PLANARITY

INTRODUCTION

Relativity has problems. The biggest problem of all is that acknowledgement and discussion of these problems is taboo. Virtually no one in the physics community today countenances skepticism of relativity, much less harbors it. On the one hand, this community insists that it alone is competent to analyze and evaluate relativity; and on the other hand, it insists on the full, unthinking embrace of relativity – even, and especially, within itself. So where is left any forum for a scientific skepticism of relativity?

If the physics community's state of denial were relativity's only problem then it wouldn't be much of a problem. But it's not. Relativity has fundamental inadequacies. These will be examined in the following presentation of an alternative physics model, the planarity model. We will begin in the first section with a look at two highly distinguished dissenters, Drs. Louis Essen and Paul Marmet. In the second section the planarity model will be presented. The third section will address the Lorentz transformation and dispel the current confusion caused by the incomplete understanding of it. The fourth section will show that the planarity model provides the basis for a unified field theory. And the fifth section presents an overall picture of matter.

TWO AUTHORITATIVE CRITICS OF RELATIVITY

Dr. Louis Essen

Among widely-respected and distinguished physicists, relativity dissidents are few and far between. The pre-eminent such dissident was Dr. Louis Essen, the father of the atomic clock. Essen was a British physicist renowned for his pioneering work in chronometry, the first operational cesium clock in the world having been built by him in 1955 at the National Physical Laboratory in England. His knowledge of this specialized field of chronometry was unequalled among his peers and considerably greater than Einstein's. Moreover, his fluency in German allowed him to study Einstein's papers in the original untranslated. There has been no one better equipped to render judgment on Einstein's formulation and elucidation of relativity than Essen.

In 1971 Essen was invited by the Oxford University Press to write an article detailing his thinking on relativity. They published his paper, The Special Theory of Relativity: A Critical Analysis, as one of their Research Papers (No. 5). It dealt with special relativity, as opposed to general relativity, and specifically with the internal contradictions of the theory itself. I will not presume to comment on it, apart from recommending it to all physicists, mathematicians and students of physics who see themselves as free thinkers with a healthy skepticism of the scientific establishment. Essen's iconoclasm comes through in the following excerpt from it: "A common reaction of experimental physicists to the theory is that although they do not understand it themselves it is so widely accepted that it must be correct. I must confess that until recent years this was my own attitude." He elaborated on this theme in an article in the October 1978 issue of Wireless World: "Students are told that the theory must be accepted although they cannot expect to understand it. They are encouraged right at the beginning of their careers to forsake science in favor of dogma. The general public are misled into believing that science is a mysterious subject which can be understood by only a few exceptionally gifted mathematicians... The theory is so rigidly held that young scientists who have any regard for their careers dare not openly express their doubts."

In his autobiography, Time for Reflection, Essen relates the genesis of his criticism of relativity: "Einstein's theory of relativity was dealt with very briefly in my university course but we were told that we must not expect to understand it. I accepted this situation and I have since discovered that most physicists are content to remain in the same position assuming that it must be right because it is generally accepted. My doubts about it arose when I found that the experts did not understand either. An exchange of letters in Nature between Dingle and McCrea showed that they had opposite views about some of the predictions of the theory and the arguments advanced on both sides were in my view illogical and unconvincing. Much of the discussion about the theory was concerned with the readings of clocks when they are moving relatively to each other, and since I had a wide experience of comparing clocks and measuring time it seemed to be almost a duty to take a closer interest in the controversy especially as some of the so-called relativity effects although very small were now becoming significant in the definition of the atomic second and the use of atomic clocks.

"It is always better to refer to the original papers rather than to second hand accounts and I, therefore, studied Einstein's famous paper, often regarded as one of the most important contributions in the history of science. Imagine my surprise when I found that it was in some respects one of the worse papers I had ever read. The terminology and style were unscientific and ambiguous; one of his assumptions is given on different pages in two contradictory forms; some of his statements were open to different interpretations; and the worst fault, in my view, was the use of thought experiments. This practice is contrary to the scientific method which is based on conclusions drawn from the results of actual experiments. My first thoughts were that, in spite of its obvious faults of presentation, the theory must be basically sound, and before committing my criticisms to print I read widely round the subject. The additional reading only confirmed my belief that the theory was marred by its own internal contradictions. Relativitists often state that the theory is accepted by all scientists of repute but this is quite untrue. It has been strongly criticised by many scientists, including at least one Nobel Prize winner. Most of the criticisms are of a general nature drawing attention to its many contradictions, so I decided to pin-point the errors which give rise to the contradictions, giving the page and line in Einstein's paper, thus making it difficult for relativitists to dodge them and obscure them in a morass of irrational discussion."

In the February 1988 issue of Electronics & Wireless World Essen gave his read on the scientific establishment's adherence to relativity: "Why have scientists accepted a theory which contains obvious errors and lacks any genuine experimental support? It is a difficult question, but a number of reasons can be suggested. There is first the ambiguous language used by Einstein and the nature of his errors. Units of measurements, though of fundamental importance, are seldom discussed outside specialist circles and the errors in clock comparisons are hidden away in the thought experiments.

"Then there is the prestige of its advocates. Eddington had the full support of the Royal Astronomical Society, the Royal Society and scientific establishments throughout the world. Taking their cue from scientists, important people in other walks of life referred to it as an outstanding achievement of the human intellect. Another powerful reason for its acceptance was suggested to me by a former president of the Royal Society. He confessed that he did not understand the theory himself, not being an expert in the subject, but he thought it must be right because he had found it so useful. This is a very important requirement in any theory but it does not follow that errors in it should be ignored."

Essen addresses the same question more bluntly in his autobiography: "Scientists badly wanted a more detailed satisfactory explanation and this is what Einstein thought he had done. All he did was to introduce irrational ideas into physics and incorporate the Lorentz explanation into electromagnetic theory as an assumption. The original puzzling results, therefore, remain and it is important to science that a true explanation should be found."

Essen died in 1997. I do not presume to suggest that his criticism of relativity would have presaged his embrace of the planarity model. But I present him as a renowned physicist, well-respected by his peers and an undisputed authority in the specialized field of time measurement, who unequivocally rejected relativity and called for a revived effort to discover a viable alternative to it.

Dr. Paul Marmet

Dr. Paul Marmet was a Canadian physicist who was a standard model dissident and published a very useful analysis of the particle-wave. He had reached the top of his profession, as evidenced by this excerpt from his obituary: "A past president of the Canadian Association of Physicists (1981-2), he also served as a member of the executive committee of the Atomic Energy Control Board of Canada. Dr. Marmet has been elected Fellow of the Royal Society of Canada and was made an Officer of the Order of Canada. He was awarded the Herzberg prize, the Rutherford prize, the Parizeau medal and a Service Award from the Royal Astronomical Society of Canada. He is the author of over a hundred journal papers, four books and 200 presentations at scientific meetings."

Marmet was an unwavering dissident, and he paid a price for it. The following is from the website http://www.newtonphysics.on.ca/info/author.html apparently maintained by his estate (he died in 2005): "In 1997-99, physicists of the establishment showed fierce disagreement with the fact that Marmet's research implied that the fundamental principles of physics were being questioned. Although the experimental work, which could determine the energy of numerous quantum stated was highly appreciated and even honored, the physics establishment required that the author should stop questioning the fundamental principles of physics. The author was first informed by NSERC (Natural Science and Engineering Research Council of Canada) to stop doing that fundamental research despite the fact that, being theoretical, it required no research funds – all research grants were used for the experimental work needed for the electron impact apparatus. Since the fundamental research was still going on the following year, the grant was cut to zero, putting an end to experimental work using the monoenergetic electron beams.

"In May 1999, the head of the physics department came to Marmet's office and said: "Ce n'est pas ton bureau que nous voulons, ton problème est que tu remets en question les principes fondamentaux de la physique." ("We do not want your office, your problem is that you keep questioning the fundamental principles of physics.") Three months later, a letter was sent requiring Marmet's office to become unoccupied before the end of the month. Without research grant and being expelled from his office, Dr. Marmet continued his research alone at home."

In his self-published online book *Absurdities in Modern Physics* Marmet addressed the particle-wave nature of light. He set out a categorical description of the current understanding of the photon, in the process of which demonstrating what an indefensible conundrum it is. This description of his, a masterpiece of dissenting thought, will be reviewed later and used as the basis for approaching the question of the photon.

The Resolution of the Wave-Particle Conundrum

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Abstract

In this paper, a resolution to the wave-particle conundrum that is both internally consistent and in accordance with the phenomena of light is discussed. In particular, a novel concept in the understanding of the photon, planarity, and a novel concept in the understanding of the electron, massive infinitude, are introduced. Together these allow for a rational explanation of Young's double-slit experiment. Moreover, this new model of the photon invalidates the relativity postulate. Therefore, a replacement of this postulate is proposed forming the basis of a new model of physics alternative to the standard model. This alternative model of physics allows for an internally consistent explanation of the Sagnac Effect.

Keywords: wave-particle, planarity, photon, double-slit diffraction, relativity, Sagnac Effect

1 Introduction

The wave-particle conundrum is a complicated problem and there is no untangling it in one fell swoop. It is an unsatisfying contradiction in need of resolution. No less an authority than Albert Einstein had this to say about it: "But what is light really? Is it a wave or a shower of photons?... There seems no likelihood of forming a consistent description of the phenomena of light by a choice of only one of the two possible languages. It seems as though we must use sometimes the one theory and sometimes the other, while at times we may use either. We are faced with a new kind of difficulty. We have two contradictory pictures of reality; separately neither of them fully explains the phenomena of light, but together they do!" [1]. And a number of years later he further stated, "This interpretation, which is looked upon as essentially final by almost all contemporary physicists, appears to me as only a temporary way out..." [2]. But said "temporary way out" remains in place still to this day, more than seventy years later.

