composite particles. They are not centers-of-oscillation; rather each is a piece of the wave field propagated by its particle source. The difference between the two is that the photon carries angular momentum and the neutrino does not.

- Fragment particles = the product of smashing the above rest mass particles into pieces with immense energy.

  · These are all unstable with very short lives. They are not normal centers-of-oscillation; rather each is a fragment of the center-of-oscillation of their fundamental or composite smashed particle source and / or of the wave field that was propagated by the fundamental or composite smashed particle source.

Particles in Quantum Mechanics

Quantum Mechanics offers no description nor explanation of the fundamental nature of particles such as the above.

Quantum mechanics postulates that the *state* of every elementary particle can be described by a *wave function*, a mathematical representation from which one can calculate probabilities that the particle is to be found in a location or a state of motion; and that the act of *measurement / observation* of the particle causes the calculated set of probabilities to *collapse* to the value defined by the measurement.

In Quantum Mechanics the condition that, until *measurement / observation*, the specific *state* of the particle is deemed unknown, consisting of various probabilities of various states according to the *wave function*, is also described as that the particle is in a *superposition* of all of its possible states.

Particle Centers-of-Oscillation and Quantum Mechanics

Because *centers-of-oscillation* oscillate over a cyclic range of instantaneous values per the particular *[1 – Cosine]* waveform of each case, the *state* of the particle continuously varies cyclically. The Quantum Mechanics "*state*" of the particle is the particular instantaneous position in the waveform that its *center-of-oscillation* is at at a particular moment.

- The waveform of the center-of-oscillation is the "*wave function*" of Quantum Mechanics.

- The *center-of-oscillation's* oscillation over its range of instantaneous values is the Quantum Mechanics described behavior that particles are in a *superposition of all possible states* until a *measurement / observation* causes the *superposition* to c*ollapse* to the state *measured / observed*.

- Of course the particle's oscillation is in only one pure, single, simple, state, point in its cyclic oscillation at any moment not simultaneously in all possible states as the Quantum Mechanics contention implies.;

- The *collapse* is the selection of that particular instantaneous position of the waveform of the center-of-oscillation that it happens to occupy at the instant of the *measurement / observation*.

Quantum Mechanics is defective in that it neither has, nor offers, any causality, any mechanism for its contentions such as the immediately above classical physics explanation of the same phenomena. Thus Quantum Mechanics lacks one of the fundamental requisites for truth.[10]

3 - "Entanglement"

"Entanglement" is the name assigned to the circumstance of two particles being so related that if the state of one of them is known then automatically from that the state of the other is known. The paired states can be opposites or identical or any other valid type of physical relationship. Entanglement is not limited to pairs of particles; large numbers of particles can be entangled.

A simple classical example of entanglement, for the benefit of the physics layman, is the circumstance of two hands clapping. If the instantaneous direction of motion of one of the two hands is known then automatically based on that knowledge the instantaneous direction of motion of the other hand is known.

Entanglement does not imply nor require a causative relationship between the entangled particles. The entangled state is a consequence of an earlier synchronization of the particles, synchronization according to certain applicable rules of physical behavior or definition.

4 - Quantum Mechanics "Entanglement"

If two or more identical fundamental particles or composite particles of the same type are caused to be traveling in the same direction at the same speed in identical environments [e.g. identical fields], then they have identical oscillations in their centers-of-oscillation and identical wave fields propagated outward.

- In Quantum Mechanics they are said to be *entangled*.

If two or more photons and / or neutrinos are generated by identical energy changes in a corresponding two and / or more such above *entangled* particles,

- Then in Quantum Mechanics the two or more photons and / or neutrinos are said to be *entangled*.

The Effect of Entanglement

If one of a pair or group of *entangled* particles is *measured / observed* the result of the measurement / observation applies to and is valid for each member of the pair or group, regardless of its location and distance of separation. The *measured / observed state* of each of the particles will be the same as that of the other(s) because of the synchronization effect of the requisite condition for their *entanglement*.

- However, the above is theoretical and the practical fact is that the particles need to initially be near enough to each other to establish their entanglement, their traveling in the same direction at the same speed in identical environments. Any subsequent motion of one of the particles [for example to establish a different location or distance of separation] not matched by corresponding motion of the other(s) destroys the entanglement because not matching motion results in their oscillation and propagated wave forms becoming different.

- Furthermore [see "Uncertainty" below], The act of measurement / observation changes the state of the object *measured / observed* which breaks the entanglement.

If one of a pair or group of *entangled* photons or neutrinos is *measured / observed* the result of the measurement / observation applies to and is valid for each member of the pair or group, regardless of its location and distance of separation. The *measured / observed state* of each of the photons will be the same as that of the other(s) because of the synchronization effect of the requisite condition for their *entanglement*.

- This is practical because the relative location and direction of motion of photons can change without causing them to become "unentangled". The state of the photon is created at the moment of the photon's generation by its source particle. The two are independent immediately and permanently once the photon is emitted.

