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Law of Included Middle

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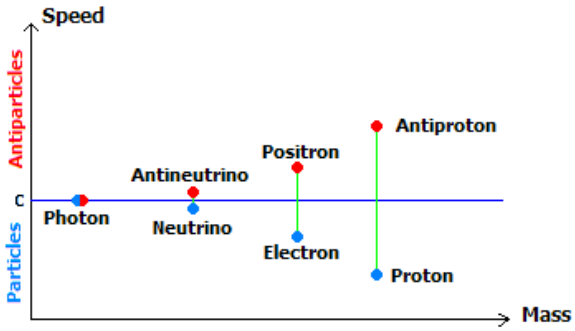
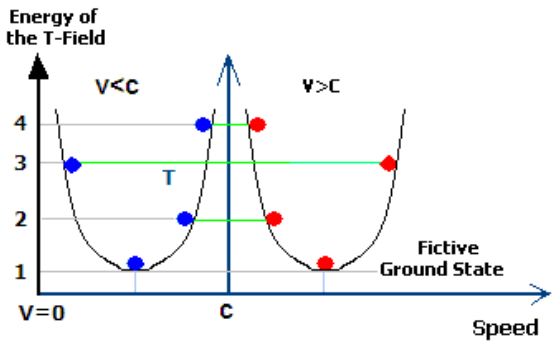
In the previous article we saw that logical paradoxes arise because of the **law of Excluded Middle**. The reason is that, in the world -as well as in the universe- nothing is independent and isolated. There are visible as well as invisible interconnections linking different structures, systems and particles. In the previous article I gave the example that the concept of 'gray', being between black and white, cannot be precisely defined. Thus, 'gray' can be considered as the color between 'black' and 'white' and becoming a '**middle concept**' which is as real as black and white.

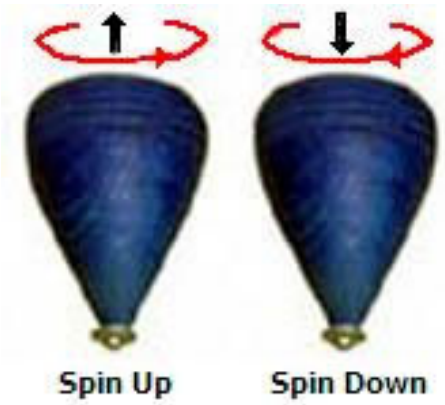
But a problem arises when we want to localize and isolate 'gray'. There are several tones of gray while both black and white have each a single tone. Black and white can be easily defined as a definite clear-cut color. But defining gray is not so easy. Gray is fuzzy, indefinite and variable. Nevertheless gray cannot be excluded from the 'real', physical world of colors. This means that we cannot exclude the middle; but on the contrary we must revise our thinking system, our logic, to include the middle.





In the present model of the universe there is a wave called the **T-wave**; the Tachyophoton, which is represented as a green line in the above graphs. The T-wave is not a particle and its energy is not localized is space-time, but is a wave that links particles to their antiparticles (see article **7-The Tachyophoton**) and matter particles between themselves. Thus, the T-wave represents the 'middle' or the intermediate wave that mediates interactions among physical matter particles. Such an understanding leads to a new law: **The Law of Included Middle**. But as all middle cases generally are; it is difficult to localize and isolate the T-wave.

The nearest description of a T-wave is that it replaces the bosons of the Standard Model of elementary particles. Elementary particles are not only defined by their mass but also by another characteristic called the **spin**. A material particle can be visualized as a spinning top; 'spin up' and 'spin down' representing the two opposite spinning directions as shown below.



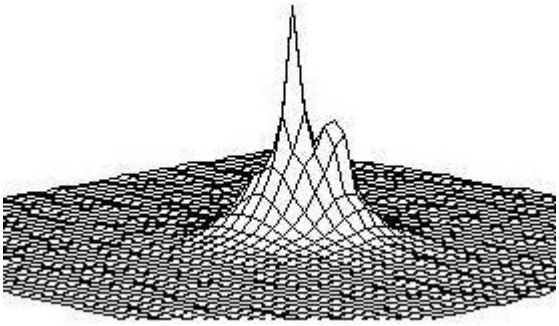
The up and down spinning directions are defined as +1/2 and -1/2 respectively. In 1925 Wolfgang Pauli (1900-1958) formulated the famous **Exclusion Principle** known after his name. According to this principle no two spinning matter particles can occupy the same energy level. Since all particles are also waves, one can visualize this situation as a spinning wave about a given axis. The spinning wave becomes dense and appears to us as being a particle. This situation is the result of angular momentum conservation. The choice of the axis around which the wave spins is arbitrary but once an axis is chosen the spin arrow can point in only two opposite directions.

The Pauli Exclusion Principle (PEP) tells us that at the lowest energy level the maximum number of electrons revolving around an atom cannot exceed two; one in the spin-up state and the other in the spin-down state. If a third electron is added to the atom it has to go the next higher energy level. The next energy level can accommodate up to eight electrons because of additional degrees of freedom that an electron can possess. Higher energy levels can accommodate more and more electrons.

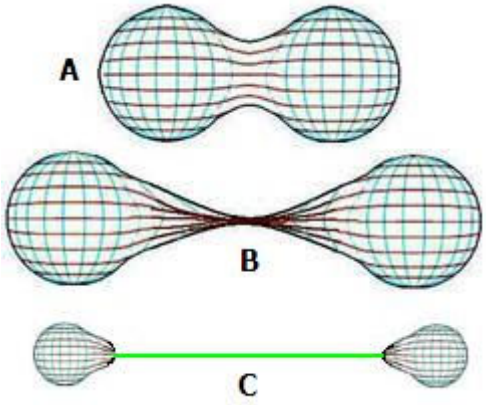
The spin concept is of fundamental importance in Quantum Mechanics and one can explain many characteristics of solids, liquids and gas with the help of the PEP. But the PEP is also valid in the present model. Consider the graph shown above right. Particles (blue) and their respective antiparticles (red) occupy symmetrical positions on any given energy level. Since particles and antiparticles must have opposite charge, they also must have opposite spin. If the particle is in a spin-up state, its antiparticle must be in a spin-down state and vice-versa.

At the speed of light the particle and its antiparticle form a single wave that has two distinct components. The two waves spinning in opposite directions cannot annihilate each other because of the PEP. They have no other choice but to add up and create a particle of spin 1 moving at the speed of light. This is why the photon is a spin 1 particle, which has two orthogonal vibration modes (see the picture at the bottom of this article). One mode creates the electric field while the other one creates the magnetic field (see article **8-Entangled States**).

In article **9-The Lattice Field**, it was mentioned that particles are local density formations within the **T-field**. The figure below represents two interacting particles; one being localized and the other more spread in the lattice field. They are like two intertwining wave packets. This way of visualizing the interaction of elementary particles is quite different than postulating a force carrier boson.



The present model proposes a different picture. When two particles -which are actually waves- interact many T-waves form a link between the two, as seen in figure A below. When the particles start to separate the link becomes thinner and starts to stretch (figure B). Even when the interaction seems to have ceased and the particles are far away from each other, the invisible link formed by the T-waves does not disappear (figure C). This situation is valid for both material particles as well as between particles and antiparticles.



The present model does not have to postulate the existence of spin 1 photons, but deduces their existence as a superposition of matter waves with antimatter waves. The model also explains why the electric field and the magnetic field are orthogonal to each other, as seen below.