

Neutrino Oscillations: A Logical Argument for Them

by

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In this brief article I outline the structure of space/time and the observer's relation to it. Then I classify the fermion-type subatomic particles into their three proper types: neutrino-quarks, charged leptons, and proton-neutrons. With that foundational framework established, I then present the simple argument from quantum principles for the natural tendency of neutrinos to oscillate. All other particles also oscillate, but in different ways. I give examples of various types of oscillation. Observations of neutrino behavior will increasingly confirm the existence of neutrino oscillation and the likelihood that neutrinos have an extremely small rest mass.

All particles are ensembles of photon wave functions at various energies (wavelengths/frequencies) and various configurations (e.g., paired/split, linear/spiral/bubble.) We usually class subatomic phenomena as either bosons or fermions. Bosons are gregarious (do not obey Pauli exclusion) and appear to have integer spins. They have no charge (including W and Z bosons) and naturally form particle-antiparticle pairs and clusters of pairs. Each partner in a pair actually has "half" integer spin, so the pair together forms a whole like a little "tai-chi yin-yang" vortex. Because we usually experience bosons in pairs, they seem to have integer spins. A boson "pair" is actually two halves of an energy loop.

A particle moves "forward" in space/time and an antiparticle moves "backward" in space/time. Space governs "forward" motion, and Time governs "backward" motion. Forward and backward motion combine to form a loop. So antiparticles are tiny time machines that anchor "reality" into the past. Particles are tiny space machines that build "reality" into the future. The observer creates and controls both of these parameters of "reality". Oddly you can change your direction in space, but you can not move "backward" in space. Wherever you go, you are moving "forward" in space (even if you walk "backwards"). Try it. Wherever you go, whatever you do, you move forward, creating from the present moment the space of your future experience. Forward-moving spatial objects are correlated with backward-moving temporal objects via quantum entanglement. If a particle happens to encounter its antiparticle partner, it disappears from space/time and returns to the unbounded vacuum.

Time is a "mental" dimension called the observer's "mind", and space is a projection of the observer's mind that appears to form a physical world. Time is mental but not physical. You can not touch or hold "time" as a physical object. Clocks are physical objects made of matter, but time is not made of matter. Time expresses energy, a purely mental concept that the observer entangles with matter by correlating it with the material objects he has created as solid by resistance to their existence.

Energy is potential, and potential depends entirely on the observer's viewpoint. Without a viewpoint there can be no potential. The content of time is an energy potential that arises from what we call "memories". Energy potential depends on reference to a prior initial condition that is out of equilibrium. When equilibrium occurs, the potential disappears, and the memory of the prior initial condition also disappears. Hold a ball in the air. It has gravitational potential. Drop the ball. The potential becomes kinetic motion. Once the ball stops moving, equilibrium is reached. Does the ball remember what height it fell from? Is there any way other than via the observer's subjective memory to trace back from the ball at rest to the ball held aloft in your hand? An infinite number of possible evolutionary paths can lead to the presence of the ball at rest in its present location. Unless the ball left a trail of ink blotches where it bounced or some other clues there is no way to trace back to its starting point. And even those clues may be from some other ball bouncing.

For the potential to reappear, either the observer must recreate it by resetting its initial conditions, or he must have in place an automaton that will automatically recreate it for him. Otherwise the system will remain in equilibrium and the system's memory will be "lost". By "lost" we mean that it becomes a mere possibility rather than a "potential". A potential is a possibility projected into the spatial dimension by an observer through exercise of his resistive will to set up initial conditions for something to happen.

An additional aspect of this is the uncertainty that is inherent whenever we set up "initial conditions". The act of observation of a particular condition changes other parameters in an unpredictable way, so we can not at any moment know all the parameters of a system that are necessary for establishing "initial conditions" sufficient to predict the future evolution of the system.

