

Invited Opinion

Consciousness as a Sub-Quantum Phenomenon

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Abstract

A sub-quantum level of reality, to be called the nuether, which results from applying the two conservation laws of energy and momentum, is described. A new creation/annihilation mechanism then appears having a self-organizing property and leading to a brain-like structure. This could evolve a primary consciousness within the nuether, which could then generate the quantum waves to produce what we call, "sub-atomic particles", together with the force of gravity. A solution to the enigma called the wave-particle duality appears naturally and is free from paradox. In this way the nuether seems able to generate the quantum world—the base on which all matter rests. Physics might be extended to include phenomena, like psychokinesis, now regarded as paranormal.

Introduction

The notion of a sub-quantum phenomenon contradicts the current reductionist view that mind is just brain-function. However, even as early as 1989, Sir Roger Penrose appears to have disagreed with this contention.¹ Penrose, together with Stuart Hameroff, offered an approach they define as "panpsychism" as described in this journal.² Their view includes a "stable self-organizing structure," but unlike the views to be presented here

theirs does not refer to a sub-quantum medium.

This panpsychism is a significant paradigm shift because, to the extent that most physicists think about "mind" at all, they regard it materialistically as mere brain function. Some treat paranormal phenomena more as threats to their own credibility, rather than as anomalies to be investigated experimentally. In this paper I consider paranormal to be phenomena outside the scope of physics.

Another difficulty is the enigma called the wave-particle duality. A number of small holes can be made in a barrier to be bombarded with any kind of sub-atomic particle. The intensity can be arranged so low that the particles pass through the holes only one at a time. Although one particle can only go through one hole, it behaves as if it had gone through all holes at once. It behaves like sets of waves, emerging from every hole simultaneously to produce an interference pattern, the signature of wave effects. Young's two slit experiment, illustrated in Figure 4, shows such interference patterns moving towards a screen where they produce a pattern of light and dark bands. These are due to waves in phase adding by constructive interference while those out of phase subtract.

Very early de Broglie proposed that all particles have a wavelike nature. He also suggested that pilot waves guided sub-atomic particles, and he published many papers and several books from 1952 onwards in attempts to show how quantum waves could be generated. Bohm in 1980 proposed an implicate order with hidden variables underlying quantum theory,³ and I. Vigier together with several others did similar work. Mainstream physics, however, makes no serious attempt to show how matter is organized by its quantum waves or how quantum waves are generated. The very question of whether quantum waves are real phenomena or merely abstract artifacts is shunned as metaphysical or non-scientific.

The pilot wave concept could not explain all observations and so, unfortunately, it was displaced by the Copenhagen interpretation. This interpretation assumed that all possibilities existed in superposition as unresolved wave-functions until observed; then these functions collapsed into the reality of particles. At least this view acknowledged that matter was controlled in some way by a consciousness, but in 1957 Everett's many-universes interpretation appeared. This view seems not to depend on consciousness but instead requires an in-