In this paper, we tackle the above-mentioned problem and demonstrate that a couple new concepts need to be introduced which significantly change our understanding of nature. In particular, in this paper the photon will first be considered and visualized in a novel way, introducing a concept which is critical to an adequate understanding of it. Following this, the electron and how it interacts with the photon will be considered. This will lead to the predication of a previously undiscovered quality of mass. An implication that this new perception of the photon has on special relativity will be investigated. Eventually in the process of all this not only will the wave-particle conundrum be resolved, but a definitive explanation of both double-slit diffraction and the Sagnac Effect will be achieved.

Taking into account that the wave-particle conundrum will be addressed in two parts, this paper has been organized as follows: The nature of the photon will be discussed in Sect. 2. In Sect. 3 we will discuss the nature of mass. Sect. 4 discusses the impact what we have developed has for special relativity, while Sect. 5 contains some crucial aspects of our study concluding the key results we have so far.

2 The Nature of the Photon

In this section, we address important aspects of the proposed photon model to be used in the tackling of the wave-particle conundrum. This discussion commences with an analysis of the wave-particle set down by the physics dissident Dr. Paul Marmet.[1] In his book, *Absurdities in Modern Physics: A Solution*, he addressed the wave-particle nature of light [3]. In particular he wrote:

"One of the best illustrations of all the difficulties in the Berkeley-Copenhagen interpretation is found when we try to find a rational explanation for the behavior of light.

"To explain the behavior of light, it has been assumed that **something**, emitted by the light source, is later detected by the detector. That **thing** is usually considered to be an electromagnetic wave packet or a **particle** called a **photon**. Since the exact nature of the **thing** that is transmitted has led to one of the most important paradoxes in science, we intentionally use the vague word **thing**, trying, unsuccessfully as everybody, to avoid preconceived ideas about the exact nature of the energy transmitted. However, we see that even the word **thing** is still not sufficiently vague because it implies an object or a wave packet.

"It is usually considered that the emitted **thing** is either:

1. a pure electromagnetic wave packet.

2. a point particle.

[1] Paul Marmet (1932-2005) was a prominent Canadian physicist who had been a Fellow of the Royal Society of Canada, an Officer of the Order of Canada, and president of the Canadian Association of Physicists. However, at some point in his career Marmet became a vocal skeptic of certain aspects of the standard physics model [4].

3. a blend of waves and particles in a fixed proportion.
4. simultaneously a wave and a particle.
5. one single thing changing unexpectedly from the aspect of a wave to the aspect of a particle.

"Let us consider these five models and show that, whatever the model considered, they are all incompatible with realism. None of these five descriptions is compatible with physical reality...

1. The hypothesis of pure E-M radiation is contradicted by observation. One example suffices to prove it. When a wave propagates according to Maxwell's theory, we know that it spreads in all directions. This is incompatible with the fact that, experimentally, all the energy (one photon) emitted by one single excited atom can be detected far away, (sometimes millions of light-years away) on a very small surface (on one single atom). If a spherical E-M wave were emitted around an emitting atom, it would be impossible to explain how one can detect all that energy concentrated on one single point at a great distance, as observed experimentally.
2. The hypothesis that those **things** are nothing but point particles is easily rejected. On the one hand, we know that these **things** are easily diffracted by gratings or through multiple apertures. On the other hand, the fundamental properties of any particle are such that real point particles cannot, in principle, be diffracted by a grating or by passing through a multiple aperture. It is simple logic. Since diffraction patterns are actually observed experimentally, this cannot logically result from a particle. Consequently, the description of light as particles is unacceptable. It is contradicted by experiments.
3. The hypothesis that these things are a blend of waves and particles is also unacceptable for at least two reasons:
   (a) If those things were a blend of waves and particles, we would then detect the wave component with a **wave detector** and the particle component with a **particle detector**. This means that the **wave detector** could detect only a part of the total energy, while the **particle detector** would detect the other part. This is not acceptable, because experimentally, the **particle detector** as well as the **wave detector** are able to detect the total energy.
   (b) A second reason is the following. If part of the energy existed in the form of a particle, that part could not be diffracted by the grating located between the source and the detector, (since diffraction is a property belonging to waves). So, part of the signal would not be diffracted. This is contrary to observations.

4. The hypothesis that those **things** are simultaneously a wave and a particle, as is frequently assumed, is equally contradictory. This can be realized from the fundamental meaning of waves and particles. On the one hand, we have seen that the fundamental characteristic of a wave is to expand and occupy a larger and larger volume in space. On the other hand, the fundamental characteristic of a particle is that the volume stays small during its motion. Consequently, if the thing is simultaneously a wave and a particle, this means that, after a while, the **thing** must occupy simultaneously a large volume (as a wave) and a small volume (as a particle). Such a description is clearly contradictory, since an object cannot be large and small at the same time.

5. It is incompatible with realism that the solution is a description in which a particle and a wave unexpectedly change into one another. This impossibility can be deduced from the argument presented in (d), since this would require that a large volume be compatible simultaneously with a small volume. In electromagnetic theory, there is no way a wave could contract in size. However, a contraction would then be necessary to form a particle at a later time, because at the moment of transformation of the wave into a particle, they must have the same size, at least momentarily. Since inverse expansion is not a characteristic of any wave, the incompatibility in size of a particle and wave makes that mechanism impossible.

"One must conclude that none of the five hypotheses described above is compatible with causality and rationality[2] [5]."

Marmet's analysis of the wave-particle nature of light organizes clearly the options from which we can choose if we wish to define our perception of the photon. In this paper we propose that the photon is a particle, and not a wave or any of the other alternatives enumerated by Marmet. However, it is not the point particle identified by Marmet; rather it is a planar particle.

Now, if the photon is a particle, and not a wave, how can this particle have no mass and, absent absorption, be invisible and entirely undetectable? Let us imagine a planar particle: it has only two spatial dimensions instead of three. What would such a particle look like? A sheet of paper? No, because a sheet of paper has the third spatial dimension and, thin as it may be, is infinitely thicker than a plane. A planar particle would look like nothing, for it would be invisible – and apparently entirely undetectable, for that matter. Does this mean that it would not exist? No, mathematically it is perfectly feasible.

As infinitesimally barely as a planar particle may be, it cannot be described mathematically as non-existent. There is indeed something here, something rather than nothing. And would such a

[2] Please note that Marmet originally predicated a rational alternative in his chapters 6 and 7, but these chapters are not included in the online version of Absurdities in Modern Physics. In their place is the following declaration: "These chapters were removed by the author." Presumably Marmet detected a flaw in his own model and therefore withdrew it. But we are still left with his dissection of the wave-particle.

something have mass? No, a planar particle could not have even an infinitesimally small amount of mass. For mass to exist there must be volume, and volume is defined by three spatial dimensions. There can be no volume where there are only two spatial dimensions, and no mass where there is no volume. Having only two spatial dimensions, and not three, the planar particle does not have volume, hence it has no mass. Planarity explains why the photon has no mass and why, absent absorption, it is invisible and entirely undetectable.

Stemming from planarity, there is a further quality of the photon that is necessary to explain its phenomena. This is the quality of relating to mass below the threshold of motion, "inframotionality." What is the acceleration rate of the photon upon emission until it has achieved light speed, and how long is this period of acceleration? There is no period of acceleration. The photon exists only in a state of light speed. It comes into existence at emission and ceases to exist at absorption. It does not accelerate or decelerate. It simply travels at light speed. Motion is the movement of mass over a period of time. Motion does not occur at a point in time. There must be a starting point and a finishing point, two different points in time defining a period of time, for motion to occur. Acceleration, similarly, requires a starting point and a finishing point, two different points in time defining a period of time, to occur; likewise, deceleration. Since the photon neither accelerates nor decelerates, but instead exists only in the state of light speed, is it not possible that its points of emission and absorption are precisely that: points, in the mathematical sense? Yes, this lack of acceleration is entirely consonant with the photon's predicated lack of mass because a factor of inertia is mass, therefore where there is no mass there can be no inertia to be overcome in acceleration so that such velocity change can occur only at a point in time rather than over a period of time. So, if the photon springs into being at a point in time, rather than over a period of time, and motion occurs only over a period of time and never at merely a point in time, then any effect motion could have on the photon's velocity is nullified. If the photon is a planar particle, then it is "inframotional," it relates to mass below the threshold of motion. Mass in motion at the point in time when the photon is emitted is effectively motionless mass.

The photon's transcendence of the effect of mass' motion does not necessitate a reciprocal transcendence on the part of mass. The two factors determining photon "wavelength,"[3] energy input and motion, are aspects of the mass involved and have no bearing on photon velocity. This means that, in spite of an equivalent energy input, the wavelength of a photon emitted from a body at rest will differ from the wavelength of a photon emitted from a body in motion. The reverse is true of absorption, so that a photon emitted with a certain wavelength can exhibit a different wavelength later on when it is absorbed. Redshift and the Doppler Effect demonstrate this.

[3]Although it may be appropriate to devise a new term rather than use the wave perspective term wavelength, no such innovation will be introduced here.

3 The nature of mass

In the previous section we pointed out that although the proposed particle photon accounts for the photon's masslessness, invisibility and absence of acceleration, it does not address Marmet's criticism of the point particle (see the discussion in Sect. 2). There is no escaping the necessity of addressing diffraction with a particle model of the photon.

