Research Paper: Basic Physics
J Aetherom Res **2**, 7:1-28 (2010)

The Uncertainties of the Uncertainty Principle, Part 1: Improbable Certainty and the Inconsistencies of Quantum Mechanics (a counterpoint to Feynman's Lecture)

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Abstract

Unlike other physical theories, Aetherometry claims that the wave interference phenomena of massbound particles is caused by the *diffraction* of the electric waves of their kinetic energy, and not by a much misunderstood particle-wave duality. The new analytical treatment proposes that kinetic energy is captured field energy adapted to the *inertial* and *magnetic* constraints of massbound charges. The coincidence of two independent, nonclassical and nonrelativistic analyses - one *inertial* and the other *electric* - in the determination of the experimentally observed de Broglie wavelengths and momenta of electrons and massbound charges highlights the central contention that the paths of the *accelerated* charges in a beam are *electric functions of its kinetic energy*, and reflect in part the more fundamental interference properties of the underlying flux of a *massfree electric field*. Conversely, the interference properties of photons only directly reflect the interference properties of moving but *decelerating* charges. Written as an antidote to **Richard Feynman**'s famous lecture, the present communication suggests that there is a method, after all, to count how many electrons pass through a slit, in a double-slit experiment.

 ISSN 1915-8408

PREAMBLE

To the memory of Eugene Mallove - and in the fulfillment of his request

It was Tuesday evening, May 11th 2004, four days before he was brutally murdered, when one of us (PC) phoned **Eugene** (**Gene**) **Mallove** to let him know we had finished our "anti-**Feynman** lecture". He was elated and wanted us to fax it to him right away - but we still wanted to let it 'ferment' a little, and put a few final touches, with the result that he would never have a chance to read it. And it would take us 6 years to get back to it.

When **Gene** had visited us early that Spring, we had a long conversation about this definitive lecture of **Feynman** on the diffraction of particles and waves. **Gene** wanted us to compose an aetherometric counterpoint to **Feynman**'s lecture that he could publish in *Infinite Energy*, and we had agreed to his request. However, his murder and the resulting mis-direction of *Infinite Energy* would preclude publication in this venue.

Feynman had brought to a climax the probabilistic notion that basic constituents of Matter - such as electrons or protons - can behave either as particles or as waves. As he put it, "sometimes like a particle, sometimes like a wave" [1]. Taking his cue from **de Broglie**'s concept of a "wavi-cle", **Feynman** pushed the paradox further when he added: "It [eg the electron] behaves in two different ways at the same time". In effect, the latter cannot be true without a fundamental contradiction if we adhere to the concepts of particle and wave such as they existed and exist in modern physics. For, once an electron, for example, is manifested - "actualized" or "observed" - it can only behave (or have behaved) as either a particle or a wave to the exclusion of the other, if the current concepts of particle and wave are retained unmodified. However, from his study of Aetherometry, **Mallove** knew full well that only energy units exist - that all physical flows are composed of such units; that all physical systems are energy systems or systems of such units, their flows and conversion pathways; and that every form of energy conversion is a transformation of energy units into other energy units. He knew that no energy unit exists without being the combination of a particle with at least two waves and thus that any approach to physics based upon a theory of the quantum without treating the latter as a property of energy units, was doomed to ultimate failure. And, indeed, the terms "particle" and "wave" were used by **Heisenberg**, **Bohr** and **Feynman** in a reductionistic sense, to distinguish between two types of distributions observed in the 'diffraction' of photons and massbound charges or particles. Yet, what is being diffracted or deflected in either type of distribution are energy units that in all cases are composed of solidary particles and waves, ie are at once and simultaneously particles and waves, only the type of distribution varying. Thus, the reductionistic concepts of particles and waves are part of the problem, as these concepts condemn one to a false alternative. Moreover, with respect to massbound charges or particles - as for example in the case of the electron - it is not the particles

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or their mass-energy that is being 'diffracted', but solely their kinetic energy, or their pathways of motion to be exact.

Feynman claimed that **Heisenberg**'s principle derived from a basic natural limitation to the experimental determination of the behavior of, effectively, energy units:

> "Heisenberg noticed, when he discovered the laws of quantum mechanics, that the new laws of nature that he had discovered could only be consistent if there were some basic limitation to our experimental abilities that had not been previously recognized. In other words, you cannot experimentally be as delicate as you wish. Heisenberg proposed his uncertainty principle which, stated in terms of our own experiment, is the following. (He stated it in another way, but they are exactly equivalent, and you can get from one to the other.) 'It is impossible to design any apparatus whatsoever to determine through which hole the electron passes that will not at the same time disturb the electron enough to destroy the interference pattern'. No one has found a way around this. I am sure you are itching with inventions of methods of detecting which hole the electron went through; but if each one of them is analysed carefully you will find out that there is something the matter with it." [2]

However, the real limitation to quantum theory resides in the reductionistic sense of the concepts (and recognized functions) of "particle" and "wave" - which is tantamount to say, in the lack of an adequate concept and systematic algebraic function of what is energy, or what are energy units. In the absence of an energy-based treatment of the different distributions, the functions for particles and waves cannot be consistently analyzed - preventing a full understanding of how waves juxtapose or superimpose. The aetherometric approach to these problems - as seen in the present communication and its follow up (Part 2) - claims to succeed in producing a consistent algebraic analysis of energy units, and their particle and wave functions. **Gene** had wondered, therefore, whether Aetherometry could solve the false paradoxes of modern quantum mechanics and electrodynamics, and specifically devise an apparatus that could count diffracted electrons emerging from a slit without altering their "particle-like" distribution. The answer found in the present communication is only possible because Aetherometry alone contends that photons are produced when massbound charges are decelerated, and not when they are accelerating or moving unhindered.

COMMUNICATION

1. Classical particle dynamics

The classical case of particle dynamics is that of the motion of a projectile cluster (see **Fig. 1A**). A gun fires through one or the other of two closely-spaced slits in a plate, or through both at the same time, and the bullets are collected in a sandbox. The number of bullets fired through each slit is always the same, and when both slits are open, the total number of bullets fired is twice what was fired through each separate slit. For slit #1, we obtain a bullet mound with a Gaussian distribution (see **Fig. 1B**); given a limit to the lateral dispersion, the height of the mound (its amplitude along

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the mean axis of the trajectories) is proportional to the number of bullets. We express this condition as:

$$N_1 \text{ oc } h_1 \qquad (1)$$

Likewise, when only slit #2 is open (see **Fig. 1C**), we find that

$$N_2 \text{ oc } h_2 \qquad (2)$$

N_1 and N_2 are equal numbers of bullets, and also the designands of the Gaussian distributions obtained through each slit when only that slit is open. Now, with both slits open and all of the N_1+N_2 bullets randomly passing through one or the other slit, we should find that two identical and partially-overlapping mounds are formed in the sandbox (see **Fig. 1C**), with heights comparable to those obtained before -

$$h_1 \approx h_1' \qquad (3)$$

and

$$h_2 \approx h_2' \qquad (4)$$

Their distribution - which, following **Feynman**, we shall refer to as N_{12} - is simply the sum of the two single distributions:

$$N_{12} = N_1 + N_2 \qquad (5)$$

Now, this example lacks some physical reality. As every sports shooter knows, for bullets to form identical dispersion patterns, the barrel must be lined up with each of the slits, and this lining up, as well as the lining up of the barrel with the maximum amplitude of the sandbox mound(s), must be made along curved trajectories that take into account the downward force of gravity (and wind). For the above example to work, the alignment must therefore be made along the horizontal.