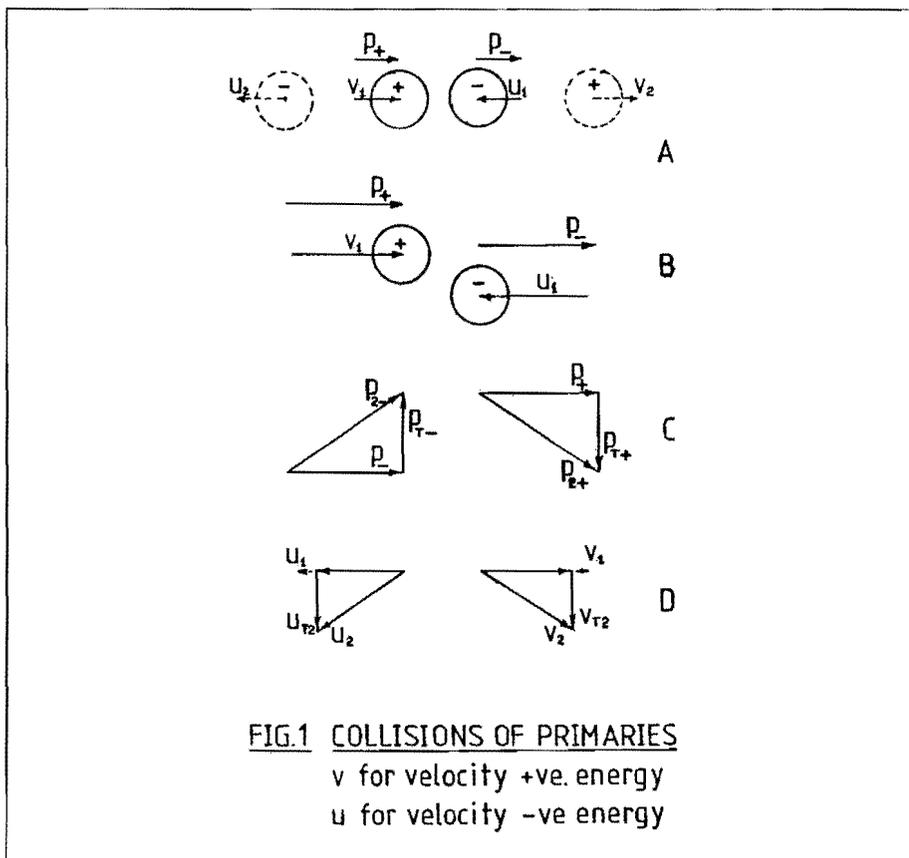


Fig. 1: At A in a head-on collision of a pair of primaries the momenta P_+ and P_- add so that neither can lose energy. At B a glancing impact adds transverse momenta, P_{T+} and P_{T-} , shown at C, thus causing extra energy of their own kind to be gained by each. Both move sideways in the same direction as shown at D.

finite number of matter systems in superposition. The present explanation arises naturally from the logic to be described and is much closer to de Broglie's early concepts.

These concepts required the existence of a background medium for the propagation of waves. Notable theorists in more recent times have sought to reintroduce modified concepts of the old rigid ether, discredited by the failure of Michelson and Morley to measure the speed of the Earth through such a medium. John Archibald Wheeler, for example, published ideas for a "sub-quantal" medium in collaboration with Richard

Feynman.⁴ Mathematical descriptions for terms like pre-space, wormholes, and quantum foam were proposed as underlying both space and matter.

These ideas are not yet accepted as part of mainstream physics, however, probably because the model seems to be currently untestable by experiment. An encouraging feature of the present formulation is that it suggests ideas for several experiments by which it could be tested. For example, this formulation is consistent with a fluid medium, the nuether, traveling with the earth in a vortex motion centered on the sun. An updated Michelson-Morley interferom-

eter, such as that used by Brillet and Hall and flown in low earth orbit,⁵ ought to give fringe shifts consistent with its relative velocity through the nuether, thereby confirming its existence. Indeed these researchers in 1979 obtained fringe shifts which Aspden interpreted as indicating a speed of 355 m/s -within 3% of the spin velocity of the earth at the latitude of test.⁶ This result already supports the vortex model.