If the photon is the predicated planar particle then how can we explain its wave-like quality as demonstrated in diffraction interference phenomena? In particular, how do we explain Young's double-slit experiment? To answer this question, a description of the electron's interaction with photons predicated on a particle photon will be given and then a novel quality of mass will be proposed.

To begin with, a description of the travel of light, the motion of photons, reformulated on the basis of a particle photon is necessary; otherwise this exercise would be crippled to some degree by a sort of reverse circular logic predicated on wave-particle assumptions. Let us mention that hereafter "emission" will be understood to be the ejection of a photon from an electron in a given direction; "absorption" will be understood to be the contact of a photon with, and its subsequent incorporation into, an electron; and "reflection" will be understood to be the interaction between a photon and an electron found in a dense substance at a point bordering a less dense substance (or a vacuum, but let us simplify the discussion by ignoring the possibility of a vacuum). Now, if an electron's energy level is such that it will absorb photons of the energy and incident angle of the incoming photon then reflection will not occur. However, if that electron's energy level is such that it will repulse such photons then reflection will occur. We see that reflection is essentially an aborted absorption. Although the interaction occurs between the photon and an electron found in a dense substance at a point bordering a less dense substance, the electrons surrounding that electron together determine what exact angle is the normal to the surface at the point occupied by that electron. Upon contacting this electron, the photon is repulsed, being released at an angle that is precisely the opposite, relative to the normal, of its angle of incidence. Since this causes the photon to pass the normal absent absorption, the photon is inverted.

Now, with this in mind, we can begin to understand from a particle perspective the photon's apparent wave-like quality as demonstrated in diffraction interference phenomena. What is happening here?

Diffraction is partly a form of reflection. Let us consider single slit diffraction where photons are passing through a narrow opening in a slit board. In the present model some photons are passing straight through without contacting either edge of the slit. Others are contacting one or the other edge. Such edge contact results in reflection. If only the very outer electron on a surface were exposed to the reflection process then the effect of electrons situated on the slit corners, front (light source side) or back (screen side), would be so minimal as to be negligible. However, it is not merely the outer electron on a surface that is exposed to the reflection process: many layers of electrons are exposed to reflection, because photons can penetrate through a considerable number of electron layers before being reflected. The result is that the front corners of a slit have considerably more than a negligible impact on the reflection produced from those two areas. Some photons will strike these front corners and reflect back toward the light source, never making it to the screen. Some will strike far enough around the corner to reflect forward onto the screen but not in front of the slit. Some will strike far enough around the corner to reflect forward onto the screen directly in front of the slit. And a few photons will reflect across from one corner to the other side of the slit, and then reflect further again from that point. These last, that bounce from one side of the slit to the other, can end up in a range of locations on the screen, whether directly in front of the slit to a point far from the slit. This is because the back corners of the slit allow for various reflection possibilities the same as the front corners. This explains why photons can strike throughout a wide swath of the screen rather than in just the narrow sliver opposite the slit. Theoretically, this range should extend through virtually 90° to the right of the slit and 90° to the left. Although the greatest concentration of photon strikes will always come in the area of the screen opposite the slit, the narrower the slit (thus, the greater the amount of slit front corner versus slit area), the lower such concentration will be. This applies whether in the context of a slit or that of some other shape.

So, we see, that reflection alone explains one part of diffraction: namely, how photons can gain access to areas not in the direct line of sight of their light source. But how do we explain the accompanying fringe pattern formation, and in particular, that of Young's double-slit experiment? In order to understand this we must gain a deeper understanding not of the photon, the seeming agent here, but rather of the electron which has always been taken to be nothing more than a passive object in the process.

To the degree that it is unconstrained by other electrons, it is predicated here that an electron is infinite in size. The significance of such electron infinitude ("massive infinitude," for the predication is actually that all forms of mass, and not merely electrons, have this quality of infinitude) is the bearing it has on photons. It is predicated here that a photon is emitted by an electron only when the center of that electron is positioned appropriately vis-à-vis the center of a second electron. What criteria determine such appropriate positioning? Placement and distance – precise, quantized distance. For placement, the emitting electron must be on the equatorial plane of the second electron, the summoning electron. As to distance, the photon to be emitted will have a precise, quantized wavelength: the distance between the centers of the two electrons must therefore be a discrete value representing any whole integer multiple of this wavelength. Where the emitting electron is positioned appropriately relative to two or more potential summoning electrons, the closest such electron – that one separated from the emitting electron by the functional distance representing the lowest number of wavelengths – is the default.

The contact between the emitting electron and the summoning electron is instantaneous and complete. The result is that a photon is released (its emission is triggered) precisely toward the summoning electron. There is no further interaction between the two electrons, no sort of bond to be maintained between them. The photon travels toward the summoning electron, but it will arrive there only if there is no change to its pathway in the meantime. Such change could involve movement of the summoning electron, movement of extraneous matter to block the photon's presumptive pathway, or movement of reflective or refractive matter forming part of this pathway. In the event of such change the photon is redirected accordingly. Such redirection is presumably frequent, and almost constant in some environments.

It is readily apparent what an immense degree of complexity massive infinitude injects into something seemingly as simple as the calculation of the travel of a single photon. There are billions of electrons competing to be the emitting electron's summoning electron, and from many directions. What's more, just as a photon's travel can change directions an unlimited number of times due to reflection and refraction, so also, in the reverse of this process, is an electron's "field" extended, through reflection and refraction, well beyond mere line of sight.

How does massive infinitude explain fringe pattern formation? Consider single-slit as opposed to double-slit diffraction: In single-slit diffraction, the overwhelming bulk of photon strikes occurs in the area of the screen opposite the slit and spilling to either side of that; whereas, in double-slit diffraction, this central concentration is lower and the fringe pattern is a regular alternation between light and dark. It is the alternative route for all electron "fields" present, albeit of differing wavelength multiples, produced by the presence of the second slit, that results in the double-slit's fringe pattern. Moreover, the otherwise all-but-mystical persistence of double-slit fringe pattern formation in the context of single photon emission now makes perfect sense: it never was the photon responsible for this, but rather it was always a function of the electrons, the successful summoning electron prevailing within the context of all its rival summoning electrons to engage with the emitting electron.

The fundamental result, practically speaking, of massive infinitude is the dependence on probability at the sub-atomic level that quantum physics has already discovered and mapped considerably. Massive infinitude is the hidden variable that we have been seeking here for the last century. No understanding of the photon can ever be complete without it. And with massive infinitude at last we have a response to Marmet's criticism of the particle alternative: the point particle may have seemed like the only particle candidate worth his mention but it is in fact the planar particle photon that reconciles the phenomena. The photon's diffraction phenomena are fully explained only when we include massive infinitude.

4 The absolute inertia postulate

The discussion presented in the two above sections has indicated why we need to consider the photon to be a planar particle and how it interacts with the electron. Now, it is time to understand what the immediate implication is that the planar particle photon has for special relativity. Let us first recall the Postulates of Special Relativity, which are as follows:

1. The Relativity Postulate. The laws, according to which the state of physical systems change, are independent of whether these changes of state relate to the one or the other of two coordinate systems in uniform translational motion [6]. Or more commonly: The laws of physics are the same in all inertial reference frames.

2. The Speed of Light Postulate. Every light beam moves in a "static" coordinate system with a certain speed V, independent of whether this light beam is emitted by a static or moving body [6]. Again, more commonly: The speed of light in free space has the same value c in all inertial reference frames.

We know that the speed of light is constant. It was measured exhaustively in the twentieth century and in 1975 its agreed upon value was set at $299,792,458$ meters per second by the 15th Conférence générale des poids et mesures [7]. We should remember that in 1905 the constancy of the speed of light was a postulate but now it is an experimentally proven fact. So, apart from acknowledging its confirmation as fact, no revision is proposed to the Speed of Light Postulate.

The Relativity Postulate, on the other hand, is untenable in the context of a planar photon relating to mass below the threshold of motion. With such a photon, mass is hardwired with a calibration of the differential of its own motion from light speed, and therefore with a calibration of the differential of its own motion from absolute inertia. Mass thus has an awareness of both light speed and absolute inertia. What is the mechanism of such calibration? The gyroscope is a good analogy. Every atom is a gyroscope. The faster an atom moves relative to absolute inertia, the slower it rotates. At light speed this rotation is nil.

In light of the above mentioned untenability of the Relativity Postulate, the following Absolute Inertia Postulate is proposed to take its place, with no change to the Speed of Light Postulate:

1. The Absolute Inertia Postulate. The oscillation rate of any atom varies uniformly subject to motion ranging from full oscillation at absolute inertia down to nil at light speed. This can be paraphrased as: The laws of physics vary uniformly relative to absolute inertia.

2. The Speed of Light Postulate. The speed of light in free space has the same value c in all inertial reference frames.

In our opinion, the writings on the clock paradox have been extensive and it is up to the reader to decide whether the proponents of the standard physics model have been able to set out a coherent explanation of it[4]. Below we give a description of the matter from the perspective of the proposed planarity model.

Two clocks, let's call them Peter Clock and Paul Clock, are together on a space station in a geocentric "treadmill" orbit that keeps the space station's heliocentric orbit in synchronization with Earth's, and they are synchronized. The clocks are put on separate rockets and both rockets are blasted a gazillion miles into space at the same velocities in straight lines but in opposite directions. The clocks' handlers ping each other with radio waves and both observe the opposing clock falling behind their own clock the further they draw apart. But then the rockets stop and return to the space station. Now the clocks' handlers both observe the opposing clock gaining until both simultaneously reach the space station and they are again in synchronization.

