the general science journal

Quantum Mechanics:
A Dublin Interpretation
With a Solution to the Measurement Problem

by
Joseph L. Archbold
archbold@flash.net

Abstract
The Measurement Problem in Quantum Mechanics owes its existence to the firmly held scientific belief that quantum waves collapse to a single point. The key intent of this paper is to prove that particles can be split both longitudinally (chapter I) and laterally (chapter II), and that this behavior offers a resolution to the apparent paradox of the measurement problem   Affording quantum waves the freedom to behave as other waves dispenses with weirdness and counterintuition. It also solves the measurement problem and restores reason to a subject long abused by quacks. In chapter I, I propose that quantum waves only seem to collapse to a single point when the threshold detection limits of our current measurement devices is exceeded; and that our current failure to detect fractional, or latent energy, at sub-quantal volumes does not prove that mass and/or energy must be transmitted in discrete quanta. Among the millions of atoms in the detection screen of our double slit measuring device, a single atom, will have sufficient matter/energy already stored to manifest a particle when the tiniest portion, of a single wave's matter/energy arrives. This new particle has little relation to the particle which produced the wave in the first place. In chapter II, I will further elaborate on the mechanism by which particles can be split and recombined laterally, and how this model can reconcile superficially paradoxical predictions from a Stern-Garlach apparatus. Taken together, these proposals argue that the nature of the measurement problem is a mechanical and technical one, and not the result of quantum weirdness. Several additional experiments to test these proposals are suggested, awaiting the appropriate technological innovation

Chapter I

Referring to the intractable "measurement problem," the famous physicist John Wheeler wrote, "Surely someday, we can believe, we will grasp the central idea of it all as so simple, so beautiful, so compelling that we will all say to each other, Oh, how-could it have been otherwise! How could we all have been so blind so long" [1].

What is this "Measurement Problem" and why has there never been a satisfactory solution? To understand the problem, we will need to look back in history at a series of experiments with repeatable, but contradictory, findings concerning the nature of subatomic particles.
In 1802, Thomas Young proved that light was a wave and measured its wavelength [2]. On sending a beam of light through a single slit he got a single cluster of light. Upon sending the same beam through two side-by-side slits he did not get two side-by-side clusters as expected. What he observed was a whole series of clusters across his screen. He correctly deduced that what he observed was an interference pattern. These patterns are caused when two waves of any kind collide to produce highs and lows as they interfere and combine with each other.

In 1899, with his cathode ray tube experiments, J. J. Thompson discovered that electrons were like high-speed bullets with velocities of up to 60,000 miles/second and a mass of 1.7×10^{-7} grams [3]. Then in 1906, Albert Einstein proposed that a logical conclusion from Planck's theory of radiation was that light was emitted and absorbed in discrete packages or quanta, in his paper "On the theory of light production and light absorption" [4]. These packages were later coined "photons" and considered to be particles. Scientists in England continued to do experiments which confirmed their belief that particles were bullet-like, while experiments in Germany seemed to convince the observers that particles were wave-like. This discrepancy was later articulated by Niels Bohr and a loose-knit group of other scientists in the mid-1920's as the Copenhagen Interpretation of Quantum Mechanics [5, 6]. Bohr argued that both interpretations were correct, as particles had a "particles/wave dual nature" [7], and the result was dependent upon the design of the various experiments.

The Davisson-Germer experiments [8] in 1927 confirmed (for electrons) de Broglie's hypothesis [9] that all particles, when sent through a double slit one at a time, would show a wave-like interference pattern. After a sufficiently large number of such random transfers has occurred, an interference pattern emerges. Subsequently, it was determined that all other particles; electrons, protons, neutrons, atoms, or buckyballs[1], displayed these same particle or wave characteristics [10].

How can this possibly be? How can each of those individual wave/particles decide to instantly collapse to a single point in one of the cluster areas (wave peaks) and not between clusters (wave troughs)? It just boggles the mind. **That, then, is the "measurement problem": one of the many enduring mysteries of quantum mechanics** [5, 6, 7, 11, 12, 13]**.**

The first question arising from these observations is: Why do quantum waves collapse to a single point or atom? No other wave we have ever observed does this trick. All waves collapse along their entire length. In this paper, I will argue that quantum waves are, in fact, no different than

[1] Buckyballs, short for buckminsterfullerene, are the largest objects observed to exhibit wave particle duality. Theoretically, every object exhibits this behavior.

any other wave. They collapse along their entire length or where they encounter an obstacle such as an atom. Quantum waves only *appear* to collapse to a point due to our limited observational abilities. Contrary to past and current assumptions that matter/energy comes in undividable packages or quanta, this paper contends that all quantum waves can be split, and the fragments can be absorbed by individual atoms longitudinally and also they can be split laterally. This second point will be the subject of the second chapter of this paper.

We will start with a concept in physics that is vital to understanding the mechanism of quantum wave collapse – the concept of latent heat. Latent heat, or latent energy, is a well-known mechanism whereby a material at certain phase shifts (e.g., ice to water and water to steam) can absorb or radiate energy without any scientifically detectable change in its structure (i.e. temperature change). We are therefore led to the conclusion that individual atoms within the material are absorbing or radiating energy without any detectable change in their structure until the addition or deletion of energy reaches a sufficient threshold to affect the shift.

The ability of atoms to absorb and store energy in doses, between electron orbital shifts without detection, is crucial to our understanding the measurement problem. Furthermore, I propose an atom has the capacity to store levels of energy that vary from those of its neighbors. That this variation in energy storage is not detected by any of our current instruments is the key to understanding not only why quantum waves appear to collapse to a single point but also the regularity of atomic decay. When an atom decays it still possesses a significant amount of energy. The remaining energy of the decayed particle, I propose, becomes a wave, and this energy is then absorbed by all the adjacent atoms. This process maintains the total matter/energy of the decaying object at close to the total energy before decay. The varying energy of atoms coupled with the collapse of a particle wave to multiple atoms then becomes the answer to both the regularity of an elements half-life despite the irregularity of atomic decay and to understanding the measurement problem.

I believe very few reasonable people would object to the following statement: When a water wave crashes on a shore, its energy is transferred to the beach, or more precisely, to the particles of sand on the beach – or even more precisely, to all the atoms in the sand grains on the beach with which the wave comes into contact. Why then does the scientific world generally believe that when a quantum wave or particle wave crashes into our test equipment (composed of atoms), it should collapse to a single atom and not to all the atoms it comes in contact with? This widespread belief likely stems from two facts. First, early and current experiments seem to show that when a quantum wave is measured it instantaneously appears at a single point; and second, the belief that quanta of energy are indivisible entities.

In 1926, Max Born “showed that these particle waves – these wavicles as some physicists called them – were not physical waves, like those lapping at the shore. Schrodinger’s equations, Born theorized, described waves of probability, mathematical undulations expressing the likelihood of where an electron would be at a certain time.” [14]

I do agree that quantum waves, as well as being pure waves, are also probability waves, as long as succeeding waves are identical or have a frequency and amplitude close to that of the initial wave. Therefore, assessing the probability of where an electron will appear from the various amplitudes of the initial particle's wave is brilliant and works like a charm. Its shape can tell us the points where most of its (and succeeding waves) matter/energy will land or not land, and thus where none will appear when a succession of waves collapse.

However, I totally disagree with the corollary idea that being a probability wave means a quantum wave is therefore not a physical wave. I propose that quantum waves are as real and physical as any other type of wave in the universe and should be treated accordingly. In my view, this corollary idea is where quantum theory took a turn that would lead to various difficulties, such as:

- the measurement problem,
- the belief that particles are solid indivisible entities, and
- the belief that the electron or photon ejected from an atom is the actual physical electron or photon that is detected by our measuring device.

It is ironic that Einstein's 1905 paper on the "Photoelectric Effect" is almost universally interpreted as arguing that light transmits in indestructible packets of energy or quanta (photons). Even Einstein himself stated that complete transfer of quanta to a single electron was only one of many possibilities. "The simplest possibility is that a light quantum transfers its entire energy to a single electron; we will assume that this can occur. However, we will not exclude the possibility that the electrons absorb only a part of the energy of the light quanta" [15].

