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# Philosophical Concepts Related to Predictive Power Given by Implications of Discrete Spatial Geometry

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**ABSTRACT.** We explore a series of philosophical concepts that are related to a theoretical physics theory and an implementation of that theory. We will explore the philosophical concepts of free will, multiple universes, measurement, etc. Some of these concepts will be examined individually and some in the context of the theory. The physics theory shows that if a correction to achieve isotropy in discrete space is made, a new and powerful way of prediction becomes possible.

**KEYWORDS:** Free Will, Multiple Universes, Discrete Space, Isotropy

# 1. Philosophical Concepts

## Free will

We have all heard Descartes' phrase “I think therefore I am.” I like to say “I feel therefore I am.” The ability to feel implies a “soul;” some entity that feels must exist. If all we are is the computation in our brains, then what would experience the emotions, sensations, etc. that are common to our everyday existence?

So how does this soul interface with the body? There might be a part of the brain that we have not completely understood yet that does not follow the laws of physics, or, it could follow the laws of physics with seemingly random, quantum oscillations (zero point energy[1] and quantum uncertainty[2]). Those may act in a way to be the bridge between brain and soul, and therefore be the fuel of free will. Zero point energy is found everywhere and is composed of tiny things mysteriously coming in and out of existence and causes things to vibrate slightly with no real pattern to its effect. All elementary objects, including the ones that make up our brains, are in a constant flux between being wave-like and particle-like. As soon as something acting in a particle-like way is no longer interacting or being measured, it returns to a wave-like form, with the uncertainty that goes along with that form. Particles are solid and behave in a predictable way. Waves exhibit seemingly random behavior to a degree. Probabilistic behavior in the nature of waves, especially when it comes to the flux exhibited in our brains, is something that we do not have a completely precise way of predicting yet to make any sort of concrete conclusion. To be precise, we know so little about a) how the brain functions, b) the types of random or probabilistic phenomena that happen in the brain, c) whether the probabilistic behavior of waves in the flux has a method regarding its action in the brain, and d) whether the seeming randomness of zero point energy plays any role in decision making and other characteristics of the brain.

Paramount to all of this is whether we have free will. If the soul does interact (meaning a “two-way street”) with the brain via one of these methods then we indeed have free will. This is a field of inquiry largely untapped because we lack the means to probe these questions fully. Also it requires an interdisciplinary approach including the basic sciences, philosophy and the more emotional disciplines. People tend to specialize and link in to one particular discipline and group, and lose sight of the larger picture. The second way I can think of that the soul interfaces with the brain is that it does not actually have a causal connection to the brain (a “one-way street”); that what we feel is a direct product of the brain's computation and a soul assigned to that individual feels what's happening in the brain. In this second idea, there would be no free will. Instead, we would be left to the mercy of physics, chemistry, etc. However, we would still feel as is obvious from our everyday experiences. Also, on the note of free will, each feeling entity must be connected to just one, non-collective, soul. This is because I do not

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[1] Valone, T. (2005). *Practical Conversion of Zero-Point Energy*. Washington DC: IRI.

[2] Bohm, D. (1979). *Quantum Theory*. (pp. 116-140). New York, NY: Dover Publications.

necessarily feel what you feel and vice versa at the same time or, perhaps ever. For instance, I will never know, in this lifetime, what it feels like to give birth to a child because I am male.

### Multiple Universes and Connections to Free Will

There are several possibilities as to the setup of our universe, other universes and how they relate to free will. If there are multiple universes, each event or decision could create another universe where the future relating to that decision plays out and we could constantly be switching to new universes[3]. If that is the case, then what is thought to be in the future *could* change. Also, events *could* persist through universes as long as something does not directly change the events that are consistent through universe changes.

If we live in one universe and have free will, then we could predict the future using what we can come up with and be ready for what we think will happen. Or, try to take steps to change what is predicted, which would be a test, to an extent, to see if we really do have free will.

If we live in one universe and do not have free will then it would still be useful to make predictions about the future because people could see what will happen in their lives if they want to, even if they would not be able to change it. Paramount to this scenario is the importance of maintaining the belief that you have free will because, if you think you do not, then you probably will not be very proactive in your life.

