CME LIVE OPEN ACCESS

Engineering and Applied Sciences Journal

Theoretical Paper

ISSN: 3067-8005

The Nature of Spin : A Constant Interaction with Quantum Fields, Which Results in the Creation of Pairs with Half Integer Spin

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Received: 2025 Apr 19 **Accepted:** 2025 May 10 **Published:** 2025 May 20

Abstract

Spin is an intrinsic quantum property, like mass, that defines a kinetic moment: an angular instant, that is to say an angle which returns constantly in sequence. In other words, a "spin" that allows the particle to return to its original state. It shows the nature of the form: boson or fermion? The properties are completely different: the boson (energy) is typically characterized by a rotation of 360°, while the fermion (matter) requires two rotations, therefore 720°. Thus, energy, which has a whole-number spin, is undifferentiated because it fits in the same space, but not the half-integer spin (matter), which suffers from Pauli's exclusion principle, that is to say it is impossible for identical matter to be at the same place in the same moment. Thus, in quantum mechanics, one is concentrated and the other dispersed. Similarly, restricted relativity imposes other conditions: the symmetries corresponding to the geometry of space-time. These are symmetries of rotations, translations or references. But they are only respected by certain objects. Indeed, the particles are either scalar (Higgs boson) that are numbers, Gauge bosons (transfers energy), that are vectors, or fermions (real and virtual matters), that are spinners. A number is always equal to itself. No matter how you look at it, from the top or the side, it's always the same number! That's why spin 0 does not seem to "rotate". So is the scalar Higgs boson. The Gauge boson is a vector, so it depends on a direction. A direction that depends on a reference. By changing the reference, we change the orientation of the vector. The orientation becomes the same again only after a full turn. That is why it is called the whole-number spin. The matter (fermion) is subtler; it's a spineur (good at turning)! It has an interaction that gives it exotic properties : a 360° rotation turns it into its opposite. Thus, it must turn twice to find its initial state. In short, the spin represents a rotation, but it's not! In classical physics, a rotation is a complete turn on oneself, so 360°. However, in quantum mechanics this "rotation" is impossible. Indeed, a spin rotation of ½, therefore a complete turn of 720°, is illusory. Moreover, the special relativity is firmly opposed to it because such a rotation of the electron would exceed the speed of light. So, what's the truth about the spin? If we consider particles, it's a mystery but if we consider quantum fields, quanta of energy and pair creation, it becomes clearer : spin is a constant interaction with quantum fields that leads to pair creation with half-integer spin.

Keywords: Nature of Spin, Half Integer, Quantum Mechanics Field, Higgs and Gauge Boson, Classical Physics

1. Literature Review

From the quantum perspective, particles are only perturbations in respective quantum fields. These perturbations are made of energy adapted to their fields by evolving by specific quanta. Quantum fields enable the storage of these quanta in diverse forms (bosons, fermions) that can move or transform. These quanta of energy take the form of disturbances that activates/ignites the properties of their respective field. Properties such as electromagnetism or nuclear charge. It gives, in our macroreality, particles that move.

This is the electron: a disturbance in the field of electrons. A disturbance that travels through a field that has specific properties. Thus, this disturbance is influenced by another field: electromagnetism. Therefore, the disturbance can orbit around an atomic nucleus. These are interactions between different quantum fields. So, these quanta or perturbations do what their field tells them to do : either transform, or move, but they never disappear ! Therefore, the energy is constantly changing. The Fine Tuning tells it how. However, it can also be preserved. Thus, it wanders in fields that can only preserve or transform. However, this energy disturbs them, forcing these fields to react to its passage. Thus, the respective quantum fields are activated in turn at its contact. And it is the properties of the activated field that will engage other interactions. So is mass: the disturbed field interferes with the Higgs field and depending on the reactivity of the field (its energy level), the mass is established. Thus, the electron field reacts little with this field, therefore, its mass is low: 0.511 MeV/cm^2, whereas a disturbance in the field of Z° bosons is much higher, giving it a mass of 91,187 MeV/cm^2! However, these bosons don't remain and transform. Those are properties of the field considered. Thus, thanks to mass, we can identify a field... and therefore the nature of the disturbance; quanta of electron or quanta of boson Z°?