The fact that energy (or matter) was emitted and absorbed with set quantities of energy was indeed correct. However, this idolatry of what was only the simplest possibility proposed by Einstein now prevented any rational discussion of the manner in which quantum waves transmitted energy or matter from one object to another. His central idea was stunning. It posited that a quantum of energy was required to eject an electron from its orbital or atom and that a specific quantity of energy was released when an electron dropped from a higher to a lower orbital. It also was the case that when large numbers of electrons were emitted from a metal by bombarding it with sufficiently high-energy photons, a nearby more positively charged macro-sized body became the receptor of a like number of electrons. This led to the idea that each individual electron transported itself in one piece.

While this idea was not necessarily true, it did take a firm hold in the scientific community. Everyone, including myself, subscribed to the idea that energy emitted from an atom was transferred in an undividable block or quanta of energy, as a unit, to another atom [12, 5, 16]. The current consensus is the Copenhagen Interpretation of Quantum Mechanics. According to this interpretation, a unitary entity can act as a particle, then as a wave and then again as a particle. Doing a quick thought experiment in which a wave is advancing to a screen composed of 14 atoms, as shown in (**Fig 1A)**, we could draw the following conclusion: The entire wave front, wave quanta

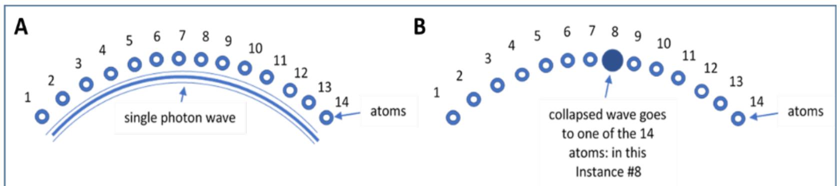

Figure 1. Common interpretation of wave/particle duality. A) Wave represents mathematical distribution of photon location probability. B) Photon energy transfers to only one atom.

or wave function, will collapse to one and only one of these 14 atoms. Perhaps in this experiment, the wave will collapse to atom #8, as shown in **(Fig 1B)**. Atom #8 changes its configuration as an electron moves to a higher orbital. As the next photon arrives, the wave may collapse to atom #3 or maybe to atom #13. And this, in a nutshell, is the measurement problem: How does this photon, as a wave, decide which atom to collapse to? Which atom receives the total energy, pushing its electron to a higher orbital?

One theory suggests that in our world, or universe, the energy goes to the atom that we observe it affecting whereas in another 13 parallel worlds or universes it goes to one of each of the other 13 atoms. This is Everett's many-world theory and is taken to be a solution to the measurement problem. Believe it or not, this theory is now being taken seriously by cosmologists and being applied to their discipline [17]. However, the most recent rejection to this many worlds theory and all the other major contenders as solutions to the measurement problem, is published in arXiv June 28, 2022 [18]. Indeed, the many-world theory is absurd. How can a simple quantum wave decide it should collapse to a specific atom? If this is a random choice, we would never see the dark/light bands when there is interference, and if not a random choice, then these photons have a greater ability to make complex decisions than we humans.

So, let us try to think of a more logical way to explain the interference pattern observed in these experiments. Let us assume a quantum wave is no different from any other types of waves, and see how that might work out. According to my thinking, which I shall coin the "Dublin Interpretation", each of the 14 atoms will receive $1/14^{th}$ of the first particle's wave matter/energy. Now, if all the atoms were at the same matter/energy level (which presumably they would not be), then all 14 atoms would experience a small matter/energy jump of 1/14 of a particle. However, noting our previous discussion on latent heat, I propose not all the electrons in identical orbits in adjacent atoms would possess the same energy level. This amount would be a continuum of energy measured from that required to get that electron into that particular orbital and the amount required to eject it to the next higher orbital. Some atoms and their electrons would have more latent energy and some less; (**Fig 2A**) shows our 14 atoms, each with a different amount of internal matter/energy as indicated by its outline density. When the first of our single emitted particle arrives, it deposits an equal amount of matter/energy to each atom. However, none of the atoms have enough energy to boost a particle to where it displays itself as a measurement,

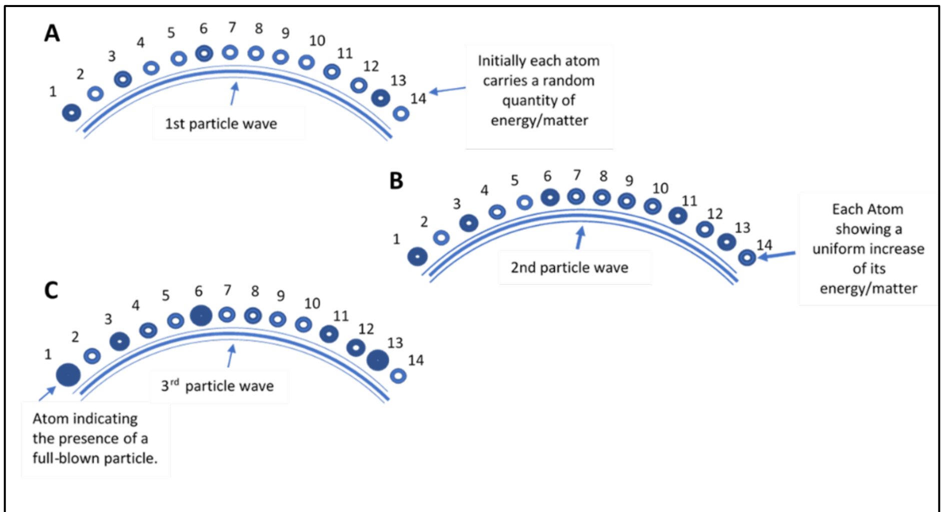

Figure 2. Wave energy is evenly distributed to all positions along the length of the wave (**A. B, C**). 14 atoms, each with varying levels of latent energy, are depicted by circumferences of varying thickness. **A**) Atoms 1, 6, 13 begin with higher latent energy levels, and thus are the first to indicate "complete particle transfer" (**C**).

although atom #1 looks like it is about ready to fire. When the second particle wave arrives (**Fig 2B)**, all atoms again receive a boost of 1/14 of the particle's matter/energy. This is now sufficient for atom #1 to display the presence of a full-blown electron or photon (**Fig 2C)**. Voila! The arrival of a particle is detected at atom #1, while atoms #6 and #13 will "fire" when the 3^{rd} particle wave arrives and all atoms get another boost in their matter/energy levels. What appears is the recreation or restructuring of an electron.

This mechanism neatly explains why, when we perform a double-slit experiment using consecutive single wave/particles, we get an interference pattern caused by atoms being infused with matter/energy at the peak areas of the wave and none, or extraordinarily little, at the trough. Continuing with our thought experiment, for the purpose of simplicity, let us temporarily assume our 14 atoms all begin at the same energy level. (**Fig 3A**) shows a single particle having traversed a double slit, and from which each slit emerges a bulging portion of the wave. Then as each wave front expands, they superimpose and interfere with each other before becoming a single superpositioned wave about to encounter our 14 atoms.

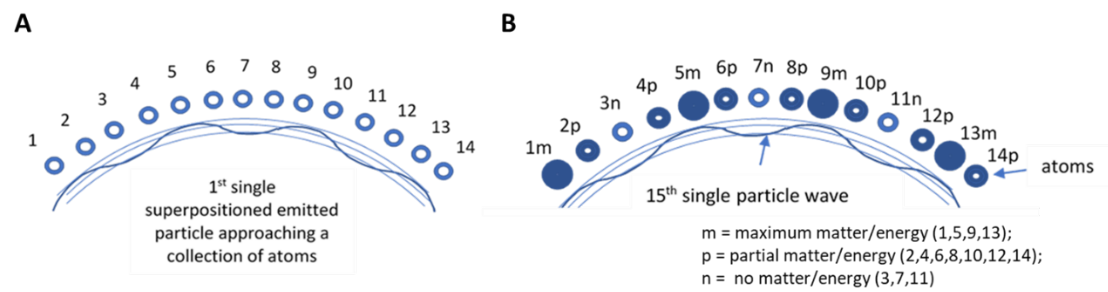

Figure 3. **A**) The double-slit experiment creates bulges of the wave front, altering the distribution of energy/matter transferred to the atoms in the detector. **B**) After 14 particles have transferred, they are distributed in an interference pattern, being concentrated at the peaks of the superpositioned waves with none at the troughs.