Time is a mental condition that the observer defines. Also the observer constructs all memories by assuming viewpoints that he anchors into "reality" as initial conditions,

even though these are not sufficient for precisely predicting future evolution of conditions. The observer erases memories by simply returning to equilibrium. Examples of temporary states of mental equilibrium include meditation, sleep, death, and so on. Try entering one of those states and see how much you remember when you are deeply engrossed in that state. After an observer emerges from an equilibrium state, he may redefine parameters however he likes or according to habit.

Space is a physical projection of a mental concept. As Einstein showed us, matter is just a tightly bound up form of energy. It is a form of potential. It exists as a primordial possibility in awareness. An observer projects possibilities into potentials by taking a viewpoint that sets up initial conditions. This implies resistance to an undefined state of possibility. If an observer strongly resists a potential, he further energizes it until it becomes physical matter. Further resistance results in the appearance of forces associated with the matter.

Physicists devote much time to describing forces and their interactions -- causes and effects -- a subject that is more properly dealt with in the realm of psychology. Increase of resistance eventually results in the subjective experience of suffering. (Then the physicist may have to see a medical doctor.) The observer disrupts his own cherished viewpoint by the back-flow of his own resistance reflecting from the conditions he initiated. In this way he creates problems for himself. If a person likes experience but doesn't like suffering, the trick is simply to tone down the level of resistance to a tolerable level. No resistance at all results in pure bliss. In the realm of all possibilities it is possible to experience bliss and also to experience interactions. (See **Observer Physics** or my article, "Welcome to Phase Wave Civilization", dpedtech.com, for practical scenarios.)

The content of space is various forms of physical matter that we call "objects". Without objects space remains undefined. However space and time are entangled by correlation through an observer's viewpoint and the fact that both space and time arise in the observer's awareness as expressions of consciousness. (Consciousness is just a name for the experience generated by an observer selecting a viewpoint.) Time is the unwinding of the potential generated by observer resistance. It therefore is a purely mental reflection of the observer's own resistance. Time generates the impression that the objects in space are dynamic. They seem to move about and change. This is actually just the unwinding of the observer's own mental energy that he has projected into space. We can think of an observer selecting a viewpoint as the winding of a clock. This sets up a potential, a lack of equilibrium in awareness.

Once the observer releases his attention in that viewpoint, the clock spring starts to unwind, returning his attention to its original state of equilibrium. The observer experiences this as the passage of time. He marks that passage of time by the dynamic oscillating wave motion of the objects he is resisting as they return to equilibrium.

Thus the observer creates space and time by resistance to his own creations. We can travel backward in time mentally to experience or imagine or create "records" of the past, but we can not travel "forward" in time. Try it. If you shift into the past to review a memory, you can always go "confirm" the memory by checking the evidence in space. Objects in space form a memory bank for prior creations. You often can trace back from current conditions to discover prior initial conditions unless uncertainty or equilibrium has erased the path. On the other hand, if you fast-forward your attention into the future, your mind immediately shifts into imagination of various possibilities that can not be confirmed because they haven' t happened "yet". Therefore, imagination is actually a creative process in which you conjure up and play with possibilities. You can then choose to project or express one of them into the physical space as a reality and build a particular future. Creative action is the only way to provide evidence that a certain future potential is an actual reality. Otherwise it remains a potential or even lapses into a possibility.

Of course there are limitations to this because of complexity, loss of information due to entropy or equilibrium phases, resolution of scale in the media available, and Heisenberg' s inherent quantum uncertainty. We have no "evidence" at all for the future other than the certainty of our own subjective determination to make something so. On the other hand, such certainty can be more effective at determining the future (or the past, or even the present!) than any gathering of "physical" evidence to confirm memory.

There is no physics in the present moment. All physics describes objects as stable configurations in equilibrium and the ways in which objects can move about dynamically and interact in space/time. The present moment has neither space nor time nor any specific object or energy. The present moment just exists in a state of pure awareness without definition. Try it. Get real present. Stop going places or doing stuff in space and stop trying to remember this and that in time. Just hang out in the moment for a moment.