Everything depends on the field and therefore its properties. Thus, there are two main families : bosons and fermions. That is, the quanta of energy transfers and the mass which

is stable (matter). Bosons are generally not stable and do not last. Their only field that can conserve energy is the electromagnetic field. So is the cosmic microwave background : electromagnetism that is preserved. Fermions have a more exotic nature, as they preserve energy in the form of a mass that remains indefinitely and also interact. But the mass brings another phenomenon: inertia, that is, the difficulty of changing motion. The nature of the fields also gives the property of energy that runs through it. If it is a field of fermions, the energy is conserved and is transported. It does so according to the attributes of the field, while activating many others.

The first field to be activated with a fermion field is the Higgs field. This one reacts immediately according to the nature of the field that interacts with it. Thus, the interaction depends on the field considered which brings its own properties ! A probabilistic interaction in the other fields, but not in the Higg's field. Indeed, this one is different : it is the only known field that is scalar. So, it radiates equally in all directions. It is also the only field that does not have an anti-field because it does not reverse. All other fields have their anti-fields with opposite properties. The best known are the antifields of fermions, which gives the antimatter. But there is also what is unknown, the black force,... which gives anti-fields of Gauge bosons ! (Cf. my article « The nature of black matter : an extrapolation of pair creation »).

However, the fields and anti-fields of fermions are in symbiosis. Thus, they interact with each other constantly, giving virtual particles. However, when fermions of opposite fields come into contact, they cancel each other out and transform. They go from fermion fields to bosons fields. So, their mass is transformed into energy that is released. As soon as the energy integrates a fermion field, it does so through both fields. Thus, a mass (matter) always appears with its opposite (antimatter), since fields and anti-fields of fermions are in symbiosis (linked to each other) by symmetry. Thus, it creates both mass in a field and in its anti-field ! This is a phenomenon of pair creation. These opposite particles interact in the same way with the Higgs' field, which is scalar. That is to say, this field has no opposite, so anti-mass.

2. Discussion

It is not the quanta that have properties, but their own quantum fields ! Quanta just follow the laws of energy conservation. This gives quantum jumps : the electron that interact with a photon disappears from an inappropriate orbit to appear directly in another orbit more appropriate. The law of energy preservation imposes quanta from both fields to add up and immediately transform into another quantum level that require another appropriate field which got unique properties, such a different orbit. In order to respect these rules, the electron that interact passes directly from one orbit to another. Actually, its disturbance is simply transported from one field to another, resulting in a change in one property (quanta/pulse/orbit) to another. This inevitably leads to other possible interactions. The concept revolves around interactions, energy conservation, and quantum fields, resulting in the illusion of a jump.

Quanta have no dimensions,... therefore no rotations, since what is without dimension cannot rotate. They don't have size, they are just uncoordinated disturbances that transform or travel. While doing so, their fields never stop interacting with their movement. So, in its journey, the energy acquires the properties of its own fields. One of them is its angular momentum ; a local rotation in the field. Disturbance doesn't spin; it is the field that has properties such as spin. Therefore, it is not a rotation but an interaction between the quanta and its field that has the effect of giving an angular phenomenon. It is perpendicular to the motion of the disturbance, that is to say, it follows the movement of the particle towards the future. In other words, its journey through the world line towards complexity. So, in its interaction, the quanta, that travel there, initiate this angular momentum. This gives a rotation to the particle we perceive. It moves in a direction that creates an axis of interaction with its field and thus also a direction of rotation... while the environment defines two possible angles of interaction based on polarity.

As the fields and anti-fields of spinners are symmetric (in contact), the energy ignites both: the quanta acquire the attributes of each field that interfere with its movement, which gives the spin of each of them to the matter, so opposite spins at the same time ! These double spins (360° and -360°) along the axis of displacement (movement toward the future) will trigger magnetic phenomena. This is comparable to the surface of a body of water: it is unique for the spaces above and below it, but opposite in the same time. Therefore, when energy is moving in a fermion field, it lit a wave of possible spin along its passage, but it lit also its opposite wave in the other side of the surface of symmetry. So, both spin and anti-spin accompany the quanta.

The fields do not provide a well-defined reality on their own but overlapping realities. Well-defined realities come from interactions between different fields. Those overlapping realities are « real », therefore they exist because they are also possible, but in addition, they happen at the same time, which offers surrealism ! Thus, the energy that travels through the fields has no position. Its movement in time causes it to have possible superpositions. Therefore, it travels as a wave of probability of density, but it interacts as a single particle according to the properties of its field. This superposition brings the first geometries : isosurface. These offer new properties : contact ! This contact brings other interactions such as resistance. Finally, this results in solid bodies that are mostly made up of quantum surrealism, but which offer only one probabilistic reality (interaction) per particle while ubiquity offers several. Their interactions with their environment are based on a probability ratio. This one is from a fine tuning of the laws of physics and their constants.