(**Fig 3B**) shows the matter/energy level of our 14 atoms after our fourteenth particle wave collapsed across all atoms. From this illustration, it is clear how an interference pattern of light/dark bands would appear when a double slit barrier is used. It also explains why, if the shape of the first particle's wave is known, it is feasible to predict where particles would appear and where they would not. This explains why the probability forecasting of the Schrodinger wave equation for the first particle's wave is so accurate and powerful in predicting the probability of where particles will appear and where they will not.

Even though it appears that a particle emerges when the first or second wave strikes our sensor, it is not because a full wave collapsed to that atom, but because this particular recipient atom required only a tiny fraction of the wave/particle's energy/matter added to its existing energy/matter to cause an (now fully energized) electron to jump to a higher energy orbital or to be ejected from its atom.

Various experiments have shown that all particles exhibit this form of behavior. Therefore, all particles can be split. Furthermore, all atoms can store varying levels of matter/energy without any outward display. I propose that the amount of this atomic storage for light energy is the value below the threshold required to manifest a photon. The amount of storage for an electron is the value required to raise it from its ground state to that required to eject it to the next orbital or out of the atom if in its highest orbital.

The undetectability of partial or virtual particles (either stored in an atom or in free flight as waves) adds up to a massive quantity dwarfing those particles which we detect. For fermions, which exhibit mass and are therefore subject to the force of gravity, this is also a considerable amount and of sufficient size to be considered dark matter. There is no need to hunt for undiscovered particles to account for this dark stuff or to create new mathematic models [19] to eliminate it. I would argue dark matter is merely this latent energy/matter, which we still lack the capacity to detect and measure.

Chapter II

In Chapter II, I will turn from the implications of longitudinally split particles and focus on laterally split particles. I first began considering this possibility while reading Dr. David Z. Albert's remarkably interesting book *Quantum Mechanics and Experience* [16], in which he discusses the theoretical implications of the Gerlach-Stern experiment and later variations thereof. Also explained succinctly by Professor Allan Adams of the Massachusetts Institute of Technology in his course on Quantum Mechanics (Lecture 1: Introduction to Superposition) [20], is that properties of intrinsic particle spin can be observed by rotating the orientation of magnets influencing electron movement along a path. This was when I first came to realize that particles could actually be split laterally. It was only later I realized they could also be split longitudinally, as discussed in Chapter 1. In this section, I will propose that these "weird" spin experiments, in fact, do have logically intuitive outcomes and provide a related solution to a different aspect of the "Measurement Problem."

The key intent of this paper is to prove that particles can be split both longitudinally (chapter 1) and laterally. Particles can be restructured by combining fragments of particles (which cannot be detected) to produce a reconstituted entity which can be detected. There may be other mechanisms for splitting particles, but here I will propose one hypothesis: that particle spin is the orientation of a free particle or wave in space or when travelling between orbitals in an atom. Or more precisely for an electron, spin describes its orientation with respect to a magnetic field. If the field deflects the electron straight up, or less than 90^o either side of straight up it is said to have *spin up*. If it is deflected straight down or less than 90^o either side of straight down, it is said to have *spin down*.

But if a particle is spinning, how can the spin be oriented in space or in relation to a magnetic field? The answer is that it is not spinning. An electron spins only when orbiting the nucleus of an atom when that atom is cojoined with other atoms in a material. This applies to all atoms in all elements. However, for the magnetic materials like iron, steel, nickel, and cobalt, there is a difference. When an electron transfers from one atom to another in these elements it leaves its orbit in one atom, ceases spinning, then travels freely through space with a set orientation. This reveals its magnetic properties. It then resumes its spinning in an orbit of an adjacent atom. In other nonmagnetic elements, in contrast, the transition of an electron from one atom to another is immediate and direct, with one electron's orbit of one atom seamlessly blending into the orbit of the adjacent atom.

We can imagine the electron movement as square dancers, where the crook of a female dancer's elbow connects to the crook of a male dancer's elbow (as they do an allemande left or right). My hypothesis would also explain why an electron's magnetic field is not detected in most nonmagnetic materials. (An exception to this is a situation where a silver atom in free flight with a single, now non-spinning, electron in the outer orbit, displays its magnetic signature to the value of one electron). It is only when in free flight that an electron's magnetic field is detected, when its rotational momentum is converted to linear momentum and its orientation is fixed as it travels through space. It is also why the electron absorbs light (black spectral lines) or produces light (color spectral lines) when jumping or falling between orbits. This can be understood much more easily if we adopt the idea of string theory. Doing so will give us some understanding of the process of how a single entity, even if a string, can have a detectable magnetic field and also become a wave.
While confined in an atom, an electron has both orbital and rotational (spin) movement, the latter being similar to the action of a skipping rope. As the rope rotates, its energy is proportional to it rate of rotation. The faster the spin, the greater the angular momentum. Also, the faster the spin, the greater the rotational circumference and, therefore, the closer the pivot points of the rotation. I will not opine on the composition of our rope at this atomic level other than to speculate that it or its fibers are composed of the same multi-dimensional material that comprises the threads of the fabric of space. This rope, when devoid of rotational energy would appear as a straight line (**Fig 4A**). As it is slowly supplied with energy, it begins to rotate and curve. As more energy is supplied, the pivot points move closer, the curve is accentuated, and the rotational circumference increases (**Figs 4B and C**). This process continues until the pivot points no longer hold and the electron is either ejected from the atom or, if in an inner orbital, is flung to a higher energy level. Now, if we could view the end of the string that has no energy, all that we would see is a dot or period (**Fig 4D**). From the same angle viewing an electron with some energy, we would see a vertical line or vector (**Fig 4E**), and finally, viewing the electron with more energy, we would see a longer vector (**Fig 4F**). The length of this vector now represents the energy contained in our rope, or our electron.

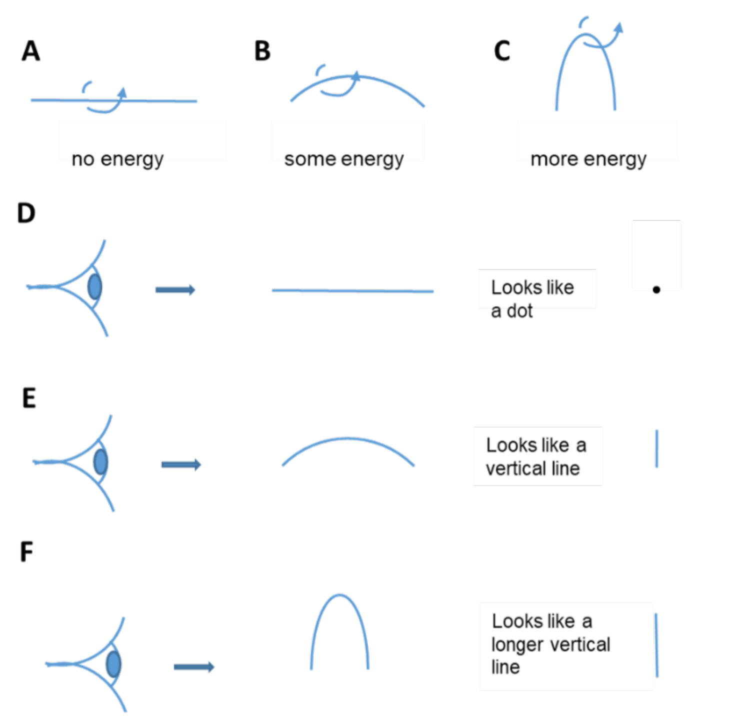

Figure 4. **Rotational energy of electrons visualized as a skipping rope.**

To continue with my hypothesis, just as the moon presents the same face to us as it spins once for every orbit it takes around the earth, an electron does likewise as it rotates around its nucleus. However, the spin of each electron is unique in that the face it presents to its nucleus is different from that face presented by another electron in an adjacent atom (**Fig 5**). An electron can have an infinite number of possible faces it could present to any nucleus, but only one in any single attachment to a particular atom. Likewise, following Pauli's exclusion principle [11], if there is another electron in the same orbital, it must be on the diametrically opposite side of the nucleus and have opposite spin and must present a face rotated 180° from its diagonal opposite.