For a second experiment the two clocks are together on an airfield high in the Andes at the equator, and they are synchronized. Peter Clock is put on a jet that travels east following the equator around the world on a non-stop flight maintaining an altitude the entire way roughly that of the airfield's elevation. After circling the globe, upon Peter Clock's arrival back at the airfield, the two clocks are compared and Peter Clock is 207 nanoseconds behind Paul Clock. This is due to the Sagnac Effect.[5] The Sagnac Effect demonstrates the Absolute Inertia Postulate: The laws of physics vary uniformly relative to absolute inertia. Peter Clock's total motion relative to absolute inertia was greater than Paul Clock's and therefore Peter Clock had a slower clock rate than Paul Clock.[6]

[4]For an excellent relativity dissident view on the clock paradox, please see Dr. Louis Essen's *The Special Theory of Relativity – A Critical Analysis* [8]. Essen was uniquely equipped to evaluate the clock paradox in that he was the twentieth century's leading physicist in the field of chronometry, having corrected the measured speed of light (despite considerable initial opposition) and developed the world's first atomic clock; moreover, he was fluent in scientific German and so was able to evaluate Einstein's papers in the original untranslated.

[5]As an ironic aside, the Sagnac Effect was predicated by its discoverer as evidence against special relativity [9].

[6]The real significance of the Hafele-Keating experiment [10] is that it demonstrated that observations performed by observers within the same inertial reference frames as the particles under observation are adequate for identifying a difference in the measurement of time undertaken simultaneously in different inertial reference frames. To conclude otherwise overlooks or discounts the distinctness of the process of performing an observation within an inertial reference frame from the subsequent process of comparing the results of that observation with the results of a similar observation performed simultaneously in a different inertial reference frame. (Shifting the analogy to the twins proper, it would be as if Paul observed only himself (his own aging) while Peter was away and at the same time Peter also observed only himself, and then upon Peter's return he reported his self-observation to Paul and Paul assumed such observation as his own observation of Peter (and vice versa). Within the constraints of the thought experiment, the logic of this methodology is circular, predicated as it is on the presence of the paradox, the very thing that it is supposedly testing – but in any event Hafele-Keating is the sword that has severed this Gordian knot, dispatching the mirage that it turned out to be.)

Now, it is very natural to ask: Why are the two clocks in synchronization again after the rocket trip but not after the jet trip? The rocket trip was linear, the two clocks' relative motion was in only one dimension, and this relative motion was isotropic; whereas the jet trip was rotational, the two clocks' relative motion was in two dimensions, and this relative motion was anisotropic.

One might ask, "If the planarity model has absolute inertia, therefore an absolute frame of reference, why is it valid to discuss the Sagnac Effect in terms of relative motion?" Although all motion with respect to absolute inertia is occurring in the background, for two bodies in an inertial reference frame all of this background motion with respect to absolute inertia is cancelled out and therefore masked. This means that while the effective linear motion of the rocket clocks is say $-1,000,000,000$ on the X-axis for the one and $+1,000,000,000$ on the X-axis for the other, followed by the inverse $+1,000,000,000$ on the X-axis for the one and $-1,000,000,000$ on the X-axis for the other, for a total motion of $2,000,000,000$ each; that of the jet clock is a total motion of say 314 compared to a total motion of 0 for the airfield clock (predicated on the jet clock cycling through the positions of say $+50$ on the X-axis and $+50$ on the Y-axis, then -50 on the X-axis and an additional $+50$ on the Y-axis, then -50 again on the X-axis and -50 on the Y-axis, and finally $+50$ on the X-axis and -50 on the Y-axis, while the airfield clock is effectively motionless). All of this is so even though with respect to absolute inertia the two motions look like a parabola or sine wave.

If the Sagnac Effect demonstrates on the jet trip that the laws of physics vary uniformly relative to absolute inertia, why do we see no evidence of this effect on the rocket trip? Why do the records kept by the clocks' handlers show a matching pattern of the opposing clock first falling behind their own clock and then gaining again until being in synchronization with the other? Should we not see evidence of absolute inertia in that the radio waves are travelling a greater distance from the "upstream" clock to the "downstream" clock ("upstream" and "downstream" in relation to absolute inertia) than vice versa? No, we do not see any such evidence because there is equilibrium between the motion of the two clocks out of the space station's inertial reference frame, thus the distance between the two clocks, and the subsequent clock rate asynchronization of the two clocks. This distance cancels out, and therefore masks, the two clocks' clock rate asynchronization with respect to each other. For instance, a linear movement that would normally create asynchronization of say 207 nanoseconds in the mutual observation of the opposing clocks via radio wave is masked by the clock rate asynchronization in the two clocks as they have moved out of the space station's inertial reference frame. As extraordinary as it sounds that there could be such a clock rate change in atomic clocks (in atoms), the Sagnac Effect demonstrates its existence. What is masked and thus hidden to us in the context of a linear motion is revealed in a rotational motion that allows for a side-by-side, before-and-after comparison in an inertial reference frame.

5 Conclusion

The wave-particle conundrum is a complicated problem and there is no untangling it in one fell swoop. In our study we developed a new approach and new ideas to achieve a workable model of the photon that fully explains the phenomena. In particular, we demonstrated that it is necessary to introduce not one but two novel concepts in the understanding of the photon: planarity, along with the photon's relation to mass below the threshold of motion; and one novel concept, massive infinitude, in the understanding of the electron.

In light now of the overall picture of this proposed model, it does not seem illogical that, on the predication of a particle photon, such photon must be planar, to explain its lack of mass, and it must relate to mass below the threshold of motion. Likewise neither does it seem illogical that there must be some explanation outside of the photon proper for a particle photon to exhibit the interference phenomena observed in Young's double-slit experiment. What more logical starting point could there be in such an investigation than the emitting electron? From there it is just a matter of formulating the most logical inter-relation between the two electrons, the emitting and the absorbing.

The introduction of this new model of the photon has invalidated the Relativity Postulate, and so the replacement of this postulate with the Absolute Inertia Postulate has been proposed. This is then reinforced by the evidence presented by the hitherto dissonant phenomenon known as the Sagnac Effect.

What are the implications of the planarity model of the photon? As already demonstrated, the immediate implication is the introduction of an alternative physics model. But the effect of this implication is surprisingly muted on account of the adoption by this new physics model of virtually all the math and experimentation of the standard model that it replaces. Time travel is lost, of course, but after a century of ongoing stillbirth it was never really found anyway. Another implication, specifically of massive infinitude, is that the way may now be cleared for the formulation of a unified field theory, a reconciliation of gravity and electro-magnetism. So Einstein's "temporary way out" is now resolved, and we can move on to his holy grail, a unified field theory.

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Uniplication: The Hitherto Lacking Mathematical Basis for the Lorentz Transformation

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Abstract

A new mathematical operation is introduced; some nice properties of it including non-linearity, commutativity, associativity, existence of zero and identity elements et cetera are proven; and it is demonstrated that the set of rational numbers is an Abelian group with the new operation. Some non-trivial uses of this new algebraic operation are demonstrated, including applications in physics with specific reference to the Lorentz transformation and the law of addition of velocities. In doing so, a mathematical basis for the Lorentz transformation is given.

Keywords: commutativity, associativity, triangle inequality, Abelian group, Lorentz transformation, law of addition of velocities

1 Introduction

The Lorentz Transformation was the most important equation of the twentieth century. It is the heart of special relativity. But neither Lorentz nor Einstein gave any mathematical justification for it. Lorentz introduces it with a simple, "I take as new independent variables…" And Einstein merely took the new independent variables as they were and ran with them. But there is a mathematical basis for the Lorentz transformation, and it will be demonstrated.

In this paper a new algebraic operation in the field of real numbers will be introduced. It will be shown that this operation is nonlinear, commutative, associative, satisfies the triangle inequality et cetera. An important consequence is that the set of rational numbers is an Abelian group with the new operation. Finally, it will be demonstrated that this new algebraic operation provides the hitherto lacking mathematical basis for the Lorentz transformation.

2 The New Algebraic Operation: Definition and Main Properties

There exist many algebraic operations that share some similarities. For instance, the operation of multiplication of exponents with the same base is equivalent to addition of the exponents. In order to put such similarities on a solid mathematical basis and study general properties of them, complex operations are defined in terms of basic algebraic operations, e.g., addition, subtraction, multiplication, division. The studying of these operations and establishment of general properties for some of them can be quite important depending on their relevance to applications.

For any two real numbers a and b, let $a = \frac{m_1}{n_1}$ and $b = \frac{m_2}{n_2}$, the following basic algebraic operations can be performed:

1. Multiplication: $a \cdot b = \frac{m_1 \cdot m_2}{n_1 \cdot n_2}$;
2. Division: $a \div b = \frac{m_1 \cdot n_2}{n_1 \cdot m_2}$;
3. Addition: $a + b = \frac{m_1 \cdot n_2 + m_2 \cdot n_1}{n_1 \cdot n_2}$;
4. Subtraction: $a - b = \frac{m_1 \cdot n_2 - m_2 \cdot n_1}{n_1 \cdot n_2}$.

   The aim of this paper is to introduce a new algebraic operation, uniplication, which is defined as:

5. Uniplication: $a \otimes b = \frac{m_1 \cdot n_2 + m_2 \cdot n_1}{m_1 \cdot m_2 + n_1 \cdot n_2}$.

Although the uniplication equation can be simplified, the form shown here is more useful than the simplification in contextualizing this operation with regard to the other four. Uniplication's numerator replicates the numerator of addition. It can similarly be seen that uniplication's numerator is the addition of both the numerator and the denominator of division; while its denominator is the addition of both the numerator and the denominator of multiplication. The fundamental distinction that sets uniplication apart from the other operations is the nature of its denominator: unlike the denominator of the first four operations, that of uniplication incorporates two multiplication equations rather than just one.