Secondly, the experiment is biased when it requires straight line paths between barrel, slit and the vertical axis of maximum amplitude of the sandbox mound; not only are there no such paths, but when both slits are open, the barrel would have to be moved to a position halfway between the slits if bullets were to pass other than through just one slit. So, the experiment must be performed, at all times, with the barrel halfway between slits. This means that a fraction of the fired bullets will not

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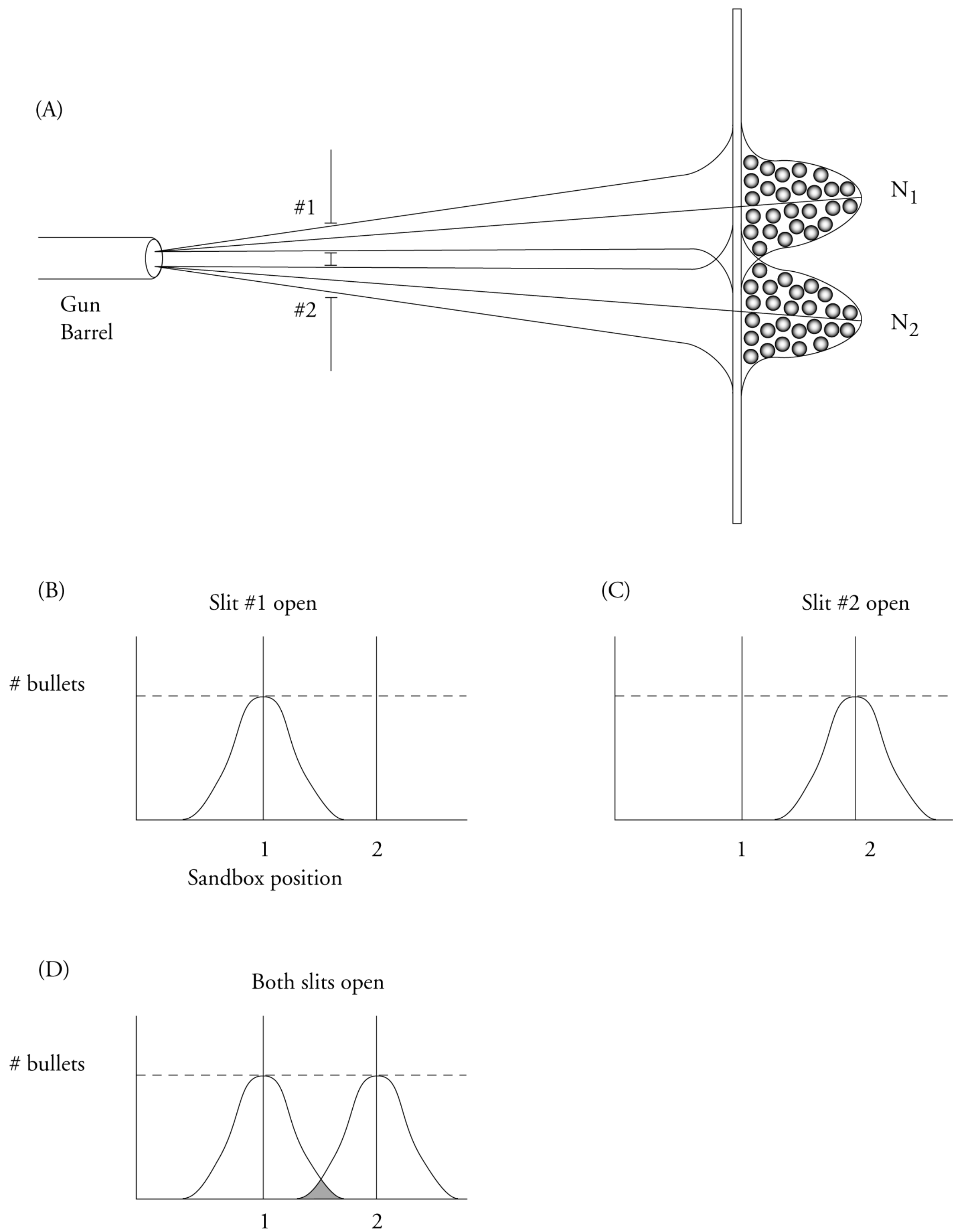
Fig 1
Instance of bullet-like particles



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make it through either slit, when only that slit is open. Only when both slits are open, would - in principle - all bullets fired pass through a slit, if we assume no bullets would rebound from the slitted plate. We can express this by saying that the distribution characteristic of each slit - when the other is closed - is a fraction F of the total number of bullets fired:

$$N_1 = N_{12} F_1 \quad (6)$$

and

$$N_2 = N_{12} F_2 \quad (7)$$

Thirdly, if gravity is abstracted from, and we suppose a region of Space where there is none, we would have to take into account the wobbly and curved paths of the projectiles - between barrel and slits, and between slits and sandbox - produced by short, loose, non-rifled barrels and the use of longitudinally-unbiased bullets, like lead balls. These dispersing paths would include ricochets from the edges of the slits.

If we abstract from gravity, then, the essential conditions for the above experiment are that the barrel be imperfect and placed halfway between slits, and the bullets be spherical. If we include gravity, then the plane of the analyzed dispersion must be a vertical one.

The probabilistic approach to the bullet/particle instance holds that the 'probability function' is directly proportional to the mean number of lumps that make it through one slit, or through the other, in the same time period. Assuming the above physical conditions, we will find that, statistically (ie given a high number of bullets fired), $F_1 = F_2 = F$, and thus that, when both slits are open,

$$N_{12} = N_{12} F_1 + N_{12} F_2 = 2\, N_{12}\, F \quad (8)$$

The so-called 'probability amplitude' or quantum amplitude of each single-slit distribution is next defined as $\sqrt{F_1}$ and $\sqrt{F_2}$, and when both slits are open, the maximum value of the combined probability amplitude becomes

$$\sqrt{F}+\sqrt{F} = 2\sqrt{F} \quad (9)$$

2. Classical wave dynamics

The classical case of wave dynamics is that of transverse water waves (see **Fig 2A**). Here - as also for the longitudinal waves of sound - the case appears to fit the model of pure disembodied wave

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functions capable of superimposition. The source of the identical disturbances is placed, once again, between two slits. With only one slit open, we register a certain height or wave amplitude at the fixed-distance wave-detector (the equivalent of the particle sandbox), shown in **Fig.s 2B & 2C**. Assuming identical disturbances, we have:

$$h_1 = h_2 \quad (10)$$

And if we now open both slits, then, to quote **Feynman**, "the height of the water, which we will call h, when both holes are open is equal to the the height that you would get from No. 1 open, plus the height that you would get from No. 2 open. Thus if it is a trough, the height from No. 2 is negative and cancels out the height from No. 1" [3]. hence:

$$h_{12} = h_1 + h_2 \quad (11)$$

However, once both slits are open, and given that waves are capable of superimposition, interference phenomena arise that permit both cancellation (negative interference) and enhancement (constructive interference) of the original waves (see **Fig. 2D**). Wave dynamics measures this property of waves as a function of their intensity. With one slit open, the intensity of a wave is a function of the square of its height:

$$I_1 = (h_1)^2 \quad (12)$$

and

$$I_2 = (h_2)^2 \quad (13)$$

Note that we are not measuring the number of waves (or particles), but addressing an intrinsic property of waves. It turns out that whereas the wave amplitude, its height h, corresponds to the probability amplitude $\sqrt{F}$, and its combined maximum amplitude when both slits are open still obeys that additive rule expressed by $\sqrt{F}+\sqrt{F} = 2\sqrt{F}$, the intensity of the *interfering* waves does *not*. Instead, the maximum probability of the intensity in constructive interference is proportional not to $2\sqrt{F}$, but to $(2\sqrt{F})^2 = 4F$, and so we write:

$$I_{12} = (h_1 + h_2)^2 = (h_{12})^2 \quad (14)$$

which applies whether the height of the waves diffracting from each slit is or not the same. If it is the