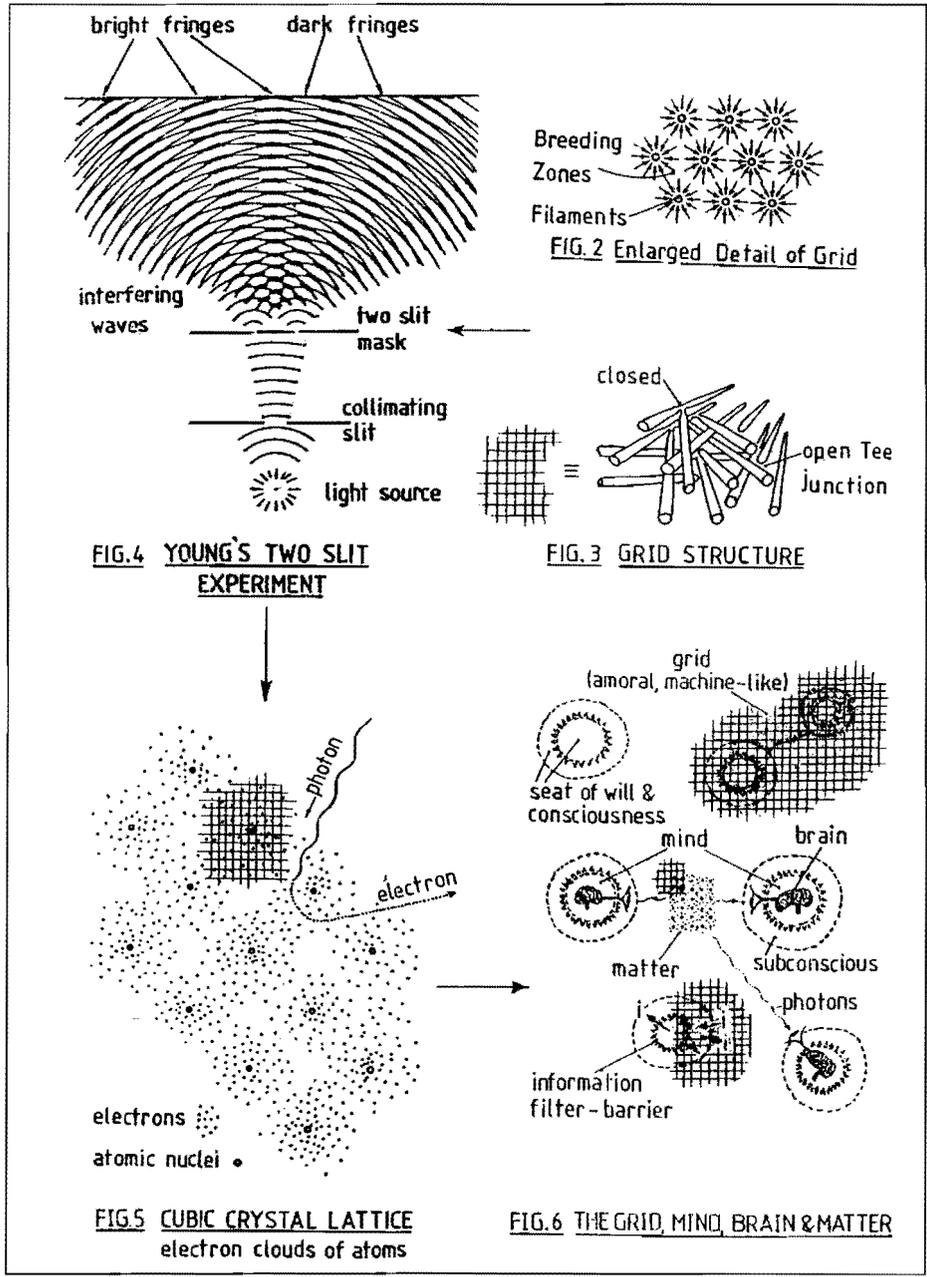
The present hypothesis evolved from an attempt to solve the problem of quantum gravitation published in 1990.⁷ A summary appeared in the proceedings of a Russian conference of 1991⁸ and was followed by another publication in 1992.⁹ The latter also gives in its appendix a full mathematical treatment of the structure of the nuether to be described. A mathematical treatment showing the link with gravitation was also included in the proceedings of the Sir Isaac Newton Conference of 1993.¹⁰

The new approach offers an explanation for the way matter is organized by quantum waves and shows how such phenomena could arise. No changes to quantum theory are required, however, except where gravitation is concerned. It has also very recently been found that relativity theory can be integrated without paradox. Hence existing theory is supplemented by providing a real basis for supporting its abstract concepts.