Just as fractions can be proper or improper, so uniplication can be proper or improper. Proper uniplication contains only proper fractions as factors and the product is also a proper fraction. Improper uniplication contains either one or two improper fractions as factors: in the case where there is only one improper fraction factor then the product is an improper fraction; whereas in the case where both factors are improper fractions then the product is a proper fraction (apart from the special case where both factors are 1, in which the product is also 1). Proper uniplication is the interaction of two parts of wholes, which wholes are equivalent in the sense of each being the totality within its own context. In proper uniplication there is thus only one whole, which is everything; there is no series of wholes.

Uniplication is focused on 1 (absolute 1) and its results converge on 1. 1, being the whole and the convergence point, has a special place in uniplication. It is uniplication's unique denominator, with its two multiplication equations rather than just one, along with the fact that its numerator is the addition of both the numerator and the denominator of division, while its denominator is the addition of both the numerator and the denominator of multiplication, that structure it with a convergence on 1. In proper uniplication, such a numerator is necessarily less than such a denominator – yet the product is necessarily convergent on 1 with reference to the factors. And although the inversion inherent in improper uniplication can allow for a product greater than 1, even this product, when inverted, still shows an inverted convergence on 1.

Because uniplication is focused on 1, in the context of proper fractions, bound as they are by 0 and 1, where multiplication converges on 0 and uniplication converges on 1, uniplication is the opposite of multiplication. To put it another way, in the unique context of proper fractions it is uniplication rather than division that is the opposite of multiplication.

There are some nice properties of uniplication which can be ascertained.

Property 1. *Uniplication is not linear, i.e.,*

$$\left(\alpha \cdot \frac{m_1}{n_1}\right) \otimes \left(\beta \cdot \frac{m_2}{n_2}\right) \neq \alpha \cdot \beta \cdot \left(\frac{m_1}{n_1} \otimes \frac{m_2}{n_2}\right), \quad \alpha, \beta \in \mathbb{Z} \setminus \{-1, 1\}.$$

Proof. According to the definition of uniplication, the left hand side is

$$\left(\alpha \cdot \frac{m_1}{n_1}\right) \otimes \left(\beta \cdot \frac{m_2}{n_2}\right) = \frac{\alpha \cdot m_1 \cdot n_2 + \beta \cdot m_2 \cdot n_1}{\alpha \cdot m_1 \cdot m_2 + \beta \cdot n_1 \cdot n_2},$$

while the right hand side is

$$\alpha \cdot \beta \cdot \left(\frac{m_1}{n_1} \otimes \frac{m_2}{n_2}\right) = \alpha \cdot \beta \cdot \frac{m_1 \cdot n_2 + m_2 \cdot n_1}{m_1 \cdot m_2 + n_1 \cdot n_2}.$$

Subtracting the two expressions, we arrive at

$$\frac{\alpha \cdot m_1 \cdot n_2 + \beta \cdot m_2 \cdot n_1}{\alpha \cdot m_1 \cdot m_2 + \beta \cdot n_1 \cdot n_2} - \alpha \cdot \beta \cdot \frac{m_1 \cdot n_2 + m_2 \cdot n_1}{m_1 \cdot m_2 + n_1 \cdot n_2} =$$
$$= \frac{(\alpha \cdot m_1 \cdot n_2 + \beta \cdot m_2 \cdot n_1)(m_1 \cdot m_2 + n_1 \cdot n_2)}{(\alpha \cdot m_1 \cdot m_2 + \beta \cdot n_1 \cdot n_2)(m_1 \cdot m_2 + n_1 \cdot n_2)} -$$
$$- \frac{\alpha \cdot \beta \cdot (m_1 \cdot n_2 + m_2 \cdot n_1)(\alpha \cdot m_1 \cdot m_2 + \beta \cdot n_1 \cdot n_2)}{(\alpha \cdot m_1 \cdot m_2 + \beta \cdot n_1 \cdot n_2)(m_1 \cdot m_2 + n_1 \cdot n_2)}$$

which is equal to zero only when $\alpha = \beta = \pm 1$. □

Remark 1. *Note that in the singular case of $\alpha = \beta = 0$,*

$$\lim_{\alpha\to 0}\lim_{\beta\to 0}\left(\alpha\cdot\frac{m_1}{n_1}\right)\otimes\left(\beta\cdot\frac{m_2}{n_2}\right)=\frac{n_2}{m_2},$$

while

$$\lim_{\alpha\to 0}\lim_{\beta\to 0}\alpha\cdot\beta\cdot\left(\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right)=0.$$

Therefore, Property 1 holds even for $\alpha = \beta = 0$.

Property 2. *Uniplication is commutative, i.e.,*

$$\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}=\frac{m_2}{n_2}\otimes\frac{m_1}{n_1}.$$

Proof. Indeed, according to the definition,

$$\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}=\frac{m_1\cdot n_2+m_2\cdot n_1}{m_1\cdot m_2+n_1\cdot n_2}=\frac{m_2\cdot n_1+m_1\cdot n_2}{n_1\cdot n_2+m_1\cdot m_2}=\frac{m_2}{n_2}\otimes\frac{m_1}{n_1}.$$

□

Property 3. *Uniplication is associative, i.e.,*

$$\frac{m_1}{n_1}\otimes\left(\frac{m_2}{n_2}\otimes\frac{m_3}{n_3}\right)=\left(\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right)\otimes\frac{m_3}{n_3}.$$

Proof. Indeed, according to the definition,

$$\begin{aligned}\frac{m_1}{n_1}\otimes\left(\frac{m_2}{n_2}\otimes\frac{m_3}{n_3}\right)&=\frac{m_1}{n_1}\otimes\frac{m_2\cdot n_3+m_3\cdot n_2}{m_2\cdot m_3+n_2\cdot n_3}=\\&=\frac{m_1\cdot(m_2\cdot m_3+n_2\cdot n_3)+(m_2\cdot n_3+m_3\cdot n_2)\cdot n_1}{m_1\cdot(m_2\cdot n_3+m_3\cdot n_2)+n_1\cdot(m_2\cdot m_3+n_2\cdot n_3)}=\\&=\frac{m_1\cdot m_2\cdot m_3+m_1\cdot n_2\cdot n_3+m_2\cdot n_3\cdot n_1+m_3\cdot n_2\cdot n_1}{m_1\cdot m_2\cdot n_3+m_1\cdot m_3\cdot n_2+n_1\cdot m_2\cdot m_3+n_1\cdot n_2\cdot n_3}=\\&=\frac{m_3\cdot(m_1\cdot m_2+n_1\cdot n_2)+n_3\cdot(m_1\cdot n_2+m_2\cdot n_1)}{m_3\cdot(m_1\cdot n_2+m_2\cdot n_1)+n_3\cdot(m_1\cdot m_2+n_1\cdot n_2)}=\\&=\left(\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right)\otimes\frac{m_3}{n_3}.\end{aligned}$$

□

Property 4. *Uniplication of direct and inverse fractions is equal, i.e.,*

$$\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}=\frac{n_1}{m_1}\otimes\frac{n_2}{m_2}.$$

Proof. This is a direct consequence of the definition. Indeed,

$$\frac{n_1}{m_1} \otimes \frac{n_2}{m_2} = \frac{n_1 \cdot m_2 + n_2 \cdot m_1}{n_1 \cdot n_2 + m_2 \cdot m_1} = \frac{m_1 \cdot n_2 + m_2 \cdot n_1}{m_2 \cdot m_1 + n_1 \cdot n_2} = \frac{m_1}{n_1} \otimes \frac{m_2}{n_2}.$$

□

Corollary 1. *Uniplication of any number with its inverse is the inverse of uniplication of that number with itself, i.e.,*

$$\frac{m_1}{n_1} \otimes \frac{n_1}{m_1} = \frac{1}{\frac{m_1}{n_1} \otimes \frac{m_1}{n_1}}.$$

Property 5. *Uniplication of any number with 0, results in that number, i.e.,*

$$\frac{m_1}{n_1} \otimes 0 = \frac{m_1}{n_1}.$$

In other words, 0 plays the same role for uniplication, as identity plays for multiplication.

Proof. It directly follows from the definition of uniplication. □

Property 6. *Uniplication of opposite numbers is 0, i.e.,*

$$\frac{m_1}{n_1} \otimes \left(-\frac{m_1}{n_1}\right) = 0.$$

Proof. It directly follows from the definition of uniplication

$$\frac{m_1}{n_1} \otimes \left(-\frac{m_1}{n_1}\right) = \frac{m_1 \cdot n_1 + (-m_1) \cdot n_1}{m_1 \cdot (-m_1) + n_1 \cdot n_1} = \frac{0}{-m_1^2 + n_1^2} = 0.$$

□

Remark 2. *It is important to note that, as it follows from Properties 3, 5 and 6, $\mathbb{Z}$ is an Abelian group with uniplication.*

Property 7. *Uniplication of any number with identity, results in identity, i.e.,*

$$\frac{m_1}{n_1} \otimes 1 = 1.$$

Proof. Indeed,

$$\frac{m_1}{n_1} \otimes 1 = \frac{m_1 \cdot 1 + 1 \cdot n_1}{m_1 \cdot 1 + n_1 \cdot 1} = 1.$$

□

Remark 3. *In the same way it is proved that* $\frac{m_1}{n_1} \otimes (-1) = -1$.

A direct consequence of Property 7 and Remark 3 follows.