The appearance of integer spin values in boson subatomic particles is due to the close

coordination of particle-antiparticle pairs of half-spin components. Pair annihilation gives us clear evidence of this. Fermions obey the Pauli exclusion principle and have half-integer spins. They are split apart by the scattering effect of observer resistance. The other half of a fermion's spin is in the observer's mind as an attention particle. Clusters of even numbers of fermions can imitate this integer spin characteristic of bosons, and fermions like to do this or at least approximate it. This expresses their memory of and tendency to return to wholeness. When pairs annihilate, the two half-integer fermion spins merge and generate whole integer bosonic photons.

Fermions fall into three categories according to the three simplest types of wave functions allowed by geometry: linear wave interference, spiral wave interference, and bubble-shaped wave interference. The first is one-dimensional, the second is two-dimensional, and the third is three-dimensional

1. Neutrinos (and their antiparticle partners) are "linear" wave packets produced by groups of quantum photon waves at certain frequencies that interfere with each other. They resemble the drawings you see in books on quantum mechanics where wave packets are discussed, but with a fundamental difference that we shall discuss in a moment.
2. Electrons (and their anti-partners, positrons) are "spiral" wave packets produced by photons that wind outward from points and inward toward points. They self-interact and generate electromagnetic fields. The electron's internal structure is precisely the same as the corkscrew path you see when a charged particle moves in a strong magnetic field, but it spirals down to the Planck scale. (For details see my article, "Energy from Electrons and Matter from Protons," available at dpedtech.com.)
3. Proton-neutrons are ensemble particles built from a pair of heavy boson black holes that mutually interact in the vacuum zero point. A proton or neutron resembles a tiny binary star solar system with a number of planets. Another analogy is that such a particle resembles a whirling bubble of energy with a number of tiny vortexes dancing in the stream. (For details see my article, "Energy from Electrons and Matter from Protons," available at dpedtech.com.)

All stable particles gain their stability because they have an automaton structure that continually self-destructs and self-replicates.

Electrons are stable only because protons are stable. If a proton decays, it wipes out a couple of electrons with it, because a proton contains a pair of positrons in its core. Fortunately protons are extremely stable, and this allows for a stable physical universe.

All other subatomic particles are "overtones" of these three fundamental particle types. The quarks are "fat" neutrinos locked inside nucleon bubbles. The quarks that are supposed to have charges get their charges from association with electrons or positrons, the only truly charged particles in the subatomic zoo. Mesons and baryons are various ensembles of quarks, neutrinos, and electron-positrons. (See "Screw the Zoo," available at dpedtech.com.)

Neutrinos are quasi-fermions. They are also "free" light quarks. (Or we can say that quarks are bound heavy neutrinos. Note that we have here lepto-quark unification.) Neutrino-quarks are not stable enough to have a fixed identity. For that matter, neither are protons. Protons, especially nucleonic protons, naturally oscillate with neutrons. The neutron is really just one of the probable configurations of the proton ensemble.

Neutrons by themselves are unstable because of the Heisenberg relation. A neutron can not hold two electrons and two antineutrinos in its grasp and satisfy the Heisenberg requirements. So an electron and an antineutrino are used as uncertainty governors. They automatically de-localize the neutron just enough so that the rest of the ensemble can hang together dynamically as a stable proton. The electron is charged, so it buzzes around close by to balance the proton's positive charge, but the antineutrino has no such restriction, and can roam as fast and far as it needs in order to balance the tight displacement resolution of the other components with a large momentum spread.