There is another possibility. There could exist every possible permutation of universes and we switch to and from them, making a true "multi-universal now." If there is no time; simply switching from one plane of existence to another, then there would be nothing but now, as far as time goes.

Now that we have introduced some philosophical ideas, let us examine an example that uses them all and some others. In addition to my interest in philosophy, I enjoy physics. This is an idea I have been working on for a long time. It falls into the category of theoretical physics, it involves all of the philosophical ideas presented thus far and it is in a manner that is accessible to non-physicists.

## 2. Discrete Space and the Importance of Isotropy

Let us begin with defining discrete space and continuous space. Discrete space means there are individual units of space that have a non-zero volume. Continuous space means there are an infinite amount of points in any amount of space and those points have zero volume. By definition, the same trajectory or trajectories, in continuous space, are isotropic (which means the same length in all directions regardless of angle). We will be using discrete space and this paper will present a way of determining whether space is discrete or continuous. I will call the units of discrete space "quanta," and the

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[3] Vilenkin, A. (2007). *Many Worlds in One: The Search for Other Universes.* New York, NY: Hill and Yang

singular word for them is "quantum." I will visualize these quanta as three-dimensional cubes with the length of a side of a cube the Planck length, which is about $1.6 \times 10^{-35}$ meters (sub-microscopically tiny). The Planck length is a popular length in discrete spatial physics. It is not picked out of thin air; it is derived from very established constants in nature[4].

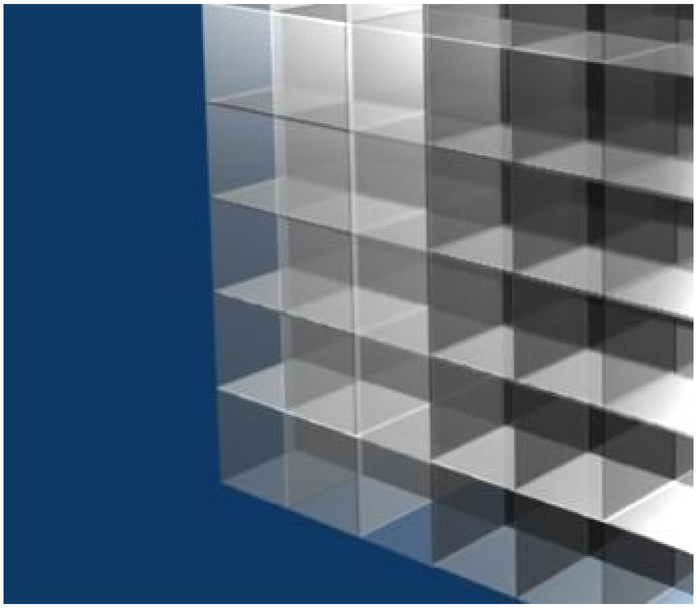

Figure 1: A three dimensional grid of quanta

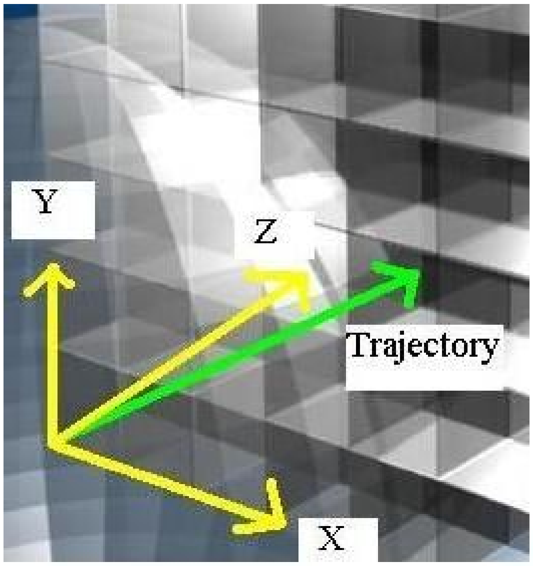

Figure 2: A three dimensional grid of quanta with the axes and a sample *continuous* trajectory plotted to the surface of a sphere with radius 4

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[4] Riggs, S. Jr. (2009). *The Origin of The Planck Length, Planck Mass and Planck Time.* Scotts Valley, CA: CreateSpace.