Corollary 2. *In the limiting case when* $\dfrac{m_1}{n_1} \to \pm 1$ *or* $\dfrac{m_2}{n_2} \to \pm 1$,

$$\left| \frac{m_1}{n_1} \otimes \frac{m_2}{n_2} \right| \to 1.$$

Property 8. *Uniplication of any* $-1 < \dfrac{m_1}{n_1} < 1$ *and* $-1 < \dfrac{m_2}{n_2} < 1$ *satisfies*

$$\left| \frac{m_1}{n_1} \otimes \frac{m_2}{n_2} \right| < 1.$$

Proof. First, let $0 < \dfrac{m_1}{n_1} < 1$ and $0 < \dfrac{m_1}{n_1} < 1$. Then,

$$\frac{m_1}{n_1}\left(1 - \frac{m_2}{n_2}\right) < 1 - \frac{m_2}{n_2}$$

or

$$\frac{m_1}{n_1} + \frac{m_2}{n_2} < 1 + \frac{m_1}{n_1} \cdot \frac{m_2}{n_2},$$

implying

$$\left| \frac{m_1}{n_1} \otimes \frac{m_2}{n_2} \right| = \frac{m_1 \cdot n_2 + m_2 \cdot n_1}{m_1 \cdot m_2 + n_1 \cdot n_2} < 1.$$

Due to the presence of absolute value, the case when $-1 < \dfrac{m_1}{n_1} < 0$ and $-1 < \dfrac{m_2}{n_2} < 0$ simultaneously, is proved similarly. Now, assume that $0 < \dfrac{m_1}{n_1} < 1$ and $-1 < \dfrac{m_2}{n_2} < 0$. Then,

$$\left| \frac{m_1}{n_1} \otimes \frac{m_2}{n_2} \right| = \left| \frac{\frac{m_1}{n_1} - \left|\frac{m_2}{n_2}\right|}{1 - \frac{m_1}{n_1} \cdot \left|\frac{m_2}{n_2}\right|} \right|.$$

Making use of the obvious relation

$$\frac{m_1}{n_1}\left(1 + \left|\frac{m_2}{n_2}\right|\right) < 1 + \left|\frac{m_2}{n_2}\right|$$

or

$$\frac{m_1}{n_1} - \left|\frac{m_2}{n_2}\right| < 1 - \frac{m_1}{n_1} \cdot \left|\frac{m_2}{n_2}\right|,$$

holding for any $0 < \dfrac{m_1}{n_1}, \left|\dfrac{m_2}{n_2}\right| < 1$, we conclude that

$$\left| \frac{m_1}{n_1} \otimes \frac{m_2}{n_2} \right| < 1.$$

Finally, assume that $-1 < \dfrac{m_1}{n_1} < 0$ and $0 < \dfrac{m_2}{n_2} < 1$. Then, it follows from the inequality

$$-\left|\frac{m_1}{n_1}\right|\left(1-\frac{m_2}{n_2}\right) < 1-\frac{m_2}{n_2}$$

that

$$\left|\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right| = \left|\frac{-\left|\frac{m_1}{n_1}\right|+\frac{m_2}{n_2}}{1-\left|\frac{m_1}{n_1}\right|\cdot\frac{m_2}{n_2}}\right| < 1.$$

□

Property 9. *Uniplication of any* $\left|\dfrac{m_1}{n_1}\right| < 1$ *and* $\left|\dfrac{m_2}{n_2}\right| > 1$ *satisfies*

$$\left|\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right| > 1.$$

Proof. First, let $0 < \dfrac{m_1}{n_1} < 1$ and $\dfrac{m_2}{n_2} > 1$. Then, in view of the trivial inequality

$$\frac{m_1}{n_1}\left(\frac{m_2}{n_2}-1\right) < \frac{m_2}{n_2}-1$$

we immediately arrive at

$$\left|\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right| > 1.$$

The case when $-1 < \dfrac{m_1}{n_1} < 0$ and $\dfrac{m_2}{n_2} < -1$ is proved in the same way noting that

$$\left|\frac{m_1}{n_1}\right|\left(\left|\frac{m_2}{n_2}\right|-1\right) < \left|\frac{m_2}{n_2}\right|-1$$

and, therefore,

$$\left|\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right| = \left|-\frac{\left|\frac{m_1}{n_1}\right|+\left|\frac{m_2}{n_2}\right|}{1+\left|\frac{m_1}{n_1}\right|\cdot\left|\frac{m_2}{n_2}\right|}\right| > 1.$$

Now, let $-1 < \dfrac{m_1}{n_1} < 0$ and $\dfrac{m_2}{n_2} > 1$. Then, the obvious inequality

$$\left|\frac{m_1}{n_1}\right|\left(\frac{m_2}{n_2}+1\right) < \frac{m_2}{n_2}+1$$

implies

$$-\frac{-\left|\frac{m_1}{n_1}\right|+\frac{m_2}{n_2}}{1-\left|\frac{m_1}{n_1}\right|\cdot\frac{m_2}{n_2}} > 1.$$

Therefore,

$$\left|\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right| = \left|\frac{-\left|\frac{m_1}{n_1}\right| + \frac{m_2}{n_2}}{1-\left|\frac{m_1}{n_1}\right|\cdot\frac{m_2}{n_2}}\right| > 1.$$

In the case when $0<\frac{m_1}{n_1}<1$ and $\frac{m_2}{n_2}<-1$, we need to take into account the obvious inequality

$$-\frac{m_1}{n_1}\left(\left|\frac{m_2}{n_2}\right|-1\right) < \left|\frac{m_2}{n_2}\right|-1$$

or

$$-\frac{\frac{m_1}{n_1}-\left|\frac{m_2}{n_2}\right|}{1-\frac{m_1}{n_1}\cdot\left|\frac{m_2}{n_2}\right|} > 1,$$

which implies that in this case also,

$$\left|\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right| > 1.$$

In all cases above, the null of the denominator must be excluded. □

A direct consequence of Properties 8 and 9 follows.

Corollary 3. *Uniplication of* $\left|\frac{m_1}{n_1}\right|>1$ *and* $\left|\frac{m_2}{n_2}\right|>1$ *satisfies*

$$\left|\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right| < 1.$$

Another important property of uniplication follows which is quite similar to the triangle inequality holding true for addition.

Property 10. *Uniplication of* $\left|\frac{m_1}{n_1}\right|<1$ *and* $\left|\frac{m_2}{n_2}\right|<1$ *satisfies*

$$\left|\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right| \le \left|\frac{m_1}{n_1}\right|\otimes\left|\frac{m_2}{n_2}\right|.$$

Proof. First, let $0<\frac{m_1}{n_1}<1$ and $0<\frac{m_2}{n_2}<1$. Then, obviously,

$$\left|\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right| = \left|\frac{m_1}{n_1}\right|\otimes\left|\frac{m_2}{n_2}\right|.$$

It is also the case when $-1<\frac{m_1}{n_1}<0$ and $-1<\frac{m_2}{n_2}<0$. Now, let $-1<\frac{m_1}{n_1}<0$ and $0<\frac{m_2}{n_2}<1$. Then, considering the equality

$$\left|-\left|\frac{m_1}{n_1}\right|+\frac{m_2}{n_2}\right|\left(1+\left|\frac{m_1}{n_1}\right|\frac{m_2}{n_2}\right) = \left|-\left|\frac{m_1}{n_1}\right|\left(1-\left(\frac{m_2}{n_2}\right)^2\right)+\frac{m_2}{n_2}\left(1-\left(\frac{m_1}{n_1}\right)^2\right)\right|,$$

we use the usual triangle inequality to show that

$$\left|-\left|\frac{m_1}{n_1}\right|+\frac{m_2}{n_2}\right|\left(1+\left|\frac{m_1}{n_1}\right|\frac{m_2}{n_2}\right) \le$$

$$\le \left|\frac{m_1}{n_1}\right|\left(1-\left(\frac{m_1}{n_1}\right)^2\right)+\frac{m_2}{n_2}\left(1-\left(\frac{m_1}{n_1}\right)^2\right) =$$

$$= \left(\left|\frac{m_1}{n_1}\right|+\frac{m_2}{n_2}\right)\left(1-\left|\frac{m_1}{n_1}\right|\frac{m_2}{n_2}\right).$$

Thus,

$$\left|-\left|\frac{m_1}{n_1}\right|+\frac{m_2}{n_2}\right|\left(1+\left|\frac{m_1}{n_1}\right|\frac{m_2}{n_2}\right) \le \left(\left|\frac{m_1}{n_1}\right|+\frac{m_2}{n_2}\right)\left(1-\left|\frac{m_1}{n_1}\right|\frac{m_2}{n_2}\right),$$

implying

$$\left|\frac{m_1}{n_1}\otimes\frac{m_2}{n_2}\right| \le \left|\frac{m_1}{n_1}\right|\otimes\left|\frac{m_2}{n_2}\right|.$$

The last case when $0<\frac{m_1}{n_1}<1$ and $-1<\frac{m_2}{n_2}<0$ is proved similarly. □

Property 11. *If* $\frac{m_1}{n_1}=\frac{m_2}{n_2}\otimes\frac{m_3}{n_3}$, *then* $\frac{m_2}{n_2}=\frac{m_1}{n_1}\otimes\left(-\frac{m_3}{n_3}\right)$ *and symmetrically* $\frac{m_3}{n_3}=\frac{m_1}{n_1}\otimes\left(-\frac{m_2}{n_2}\right)$.