Origin of an Alternative Approach

The impetus for this approach was an article by Professor Tryon in

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Figs. 2 THRU 6: In Figures 2 and 3 the grid structure of the nuether is shown, and the quantum waves spontaneously generated form interference patterns, an example of which is shown in Figure 4. These specify where imploding waves are to be focused to create sub-atomic particles, and these form atoms of crystals as shown in Figure 5 (with nuclei on a square grid inclined so as not to line up with grid symbolism). A number of minds separated by information filters of the grid structure observe matter via sense organs and the brain as shown in Figure 6.

which the mass-energy of matter was balanced against "negative gravitational potential energy."¹¹ The mass-energy, however, would remain when matter had expanded to infinite distance, but here the gravitational energy was defined as zero. To resolve this puzzle one might adduce the ideas of Gibbons, Hawking and Siklos¹² and Novikov¹³ who attributed a high energy-density balanced by an "intrinsic negative pressure of the vacuum."

These ideas were all part of the established big-bang theory in which the universe of matter arose simultaneously with space in a tiny fraction of a second. A direct consequence was the emergence of an apparently insoluble problem of the cosmological constant, which predicted that all galaxies would be moving apart with accelerations fifty orders of magnitude greater than astronomical observations could allow. This value is not to be confused with the cosmological constant originated by Einstein. His gravitational theory showed that the galaxies had to be accelerating relative to our own, a prediction which was contrary to accepted opinion. He then added an artificial constant to make them appear stationary. Later he admitted that this was his worst mistake. An associated problem, which had troubled theorists for more than fifty years, was the incompatibility of general relativity with the quantum approach.

The specialist knowledge of the engineer in thermodynamics and mechanics might help resolve these problems. An attempt to produce a para-

dox-free theory of quantum gravitation is mounted here such that such a force of attraction can not be modeled without the re-introduction of negative energy states. Such states had first been proposed by Paul Dirac¹⁴ in the 30's but were then rejected and are now regarded as non-physical. However, the reasons used for rejection are not applicable in the present context. For example, one argument says that electrons in negative states must fall indefinitely to infinite negative values: but in the present theory no electrons can exist in negative states. Such states will be confined to the sub-quantum level where none of the four forces of nature exists. Furthermore, at the quantum and higher levels only a net positive energy will be evident.

A balance of both positive and negative states needs to exist at the sub-quantum level only, in such a way that a positive excess appears for building matter, yet leaves a negative excess to produce the force of gravity.

The meaning of these energy states is best understood by considering an object accelerated by the application of a force. Any object, even when stationary, can be considered as being constructed from energy, rest-energy to be precise, since mass and energy are known to be equivalent to one another. An object made of positive rest-energy will accelerate in the direction of the applied force while one of negative rest-energy would accelerate in the reverse direction. This relationship may seem impossible at first sight, but forces of action are always balanced by opposing forces of reaction, and an alternative

set of mechanics can be set out with these forces reversed. These mechanics give exactly the same responses when all other objects are considered as made of negative energy.¹⁵ Motion adds kinetic energy of the same sign in either case.

A background medium, therefore, has to exist which consists of a mixture of both positive and negative energy states. This medium cannot be a continuum since the two states would cancel each other. So the energy states must be considered to exist as an intimate mixture of two kinds of complementary particle to be called primaries. All particles will move at high speed to repeatedly collide and so form a seething mass in the manner of a gas-like fluid. This fluid is the primordial nuether whose intricate structure has yet to be described.

A New Creative Mechanism

Half of all collisions will be between primaries of like kind: either positive to positive or negative to negative. In either case they will bounce away from each other like billiard balls obeying two basic laws of physics: the conservation of energy and the conservation of momentum. While energy is the basic material of both matter and the motion of that matter (kinetic energy), momentum is a property of matter. The momentum of an object is obtained by multiplying its mass by its velocity (the meaning of its conservation is explained in the appendix). On this basis alone both phases of the fluid, positive and negative, would neither gain nor lose energy.