Neutrinos are wave packets produced by energetic photons moving closely parallel -- virtually on top of each other -- so that they overlap. The reason they oscillate is quite simple. They are made of photons. Photons are quantum particles that themselves form from wave packets. So neutrinos and photons are really the same thing. Neutrinos are just hyper-packets -- clumps of packets of wave functions that mutually interfere. Look at the way wave packets are described in the textbooks. For example, Eisberg and Resnick (**Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles**, ch. 3-4) have a particularly lucid description with nice drawings. Pay close attention to the description. They build the wave packet using

the Fourier integral. Here is what they say: "If we combine an infinitely large number of sinusoidal component waves, each with infinitesimally different reciprocal wavelength....., we obtain a central group....., but the auxiliary groups will not be present." (See p. 73 and the accompanying graphic on p. 74.) What is wrong with this description? The mathematics is very neat and ingenious. But this theory doesn't work as a description of a "real world" wave packet, because it violates the fundamental quantum principle that energy moves in discrete and finite little bunches shaped by Planck's constant. It does not describe the "real world" that we experience.

If the sun had to radiate an infinite number of "sinusoidal component waves" in order to make a single wave packet, it would wink out before it emitted a single photon. Recall that the energy of EM radiation is in the frequency. Every frequency component of that packet would drain energy from the sun. Indeed, every photon does drain energy from the sun, and eventually the sun will wink out. But each packet must contain a **finite** amount of energy, and that is certainly what the evidence shows. This means there can only be a finite number of component waves in each wave packet.

Also, these waves can not just extend to infinity. They must be standing waves of finite length that loop around. They loop by spiraling into protons and out of electrons. Hopefully our sun will continue to shine on for a few billion more years.

The components of the group wave packet must also NOT be infinitesimally incremented for the same reason that any range of wavelengths would then require an infinite number of component waves. Therefore every wave packet emitted from the sun or any other source must contain a finite number of component waves, each of finite length.

What does this mean in terms of practical physics? It simply means that the "auxiliary groups" MUST BE PRESENT. What are the "auxiliary groups"? They are repetitive iterations of the same pattern of group wave packet that repeat over and over periodically in space and time. We experience that in terms of light when a source emits streams of photon packets. Neutrinos are "hyper-packets" so we experience this as neutrino oscillation. It is exactly analogous to the wah-wah beats you hear when sound waves interfere with each other. Streams of sound waves go "wah-wah" precisely because there are only finite component waves and they all have a starting point and an ending point. A staccato sound occurs only when the energy

is turned on and then turned off abruptly and no longer transmitted. The vacuum state contains all possible frequencies overlapping and canceling each other. But a finite source can not do that. So the model of the infinite waves with infinitesimal frequency differences canceling everywhere except at one location is a model of a particle floating by itself in the vacuum state. The reality is that all phenomena arise as finite standing waves in a finite space/time, the space/time and the phenomena being mutually defining. The origination of these phenomena is the observer's exercise of will to define a viewpoint. Lacking a defined viewpoint that upsets equilibrium and sets things into dynamic interactions, we are left only with constant relationships in a zero-point (equilibrium) vacuum sea of possibilities. (See my article, "Reference Frames, Negative Velocity, and the Uncertainty Principle," at dpedtech.com.)

As neutrino-rich radiation spreads out in space, there is reduction in the density of the oscillations due to dilution in space/time, but not of the wave packets themselves. If the component waves exactly overlay each other, which is quite possible with the bosonic photons, they will continue to oscillate into neutrino packets however far afield they travel.

The next question is -- why do the neutrino beats occur at particular frequencies? Part of the problem is that we do not know the exact neutrino frequencies, wavelengths, or masses. We only know that there seems to be a neutrino type that corresponds to each of the three charged leptons. I have proposed some possible frequencies in my book, **Observer Physics**, but further study of neutrino behavior will undoubtedly shed more light on this question.

Oscillation is a fundamental property of all phenomena, it is simply another way of describing the wave nature of phenomena. All particles are made of nothing but oscillations and also oscillate among each other. Neutrinos oscillate among themselves as they fly along in space/time. Inside the proton the up and down quarks continually oscillate among themselves in a process known as quark mixing. Inside the nucleus the protons and neutrons continually oscillate among themselves. Even electrons oscillate with their fatter versions, the muons. Muons have about 200 times the mass of electrons, so the usual low-energy electron "oscillation" takes the form of electrons shifting up and down in their atomic orbits as they absorb and emit photons. Only in high-energy scattering do you see the muon-electron oscillation. Just as a neutron decays into a proton as its least excited state, a muon decays into an electron as its least excited state.