Proof. This directly follows from the definition

$$\frac{m_1}{n_1}=\frac{m_2}{n_2}\otimes\frac{m_3}{n_3}=\frac{m_2\cdot n_3+m_3\cdot n_2}{m_2\cdot m_3+n_2\cdot n_3},$$

implying

$$\frac{m_2}{n_2}=\frac{m_1\cdot n_3-m_3\cdot n_1}{-m_1\cdot m_3+n_1\cdot n_3}=\frac{m_1}{n_1}\otimes\left(-\frac{m_3}{n_3}\right),$$

and

$$\frac{m_3}{n_3}=\frac{m_1\cdot n_2-m_2\cdot n_1}{-m_1\cdot m_2+n_1\cdot n_2}=\frac{m_1}{n_1}\otimes\left(-\frac{m_2}{n_2}\right).$$

□

Remark 4. *Property 11 is quite similar to addition in the sense that from* $\frac{m_1}{n_1}=\frac{m_2}{n_2}+\frac{m_3}{n_3}$ *it follows that* $\frac{m_2}{n_2}=\frac{m_1}{n_1}+\left(-\frac{m_3}{n_3}\right)$ *and* $\frac{m_3}{n_3}=\frac{m_1}{n_1}+\left(-\frac{m_2}{n_2}\right)$.

3 Examples of Using Uniplication

In this section, we present some examples of uniplication in representation of various functions.

Example 1. $\sin x$ *is uniplication of* $\tan\dfrac{x}{2}$ *with itself. Indeed,*

$$\tan\frac{x}{2}\otimes\tan\frac{x}{2}=\frac{\tan\frac{x}{2}+\tan\frac{x}{2}}{1+\tan\frac{x}{2}\cdot\tan\frac{x}{2}}=\frac{2\tan\frac{x}{2}}{1+\tan^2\frac{x}{2}}=\sin x.$$

Example 2. *Corollary 1 allows the establishment of the following connection:*

$$\tan x\otimes\cot x=\frac{1}{\sin 2x},$$

where Example 1 is used.

Example 3. $\tanh x$ *is uniplication of* $\tanh\dfrac{x}{2}$ *with itself. Indeed,*

$$\tanh\frac{x}{2}\otimes\tanh\frac{x}{2}=\frac{\tanh\frac{x}{2}+\tanh\frac{x}{2}}{1+\tanh\frac{x}{2}\cdot\tanh\frac{x}{2}}=\frac{2\tanh\frac{x}{2}}{1+\tanh^2\frac{x}{2}}=\tanh x.$$

Example 4. *We have*

$$\tanh\left(x-y\right)=\frac{\tanh x-\tanh y}{1-\tanh x\cdot\tanh y}=\tanh x\otimes\tanh\left(-y\right). \tag{1}$$

Making use of Property 11, (1) implies

$$\tanh x=\tanh\left(x-y\right)\otimes\tanh y \tag{2}$$

and

$$\tanh y=\tanh\left(x-y\right)\otimes\tanh\left(-x\right),$$

which can be verified straightforwardly.

Example 5. *It is easy to verify that*

$$\frac{d}{dx}\arctan x=\frac{1}{2x}x\otimes x$$

and

$$\frac{d}{dx}\log\left(1+x^2\right)=x\otimes x.$$

4 The Lorentz Transformation

Lorentz developed the Lorentz transformation independently in 1904[1], although it paralleled an equivalent transformation developed by Voigt in 1887[2]. Even though neither Voigt's nor Lorentz's reasonings are completely understood so far (for instance, rather than giving a justification for the new variables in his transformation, Lorentz merely stated in introducing them, "I take as new independent variables..."[1]), this does not prevent physicists from using these transformations. Formulating the basis of the special relativity theory, Einstein used the Lorentz transformation to derive the law of addition of velocities relating the velocities of an object in fixed and moving frames.

The Lorentz transformation[1] is a mathematical scheme allowing one to relate the coordinates of two different coordinate frames moving with respect to each other. For the sake of simplicity, we limit the consideration by Cartesian coordinate frames. Consider a stationary frame F, any event which is described by 4 quantities: time t and coordinates x, y, z. Consider another frame F′, any event which is described by another 4 quantities: time t' and coordinates x', y', z'. For the sake of simplicity, let F′ move relative to F in the direction of x-axis with a known velocity v. Assume that at $t = t' = 0$, F and F′ share the same origin and in all subsequent moments they remain Cartesian. Then, any event (t, x, y, z) in F can be written in F′ using the Lorentz transformation

$$t' = \frac{1}{\lambda}\left(t - \frac{v}{c}x\right)$$

$$x' = \frac{x - vt}{\lambda},$$

$$y' = y,$$

$$z' = z.$$

Here,

$$\lambda = \sqrt{1 - \frac{v^2}{c^2}}$$

is the inverse of the Lorentz factor, c is the speed of light.

When it comes to the velocity, the Lorentz transformation leads to the well-known law of velocity addition stating that the velocity in F can be expressed in terms of F as

$$\boldsymbol{u} = \left(\frac{u'_x + v}{1 + \frac{u'_x}{c}\frac{v}{c}}, \frac{\lambda u'_y}{1 + \frac{u'_y}{c}\frac{v}{c}}, \frac{\lambda u'_z}{1 + \frac{u'_z}{c}\frac{v}{c}}\right).$$

Here, $\boldsymbol{u}' = \left(u'_x, u'_y, u'_z\right)$.

It is now easy to recognize that the first component of $\boldsymbol{u}$ is uniplication of $\frac{u'_x}{c}$ and $\frac{v}{c}$ multiplied by c, i.e.,

$$u_x = \frac{u'_x + v}{1 + \frac{u'_x}{c}\frac{v}{c}} = c \cdot \left(\frac{u'_x}{c} \otimes \frac{v}{c}\right)$$

or

$$\frac{u_x}{c} = \frac{u'_x}{c} \otimes \frac{v}{c}. \tag{3}$$

Remark 5. *Property 11 allows us to represent the inverse Lorentz transformation in terms of uniplication. As a matter of fact, (3) implies that*

$$\frac{u'_x}{c} = \frac{u_x}{c} \otimes \left(-\frac{v}{c}\right). \tag{4}$$

Thus, the law of addition of velocities and its inverse can be written simply in terms of uniplication.

It turns out that using uniplication, we are able to derive other interesting relations as well. More specifically, introducing the hyperbolic rotation as

$$\sinh\psi = -\frac{1}{\lambda}\frac{v}{c}, \quad \cosh\psi = \frac{1}{\lambda},$$

we immediately derive

$$\tanh\psi = -\frac{v}{c}.$$

On the other hand, from (4) we have,

$$\frac{u'_x}{c} = \frac{u_x}{c} \otimes \tanh\psi.$$

Combining it with equation (3) above, we conclude that there exist φ and ϕ such that

$$\frac{u'_x}{c} = \tanh\phi, \quad \frac{u_x}{c} = \tanh\varphi$$

and

$$\varphi = \phi - \psi. \tag{5}$$

This relation means that if the fraction $\frac{v}{c}$ is represented in terms of a hyperbolic rotation, then $\frac{u_x}{c}$ and $\frac{u'_x}{c}$ can also be represented in terms of a hyperbolic rotation. Accordingly, the rotation angles of these three quantities are related by (5).

In the particular case when $u_x = v = \tanh\psi$, i.e., F$'$ moves relative to F with the velocity of the observed event, making use of Example 2, we derive $u'_x = \tanh 2\psi$. For small values of

ψ, $\tanh 2\psi \approx 2\tanh\psi$, meaning that $u'_x \approx 2u_x$. In other words, in this case, an observer in the moving frame will register two times higher velocity, which should be expected.

Using properties of uniplication proved in Section 2, new kinds of similar relations can be derived.

The Lorentz transformation, which forms the basis of Einstein's special relativity theory, has not been justified mathematically before now. However, some relations that directly result from the Lorentz transformation, such as the relativistic law of addition of velocities, can be observed in nature (Doppler effect, aberration of light, dragging of light in moving water et cetera). Uniplication provides the mathematical basis for the Lorentz transformation, and therefore for the law of addition of velocities.

5 Concluding Remarks

The new algebraic operation introduced in this paper possesses such fundamental properties as *i*) commutativity, *ii*) associativity, *iii*) existence of identity, *iv*) existence of zero and *v*) triangle inequality. In particular, it is established that $\mathbb{Z}$ is an Abelian group with uniplication. In order to illustrate the usage of uniplication in specific applications, we consider some trigonometric relations, as well as the velocity addition formula arising from relativity theory. This last application is of particular significance because uniplication provides the hitherto lacking mathematical basis for the Lorentz transformation. All of this suggests that uniplication has great potential for further study and in fact opens up a whole new branch of algebra.

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Planar Traction

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Abstract

The parallels between the Law of Universal Gravitation and Coulomb's Law of Electrostatics are reviewed; the necessity of a planar aspect of both gravity and electromagnetism is presented; gravity is further investigated introducing a planar conceptualization of electrons; electromagnetism is also investigated in light of this planar conceptualization; in doing so, a unified field theory is introduced.

Keywords: unified field theory, planarity, planar traction, gravity, electromagnetism

1 Introduction

The Law of Universal Gravitation:

$$F = G\left(\frac{m_1 m_2}{d^2}\right)$$

where F is force of attraction, G is gravitational constant, m_1m_2 is product of masses and d is distance between their centers.

Coulomb's Law of Electrostatics:

$$F = k\left(\frac{q_1 q_2}{d^2}\right)$$

where F is force between two charges, k is proportionality constant, q_1q_2 is product of charges and d is distance separating charges.