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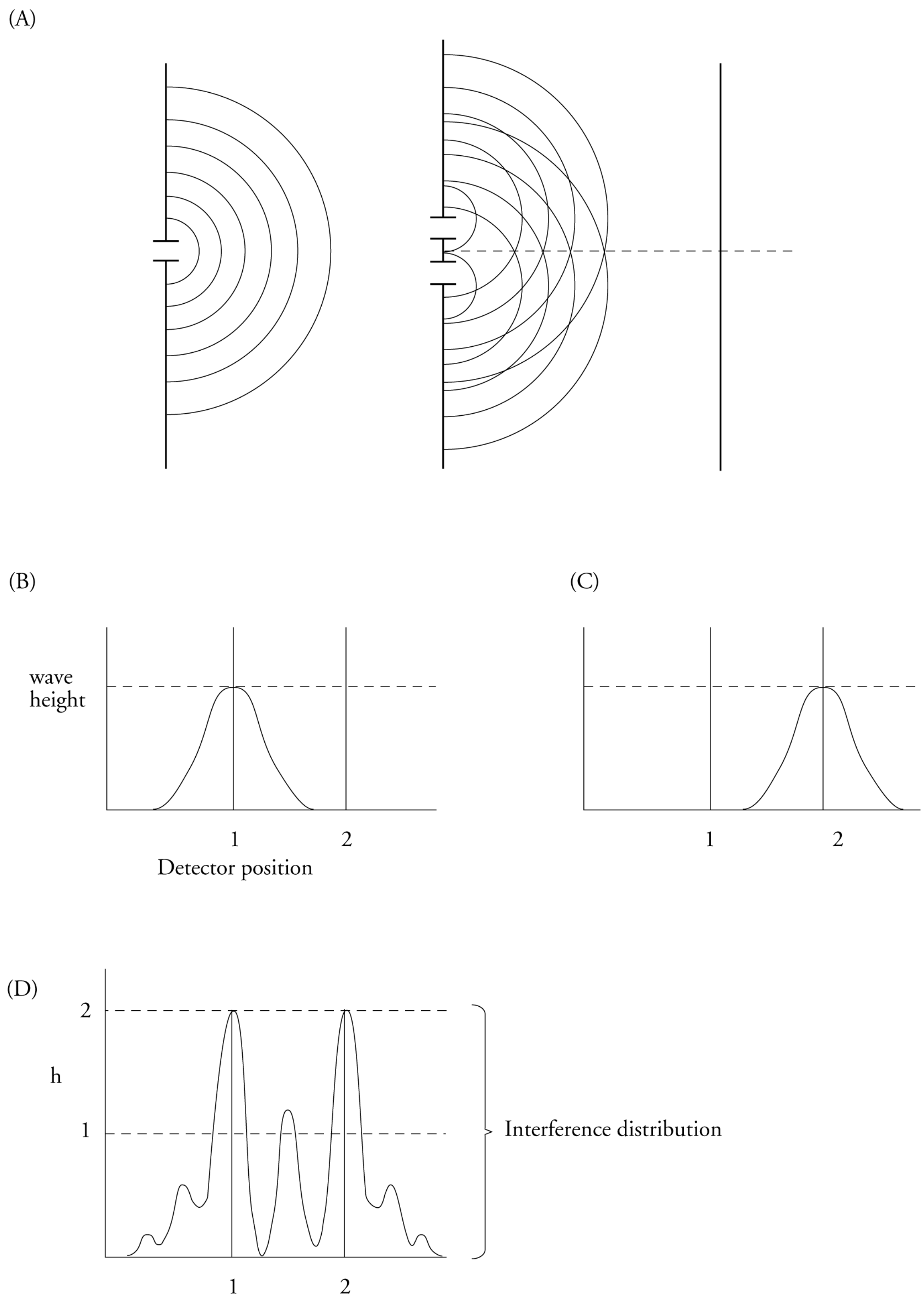
Fig. 2

Case of Water Waves & Cases of 'photon' or 'electron' diffraction



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same, and $h_1 = h_2 = h$, then -

$$I_{12} = (2h)^2 = 4h^2 = (h_{12})^2 \quad (15)$$

But intensity is a measure of the distribution of energy. What it measures is the energy of the waves. Water waves are not disembodied waves, but waves of a propagating energy field that temporarily confers kinetic energy to the water molecules. Through jostling and collisions, these water molecules lose their kinetic energy and pass it on to other molecules in multiple decaying modes. But the propagating energy field moves on - faster than any molecule - even as its energy disperses. Whether we consider the propagating energy field ultimately responsible for the water waves as being solely a field of kinetic energy in modal states of transfer between jostling and colliding molecules, or as a field of massfree energy that accelerates the molecules (ie imparts them with momentum) by conferring them kinetic energy is irrelevant to the extent that, from the viewpoint of Aetherometry alone, kinetic energy is still and only massfree energy transiently associated with massbound particles or their mass-energy. Ultimately, it is massfree energy that is transmitted across water (across the material medium of water) and undergoes superimposition by both constructive and destructive interference. These two forms of superimposition then indicate how, in the course of its propagation, this massfree energy oscillates between massbound (or molecule-bound) kinetic states and purely massfree states.

For aetherometric theory, the situation encountered when electrons, or massbound charges, are accelerated in a beam by an applied electric field is still clearer than that of moving water waves for the simple reason that the kinetic energy of these massbound charges is energy they captured from the *accelerating field*, ie from the flux of massfree electric energy that accelerates them to begin with. Accordingly, when we focus on the de Broglie waves produced by interference of electron beams - with both slits open - the superimposition in question directly integrates the field waves (or field wavepacket) of massfree energy that accelerate the massbound particles, with the form these waves take (the kinetic wavepacket) once they are captured as the kinetic energy of a massbound particle. Thus, following our analysis, the de Broglie waves produced by interference of electron beams are not the waves that constitute the mass-energy of a massbound particle or molecule. There is no electron diffraction per se, only diffraction of the kinetic energy of electrons. The interference relates solely to the interactions of field energy waves and of kinetic energy waves. It is, strictly speaking, the result of the properties of superimposition of massfree energy, whether as field energy or as kinetic energy.

The reason, then, why in equation #15 the energy distribution is proportional to the square of the amplitude, is because *phase energy* (the energy of superimposition) is proportional to the product of two wave functions from distinct energy units, sources or emitters (the slits function as sources or emitters, and so do the molecules or massbound particles). Given two dispersing energy units, or emitters each composed by the *primary* superimposition of waves 'at the source' -

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$$E_1 = \lambda (W_1)^2 \quad (16)$$

and

$$E_2 = \lambda (W_2)^2 \quad (17)$$

- we obtain the *mean* kinetic energy of the water molecules (before dispersion) subject to the action of both emitters and near them, as being equal to the sum of the energies captured by each molecule:

$$E_{KIN} = E_1 + E_2 = \lambda [(W_1)^2 + (W_2)^2] \quad (18)$$

However, interference creates regions where this kinetic energy goes to zero or increases to a maximum. For equal wave energy contributions from each slit, and in the region of maximum constructive interference, the kinetic energy of the water molecules is instead equal to twice the sum of the energies

$$E_{KINmax} = 2(E_1 + E_2) \quad (19)$$

which, *given identity* between the heights of the waves of the two units, or identity between their waves, ie $W_1 = W_2$, can be simply written as

$$E_{KINmax} = 2(E_1 + E_2) = 2\lambda [(W_1)^2 + (W_2)^2] = \lambda [(W_1 + W_2)^2] \quad (20)$$

where the phase sign value retains its full operationality - so that, if the sum results in a subtraction, negative interference conditions remain satisfied. This, therefore, is the condition for the observed proportionality of the wave intensity:

$$I_{12} = (h_1 + h_2)^2 = (h_{12})^2 \propto (W_1 + W_2)^2 = (W_{12})^2 \quad (21)$$

Aetherometrically, this particular summing relation between wave energy packets, groups or units *does not invoke any phase Space and phase Time relations* [4], only the relations of primary superimposition for waves and energy addition between distinct units - or addition of the squares of the wave functions of distinct energy units.

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3. Light interferometry: interference of 'photons', 'light waves' or ambipolar massfree energy?