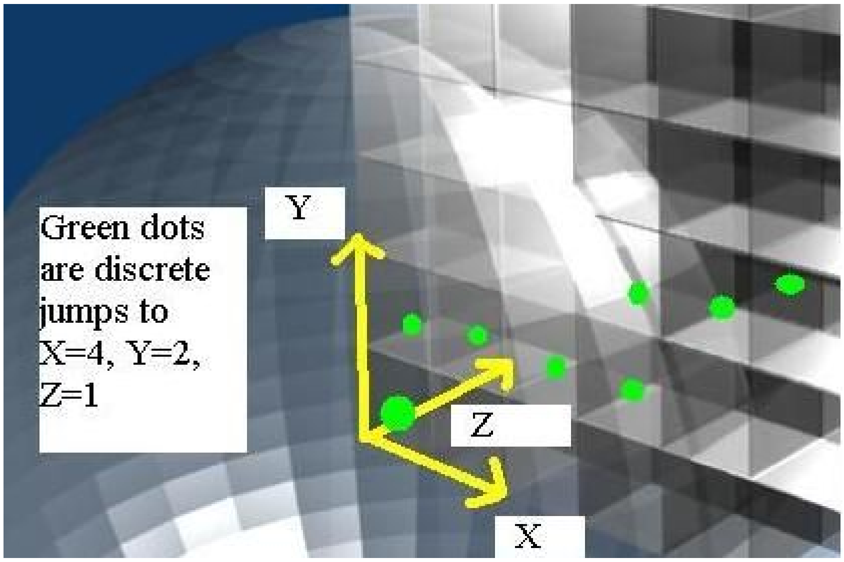

Figure 3: A three dimensional grid of quanta with the axes and a sample *discrete* trajectory plotted to the surface of a sphere with radius 4

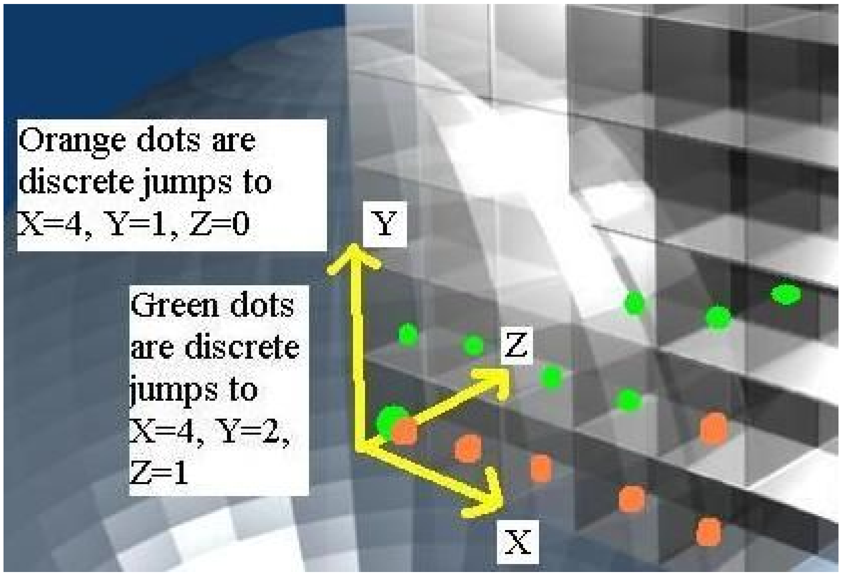

Figure 4: The same as Figure 3 but with a second discrete trajectory plotted to the surface of a sphere with radius 4

A very important concept is isotropy. It means the same in all directions and we will be using the temporal version of isotropy, which means for the journey to the surface of a given sphere, the same amount of time should elapse as would happen in any direction to get to the surface. This is assuming one trajectory with one speed. The common, *continuous*, way of conceptualizing this is a sphere (a set radius in any direction). We illustrate a sphere here the same as we would a continuous sphere for simplicity. A discrete sphere would have the same zig zagging surfaces as the discrete grid. A discrete sphere would be composed of all the quanta that a continuous sphere's perimeter touches. I propose that isotropy must be preserved in discrete space. Otherwise, symmetry would be broken and things would not go the expected distance in the same amount of time, when different paths are used to the same sphere surfaces.