- Of course the state of one of the photons can be changed by various actions subsequent to its original emission, without a corresponding change of the other photons, by various actions. Such a change would break the entanglement.

5 - Centers-of-Oscillation and Quantum Mechanics' "Uncertainty"

In view of the overall above presented nature of particles and their *centers-of-oscillation* the *state* of a particle is always definite and determined. The particle is where it is and it is going where and how it is going, both so long as it is independent of any interfering, disturbing action by a measuring observer or another particle or particles or field.

There is no actual *uncertainty* about the *state* of the particle; its *state* is certain and definite.

However, it is impossible to observe the location or motion of a particle without disturbing it. The act of observation changes the particle's location and / or motion so that while data can be obtained indicating what the location and / or motion of the particle was immediately prior to the observation, those data will no longer be currently valid because the disturbing effect of the observation has resulted in the particle having a new, different location and / or motion.

Therefore, observer knowledge of the *state* of a particle is always *uncertain*.

The reason for this is that for data about the particle to be obtained energy containing the information must travel from the particle to the observer and that transmission / communication results in its source, the particle, undergoing change.

6 - Cause, Mechanism, and Quantum Entanglement Effects

The Over-riding Fundamental Principle Governing all of Physics

Every action, every effect, and every event must have a cause and a mechanism by which it takes place. A theory lacking cause and mechanism cannot be considered valid until that defect is cured. [10]

Quantum Mechanics has no cause or mechanism supporting its contentions.

For theoretical validity it must be possible for the requisite cause and mechanism to exist and it must exist and, therefore, be subject to discovery.

If a cause or mechanism for a contended action, effect or event is absolutely, irrevocably impossible then the contention is not valid.

The Fundamental Principle Applied to Quantum Entanglement

Both communication and change of location instantly or at a speed greater than the speed of light are impossible. They are impossible by virtue of the nature of matter and light and because violating that principle requires an actual infinity, which is impossible.

Therefore the contended instantaneous communication between separated photons as in the Bell's Inequality experiments and opposed in the Einstein, Podolsky and Rosen *Gedanken* [thought] Experiment is an invalid contention.

Furthermore Quantum Mechanics violates one of the basic principles of reasoning and logic. One of the most effective ways of defeating a proposed contention or hypothesis has been to show that it inevitably leads to an impossibility, an absurd outcome, the so called *reductio ad absurdum*.

Quantum Mechanics leads to such an absurd result, contains such a *reductio ad absurdum* – instantaneous communication over vast distances with no proffered mechanism. Quantum Mechanics' unquestioning acceptance of that as reality is a result of mathematical *hubris* – because the mathematical details are mathematically correct the physical result is deemed correct when its absurdness actually means that the hypothesis or the model or the manner of application of the mathematics to the actual physical situation is in error.

Also therefore, the contention that a particle has no specific location until specifically observed / measured, that the particle only exists in a superposition of all possible locations for it, is not valid because it requires that the act of observation / measurement cause the particle to instantaneously change its location from the contended various locations in the superposition to the single specific location observed / measured.

The Principles of Locality and Local Realism

The principle of locality states that an object is only directly influenced by its immediate surroundings. Locality is a property of the field theories of classical physics. The concept is that for an action at one point to have an influence at another point, something in the space between the points must mediate the action. To exert an influence, something, such as a wave or particle, must travel through the space between the two points, to carry the influence.

Local realism is the reasonable assumption that all objects must objectively have a set of pre-existing values [e.g. speed and direction] before, and independent of, any measurement, before the measurement is made. The measurement cannot and does not create or initiate the pre-measurement values.

However, the measurement does cause new values to replace the pre-measurement values.

It is impossible for a theory to be valid yet contradict locality and / or local realism. Quantum Mechanics contradicts both and offers no cause-and-effect mechanism for the phenomena it proposes. That is not science; rather, it is pre-enlightenment superstition.

References

[1] R. Ellman, *The Origin and Its Meaning*, 2nd Edition, 2004, The-Origin Foundation, Inc., http://www.The-Origin.org. The book may be downloaded in .pdf files from the website.

[2] Per 1 above, specifically Section 10, beginning on page 49.

[3] Per 1 above, specifically Detail Notes 2, beginning on page 57.

[4] Per 1 above, specifically Section 20, beginning on page 391.

[5] Per 1 above, specifically Section 12, beginning on page 70.

[6] Per 1 above, specifically Section 13, beginning on page 91.

[7] Per 1 above, specifically Section 15, beginning on page 159.

[8] Per 1 above, specifically Section 17, beginning on page 293.

[9] Per 1 above, specifically Section 18, beginning on page 330.

[10] R. Ellman, *The Philosophic Principles of Rational Being*, 2007, The-Origin Foundation, Inc., http://www.The-Origin.org. The book may be downloaded in .pdf files from the website.

[11] R. Ellman, *On the Nature of Matter, 2018*, The-Origin Foundation, Inc., http://www.The-Origin.org. The book may be downloaded in .pdf files from the website.

[12] R. Ellman, *The Problem of the Photon*, http://www.the-origin.org/The Problem of the photon.pdf.