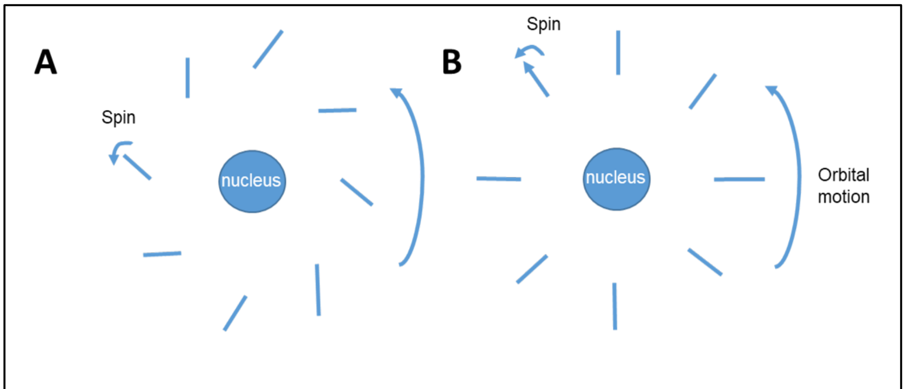

Figure 5. Electron spin. A) A random atom showing a single electron vector and orientation of spin as it progresses through 8 orbital positions in 360°. B) An adjacent atom may have a different orientation of spin.

Using Maxwell's Right-Hand Rule [21], this allows the magnetic field of both electrons to combine and act in unison. For electrons in a multiple electron orbital their distribution need be such that their combined magnetic field is evenly distributed around the nucleus. This also explains why, when two electrons are emitted from an atom, they are always of opposite spin (**Fig 6A**). Thus, there is no need for two entangled particles to communicate over any distance to coordinate opposing spin. When ejected from an atom, the orbital rotation of the electron is converted to lateral motion and the spin ceases assuming a fixed orientation as it travels through space. Likewise, when released from the atom an electron may assume one of an infinite number of orientations depending on which of an infinite number of faces it presented to its nucleus when it was part of an atom. Its orientation in space is what is now considered mistakenly as spin. Since this misnomer is so well ingrained in the culture, I will continue to use it in this paper. If we envision this "spin" or fixed orientation, we can now see a fixed magnetic field surrounding the legs

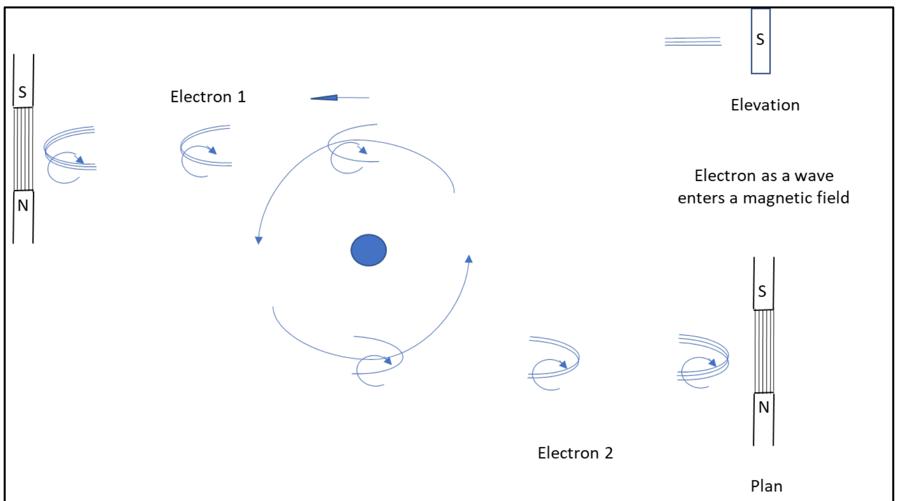

Figure 6A. Two electrons simultaneously being ejected from an atom. Each electron expands as a wave as it is ejected. As the electron enters a magnetic field, half of each electron will be deflected up (spin up) and half will be deflected down (spin down). Electron 2 is rotated 180o from electron 1 in keeping with Pauli's exclusion principle.

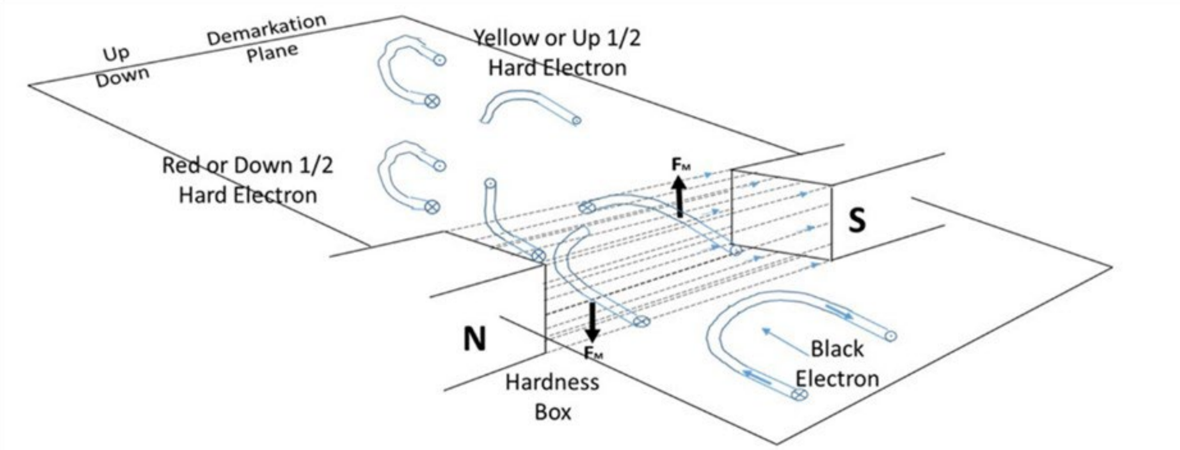

Figure 6B. A black electron enters the horizontal magnetic field, which is an electron hardness box. Using the "Right Hand Thumb, Index and Middle Finger Rule" the right leg of the particle is forced up and the left leg down. The electron splits with the twisting motion. Upon exiting the field both half electrons curve into two half horseshoes, the up-spin yellow and the down-spin red. Should either of the half electrons traverse through another hardness box they will pass unscathed as the forces are directly aligned opposite each other and there is no twisting motion. Should they be subjected to a color box i.e. a vertical field, our original electron would now be split into four quarter electrons. They would recombine when three more black electrons enter the apparatus to produce four unique new particles. Two yellows from above the plane and two reds from below, and again if run through a color box would produce two black and two white electrons.

and curve of our U-shaped electron, with the field rotating in one direction on one leg of the "U" and rotating the opposite on the other. Therefore, as the electron passes parallel through a magnetic field, half of the electron will be forced up and half will be forced down, splitting the electron in two (**Fig 6B)**. This would not only cause the electron to split, but, as in the case of a silver atom with its single outer electron in control, passing through a field, the entire atom is split while in this wave state.

It should be noted, the natural splitting of particles after they become free agents and free-standing waves is quite different than the splitting of an atom, or what we call nuclear fission. With nuclear fission, the powerful forces holding together the atom are torn apart, releasing an enormous amount of energy. I propose splitting of a photon, electron, atom, or a fullerene molecular wave splits all forces within the particle proportionally, leaving each portion in the same balanced equilibrium as the original particle. Therefore, "splitting" in this paper only refers to the natural splitting of a particle in its free wave incarnation. The split pieces are virtual particles or dark matter. After this split, if we view only one half of our electron from its pivot point to its middle, the breakpoint, what we might expect to see is a half horseshoe (**Fig 7A**) at a specific angle of rotation. For example, a split at 70° relative to the magnetic field is shown as a black vector. If it were released from the atom at about 210° relative to the magnetic field, it would be a yellow vector, and were it

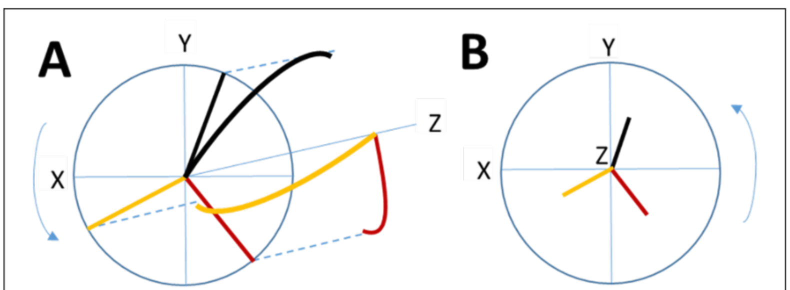

Figure 7. **Electron vectors**. A) Three different angle of electron spin. Z axis shown perpendicular to the page. B) Upon exiting the appropriate orientated magnetic field each half electron reconfigures itself to a new horseshoe shape and vector.

released at about 320°, a red vector. However, when our electrons get split, upon leaving the magnetic field, each half would reconfigure, and the three-half electron horseshoes would reorganize themselves into three smaller horseshoe shapes and appear as the three half vectors/half electrons **(Fig 7B)**.