Now, for the case of photons. *Like bullets*, when only one slit is open, we find photons distributed by a single Gaussian curve with maxima in a straight line with the centers of the slit and the source. If the collimated source of photons is placed halfway between the slits - and we assume it is an homogenous source - then the Gaussian distribution from one slit, when the other is closed, will account for half of the total number of photons emitted by the source, and will be identical in size to the Gaussian distribution obtained from the other slit alone.

However - and this is another of **Feynman**'s sleights of hand - this Gaussian distribution is as much one of particles (photons), as it is one of energy, so that the amplitude of the distribution should be, as in the case of bullets, simply proportional to the number of photons (given a certain width of dispersion). In another example of voluntarism, Feynman writes (of electrons, as much as of photons): "[we] have to change h [ie the height of water waves] to something else, which is new - it is not the height of anything - so we invent an 'a', which we call probability amplitude, because we do not know what it means." [5] And without further ado, the energy distribution of these photons when only one slit is open is said to be a function of this probability amplitude squared:

$$N_{12} = (a_1 + a_2)^2 = (a_{12})^2 \qquad (22)$$

Feynman might say that this distribution is not of "the energy in a wave", but of "the probability of arrival of these lumps" [5], yet what this treatment parallels, and wants to parallel, is, after all, the relationship that was extracted from the dynamics of water waves and which, in probabilistic terms, we expressed above by the maximum probability function

$$(2\sqrt{F})^2 = 4F \qquad (23)$$

Given that this has been known since **Young**'s 1803 experiments on 'the diffraction of light waves', *the only aberration that photon interference can pose is how it is possible if photons are to be thought of as bullet-like particles*, ie *as massbound particles*. Indeed, aside from whether the waves that propagate light are really the waves of photons - and assuming for now that they are, as electromagnetism claims that they are - the only basis for the analogy of photons to bullets is the notion introduced by **de Broglie** that photons have, not zero rest mass, but a finite rest mass that could be no greater than 10^{-44} gm [6]. Only then does the puzzle arise as to why bullet-like particles could superimpose and add in the same way as water waves do, in sum, as massfree energy waves. So it is only when one moves from the concept of light waves with their interference properties, to the concept of *inertial* photons (of photons as "elements of Matter") or bullet-like photons, that the properties of interfer-

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ence appear to be peculiar and inconsistent, and seem to give rise to a paradox.

However, if photons are understood to be *massfree or noninertial* particles [7-8], if photons are massless and operationally have zero rest mass, then it is hardly astonishing that they can superimpose with one another within the same Space and Time, and themselves be diffracted with interference. So photons are particles alright, just not bullet-like particles.

We have but merely begun our dismantling of these quantum-mechanical acts of magic that have become veritable impediments to understand the quantum world. For the observed diffraction and interference phenomena of light are not primarily properties of photons, not per se, nor even properties of transverse light waves, but ultimately properties of a massfree energy composed of *longitudinal* electric *ambipolar* waves [9-10], more like the waves of sound than like those of water. Assuming a dispersive field of such ambipolar waves, the properties of diffraction, separation and interference are all wave properties that do, or not, confer kinetic energy to the massbound charges found in the path of these field waves. Once kinetic energy is acquired from the field energy by an element of Matter (a massbound particle), this element becomes a potential emitter of photons - which are produced whenever it loses some or all of this kinetic energy. Typically, such decelerations occur by particle jostling and collisions, exhaustion of energy through work, or destructive interference of field energy by superimposition of cancelling or oppositely directed fields. Effectively, the punctual and local release of photons from such moving but decelerating emitters *mirrors or reflects* the kinetic energy of the emitters, though it only punctuates with light the decelerating phases of their motion along a path in abstract space. In turn, as we have proposed [10], the kinetic energy of the moving emitters is a secondary expression of the moving energy flux of the underlying ambipolar waves that constitute the accelerating field (for the entire process consult **Diagram 1**). Thus, in effect, the photons released from decelerating emitters do not mark this underlying, moving and accelerating field of massfree energy; they only signal the moments when massbound particles accelerated by this field undergo deceleration, that is, the moments that kinetic energy is lost from the moving emitters [11-12]. It follows that, while the assemblage of photons into light rays accurately mirrors the trajectory of moving emitters in a state of deceleration, they only give a distorted image of the superimposition and interference patterns of the underlying ambipolar field. The "photon mirror" is always somewhat displaced from the ambipolar acceleration that induced the motion of massbound charges. It is only an accurate mirror of the kinetic energy of particles at the moment of their deceleration.

What then gives an accurate reflection of the underlying field? Obviously, it is not the photons but, as we shall see in the next section, the diffraction and interference properties of the kinetic energy of the moving massbound charges or photon-emitters. These are the physical signals that reflect in turn the properties of diffraction and interference of the underlying ambipolar energy field. That is what we meant above by "secondary expression" - that only the paths of the accelerating charges present a physical indication (a "signal" or "image") of the underlying, accelerating field.

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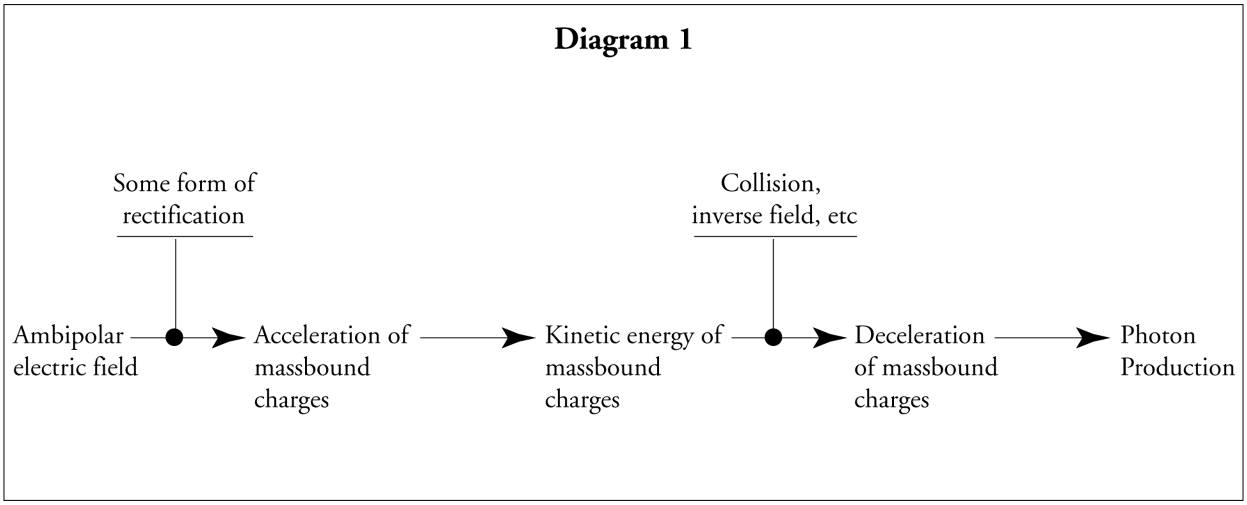

Diagram of the aetherometric process linking the conversions of field energy, kinetic energy and electromagnetic energy.

Thus, ultimately, it is the ambipolar field which is subject to diffraction and interference: the wave property is, fundamentally, a property of the light-producing stimulus (the accelerating field), not the property of photons. There is no inconsistency possible - photons are particles that do not part with their waves, and the ambipolar waves that ultimately source production of these photons are not part of them, nor do they part company with their own particles, ie with their massfree ambipolar charges. The distribution of (blackbody) photons is the indirect result of the distribution and superimposition properties of massfree ambipolar waves and thus cannot be confused with it, as it only gives a distorted and displaced image of these waves. The only accurate image which photons can directly provide is that of the kinetic energy of *decelerating* massbound charges.

4. Electron interferometry and de Broglie's theory of Matter-waves

Now, we come to the case where the physical particles have some analogy to bullets - the case of the electron which, unlike the photon, is indeed a massbound particle. If electrons are bullets, or merely like bullets, they cannot superimpose or coexist at the same time in the same locus of abstract space; if we try to make them do so, they collide and function like a bunch of billiard balls whose paths were made to converge (intersect) in mid-air.