The remaining half of all collisions will be between pairs, one of each kind. Then the same two laws of momentum and energy, when applied together, result in the prediction of a balanced increase of both energies at each collision. This increase is explained by Figure 1, which shows how pure energy creation can now occur without violating the laws of physics. The first law of thermodynamics now appears as a special case of a more general law, which should read, "Energy can only be created or destroyed in equal and opposite amounts." This breeding effect implies that the zero state is unstable, and once triggered, the sub-quantum background fluid is committed to eternal growth. The nuether has to exist as a sphere whose radius will increase indefinitely.

An expanding universe is predicted with galaxies receding at speeds proportional to their distance from us, as the astronomer Hubble was the first to observe. A theory free from the false prediction of the "cosmological constant" emerges for which established cosmology can offer no acceptable solution, as shown by Abbott.¹⁶ Some other process needs to exist, however, to eliminate most of the pure creation generated because it is many orders of magnitude greater than observation can allow. The solution appears naturally.

When large numbers of both kinds of primary approach a point from all directions the net growth rate is drastically reduced because the net momentum at such a point now cancels to zero, thus causing the same laws of physics to favor mutual anni-

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hilation. Flow patterns spontaneously appear, as shown in Figure 2, in which pure creation drives primaries toward centers of annihilation. Cylindrical symmetry is favored over the spherical kind because the cusp-shaped voids between packed spheres are about three times greater than those between packed cylinders. These are not voids; they are breeding zones creating whisker-like projections, which enable a flip to the most stable configuration. The result is the spontaneous formation of permanent filaments of both kinds of energy at the centers of every breeding cell. Filaments are not material objects; they are primaries in the act of squeezing each other out of existence and are really flow patterns in the liquid state. They tend to form into honeycomb-like arrays, shown in cross-section in Figure 2. Being of very fine spacing, many thousands could lie side by side within the compass of each tiny electron. These filaments must not be confused with elements of the string theories of mainstream physics, which are described in higher curved dimensions with the eleventh providing the source of creation. Some are compacted into little balls so that only the strings poke out into the four space-time dimensions we observe.

The present theory is written in only these four space-time dimensions and is based entirely on Euclidean geometry. However, string theories are not ruled out since the strings could be higher order constructs, not the filaments themselves. It is possible that the higher dimensional mathematics do not represent reality and

that the nuether employs similar mathematical constructs, which are then discarded, in the way that mathematicians use imaginary numbers and then discard the imaginary parts of the final solution.

At larger scales bundles of the arrays of filament-containing cells will criss-cross in all directions as shown in Figure 3. It requires no mathematical formalism to see that, as a consequence of such random geometry, each filament will terminate at both ends in a tee-junction with some other filament that crosses its path. Due to the sharing of imploding flows near junctions, a local thinning of filaments will result. The junctions, therefore, are weak points which can easily break. They can exist in bistable states, either open or closed.

In the open state any asymmetry causes an energy imbalance to build up, caused by rectification of random fluctuations occurring in the surrounding region. When some shock causes closure, an energy discharge will occur and the resulting flow can provide the shock needed to cause a change in state of other nearby junctions. So waves of switching action will arise spontaneously, which could be the quantum waves—the core feature of quantum theory. Furthermore, all the ingredients are present from which a working neural network could evolve and ultimately yield a primary consciousness.

The network or grid now defining the nuether and represented symbolically by a rectangular mesh in Figures 3, 5, and 6, would interconnect everything in the universe. As yet,

however, no universe of matter could exist. Spontaneous creation of the nuether had to occur first, followed by evolution of its consciousness, since on this model matter would require deliberate design.

The only tools available for the creation of matter would be the quantum waves, organized by the computing ability of the network. Waves could be focused by such computer control, so they implode to a central point after originating from a spherical shell of the grid. Humps of energy density will appear around any focus because wave action will create more collisions and so stimulate an excess of creation. No violation of the second law of thermodynamics is involved here because, at the sub-quantum level, pure energy creation is driving a flux of primaries, a small fraction of which is intercepted continuously to produce energy imbalances in the filaments. An immense power source is available everywhere to drive the universe. In this way the tendency toward greater disorder, represented by increase of entropy, is counteracted.