In this model, the vectors represent an end-on view of our rope or electron string, and the energy contained is the area under the string. The longer the vector, the more energy, and vice versa. Using these vectors, we can calculate the resultant energy in the X and Y direction, and the resultant energy or mass when two or more partial electrons combine. Before our electron (traversing freely through space and no longer under the attraction of a nucleus) is split, we can plot a standard sine wave of any electron vector position relative to any arbitrary magnetic field (**Fig 8).**

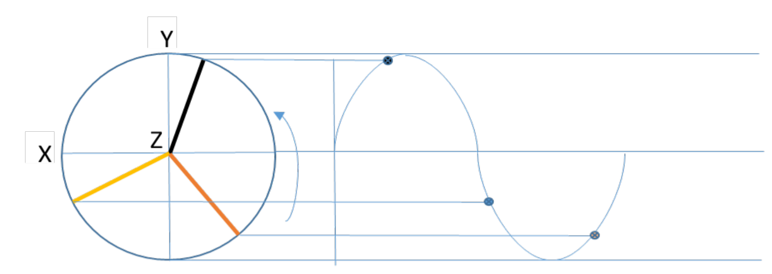

Figure 8. **Electron vectors**. Projected over to the sine wave.

With this model in mind, let us revisit Dr. Albert's interpretation of the Stern-Gerlach experiment and his clever idea of identifying each magnetic field's orientation and each *spin-up* and each *spin-down* with its own unique label. If, in the first instance, the magnets are held in a horizontal position with the north pole on one side and the south pole on the other and our stream of electrons shooting through the magnetic field between them, he arbitrarily calls this configuration[2] a **Hardness Box**. (In this paper, for ease of illustrating with color, I am labeling a electron that exits a **Hardness Box** as follows: a **Hard** electron with *spin up* as **Yellow,** and one with *spin down* (a **Soft** electron) as **Red.** If, on the other hand, the magnets are rotated 90° and are held in a vertical position, he calls this a **Color Box**. Further, he calls the *spin-up* electrons, from this box **Black** and the *spin-down* electrons **White,**[3] a color designation I am retaining.

Dr. Albert further identifies several puzzling experiments with **Hardness** and **Color** boxes. Each box has the ability, when particles are fed into an aperture, to sort those particles into two groups: those with spin-up (**Black** or **Yellow**) and those with spin-down (**White** or **Red**). For example, if **Black** particles are fed into a Color Box, then 100% of the **Black** particles will emerge from the black aperture. Likewise, when **White** particles are fed into a Color Box, then 100% of the **White** particles will emerge from the white aperture. The same pattern will repeat itself when **Yellow** or **Red** particles are injected into a Hard Box: 100% **Yellow** will emerge from the yellow aperture and 100% **Red** will emerge from the red aperture, respectively. See **figure 9A-D** for illustrations of this.

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[2] This configuration, called a Stern-Gerlach apparatus, was first used by Otto Stern (a theorist) and Walther Gerlach (an experimenter) in 1922 when they discovered electron spin. At that time, they used a stream of hot silver atoms to traverse the magnetic field. Silver atoms contain 51 electrons, which allowed the 51st electron in its sole outer orbit to interact with the magnetic field and deflect the halves of silver atoms up and down or side to side, depending on the electron's orientation.
[3] This Color/Hardness Box scenario can be used for other particles. For photons, we use a polarized lens sometimes called a grating, which instead of deflecting up or down, allows photons to be either reflected from or to pass through. This grating, in a horizontal position being a Hardness Box and the grating in a vertical position being a Color Box.

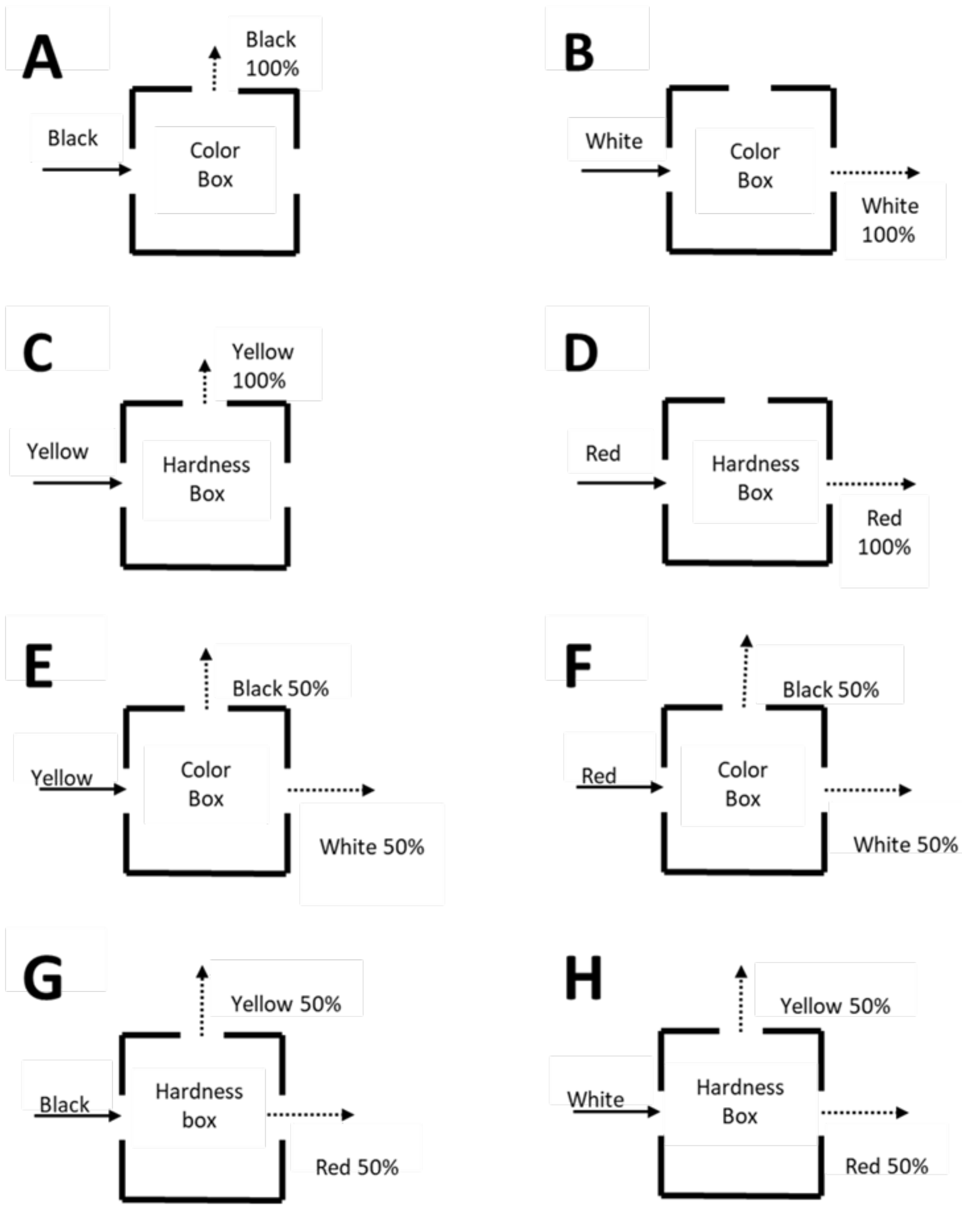


Figure 9. Stern-Gerlach apparatus. Arrowheads indicate particle movement. Terminology used for Color Box (spin up) black and (spin down) White. For Hardness Box (spin Up) Yellow and (spin down) Red.