Let us imagine that we have, as in **Claus Jönsson**'s experiments [13], a collimated beam of 50 keV electrons placed half-way, say, between the slits, at some distance from them, and will observe -

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as we did in the bullet experiment - two distinct and comparable Gaussian distributions of accumulated electrons on our detector (which could be a fluorescent screen that physically translates the number of those electrons into intensity of fluorescence). Now, we open both slits, and lo and behold, electron interference is observed as if the electrons were 'light waves', or 'photons' or ambipolar radiation - depending on whether the perspective is, respectively, classical, quantum-mechanical or aetherometric. What has happened? Are electrons ambipolar charges that only appear to have inertial mass when photographed or captured but behave as if they were massfree? Maybe photons might have rest mass after all! Then photons and electrons would both be elements of Matter and all Matter be made of Light. In sum, that is what **de Broglie**'s theory of 'Matter-waves', whether classical or relativistic, tells us. This, too, is the essence of the foundational paradox of Quantum Mechanics - that particles are particles of Matter and Matter alone, always massbound and inertial, and that the waves composing them and their states of motion are, in essence, waves of Light, electromagnetic waves. Like Light, electrons would have a wave character.

We must welcome the quantum mechanical re-discovery of the granular character of Light in the form of photons, as well as the discovery of the de Broglie wave properties of electrons, but on condition that photons be understood as massless particles that are distinct from their light-producing, 'phase' or 'guide' (ambipolar) waves, and on condition that the so-called wave properties of electrons be understood, rather, as the wave properties of their kinetic energy, of the energy of their motion or, more properly still and ultimately, of the field energy that, once absorbed, imparts them motion.

In other words, the properties of diffraction and interference are not properties of the electron per se, but ultimately or primarily properties of the underlying electric field responsible for the acceleration of the electron, and secondarily properties of the wave nature of the kinetic energy acquired by that electron. Since it is the field that confers kinetic energy to the electron, a resultant field can only do so where the interference of the component fields or subfields is constructive, not where it is destructive. So the acceleration of the electrons follows the dispersive pattern of the resultant electric field, and the distribution of electrons obeys the distribution of their kinetic energy which mirrors the distribution of the field energy.

There is, therefore, no need (from the aetherometric vantage point) to provide an explanation that, in substance, is any different from that which we have already provided for photons - the diffraction and interference properties are properties neither of photons nor of electrons (where Aetherometry disagrees with Quantum Mechanics), but properties of the massfree ambipolar field translated either *indirectly* after de-excitation of massbound charges (into production of photons), or *directly* by the accelerated motion of these massbound charges (occurring during their "excited states") with respect to the local electromagnetic (and inertial) frame. Photons can remain massfree and electrons remain massbound, since the interferometry reflects, in the case of photons, the loss of kinetic

 ISSN 1915-8408

energy from decelerating charges, and in the case of the electrons, the acquisition of kinetic energy by accelerating charges - which follows the distribution pattern of the underlying primary massfree field(s). Indeed, one cannot "think through" the kinetic energy of a single electron without "thinking through" the field energy that to begin with accelerates that electron. Kinetic energy is nothing other than captured field energy (whether by juxtaposition or true superimposition).

That the properties in question - when speaking loosely of the wave diffraction of electrons - directly relate *to the kinetic energy of the electron* and not to its mass-energy or rest mass, can be simply demonstrated with aetherometric tools, as follows. Under conditions such that the kinetic energy E_k is the same as the input (or "field") energy E_{in}, as is the case with nonrelativistic accelerations, we can say that, for a 50 keV electron beam, each electron will have acquired a kinetic energy of:

$$E_{in} = p_e W_v = 4.8*10^{10} \text{ m}^3 \text{ sec}^{-2} \quad (24)$$

where p_e is the aetherometric value of the elementary charge in the aetherometric meter-second system of units (13.97017654 m^2 sec^{-1} [9, 14-16]) and the field voltage wave speed is directly given by

$$W_v = (4.8*10^{10} \text{ m}^3 \text{ sec}^{-2})/p_e = 3.45*10^9 \text{ m sec}^{-1} \quad (25)$$

- which corresponds to the electric potential of 50kV. If the conventional non-relativistic approximation is used - as the kinetic energy is small compared to the mass-energy of the electron (less than one tenth of the latter) - then the de Broglie wavelength of the electron beam is given by:

$$\lambda_{BEAM1} = h\ c/E_{in} = h\ c/p_e W_v = 2.48*10^{-11} \text{ m} = 0.248Å \quad (26)$$

where h = 3.990313212*10^{-9} m^3 sec^{-1} [14,16].

Jönsson experimentally found that the wavelength was much smaller than this, smaller in fact that one tenth of an angstrøm [13]. Clearly, the classical relation was erroneous. With the final, relativistic equation provided by **de Broglie** [17], the wavelength found by **Jönsson** was predicted to be:

$$\lambda_{BEAM2} = (h/m_e\ c)/[2(E_{in}/m_e\ c^2) + (E_{in}/m_e\ c^2)^2]^{0.5} = 5.35*10^{-12} \text{ m} = 0.054Å \quad (27)$$

where m_e is the mass of the electron at rest. Since $p_{Ae} = (m_e\ c)$ is the linear momentum of the electron mass-energy at rest, the accepted relativistic formula is a ratio of a constant angular moment to the rest momentum of the particle under acceleration, divided by the relativistic factor.

Now, Aetherometry argues that, when $E_{in} = E_k$, the classical formula provides no approximation at all - *for it gives the correct value of the "inertial linear momentum" of the kinetic energy alone*,

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as if one were determining the de Broglie wavelength λ_{BK} that corresponded to the "inertial wave-like diffraction" of the kinetic energy alone:

$$p_{Kin} = E_{in}/c = p_e W_v/c \quad (28)$$

It follows that the classical wavelength result is but the wavelength corresponding to the photoinertial treatment of the kinetic energy alone of the accelerated electron:

$$\lambda_{BKin} = h/p_{Kin} = h\ c/E_{in} = h\ c/\mathbf{p}_e W_v = \lambda_x\ c/W_v = \lambda_{BEAM1} \quad (29)$$

Aetherometry treats rest mass as having a wavelength equivalent in the meter-second system [18], such that for the electron we have

$$m_e =\!\int\!= \lambda_e = 5.485799*10^{-6}\ m \quad (30)$$

with the result that the energy of the electron rest mass is:

$$E_{\delta e} = m_e c^2 =\!\int\!= \lambda_e c^2 \quad (31)$$

It follows [19] that the (photo)inertial linear momentum of the kinetic energy of an electron is

$$p_{Kin} = E_{in}/c = p_e W_v/c = \lambda_e^{0.5} (E_{in}/E_{\delta e}^{0.5}) \quad (32)$$

If, instead, the entire complex of rest mass-energy and acquired kinetic energy *diffracted together* like waves with an associated *total inertial linear momentum*, then, *according to Aetherometry*, the latter would be given by:

$$p_{Tin} = [n_{in} \lambda_e (E_{\delta e}+E_{in})]^{0.5} = p_{Ae}+p_{Kin} \quad (33)$$

where $n_{in} = [(E_{in}/E_{\delta e}) +1]$. Then, for a 50keV electron beam, the de Broglie wavelength λ_{BTin} for the total energy would be:

$$\lambda_{BTin} = h/p_{Tin} = h/[n_{in} \lambda_e (E_{\delta e}+E_{in})]^{0.5} = 2.21*10^{-12}\ m = 0.02Å \quad (34)$$

However, Aetherometry argues that neither does the mass of the electron increase with increasing velocity (ie that there is no addition of "electromagnetic mass" to rest mass), nor are the

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detected de Broglie waves the result of the diffraction of the combined mass-energy and kinetic energy of a particle - in this case the electron; in other words, it is not the total energy of the electron, for example, that is diffracted. Moreover, **de Broglie**'s famous "Matter-waves" are, in fact, *not (photo)inertial* waves but *electroinertial waves derived (during passage through matter) from the electrokinetic waves of the massfree energy that is associated with a massbound particle in the form of the latter's kinetic energy*. Indeed, Aetherometry argues that what is diffracted like waves, what behaves like a wave and *actually serves as a track for the motion of the massbound particle or charge*, are the electric wave components of the kinetic energy of that particle. They alone are diffracted. There is no diffraction of the total energy, nor is kinetic energy diffracted by the classical "photo-inertial" model where only kinetic energy is taken into account. Rather, the kinetic energy is diffracted *electro-inertially*.