These humps will serve as the elementary sub-atomic particles, which can be generated in a state of motion and grouped by the organizing power of wave interference patterns (an example is shown in Figure 4) will form up into complete atoms, molecules, and crystals, as shown in Figure 5. It should be noted that the atomic nuclei are shown on a cubic lattice, but it is tilted so that it is not confused with the grid symbolism also shown as underlying everything.

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makes the net pressure gradients negative. (See pp. 286-290 in Pearson¹⁷ and note that the wrong asymmetry was assumed. An updated edition is in preparation.) There is now a real force of gravity, as formulated in the author's paper¹⁸, generated as one of negative buoyancy by the resulting gradients of excess negative pressure. Furthermore the excess positive rest energy is available everywhere to become concentrated to form the sub-atomic particles of positive matter by wave-focusing.¹⁹

An overall representation of the nuether generating the force of gravity on a particle is given in Figure 7. The graph 7b is a plot of energy density e for the nuether against radius R from the center of a concentration of matter marked Attractor. Quantum waves radiating from this mass enhance creation and annihilation causing the energy density of both phases to fall off with radius. The positive phase has a greater rest energy density e_{0+} than the negative phase e_{0-} so that the negative kinetic energy e_k is the greater. These net values are also shown.

In Figure 7a a spherical-radial mode of vibration is indicated as produced by quantum-wave focusing; its amplitude is indicated as number-density concentration n/n_i where suffix i represents the initial state. Excess creation increases all local time-averaged energy densities at radius R including the net values as shown in Figure 7b. The net negative pressure, shown at Figure 7d, is also amplified, being equal to $e_k/3$. In fact, this suggests that an extra life will be pro-

duced in trapped positive primaries to fill up this depression, thus enhancing the amplification to produce a particle of dominant positive rest-energy. Filaments increase in radius when the creation rate is increased,²⁰ and it is this increase together with the local negative pressure gradient which produces the gravitational force, as illustrated in Figure 7c.

The asymmetry in these energies is also exactly that needed to power the neural network. Without this asymmetry, open junctions cannot build up the required energy imbalances. Hence a unified description of the universe of matter has emerged together with its formative mechanism.

Physics Might Now Explain the Paranormal

The reason for the creation of matter can now be deduced. The creation of matter is needed to provide the primary mind with a set of meaningful environments. Figure 6 illustrates the possible overall structure of these environments. The primary mind exists as a myriad of conscious regions, or minds, of small volume interconnected by a vast machine-like net. The minds possess a sense of morality, the remaining network is amoral. Each mind is split into an individual conscious part and a subconscious part, the latter interconnecting with all others. The separation is provided by an information filter-barrier, programmed as an enclosing shell, which prevents communication from the subconscious but permits flow of information in the reverse direction.

In this way the whole can be enriched by individual experience. Each mind can, however, only receive information via sense organs, such as eyes, which record photons reflected from objects made of matter. The environment of matter will then appear as the only reality and will enable all incarnate minds to relate to one another in meaningful ways through cooperation and competition to help them develop.

The paranormal can now fit into physics. Out-of-body experiences are occasions when the mind goes temporarily out of register with the brain, the latter most probably being merely an interfacing mechanism for operating the control systems of the body. This notion, which most world religions will find attractive, suggests that the mind has the potential to be immortal. Psychokinesis can also be readily explained. The programmed nuether structures matter, and direct mind-control is normally inhibited. Under certain conditions the inhibition routine is partially bypassed. A similar explanation for telepathy appears. Controlled leaks in the information filter-barriers are responsible for the direct interconnection of minds via the filamentous structure of the nuether.