Interactions aren't dependent on a measurement, only on the environment,... but this one can impose a value (mesurement). The environment defines possible realities. If the environment refers to a reality, others become unrealistic and cannot appear ! It is the interaction established with the environment, according to the rate dictated by the Fine Tuning,

that determines our reality ! This allows the matter to evolve, so it becomes more complex structurally.

3. Findings

Spin is established according to the direction taken by the particle, which gives it an axis, but also according to the angle of interaction due to the environment (how we place magnets or filters). Since the quantum is a tangle of events, depending on which one emerges, spin can be either positive or negative, according to the parameters established by the axis of motion and the angle of interaction. This brings about opposing electromagnetic attributes. In the case of a fermion, it is an illusionary « rotation » of the particle. Depending on the case, a magnet attracts it in one direction or the other. In the case of a photon, it is an orientation of its electromagnetism. Depending on the case, a filter prevents it from passing or not. "Depending on the case" means that quantum mechanics comes into play to calculate the probabilities of all possible cases. This gives probability waves, like the Young's slits. So, a quanta is a shape that moves like a wave but interacts as a particle. It's a probability density wave that only interacts once at a time.

However, the information of a wave is flawed, thus, we speak of overlay states. States without a precise position in a tangle of possible positions. It is at the arrival (interaction) that the particle defines its attributes, such as polarity or kinetics. However, these depend on probabilities from the quantum and its superpositions. They are organized according to a rate of interactions between Fundamental Forces and environment. This rate also depends on the Fine Tuning and describes our reality!

This is the spin in quantum fields: an interaction between a perturbation that moves in one direction, that is to say the axis of movement towards the future in the world line, and a field whose specific properties provide angular momentum. These overlap into different possible realities. They arise from circumstances dependent on the environment. Thus, it is the environment that determines the possibilities of each reality. Realities that are impossible or interfere cannot appear! Thus, once defined, spin becomes the only reality of the moment. But as soon as we change the interactions, other possibilities come back. Therefore, we still have to redefine reality (spin) according to a probabilistic interaction. The particles appear in different probabilities according to their states. They all are only superpositions in a general interaction of quantum realities. These realities overlap different events at the same moment for the same particle. But it is the interaction with the environment that determines the reality common to all. An interaction from a field of probabilistic possibilities. It is this field of probability, dependent on interactions, that defines our reality. Thus, appears the kinetics, dynamism and spin in our world (realism).

But not in the micro world of quantum : we see only superpositions of disturbances in fields (surrealism) that progress in the timeline while maintaining their movements. This enables particles to move like waves in space. Those waves of probability density intertwine to define our reality. They are made up of the possible state overlays of these disturbances. Probabilistic realities remain to interact with the environment while impossibilities and interferences are eliminated with virtual particles. Thus, the real particles evolve through their movements and angular interactions. This gives them a kinetics, a frequency but also angular moments, that is to say "rotations" which define a polarity. This brings electromagnetic properties inherent to this movement, that is to say that the particle has a North pole and a South pole at its ends. Thus, it is similar to a magnet with one positive and one negative pole, but their orientation is arbitrarily balanced: they are random as well as fair. Thus, the North is in one position in half of the superpositions, while the South is in the others, for each fermion.

It all depends on the event that occurs during the interaction because the quantum is a universe where realities overlap. Thus, the event, which has become our reality, displays the meaning of spin. A spin that appears through interactions between the particle and its field. Interactions considered according to a single axis, the axis of displacement. An axis that has a well-known vector, that of direction. The direction is a reflection of a move towards the future (timeline). Thus, it is the movement of the particle (disturbance) in its field along the timeline that triggers the interaction called "spin" and whose phenomenon is angular! This sense of motion also hides the relativistic momentum. Indeed, the spin is related to the same axis that affects the length in relativity, that is to say the axis of movement which must be maintained in all space-time (special relativity)! This movement towards the future is the world line that testifies to its evolution. This vector of displacement stimulates other phenomena, such as the red shift. Thus, it is the direction that determines the orientation of spin. It is the only axis of rotation whose direction is considered by quantum mechanics. So, the only axis that brings a magnetic attribute to the moving particle. Even if other axes exist, it is decisive in itself. However, it is the interaction that determines the angle that this vector (axis) brings. This one can only display 2 possible realities: the North and the South of the axis!