This conceptualization follows from the fact that, aetherometrically, the accelerating field consists of massfree ambipolar charges, while the kinetic energy is captured field energy that becomes associated with monopolar massbound charges and conforms to the latter [11]. So, when we consider the de Broglie wavelength of the electroinertial waves derived from the kinetic energy of accelerated electrons, we must first consider the electric configuration of this kinetic energy, ie a fine structure that includes the charge p_e (a "charge-type momentum", and not the ordinary inertial momentum) and the magnetic and electric waves. For the electron, when the kinetic energy E_k is the same as the input (or “field”) energy E_{in}, this is formally written as:

$$E_k = p_e W_v = \lambda_e W_k W_v \quad (35)$$

where W_k is the magnetic wave function characteristic of the electron (or of all light leptons), $W_k = 2.5466 * 10^6$ m sec^{-1}. Also, note that, in a 50keV electron beam, the quantum frequency of these kinetic energy waves is given by -

$$\upsilon = \mathbf{p}_e W_v / h = W_v / \lambda_x = 1.2 * 10^{19} \text{ sec}^{-1} \quad (36)$$

This is the quantum frequency of the kinetic energy associated with each electron in the field. In electric deflection and cathode ray experiments, the velocity ($v = (W_k W_v)^{0.5}$) and wave functions are those of the electrokinetic fine structure provided by equation #35 (though not discussed in the present communication, this only applies for as long as the field energy is low, and thus modal kinetic energy equals field energy). However, in diffraction and refraction experiments where moving electrons both exert and are subject to mechanical forces, the true de Broglie waves are electroinertial, and given by a very different set of functions than those extracted from consideration of kinetic energy alone, or from the classical account of the addition of kinetic energy to mass-energy, or, still, from the relativistic account. The solution of the de Broglie waves as electrical functions presents, in fact, *the*

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equivalence of electroinertial and photoinertial formulas [20]. The diffracted kinetic energy waves have a wavelength that corresponds to a linear momentum which, (1) in *inertial* terms, is equivalent to the geometric mean (or 'integral') of the kineto-inertial and total inertial linear momenta:

$$p_{AVin} = (p_{Tin} * p_{Kin})^{0.5} \quad (37)$$

and which, (2) in *electric* terms, is a function of both the magnetic wave constitutive of the particle under acceleration (W_k for the electron), and the voltage-equivalent wave (in the present example, the electric field wave W_v corresponding to 50kV):

$$p_{AVin} = p_e (W_v n_{in}/W_k)^{0.5} = h/\lambda_x(W_v n_{in}/W_k)^{0.5} = (p_{Tin} p_{Kin})^{0.5} \quad (38)$$

In other words, the interferometry of kinetic energy operates like a computing process that through a geometric mean balances the inertial effects attributed to both total and kinetic energy terms, and does so electrically, by a wave differential ($W_v n_{in}/W_k$) that takes into account the energy proportionality between kinetic energy and mass-energy. Thus, the *electric function* for the *observed* de Broglie wavelength is not

$$c\ h/p_e W_v \quad (39)$$

as in the classical analysis, nor is it

$$(W_k W_v)^{0.5} h/p_e W_v = W_k^{0.5} h/p_e W_v^{0.5} \quad (40)$$

as one might at first suppose from consideration alone of the electrokinetic energy term (equation #35), but instead the electroinertial function:

$$\lambda_x (W_k/n_{in} W_v)^{0.5} = (h/p_e) (W_k/n_{in} W_v)^{0.5} = W_k^{0.5} h/p_e (n_{in} W_v)^{0.5} \quad (41)$$

Thus, we emphasize how this expression and the above expression (see equation #38) for the electric function of the observed de Broglie momentum, $p_{AV} = p_e (W_v n_{in}/W_k)^{0.5}$, put into evidence how the real de Broglie waves are electric waves derived from the kinetic energy of the massbound charge, in this case, the electron. The same expressions directly put into evidence the constraint imposed by each distinct charge carrier: the electric waves of the kinetic energy of massbound charges are configured inertially by adoption of the magnetic wavespeed of the electron, in our example.

It follows that the de Broglie beam wavelength that is experimentally detected with a 50keV

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electron beam must not be 0.054Å (as assumed with the relativistic calculation), but 0.074Å, since this result alone is that which is obtained from the *simultaneous and independent solution of electroinertial and photoinertial treatments*:

$$\lambda_{BEAM3} = \lambda_{AVin} = h/p_{AVin} = (\lambda_{BTin}\,\lambda_{BKin})^{0.5} = (W_k^{0.5}\,\lambda_x/W_v^{0.5})/[(E_{in}/E_{\delta e}) +1]^{0.5} =$$
$$= \sqrt{(W_k\,W_v)}/\upsilon\;\;[(E_{in}/E_{\delta e}) +1]^{0.5} = 7.40*10^{-12}\text{ m} = 0.074\text{Å} \qquad (42)$$

From our perspective, this demonstrates that the λ_{AVin} wavelength of the beam is the true de Broglie wavelength *in the diffraction of the electrokinetic energy* of the electrons, and thus that the waves being diffracted are *the inertially reconfigured electrical waves of the kinetic energy of the electrons* and *not* the waves constituting the electrons or their mass-energy, or the waves of a composite of "electromagnetic" energy associated indistinctly with the rest mass and the "electromagnetic mass". The electrons are not being converted into ionizing photons, nor are their mass-energies being diffracted through foils or their slits. This is obvious to the aetherometric perspective, since electrons constitute toruses having a typical diameter of 2.16Å, so they will easily pass through, and bounce off as well, the slits which will have diameters 30 to 4000 times greater (**Jönsson** employed 0.5 μm wide slits spaced 2 μm apart).

So when **Feynman** contends that (1) for electron distributions with either one of the slits closed, we obtain a probability distribution that he now specifies as a function of the number of charges, by either

$$N_1 = (a_1)^2 \qquad (43)$$

or

$$N_2 = (a_2)^2 \qquad (44)$$

(where 'a' is the probability amplitude of the event), and that (2) for electron distributions with both slits open, the maximum probability distribution is no longer one of bullets but of waves, and writes instead -

$$N_{12} = (a_1 + a_2)^2 = (a_{12})^2 \qquad (45)$$

it is not as if the first set of properties were exclusive to bullets and not present, also, in waves, nor as if because these are now properties of bullet-like electrons that they could not be, instead, properties of some other energy (eg kinetic) associated with these electrons. It is **Feynman** that skews the presentation to bring out the inconsistencies that would have to be accepted by the paradoxical views of probabilism and Quantum Mechanics. Taken together, all three expressions also describe the wave

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properties of the distribution of kinetic energy in water. The double inconsistency, the sole one, lies not just in thinking that particle and wave are contradictory or antinomic terms, which they are not, but also that it is the mass-energy of massbound particles that diffracts through Matter (note that if mass is taken to increase with velocity, the total mass-energy in question would be energy associated with both rest mass and "electromagnetic mass"). No such thing occurs, electrons remain electrons while they diffract through the atoms of Matter, and what ultimately refracts, diffracts or interferes are the electric waves responsible as much for the paths of these electrons as for their energy of motion. What changes with each energy conversion are the forms of these waves, according to whether the reference is field energy, electrokinetic energy or the inertial reconfiguration of electrokinetic energy.