Most other aspects of the paranormal can, in similar manner, be provided with rational explanations and be shown to have the potential to be real effects. More complete descriptions covering almost the entire spectrum of the paranormal together with examples based on direct experience can be found in the popular sections

of the author's books.²¹ These both have mathematical appendices, the former dealing with the extended Newtonian theory of quantum gravitation and the latter dealing with pure creation/annihilation processes and resulting filament theory.

Conclusions

A grand unification seems possible starting from the ultimate in simplicity: a universe dependent on only two complementary forms of kinetic energy and existing as primary particles, the only true particles in existence. More energy is locked up in spin to be exhibited as rest energy in the positive primaries than in their negative partners and causes a fraction of the pure creation proceeding at a hyper-astronomical rate everywhere to power the universe. This view originated from a new theory of quantum gravitation which predicted the existence of a background medium, the nuether, structured like a neural network. This theory can explain the creation of a universe of matter by the use of intelligently organized quantum-waves. Their mode of computation can be relativistic, thus permitting relativity to coexist with the concept of nuether. A plausible interpretation for wave-particle duality appeared naturally, and the theory also showed that physics could be extended to incorporate the paranormal. The human mind cannot be mere brain function. The brain may or may not be a conscious entity. What seems certain, however, is that the brain connects with a primary consciousness which exists as part of the structure of the nuether and could be immor-

tal. Since immortality is the basis of most religious beliefs, it now seems possible that a new unity may emerge in which science can provide faith with support.

Appendix

MOMENTUM is a property of matter given by the product of the mass and velocity vector of any object. The direction of motion is important as well as the speed, so the term, velocity, contains both factors. The momentum vector is often represented by an arrow pointing in the direction of motion and having a length proportional to mass multiplied by speed.

The law of conservation of momentum requires that in any collision the vector sum of the momenta of all interacting particles always remains constant. This relationship is true whatever arbitrary frame of reference is taken for analysis. The components of the momentum arrows, which point in the direction of this frame of reference, are used with one direction representing positive momentum and with the reverse direction regarded as negative (the choice of positive direction is purely arbitrary).

In quantum theory forces of repulsion are modeled by so-called gauge particles which act as mediators of the electromagnetic force. These are emitted from sub-atomic particles so that the latter recoil to balance the momentum imparted to the mediator. This momentum is transferred to another sub-atomic particle by absorption of the mediator, so that the latter bounces away.

The same model is used to represent forces of attraction, but now resort is made to a stratagem called negative coupling to reverse the direction of motion of the sub-atomic particles in mathematical equations. Clearly a violation of the law of conservation of momentum is involved and cannot be tolerated if freedom from paradox is to be attained.

The only solution has to assume the mediator of attractive force to be a carrier of negative momentum; the arrow representing the momentum vector needs to point backwards (i.e., opposite the direction of motion). Thus the mass and energy of the mediator need to be considered as negative. This requirement explains why the nuether needs to contain negative as well as positive states.

PURE CREATION can be explained by figure 1 without using mathematics though a full mathematical analysis is given by the author.²² Case A shows a positive primary of velocity u_1 with its momentum vector P_+ in head-on collision with one of negative energy moving in the opposite direction with velocity v_1 . The latter carries negative momentum P_- and points in opposite direction to its velocity. The two vectors are additive whereas for billiard balls of positive energy in collision they could cancel to zero. Hence very different results will occur. For case A the only solution is for the particles to pass through each other without change of either momentum or energy: it is impossible for any mutual annihilation to occur.

Now consider the offset collision of case B. A transverse component of

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impulse is added due to the glancing impact and acts on each primary. To conserve momentum in this direction the negative momentum P_{T-} imparted to one must exactly cancel the positive one P_{T+} imparted to the other, as shown at C. Then, as shown at D, both particles are deflected in the same transverse sense.

The longitudinal momenta, however, still add up and the associated energies are still unable to change. Extra energies are associated with the transverse additions and so, for glancing collisions, each primary must gain energy of its own kind. The gains, however, sum to zero so that, overall, there is no violation of the modified law of energy conservation.

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