Einstein was endlessly fascinated by the parallels between the Law of Universal Gravitation and Coulomb's Law of Electrostatics. In fact, he devoted the latter half of his career to the pursuit of a unified field theory. Such a theory would have revealed the single underlying force which was manifested in the two seemingly distinct forces of gravity and electromagnetism, thereby explaining the parallels between their respective equations. Look at these parallels: Both equations have an empirically determined constant. In both equations the interaction factors of the two bodies are multiplied by each other. In both equations the product of this multiplication is multiplied by the constant. And in both equations the product of this aggregate multiplication is then multiplied by the inverse square of the functional distance separating the two bodies. Is it any wonder that Einstein felt these two equations were not distinct but rather the same equation applied to two distinct contexts?

Consider the elements of these two equations. One can see the contextual necessity of distinct constants. The multiplication of the interaction factors of the two bodies is also perfectly straightforward. The functional distance separating the two bodies certainly should be a factor too, and inverted, for that matter. However, why would this inverted factor then be squared? Why would a simple, linear factor like distance have to be conditioned in both equations by squaring to yield a valid result?

In this paper it is proposed that, whether it is the force of gravity or that of electromagnetism being calculated, the inverse of the functional distance separating the two bodies is necessarily squared because both forces, gravity and electromagnetism, are planar in nature.

2 The Planarity of Gravity

On what basis can one say that gravity and electromagnetism are planar in nature? With reference to the planarity of the photon described in a previous paper by the author,[1] this concept applies in a different way to particles apart from the photon.

Consider this planar model of, for instance, the electron: The electron is a rotating plane. One axis of this plane is the pole and the other extends in both directions from the center of the pole at an angle perpendicular to it. Both axes are infinite in length. Further, this rotating plane that is the electron is a composite plane; and this composite plane contains an infinite number of sub-planes. Each sub-plane extends from the center of the electron in both dimensions by increments governed in size by the photon potential of the electron. Whatever may be the most potent photon that an electron has the capacity to emit, which is to say, the photon of the shortest wavelength, the wavelength of that photon determines the minimum increment to be found within any of that electron's sub-planes; the increments of all its other sub-planes are larger than that one, and each by an appropriately quantized amount reflecting the quantized incrementation of photon wavelength.

It is predicated that an electron's speed of rotation is maximum at absolute inertia and nil at light speed. As it rotates, the electron's equatorial axis describes a disc-shaped path. It is on this path that the interaction the electron has with other particles takes place. There are three forms of such interaction: bending, photon release and traction; all of which involve any one of the electron's sub-planes and either a sub-plane or the center of some distant particle. Bending

[1] Resolution of the Wave Particle Conundrum [1].

occurs when a sub-plane is diverted by the center of a distant particle from continuation in a single straight line so that it proceeds in a new straight line beyond the interaction with that distant particle. From an outside perspective it is apparent that the plane (the sub-plane) has not extended unbroken, but from the perspective of its point of origin it is still an unbroken plane. Any number of a composite plane's sub-planes may be bent at any given instant, and in any number of directions and compound bendings.

Photon release can occur when a sub-plane, bent or unbent, extends to an equivalent sub-plane of a distant particle that is the quantized distance away so that the two sub-planes extend precisely to each other such that momentarily a single plane double in size is formed. If that distant particle is susceptible to releasing a photon of the appropriate wavelength then such release occurs. On the other hand, if the distant particle is not susceptible to so releasing a photon then traction, a momentary bond between the two particles, is formed. This bond is gravity.

It is predicated that rotation is what transforms an otherwise planar particle into a functionally three-dimensional particle. Nevertheless, it is predicated that with regard to gravity a particle remains strictly planar. How can this be so? Because particle/particle interaction is a planar phenomenon and so must be calculated accordingly. This is necessarily true whether one is calculating the gravitational force between two electrons – an infinitesimally minute amount of such force – or, as must always be the case where calculations can be empirically confirmed with actual measurements, between two bodies, each containing an enormous host of particles. Despite the fact that the latter manifestation of gravitational force is a complex, aggregate force between all the particles in those two bodies, rather than any simple unitary force between the bodies as wholes, the calculation of this aggregate force is perfectly susceptible to statistical reduction as exhibited by the use of their masses and the distance between their centers – two clearly statistical factors – in the Law of Universal Gravitation. It is this statistical reduction translating the calculation of an aggregate force into that of a unitary that necessitates the maintenance of the calculation of gravity on a simple planar footing. The squaring of inverted distance demonstrates the diminution of force occurring in two dimensions (a planar context) rather than only one (a linear context). This element of the equation

$$\frac{1}{d^2}$$

is actually a reduction of

$$\frac{1}{\left(\frac{d^2}{2} + \frac{d^2}{2}\right)}$$

because only one half of each of the two sub-planes (in a simple interaction between only two particles) is forcefully significant in the double-plane that is momentarily formed. That is to say, only the two adjacent halves of the sub-planes – therefore excluding the two halves that lie on the other side of their respective electrons – contribute to the equation; so that, precisely speaking, it is not simply inverted distance squared, but rather inverted distance times half inverted distance (for the contributing portion of the first sub-plane) plus inverted distance times half inverted distance (for the contributing portion of the second sub-plane).

3 The Planarity of Electromagnetism

Regarding electromagnetism, it is predicated that the same phenomenon of planar traction is evident as with gravity. The only differences are that where gravity is particle/particle planar traction, electromagnetism is nucleus/electron planar traction; and where gravity's particle is a composite plane, electromagnetism's nucleus is an aggregate of composite planes, one for each proton and neutron present. Planar traction underlies both gravity and electromagnetism, and reconciles the two as different manifestations of a single, unified force.

4 Concluding Remarks

The parallels between the Law of Universal Gravitation and Coulomb's Law of Electrostatics are fascinating. Einstein and many others have pursued a unified field theory to explain these parallels. In this paper it has been proposed that, whether it is the force of gravity or that of electromagnetism being calculated, the inverse of the functional distance separating the two bodies is necessarily squared because both forces, gravity and electromagnetism, are planar in nature. And planar traction, the momentary bond between the planes of two rotating particles, has been identified as the unified force that underlies both gravity and electromagnetism.

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NULLITY AND SUBSTANCE

Nullity is composed of four dimensions. Three of these dimensions are static, and the fourth is dynamic. The dynamic nature of the fourth dimension is progressive, and uniformly so.

The three static dimensions are isotropic; thus they are flexibly inter-relative to each other. The dynamic dimension is anisotropic and so it rigidly inter-relates to the static dimensions, which is the equivalent of saying that the static dimensions are rigidly inter-relative to the dynamic dimension. The three static dimensions are length, height and width, and together comprise space. The dynamic dimension is time.

Substance is composed of four aspects. Three of these are the modes of substance, and the fourth is its context. Being interchangeable, the three modes of substance are flexibly inter-relative to each other. The context of substance rigidly inter-relates to the modes of substance, which is the equivalent of saying that the modes of substance are rigidly inter-relative to the context of substance.

The three modes of substance are “inframass,” mass and “ultramass.” “Inframass” is substance in the state of two static dimensions plus the dynamic dimension: this is light. Mass is substance in the state of three static dimensions with the dynamic dimension suspended, thus nullified: this is inert mass, mass with absolute inertia. And “ultramass” is substance in the state of all four dimensions: this is moving mass, mass with absolute motion.

The context of substance is velocity. Inframass exists only in the context of light speed. Mass exists only in the context of absolute inertia. And ultramass exists only in the context of absolute motion, that being defined here as any velocity between absolute inertia and light speed.

Electromagnetic radiation, the shift in velocity from absolute inertia to light speed, demonstrates the inter-relativity of mass and inframass, the transformation of mass to inframass. Absorption demonstrates the opposite transformation. Acceleration, the shift in velocity to any higher speed below the threshold of light speed, can demonstrate the shift from absolute inertia to absolute motion, thus the inter-relativity of mass and ultramass, the transformation of mass to ultramass. Deceleration from any speed below the threshold of light speed can demonstrate the opposite transformation. The Compton effect, the shift in velocity (for part or all of a photon) from light speed to a speed between absolute inertia and light speed, demonstrates the inter-relativity of inframass and ultramass, the transformation from inframass to ultramass. And particle collision, such as that between a positron and an electron, can demonstrate the opposite transformation.

Although, with regard to the process of electromagnetic radiation, all ultramass is inert, thus merely massive and not ultramassive, [inert] mass is otherwise virtually non-existent. However, for all practical purposes, ultramassive bodies sharing any inertial reference frame are effectively inert with regard to each other; their collective momentum is nullified because their respective momenta cancel each other out.

CONCLUSION

Relativity is fundamentally flawed. The father of the atomic clock rejected it categorically. The ‘wave-particle duality’ of light is an untenable contradiction. Hafele-Keating demonstrates the invalidity of the relativity postulate in that observations performed by observers within the same inertial reference frames as the particles under observation are adequate for identifying a difference in the measurement of time undertaken simultaneously in different inertial reference frames. And the Lorentz Transformation, relativity’s last refuge, is a needless elaboration on a more direct and fundamental operation, uniplication.

The planarity model of physics, apart from the far-reaching mathematical re-interpretation resulting from the replacement of the Law of Addition of Velocities by the uniplication operation, adopts the mathematics of relativity and quantum electrodynamics entirely. Unlike relativity, it explains both the particle nature and the seeming wave nature of light. Unlike relativity, it explains the photon's lack of mass. Unlike relativity, it explains the photon's lack of acceleration. And unlike relativity, with planarity there is no more state of denial, no more dependence on dogma, no more denunciation of reason as mere "common sense." The time has come to retire the relativity model with its irrationality and dogmatism; and replace it with a worthy successor, the planarity model of physics.