Little wonder then, that the energy-distribution of electrons when both slits are open would be like that of waves. Since both slits are exposed to a collimated beam, both slits function as identical field energy emitters, and thus the maximum intensity of the beams would be proportional to

$$I_{12} = \text{oc}\ (W_1 + W_2)^2 = (W_{12})^2 \qquad (46)$$

and the number of electrons registered by the detector/target, be given by

$$N_{12} = (a_1 + a_2)^2 = (a_{12})^2 \qquad (47)$$

It follows that the mean number of all the electrons transmitted through each slit would remain equal to the sum of the number of electrons that passed through each slit when the other was open:

$$(4NF + 0)/2 = 2NF \qquad (48)$$

and thus we must conclude, against Quantum Mechanics, that no one is forced to think that electrons in the submicroscopic world do anything other than pass, one at a time, through either of the two slits, much like bullets in the macroworld are obliged to do. It is only their waves of kinetic energy that shift the distribution of this energy term from one characteristic of bullets shot from a barrel, to one characteristic of guided bullets that follow field lines. So we do not say, as Quantum Mechanics does, that the probability of arrival of electrons is determined as the intensity of waves would be, but that their trajectories are ultimately determined by the intensity of the field waves. Accordingly, Feynman's proposition A ("an electron either goes through hole No. 1 or hole No. 2") is - in aetherometric terms - not false, but true: an electron, at any one time, either goes through slit one or through slit two, and not through both at the same time.

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5. Can one count electrons in double-slit experiments?

There is relativity under the Einsteinian forms, Special and General; there is relationism - of which **Mach**'s is merely one possible example; and there is a relativism a la **Feynman**, characteristic of the Quantum Mechanics taught by **Niels Bohr** and **Werner Heisenberg**, and which wants to be more than **Einstein**'s Relativity and, at the same time, a mere extension of pure relationism - where the dogma that an observer affects the observed interaction no longer permits any possible understanding or impartial description but only partial, subjective ones. Such an approach appears viable but solely because one persists on misrepresenting the physics of observation. The "observed" is always the product of an interaction or a relationship of production. If we persist in studying a given interaction (eg the diffraction of moving electrons by a slit) - our "observed" - by coupling to it a second interaction (say, we add a photon beam), we may not, and should not, describe the second interaction as "the observer", only to conclude what is obvious - that the second interaction may modify the first. The real observer will have to observe the synthesis of both interactions - of both "observeds together". This kind of sleight of hand is never more in evidence than when Feynman wants to demonstrate the supposed solidity of his combination of "objective" relativity and "subjective" relativism by introducing a new variable into the electron interferometry experiment: he wants to count electrons, to make sure that he is getting a distribution characteristic of wave interference, and so he (ie the quantum mechanic) flashes a light behind each slit, hoping that it flashes fast enough to count electrons (which, by the way, in typical beam experiments have electric wave frequencies of motion much greater than the frequency of any possible blackbody flashlight).

So now what happens? What happens is, for Feynman, the peak of his relativistic relationism - the peak paradox of physics, the one that almost clinches a near-indifference as to whether or not there are massfree photons: shining these photons in the path of the beam electrons cancels the wave interference, and now the electrons behave strictly as bullets, with the distribution becoming that of the dual, superimposed Gaussian curves characteristic of the bullets example. In other words, in the dark - in the absence of substantial photons - an electron beam passing through an open double-slit will present a particle and energy distribution which is like that of water waves, ie with a maximum probability given not by $\sqrt{F}+\sqrt{F} = 2\sqrt{F}$, but by $(2\sqrt{F})^2 = 4F$. But it suffices to shine some light along the path of the electron beam for the distribution to become that of massbound bullets:

$$N_{12} = N_1 + N_2 \qquad (5)$$

and thus for the maximum probability to become $\sqrt{F}+\sqrt{F} = 2\sqrt{F}$, as the amplitude of each of the peaks of the bimodal distribution becomes proportional to the number of electrons (within a fixed scale of lateral dispersion).

How is this possible? What has happened here? Maybe the electrons are not so solid, after all; maybe Matter is composed of Light, of photons (again)...?

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No to either case - answers Aetherometry. We can still perfectly well hold to our aetherometric decoding of the paradoxes of double-slit interferometry: the number of electrons that passes through each slit is in all cases sensibly or comparably the same; what changes are the patterns of their distribution and the intensity of their 'illumination', so to speak. The balanced wave-interference pattern of the double-slit experiment was undisturbed in the dark, but once light was shone on it, and this production of light or photons was not synchronized to the field of the collimated beam, what else have we done but applied or superimposed still another field over the field responsible for the electron beam acceleration? One can argue as to whether the second field is electromagnetic, may be electromagnetic, or is ambipolar, or both. Irrespective, application of a second field implies a second flux of energy, and the imparting therefore of extra kinetic energy to the beam electrons. Moreover, besides the question of its physical nature, application of a second field immediately raises vector questions as to its direction, intensity and time relation to the first field, and how the second field combines these characteristics with the field accelerating the electron beam and with the kinetic properties of the motion of those electrons in the beam.

Aetherometrically, one can conceive of a photon flux that may phenomenologically appear as forming a propagating electromagnetic field; this may be the case when the molecular or massbound charge density of the medium conveying the photon flux is high, as in a monochromatic laser pencil, with the result that the photons may be relayed by being consecutively absorbed and released by closely packed molecules or charges, if these charges are in a state of electric resonance with respect to their motion, which therefore must be minimally coherent. A flux of this nature directed opposite the electron beam will act as a break on the latter, since (1) it will provide kinetic energy to the electrons emerging from the slits, but this energy will come with a momentum opposite that of the beam motion; and (2) it will provide moving photon-relaying charges directed against the beam electrons. Moreover, if the photon flashlight produces broad spectrum photons, then no particular synchronism will be possible.

However, aetherometrically, most photon rays are the indirect byproduct of an underlying ambipolar electric field that transmits the "excitation" and accelerates massbound charges. The acquired kinetic energy is solely captured field energy. Once captured, the field waves undergo specific deformation caused by the magnetic and inertial properties of massbound charges (that is, for instance, the physical sense of the quantum index n in the above equations for the inertial deformation of the electric waves of kinetic energy), with the result that the motion of the accelerated massbound charges follows wave tracks that are distinct from the tracks of the field waves, since they are the resultant of the combination of these field waves with the magnetic field waves characteristic of the massbound charges being accelerated (see for example equation #41 above). Further, in diffraction experiments, the moving electrons follow the diffraction of the electroinertial waves derived from their kinetic energy, and which result from the interaction of the underlying ambipolar field with

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both the inertial properties of the rest mass of the charge carriers and the magnetic wave characteristic of each carrier. Likewise, in the diffraction and interference of photons, what is being observed is a consequence, or byproduct, of the diffraction and interference of the 'kineto-inertial' energy waves of emitters undergoing deceleration, whether coherently or not. So if we want to produce a photon flux that can back-illuminate the slits diffracting an electron beam, we have to apply a second ambipolar field to the same beam electrons, and then the problem reduces to how is kinetic energy captured (constructively or destructively, ie lost) by the superimposition of two ambipolar fields, or how are two distinct kinetic energy terms acquired and combined, such that, in back-illumination, they will induce opposing linear momenta (in other words, this is a problem of electrodynamics!). In back-illumination, the second ambipolar field will act as a decelerating field, with the result that the beam electrons will undergo a momentary loss of kinetic energy without the need for molecular collisions.

This is therefore a very different experiment, be it that electrons with a certain kinetic energy absorb the energy of photons with a linear momentum opposite the kinetic momentum of those electrons, or that, as they emerge from the slits, electrons absorb kinetic energy from two distinct ambipolar sources or fields which, being oppositely directed, result in the deceleration of those electrons and local production of photons. Since the sources are unsynchronized, what happens is that the interference pattern of one kinetic state interferes, in complex constructive and destructive ways, with the interference pattern of the second kinetic state of the same massbound charges. **Feynman** is ultimately incorrect: the bullet distribution is not restored, not per se - it is the wave distribution that is partially cancelled and complexified, and all the more so as the employed light is not even monochromatic. It is not as if interference disappears; it is that it becomes randomized all the more as more fields are superimposed haphazardly. Either way, with light on or off, the electron distribution will always total the same number of electrons.