So far, no big mystery. Let us see what happens when we insert **Hard** (either Yellow or Red) particles into a **Color Box** (**Figs 9E and 9F**) and **Color** particles (Black or White) into a **Hardness Box** (**Figs 9G and 9H**). The percentage now changes to 50/50 of the opposite spin of particles.

Now, something a little different was attempted (although Dr. Albert does not cite who actually performed the following experiment). In this scenario, the White output of a Color Box (**Fig 10A**) was used as input to a Hardness Box **(Fig 10B)**, and that in turn was used as input to a second Color Box (**Fig 10C**). The expected output from the second color box (**Fig 10C**) from an input of 100% White particles to the hardness box (**Fig 10B**) was 100% White (under the

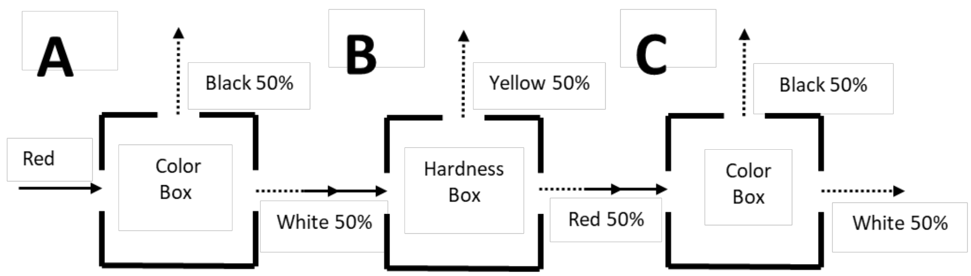


Figure 10. Since all the Black particles were ejected at **A**, it was surprising and counterintuitive to have another 50% exit at **C**.

assumption that all black particles would have been deflected in step **10A).** However, surprise, surprise: that did not happen. Exactly 50% White and 50% Black emerged (**Fig 10C**). What is going on?

An observation by Dr. Albert is to be noted at this juncture. The output percentages are always 50% or 100% of what was introduced to each box. Dr. Albert also made the astute observation:

> "What's striking here isn't that we are unable to build hardness boxes which don't disturb the color of electrons at all, but rather that we are unable to move the statistics of color disruption even so much as a one millionth of one percentage point away from fifty-fifty in either direction, no matter what we try."

In another related experiment, with some slight changes, the following results were obtained by adding a pair of mirrors at a 45° angle to the beams from a Hardness Box and a Blue Box that recombined the two beams from the two mirrors into a single beam, (**Fig 11A).** Since the initial

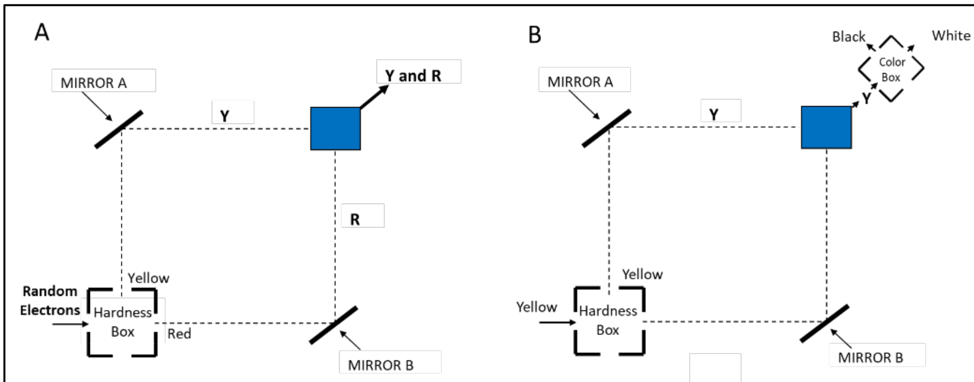


Figure 11. Mirror experiment. A) Blue Box is a device that combines the split particles. B) A color box is added after recombining the beams.

box is a **Hardness Box**, we are not surprised to have Yellow and Red electrons exit the apparatus, assuming the initial random electrons (entering from the left) have varying amounts of Yellow, Red, Black, and White. Yellow is producing Yellow and Red is producing Red to a greater or lesser extent, while the Black and White electrons in the mix produce even numbers of Yellow and Red.

Even if there is a difference in the initial number of Black and White electrons, it is immaterial, since both produce the same result – 50% Yellow and 50% Red electrons. The combined result is a final product of only Yellow and Red electrons exiting the apparatus. A similar outcome was again confirmed when random electrons travel through a **Color Box** (not shown): only Black and White electrons emerged from the Blue Box**.** Furthermore, when a **Color Box** is placed after the blue box and the input is changed to Yellow electrons **(Fig 11B)**, 50% Black and 50% White electrons emerge from the Color Box. Substituting Red electrons as input (not shown), the same expected results were again noted, with 50% Black and 50% White electrons emerging from the Color Box.

However, when injecting a stream of White electrons into the **Hardness Box**, surprise, surprise! The output was 100% White (**Fig 12**), and not the expected 50% Black and 50% White. Since Yellow and Red electrons were the output from the Blue Box into the Color Box, each should have been evenly divided into black and white (as shown in **Fig 10A**). This does not make sense. What is going on? How can a Yellow electron – which always produced 50% Black electrons and 50% White electrons – followed by a Red electron – which also always produced 50% Black and 50% White electrons – suddenly start producing only White electrons?

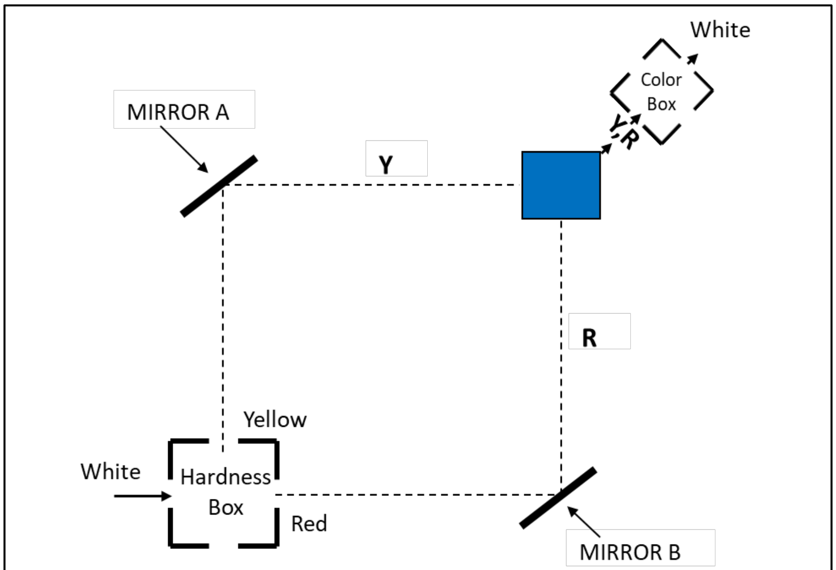


Figure 12. Surprise result. Only White electrons are emitted from the final Color Box.

I propose the following answer to this conundrum: our long-held belief that particles are indivisible and, therefore, that every electron that emerges from one of our boxes is exclusively and entirely a Yellow, Red, Black, or White electron, is wrong. Could it be possible that these boxes are splitting our individual electrons or photons in two and these fragments are rejoined to produce new particles with a different spin? This would explain the weird experimental results and account for the invariable ratio of the output from the boxes (50 or 100%), no matter how hard the good Dr. Albert would try to find exceptions.

Therefore, let us look at this second interpretation to see what outcome it would predict. Every time, no matter how many particles we use in our experiments, we will assume that any electron entering into a **Color** or **Hardness Box**, will be split *laterally* in half, if (and only if) that particle is of the opposite **hardness** (Yellow or Red) or **color** (Black or White) of the box. Now this lateral splitting differs from the split of the particle wave we encountered in Chapter 1, where adjacent atoms each took their portion splitting and absorbing the wave longitudinally along the full breadth or front of the wave. A lateral split occurs perpendicular to this direction, where the wave is undulating up and down, and occurs at the crest, at the trough, or at the positive/negative or negative/positive transition of the wave.