Examine each figure. The sphere is centered at X=0, Y=0 and Z=0 (the corner cube). As you can see from Figure 4's green dots, there are seven quantum jumps from the beginning of the trajectory to the end. With the orange dots, there are five quantum jumps from the beginning of its trajectory to the end. Since the green dots present a higher number of jumps to the same sphere as the orange trajectory, we can conclude that something going along that path will make jumps faster than on the orange path if isotropy is to be preserved.

## 3. The Correction to Achieve Isotropy

If a particle, such as an electron, *changes* slope (one cycle of jumps along a single trajectory before it repeats), then that is a new trajectory and therefore another sphere should be drawn to analyze the new trajectory. If you have more quantum jumps to go compared with a competitor in a race in which your goal is to tie her or him, you must travel faster than her or him in order to produce a tie for the race. That is temporal isotropy. An example of this is Figure 4 if both trajectories reach the surface of the sphere at the same time. The "instantaneous correction" is how much correction is applied at a given time to a trajectory. The instantaneous correction is active in the three dimensions X, Y and Z. The instantaneous correction is in relation to the "natural speed" of a particle. The natural speed is the particle's speed without any correction. For instance, if a particle's natural speed is zero in the X axis for a trajectory (the trajectory's slope does not contain an X axis value), then there is no correction applied to the X dimension during that trajectory due to the relation between natural speed and instantaneous correction.

We can reason that the slope of the trajectory in the current sphere must be known because how else would nature know how much correction to apply? However, the number of repetitions of the slope and therefore the size of the sphere remains elusive. Also, the location of where the next sphere begins and its size and trajectory remains unknown. However, due to a recent breakthrough in physics, these variables must already be defined. In Discover Magazine, there is a very interesting article[5]. It presents evidence that the future influences backward in time. The area of physics is called Time-Symmetric Quantum Mechanics (TSQM). Discover Magazine is a very highly respected magazine and a good source. With this breakthrough[6], we can conclude that future spheres, and the slopes and lengths of the trajectories they contain, are predetermined because how else would future spheres effect the present unless they existed? More and more scientists find the same results as the researchers mentioned in the Discover Magazine article.

The best nature can do in terms of a correction is to apply an average change for

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[5] Merall, D. (2010, April), Back From the Future. *Discover Magazine*, 38-44.

[6] Aharonov, Y. and Tollaksen, J. (2007). *New Insights on Time-Symmetry in Quantum Mechanics*. arXiv.org. Retrieved from http://arxiv.org/PS_cache/arxiv/pdf/0706/0706.1232v1.pdf

all trajectories. According to Einstein's Theory of Relativity[7], speeds that change the same amount relative to each other are the same to each other. So, by applying an average, constant correction to all spheres, nature considers them unchanged relative to each other. Therefore, there is no need to redo the forward and backward causality, which would result in an infinite loop: If nature corrects for a given sphere differently than it has for others, then since the future effects backwards in time, the sphere before it would have to change. That change would require a difference in the sphere ahead that just changed it because the present influences the future as well. Then that sphere would influence the one before it again. This would continue an infinite amount of times, eliminating this possibility. Corrections tailored to each sphere at the time of each sphere's traversal are impossible because they would change the spheres in a non-relatively equivalent way, triggering the infinite loop. So the best nature can do is, at the birth of a particle, take a snapshot of all future spheres for the particle and apply a correction to all of the future spheres, which is the average of the corrections needed for each one. That is the best nature can do to try to do three things at the same time: a) preserve isotropy, b) have the future effect backwards in time, and c) have the past and present effect forwards in time. Therefore, the averaged correction is the instantaneous correction. We will explore the predictive power this presents in Sections 4 and 5.

If experiments to detect the instantaneous correction are done, which we will get to in Section 5, then that correction will be proved or disproved and also there will be light shed regarding the question of the layout of space (whether it is discrete or continuous). There is already a substantial movement in the physics community for spatial discreteness, although no one yet has any conclusive data.

So why do we not notice the corrections in everyday life? As we will see in Section 5, there are ways to magnify the instantaneous correction to detectable levels, perhaps with current technology.