In short, matter is a "disturbance" that seems to spin strangely: it requires a double interaction with space during its journey ; one with its field and the other with its anti-field. These are simultaneously opposite spins. Thus, the disturbance acquires a spin from each field, which doubles it. It is this attribute of half-integer spin that testifies to the properties of matter! Thus, this quantum phenomenon has its impact on the physical world since it will trigger phenomena specific to magnetism. This enables the particle to imitate the behavior of a magnet. Therefore, electromagnetic interactions play with the spin attributes, forcing the particle to follow a magnetic current or another.

The one it will follow corresponds to the spin defined during the interaction. An angular direction (polarity) that varies according to the event chosen by the probability. Thus, the probabilities define the attributes of the particle during its interaction: attributes such as its speed, position or spin. A spin derived according to the direction taken by the parti-

cle, but which will be kept until another interaction forces the particle to identify itself. Particles travel like probability waves. When probabilities are eliminated, their quantum realities cannot survive. Other realities decide between themselves only upon arrival, which means a probabilistic interaction in a long list compiled in nanoseconds. Thus, once the event is selected, it retains its properties such as its dynamics (speed) or its frequency (pulse). Indeed, all other quantum realities, being incompatible, are erased. Only the realities that retain movement remain, such as spin. They remain until the environment selects another event.

An event that must correspond to new interactions. It will create new possibilities, therefore quantum realities. Realities that manifest themselves through the laws of probability. They are based on predicable rates, eliminating those that are impractical and leave only those that are feasible. They correspond to the mathematically possible versions of the universe and appear instantly (as quantum jumps). The following interaction will occur at another time with other events that cause the disturbance to move or transform. These create new realities that retain the kinetics, dynamism and spin of the disturbance. From far away, it gives a particle that moves like a wave. Until a new interaction occurs that will force the disturbance to adopt a new state/behavior. A behavior that will cause the appearance of new quantum events, which will give the travelling disturbance new possible attributes and one of them will emerge according to the laws of quantum probability. This new reality prevails over the previous one that is disappearing!

Thus, spin is redefined with this new interaction with the environment and its reality will be preserved as long as probabilities allow. But as soon as the interactions change,... probabilities change! Either the same interaction (spin) returns, or its inverse. The only exception is the Higgs boson which has no angular motion. It is the only particle that does not have a direction vector since it is scalar. With its spin 0, whatever the angle of observation, it is imperturbable. Thus, it has no "rotation", therefore no poles, nor electromagnetism. This is how perfect spheres are: they always have the same face. Therefore, it is impossible to distinguish any angle.

4. Conclusion

The laws of physics are surprising: they never make mistakes! They are based on logical but harmonious mathematical principles. They do not depend on time or location but modify the substance. Quantum mechanics ensures that all interactions occur as planned. Thus, entangled disturbances have correlated polarities (EPR paradox). They are always strictly interlinked without any errors, nor even information transfers, because some particles escape at speed c. Yet, their entangled spins are established despite the speed and distance without having hidden variables [1-3].

This is due to a mathematical elegance discovered by Paul Dirac. It speaks of a foundation of the laws of physics; the pair creation. Whether these pairs are matter or mere attributes, it does not matter ; it's the same system, regardless of their nature. Indeed, the creation of pairs is a basic universal law of physics that doesn't depend on time or distance. This is the version on the universal side of physics laws. It states that any interaction has consequences. If they are part of the laws of physics, they are immediate, no matter the distance. This is where we get out of the law of "locality" for that of "universality", because if the interactions are local, some consequences are universal! Thus, the EPR paradox is not dependent on time or proximity but only dependent on interactions (measurements), in other words, their "arrival". Indeed, it is at the finish that they determine the creation of a pair of attributes, a pair of particles linked by polarity in this case, but for fermions that move, it is a pair of spins (360° and -360°). The pair creation is part of the laws of physics. Universal laws valid in all localities. Consequently, if an entangled spin is determined, its opposite must also appear and when a half-integer spin is traveling, its opposite must also travel,... which means they travel together! All these quantum interactions allow the evolution of the energy that activated the universe 13.8 billion years ago. Since then, it has progressed through time towards complexity due to the constant increase in entropy [4-10].

Conflict of Interest

This theory is related to a book : "The origin of matter". This book is a product of a French encyclopedia named "Les Enseignements de l'Ange". This collection has a lot of theories, including the beginning of life in the second tome (Les origines de la vie). So, there is conflict of interest: being right makes sales while being wrong makes idiots! This can lead to human blunders. This is why we must exercise caution: because conflict is unavoidable, information can only be validated if it is supported by others.

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