This brings us back to our diagram of electron vectors in (**Fig 8)**. The radius of the circle will indicate the particle's energy at the point of contact with the circumference (see **Fig 13**). It is generally accepted that all particles have an opposite twin, i.e., for the negative electron there is a positive positron. The two particles are identical except for their direction of spin. **(Fig 13)** shows the circle, and sine wave graphs of all the possible spins of both a positron and an electron. The upper circle and sine wave represent the positron. Its spin is **clockwise** with a vector starting at B and rotating through Y, then W, then R and back to B.

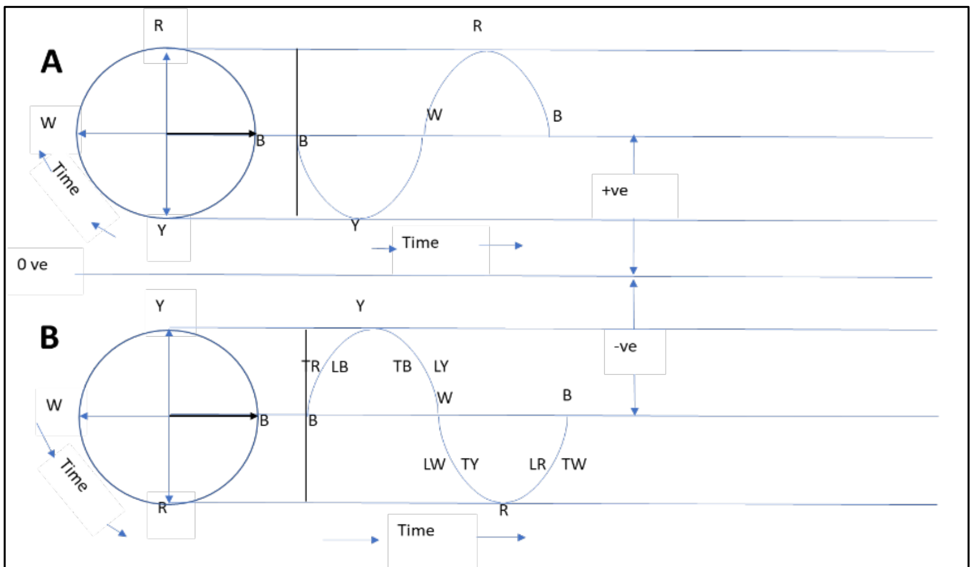


Figure 13: A) Positron Top. B) Electron Bottom. LB is a leading black electron, TB is a trailing black, LY is a leading yellow, TY is a trailing yellow etc.

The bottom circle represents the electron. Its vector's spin is **counterclockwise**, starting again at B and rotating through Y then W and R then back to B. The voltage difference for the two circles sine waves is shown as +ve for the positron and -ve for the electron. Note: The electron's vectors R and Y are displaced 180º from those of the positron. This results in a zero-sum charge when they are combined and the apparent elimination of both particles. The two particles are not actually eliminated, just their spin, and they end up as a point, or a flat line as we see in (**Fig 4)**. Even though their combined charge is zero, I propose their combined mass is still effective and adds to the totality of dark matter.

To better understand this nomenclature (B Black, Y Yellow, W White and R Red), the illustration in (**Fig 14A)** may be of assistance. Leading at B in the lower right corner of the 1st quadrant and continuing 180° through the 2nd quadrant, any electron with a vector in these two quadrants area will have spin-up and be called a Black or B electron if the magnetic field through which it traverses is oriented vertically, or in what we call a **Color** Box configuration. Using this magnetic orientation, or Color Box, all electrons that deflect down will lead in the 3rd and trail in the 4th quadrant. We know these to be White electrons (**Fig 14B**).

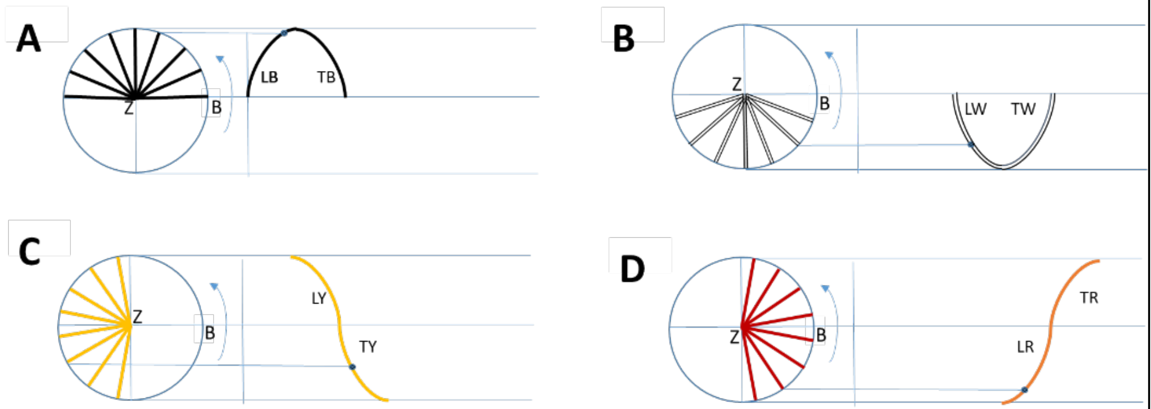


Figure 14. **Position in sine wave determines "color".** A) Leading and Trailing Black (LB & TB) B) Leading and Trailing White (LW & TW) C) Leading and Trailing Yellow (LY & TY) D) Leading and Trailing Red (LR & TR).

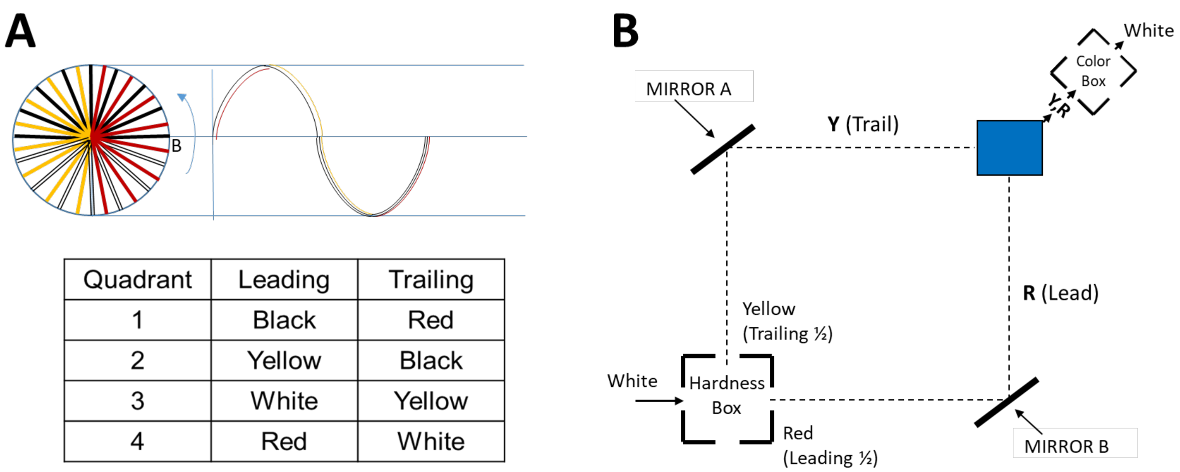
Rotating our magnets 90° to a horizontal position, we make our apparatus a **Hardness** box, and now find up spin or Yellow electron vectors leading, and sharing, this 2nd quadrant with a trailing Black and trailing in the 3rd quadrant with a leading White (**Fig 14C**). And finally, with the same **Hardness** box configuration all the down spin electrons are labeled Red. They lead in the 4th quadrant and trail in the 1st quadrant (**Fig 14D**).