## 4. Implications of the Correction

Now comes the most exciting part of this paper. We have established that there should be a correction that makes the paths, which a particle takes, isotropic to the best of nature's ability. But what does this imply? It implies that if you are to measure the amount of the instantaneous correction distinctly from the particle’s natural speed, while holding distance of each trajectory, and the slopes of the trajectories constant, you can get an idea of how far the particle, such as an electron, will go until it reaches the end of its trajectories. In other words, you apply a controlled environment to the particle so that the measurement of the instantaneous correction tells you where, in the controlled environment, it will end. Different ending places in the controlled environment would produce different averages that form the instantaneous correction. This brings incredible predictive power. We now understand we can get an idea of how far a particle is going

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[7] Einstein, A. and Lawson, R. (2005). *Relativity: The Special and the General Theory.* New York, NY: Pi Press.

to go. In Section 5 we will examine a controlled environment where the above conditions can be held constant. And now the really exciting part: If you can control, based on the outcome of a future event, how far the electron goes, and you measure the instantaneous correction, then you are able to predict the outcome of future events. Again, this is assuming that you hold the distance of each trajectory, and the slopes of the trajectories constant, which is completely feasible as we will see later. If you can control how far the particle is going to go depending on the outcome of a future event, then the distance traveled will depend on the outcome of that future event and therefore you are able to predict all sorts of things. We will explore an example of this process in Section 5.

One mistake you do not want to make is predicting the future for certain purposes, for instance crime prevention. If you incarcerate someone because you think they are going to commit a crime, but they do not because you have them locked up, then in order for the prediction to come true, you would have to make the outcome for the particle as if they had committed the crime, which would be a "self fulfilling prophecy." In other words, everyone would be found guilty. However, if a crime is predicted, nothing is done and the crime happens, that opens up a line of thought where perhaps this technology could be prudently used for crime prevention.

You could predict but not alter the future in the current universe regarding the prediction because in order for the prediction to come true, the event has to happen in at least one universe. However, recall the possibilities relating to multiple universes. Something may happen in the universe the prediction was made, but not in other universes created through free will actions.

You also might be wondering how predictions can be made with free will intact. First of all, there are many established laws of physics and in other disciplines that hold true and provide prediction. This theory, if it holds true, would add to that body of tools in a dramatic way and the philosophical concepts we examined earlier will apply.

According to the conservation of energy law of physics, energy can neither be created nor destroyed; it can only change from one type to another. So one good question is: Where does the energy come from when the particle needs extra energy in order to speed itself up? This is a weak point in the theory and my best answer is taking a little extra energy from zero point energy. Zero point energy is an energy that exists everywhere, even where there is nothing. It is composed of tiny things blinking in and out of existence and is a great puzzle in physics.

## 5. Implementing the Theory with a Particle Accelerator

If you get a particle going at "relativistic speeds" (near the speed of light, which is about 299,792,458 meters per second), the energy of that particle skyrockets. It forms a graph where leading up to relativistic speeds, the increase in energy is slow, and then very dramatically shoots up to very high energies at relativistic speeds. This makes both the energy of the natural speed of the particle larger and the instantaneous correction larger because both energies are amplified. This is one of the two main secrets to magnifying the instantaneous correction. In order to do this in a controlled environment, you need a particle accelerator. Many particle accelerators are circular in design and the particles accelerated inside of them follow that path. This is the controlled environment I referred to in Section 4, where the trajectories and trajectory lengths can be held constant long enough for the measurement of the instantaneous correction to become predictive to us.

Particle accelerators commonly have a "dump" design built into them so they can get particles out of the accelerator. I suggest using multiple dump locations, one for each outcome of a future event or events. Which dump location the particles will be dumped at is what is revealed by the measurement of the instantaneous correction. Inside some particle accelerators are "energy spectrometers" which measure the energy of a particle or particles going through them. The second main secret in measuring the instantaneous correction is to use "bunched" particles. Particle bunching is commonplace in particle accelerators and is simply putting a lot of a type of particle together. I suggest using bunched electrons because they are so lightweight that many can be added and accelerated. You bunch as many electrons as you can and accelerate them as fast as you can. This increases the energy measured in the energy spectrometer. Hopefully, the combined instantaneous corrections of all the electrons is large enough to be detected as an amount of energy beyond what would be expected by current theory. In addition to that measurement, you need to keep track of energy radiated by the bunch as it travels around the accelerator.