One possible consequence of neutrino mixing is that neutrinos may have rest mass. The heavier quark neutrinos that are bound and loop around inside the proton definitely contribute to the overall rest mass of the proton. Three of them interacting generate almost all of the proton's mass. Quark wave packets look more like bubbles. However, the leptonic neutrino wave packet has the linear nature of an ordinary photon wave packet. We know that photon wave packets have no mass or almost no mass, only linear momentum. This is evident from the relativistic consideration of the photon.

$$* \quad E = hf = M_0 c^2 / (1 - (v/c)^2)^{1/2}.$$

The photon velocity (v) = (c) or so close to (c) that we can not measure the difference, and its energy (hf) is finite. Therefore its rest mass must be zero or so close to zero that we can not measure it. On the other hand, the neutrino has a group wave packet made of several component photons. The individual photon merely has a wave packet of energy determined by a frequency (f) interacting with (h), the quantum constant angular momentum of the individual photon packet. As long as the photon moves in free space without any dispersion influences, it will move at its natural wave train phase velocity

$$* \quad V_p = (L f) = c. \quad (L = \text{wavelength.}) \quad (V_p = \text{phase velocity.})$$

$$* \quad f = c / L.$$

The iterative stream of photons from a source is the "heartbeat" of observer quantum consciousness. Bound electrons that absorb and emit photons simply act as reflectors or temporary storage devices for the stream of low energy photons that flows in a loop between electrons and protons.

The neutrino's group wave should travel at the "group velocity", i.e. less than light speed. We can use (g) to represent the relativity factor $(1 - (v/c)^2)^{1/2}$. Then we solve for the Compton wavelength of the electron neutrino (M_{ne}). For the neutrino we also find a wavelength that depends on its mass or on its velocity compared to (c).

$$* \quad h / M_{ne} c \leq c / g f = L.$$

$$* \quad M_{ne} \geq h / L c.$$

We can not tell from this relation exactly what the rest mass is. It could be

extremely small, with most of its effective mass coming from kinetic velocity. If you could somehow stop the neutrino, its mass would drop to almost zero and so would its energy. In other words, the neutrino is a ghost-like particle whose apparent energy is caused almost entirely by the kinetic motion of wave packets that make it up. A ghost is a spirit energy that lacks a body. In the same way a neutrino has almost no body -- just a momentary fluctuation of photon energy. A photon has velocity (c) and zero rest mass, and the neutrino at rest has almost zero mass. The only mass it has comes from tiny fluctuations in space/time as the photon packets that make it up oscillate in and out of phase. This is a "sideways" motion that gives the neutrino some temporary quasi-size. I estimate the rest mass of the electron neutrino to be in the neighborhood of 10^{-42} kg. Free neutrinos moving at speeds close to (c) would appear to have more mass than that due to the accretion of kinetic mass. Bound electron neutrinos are nearly without mass. Quarks, on the other hand, have quite significant rest masses, most of which are in the form of virtual fluctuations in the vacuum state that take place within the tight compass of the proton. (See details in **Observer Physics**. See also my paper "Electromagnetism in the Light of Observer Physics" for a "rest frame" interpretation of particle interactions.)

In summary we can expect neutrinos in free flight to oscillate among the various neutrino states.

Suggested Resources

White, Douglass. **Observer Physics: A New Paradigm**. Taipei: Delta Point, 2002, 2003. dpedtech.com. (See also numerous articles posted at that site.)

Eisberg, Robert, and Robert Resnick. **Quantum Physics of Atoms, Molecules, Solids, Nuclei, and Particles**. New York: John Wiley & Sons, 1974, 1985.