Combining all the spins together, we find the following: All rotational angles correspond to two identities, one in the Black/White system and one in the Yellow/Red system, and one identity is trailing (second half of wave), while the other is leading (first half of wave). (**Fig 15A**) illustrates the following:

1st quadrant a leading ½ Black is also a trailing ½ Red
2nd quadrant a leading ½ Yellow is also a trailing ½ Black
3rd quadrant a leading ½ White is also a trailing ½ Yellow
4th quadrant a leading ½ Red is also a trailing ½ White

Or stated in another way, a recombined

Black Electron = 1st quad trailing Red + 2nd quad leading Yellow.
Yellow Electron = 2nd quad trailing Black + 3rd quad leading White.
White Electron = 3rd quad trailing Yellow + 4th quad leading Red.
Red Electron = 4th quad trailing White + 1st quad leading Black



Quadrant	Leading	Trailing
1	Black	Red
2	Yellow	Black
3	White	Yellow
4	Red	White

Figure 15. A) Vector addition schematic. Composite of all 4 spin vectors with table of leading and trailing attributes. B) White electrons leave the initial color box as trailing yellow and leading red (both spin down 3rd and 4th quadrant). Recombining these two and running them through the second color box naturally results in white electrons.

If we now revisit the experiment discussed in **Fig 12**, we can understand why a White electron entering our apparatus through a **Hardness** Box produces a trailing ½ Yellow and a leading ½ Red electron. When this trailing ½ Yellow and leading ½ Red exit the Blue Box, they are recombined and recognized by our **Color** Box as being spin down (i.e., third and fourth quadrant white vectors electrons). (**Fig 15B**). Yes! White electrons are now the rational and logical outcome of this particular experiment. And so, another mystery is solved.

There are two items still left to consider:

1. How does the vector of Chapter II become the wave of Chapter I?
2. What other proof exists and what other experiments could be performed to support this thesis that particles can be split and reconstituted?

Regarding item one: since we know that a particle becomes a wave (Young's Experiment), we must conclude that the curved string, last seen as a vector, expands in width. As the vector (or string) expands and widens to become the expanding wave, its amplitude diminishes proportionately, conserving the particle's/wave's energy.

Item two has now become an easier question to answer. Since I first conceived this idea many years ago[4], experimental evidence suggesting electron wave fission has been published. In 2015, novel research by Wei et al. created "exotic ions" within helium bubbles, using a spark to generate electrons at the top of a helium container. These ions traveled at different speeds by being attracted to a positively charged plate at the bottom of the container. The varying speeds indicated the varying charge in each bubble. By measuring the individual charge within each bubble, which were less than that of a full electron, the researchers were able to conclude the particles had been split. The idea of the possible fission of the electron wave function mentioned

[4] while discussing the weirdness of quantum mechanics with two of my best friends, Don Fohey and Russ Vente

in this paper is the first I have come across that supports my hypothesis that electrons can be split. These outstanding researchers are still hedging their bet that it is the wave function that is being split, not the physical wave, as can be seen in the title of their paper: "Study of Exotic Ions in Superfluid Helium and the Possible Fission of the Electron Wave Function" [22] . They also cannot quite conceive that what they observe is a clean split. The helium bubbles that contain the exotic ions are now subject to the question – which bubble holds the true electron? It seems that thinking of the electron as an indivisible particle is a habit hard to break. However, I would posit these mental gymnastics are unnecessary: Dear Brilliant Researchers, there is no part of a particle wave that is the "heart" of a particle. All pieces of the wave are equal, or rather, are *proportional* to their longitudinal and lateral percentage of the original wave and its amplitude or frequency energy.

Experiment to prove that particles are not bullet-like and can be split

So then, beyond the logic of the previous few pages, and the result from the exotic ions experiments with their split electrons, is there any other way to prove that particles can be split longitudinally and laterally? The following experiment should confirm or disprove the possibility of splitting quantum waves in a longitudinal direction.

As equipment is now available to detect single particles, it should be possible to determine if they arrive in bullet-like fashion (i.e. the wave or wave function collapses in an instant to a detectable form) or if the energy of the particle arrives in small (less than particle size) quantities, over a period of time until sufficient energy is accumulated to manifest a full-blown particle at the sensor.

Consider that it is possible to measure the rate at which particles arrive at our sensor over some period and it is possible to regulate the shortest arrival time between particles, with the insertion of Small Aperture Plates (SAP). Then, using our initial run, over this period let us call the smallest interval between particle arrival as time "**T**". Then, if we insert a shutter to interrupt the beam immediately following the detection of each particle and the shutter closure time is less than time "**T**", if the particle is bullet-like, the rate of particle detection over the same period should not change. If, on the other hand, the rate of detection over our selected experimental period should be reduced by the ratio of total shutter closure time to the selected experiment period time, then it will have been shown that our shutter has interrupted small portions of particles traveling from source to detector as pure waves and not as particles. **Figure 16** is a drawing of the proposed experimental device.

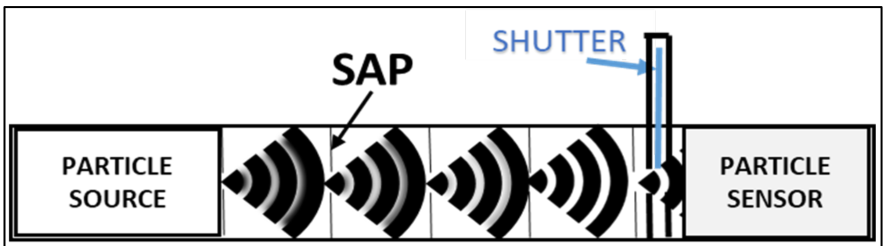


Figure 16. Proposed Experimental Design. Small aperture plates **(SAP)** inserted at regular intervals to reduce the number of particles or portion of the wave advancing to the sensor. This shutter at the exit of the last SAP is set to close for intervals shorter than time T, T being the shortest interval detected between the arrival of any two particles during the initial particle count run, with the shutter wide open.

Conclusion:

Although particles in cathode ray tubes, cloud chambers, cyclotrons, colliders, old fashioned TV tubes, atoms, etc. appear to be bullet-like due to their compactness, high-energy ejection or channeling, I propose they are pure expanding waves, when not confined to an atom, channeled by external forces or interacting with other particles.

As such, I would argue that these quantum waves behave just as all waves in our experience behave. They follow the same laws of physics as all other waves. They can be spread over a wide area, added, and subtracted from each other, sliced, and diced to a fare-thee-well, absorbed by atoms in bits and pieces, but only manifested – to the best of our knowledge and instruments – when combined in specific quantities of energy.

Quantum mechanics is deterministic and local. There is no weirdness. No conclusions about many multi-or-parallel universes can be drawn from its behavior. The so-called weirdness of quantum physics [23, 24, 25, 26, 27] can no longer be used by quacks to promote unscientific philosophies.

The probability calculation from an initial wave or initial combination of superimposed waves is still correct. There is nothing wrong with the current mathematics of quantum mechanics other than our explanation of how a particle gets from here to there. It does not arrive at an atom as it left an atom. We can only calculate the probability of what pieces of a particle will arrive here, there, or somewhere else. The current probability mathematics are fine. To the present day, we have insisted that Particle Physics had to have unbreakable particles with bullet-like characteristics and waves must immediately collapse to bullet-like proportions. But remember, in the real-world, and it is real, probability is just the accumulation of actualities.

We live in, but cannot sense, this vast swirling sea of virtual particles that can quickly seek and join suitable *spin-like* partners to construct the solid particles we sense and classify as matter. The only evidence we have of such seas is their vast effect on gravity at the galactic level and the weird experimental results found when we probe matter at the quantum level.

I have called this analysis "The Dublin Interpretation of Quantum Mechanics" as a balance to "The Copenhagen Interpretation of Quantum Mechanics", and to recognize the contribution Erwin Schrodinger made to physics, his contribution to Ireland through his teaching in Trinity College Dublin in the 1940s, and his part in the wave vs. particle debate. Although badgered by Niels Bohr and Warner Heisenberg to forget this wave idea, Schrodinger was extremely negative on their idea of quantum jumps. "If all this damned quantum jumping were really here to stay," an exasperated Schrodinger explained, "I should be sorry I ever got involved with quantum theory" [6, 24]. In hindsight, I believe both parties were wrong in some respects, although enormously correct in others, and therefore, I ask you dear reader, to not act in haste to dismiss my ideas.

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