You measure the energy of the bunched electrons as soon as you have them going at a relativistic speed. You subtract the particle accelerator magnets' energy you have put into the bunch, any other energy put into the bunch, and you know how much of an instantaneous correction is present. It is adhering to the average correction obtained by the snapshot at the particles' births as mentioned in Section 3. These dynamics are present since we have the particles in a very controlled environment.

The measured amount of the instantaneous correction depends on which dump location you will use because the distance traveled inside the particle accelerator depends on which one you use, and therefore effected the averaging done to produce the instantaneous correction.

It is important to slow the particle bunch as it travels around the particle accelerator after you have measured the instantaneous correction. This makes it so less trajectories were in the future when the snapshots were taken at the particles' births to compute the instantaneous corrections. In other words, you are doing your best to make sure the indication in the instantaneous correction of which dump location will be used does not get lost in the averaging. The more numbers go into an average, the less any one of them stands out in the average.

Another thing you can do to make the indication in the instantaneous correction stand out is by making the particle bunch go at relativistic speed soon before a dump location is to be used. As we explored before, relativistic speeds produce a large increase in energy. Therefore, the instantaneous correction will get a large number indicative of which dump location you will use, which the snapshot must have foreseen and averaged into the instantaneous correction. So if you use relativistic speed as little as possible except for measuring the instantaneous correction and right before a dump location is used, you will produce the largest possible indication of which dump location will be used in the instantaneous correction.

Test runs should be done to see which instantaneous correction amounts correspond to which dump locations. The particles should get annihilated by running into positrons (the antimatter partner of electrons) when dumped. It is important that the electrons get annihilated when they get dumped because you want that to be the end of their "lives." Therefore, no additional trajectories are left to have effected the instantaneous correction. It is important to be using "new electrons." Electrons that have just been created will have less of a history of trajectories from which to form the instantaneous correction. New electrons can be created from high-energy photons, called gamma rays. I suggest creating the new electrons near where they will be injected into the accelerator and soon before they are to be injected. The more trajectories they traverse, the less the instantaneous correction is able to indicate a particular dump location. It can get lost in the averaging done by nature to compute the instantaneous correction.

You might be thinking about predicting the past with this theory. However, since there are many different paths a particle could have taken in order to be where it is right now, with all those paths leading up to the same instantaneous correction amount, I think that road is not a possibility.

Let us explore an example of how this would work. You are at a convention and want to know if within the next hour you will meet someone who is interested in collaborating with you. You make up your mind that if you do have that experience, then you will make a phone call to the people at the particle accelerator to dump the particle bunch at location X inside the particle accelerator after an hour has elapsed. If you don't make the call, then the people at the particle accelerator will dump the particle bunch at location Y inside the particle accelerator after an hour has elapsed. The people at the particle accelerator get the electron bunch going around the accelerator at relativistic speed and determine the instantaneous correction. With the instantaneous correction measurement, they can determine if you will meet someone who is interested in collaborating with you; they can tell from the measurement at which dump location the particle bunch will get dumped. They can do one of two things: a) They can call you and tell you the event will or will not happen, or b) They can not call you and see if the prediction comes true. For instance, if you meet someone who is interested in collaborating with you, then you will make the call and they will dump the particle bunch at location X. However, the people at the particle accelerator already knew that because they measured the instantaneous correction and that measurement indicated they would dump the particle bunch at location X. They could have called you and said to wait around because you will meet someone interested in collaborating with you. If given this knowledge, you might put a mint in your mouth to help make a good first impression with the person, whoever they are, who you will meet within an hour and will be interested in collaborating with you. This is not an example worth using the expensive resources of running a particle accelerator for an hour. However, it illustrates and hopefully makes the process more understandable because we can relate to a such a situation.

Note: In the Discover Magazine article, the future effects a measurement on a particle while in wave-like form. Therefore, if the effect of an instantaneous correction is not observed according to the methods in this paper, then an effort should be made to observe the instantaneous correction *as if* the life of the particle is while it is wave-like. Acceleration of electrons in wave-like form is possible with lasers. The predictive power may only be present while a particle is in wave-like form and start again after it goes to particle form and then back to wave-like form.

Note: Feel free to contact the author.

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