Aetherometrically, what is curious about all this is that *there is a specific prediction that can be made concerning the interference of a 'beam of photons' with 'a diffracted beam of electrons'*, *if* the photon beam could exist without either a closely packed molecular flux or an underlying ambipolar field: the 'electron wave' interference would disappear and the bullet distribution would be restored (and the electrons properly counted...) if: (1) the 'beam of light' shone at the back of the slits is monochromatic light resonant with the electron beam energy, ie identical in energy to the photon energy which the electrons in the beam are capable of shedding; (2) the number of photons shot at each of the slits is the same as the number of the electrons emerging from each of the slits; and (3) the beam of light is made synchronous with the electron beam, so that at the level of a slit, the accelerated electron will absorb a single "anti-sense" resonant photon [21] and immediately shed two identical photons. In other words, under these conditions, the exiting beam electrons will be slightly decelerated by absorption of the resonant monochromatic photons, and will shed double the number of photons they will absorb.

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An electron beam and its diffraction and interference pattern can only be employed for purposes of creating, say, an electron transmission microscope, if the electrons are only decelerated at the target, not if they are decelerated throughout the beam and give rise to electron scatter (or photon production) along the beam. For a 50 keV electron beam, the maximum photon energy generated by a decelerating electron is aetherometrically equivalent to 2.6 eV:

$$h\upsilon = p_e W_v / \alpha^{-2} = 2.51*10^6 \text{ m}^3 \text{ sec}^{-2} \quad (49)$$

Thus, the blackbody photon quantum frequency will be

$$\upsilon = p_e W_v / h\, \alpha^{-2} = W_v / \lambda_e = 6.29*10^{14} \text{ sec}^{-1} \quad (50)$$

putting the photon wavelength in the visible blue range, at

$$\lambda = c/\upsilon = c\, \lambda_e / W_v = c\, h\, \alpha^{-2} / p_e W_v = 0.476 \text{ µm} \quad (51)$$

ie, precisely the width of the slits employed by **Jönsson**, for example. If a beam of such 'monochromatic light' were possible without an underlying molecular flux or ambipolar field, it would not interfere with the wave pattern of the electron distribution, but rather, if properly synchronized, superimpose over the latter a comparable photon pattern, as electrons would be decelerated at the level of the slits. But since photon beams are not separable from an underlying molecular flux or ambipolar field, it would appear that **Feynman** would be correct - and no experiment could be devised to count electrons that would not interfere with its distribution pattern.

However, in defiance of the **Born-Heisenberg** uncertainty principle, we claim that it is possible to design an apparatus that determines which slit an electron went through, without disturbing the electron motion and destroying the interference pattern. The simplest aetherometric method to illuminate and count 50 keV beam electrons passing through each slit is to apply, just past the surface of the slits, an inversely directed ("antisense") small electric field (a rectified ambipolar field) with a mere 2.6 volts potential, such that the outer surface of the slits is charged positively as an anode - much as if it were a grid insulated on one side only - and the cathode (also slitted) lies downstream at a half-micron distance. For each applied potential or input energy of the electron beam, the reverse or “antisense” field will have its potential determined by the aetherometric proportionality between kinetic energy and emitted photon energy; likewise, means will be needed to vary the resonant distance between the outer surface of the slit and the reversing, slitted cathode (which should be movable, as with a calibrated Vernier) as a function of the actual kinetic energy of the electron beam. In our example, with a 50 keV electron beam, 2.6 eV photons will be released when kinetic energy is

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lost upon deceleration. Since the deceleration is field-induced and not collisional, a beam electron will absorb 2.6 eV of field energy directed vectorially opposite its kinetic energy of 50 keV. The latter term will cancel entirely the 2.6 eV term, but the total energy before photon shedding will be (nonvectorially, 50 keV+2.6 eV). Since the final kinetic energy of each electron after photon shedding will be (50 keV-2.6 eV, the vectorial sum), our prediction is that two 2.6 eV photons will be released from each electron when the beam emerges from the "antisense" cathode. In other words, once properly tuned, the inversely directed DC-like electric field will decelerate the beam electrons emerging from each slit long enough - and by just the right amount of energy - to permit the shedding by each 50 keV electron of two resonant monochromatic photons (one for the partially shed kinetic energy of a decelerated beam electron, and the other for the shed kinetic energy resonantly absorbed from the "antisense field") with 0.476 μm wavelengths. Electrons passing through each slit can then be counted as equivalent in number to half the number of photons counted.

CONCLUSION

The present counterpoint to **Feynman**'s lecture on the ambiguous wave-particle duality of the material world and the particles of light should serve as a caution against the ontological and epistemological arguments that have led particle physics to insoluble paradoxical views. Nowhere in nature do particles part with their waves. Photons do not part with their electromagnetic waves; they simply arise from the shedding of the kinetic energy of massbound charges. And massbound charges neither part with their mass-energy waves, nor with the electric waves of their kinetic energy for as long as they do not decelerate or diffract. Where there is departure is of the accelerated massbound charges from the flux of the underlying field, since capture of kinetic energy involves the adaptation of captured field energy to the inertial and magnetic constraints of each type of charge carrier. Ultimately, the interference properties of photons derive from those of *decelerating* massbound photon-emitters, just as the interference properties of *accelerated* massbound charges derive from the electroinertial properties of its kinetic energy waves, which reflect in part the interference properties of ambipolar massfree energy fields. The new particle physics is neither relativistic, nor fuzzy. All the interference properties of photons, massbound monopolar charges and massfree ambipolar charges can be determined without resort to any relativistic computations.

Acknowledgements. The authors are indebted to Dr. Malgosia Askanas for editing and reviewing the manuscript and checking the computations, and to Dr. Jordi Solá-Soler for critical review and suggestions.

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2. **Idem, p. 143**.

3. **Ibidem, p. 135**.

4. We should note that, aetherometrically, not every form of energy interaction obeys a summing relation, or juxtaposition. In particular, (1) the interference of massfree energy fields (or of the wavepackets forming superimposed fields) and (2) the superimposition of field energy with mass-energy to yield certain forms of kinetic energy (eg gravitational) *invoke a phase-resonant relationship where energy undergoes* (*secondary*) *superimposition with energy*. The phase superimposition of waves is then differently described by:

$$E^2 = E_1 E_2 = \lambda^2 [(W_1)^2 (W_2)^2] \quad (52)$$

and the phase intensity described by

$$I \propto (W_1 W_2)^2 \quad (53)$$

Effectively, wave fields can both add (juxtapose) *and* superimpose because they are *massfree energy* fields. When these fields add to the same massbound particle, we encounter the addition of waves, as is the case in the classical analysis of water waves. In the inertial electric acceleration of massbound charges by an applied electric field, the kinetic energy extracted from the field is in a relationship of addition, albeit nonclassical [19], with the mass-energy of the charge carriers. Juxtaposition is therefore a *simple form of superimposition*, one described by addition of waves or addition of energy terms. But field waves (or energy fields) also have the property of phase superimposition, whether between themselves or with the waves forming the mass-energy of the particles of Matter, as happens for example, in our proposed model of gravity and gravitons **(Correa, P & Correa, A (1998, 2006, 2008) "The Gravitational Aether, Part II: Gravitational Aetherometry (9) - Quantum & Subquantum Aether (Anti)Gravity: Fine Variation and Determinations of G", Volume II of the Aetherometric Theory of Synchronicity (AToS), Akronos Publishing, Concord, ON, Canada, ABRI monograph AS3-II.11)**. Every energy unit is a wavepacket, the result of the primary superimposition of two waves. Primary superimposition of waves is not a juxtaposition, or a simple superimposition. It involves, rather, the "multiplicative" or better, "productive" power of two or more waves in the formation of every energy unit (just as secondary or phase superimposition involves the "productive" power of two or more energy units). All energy units arise from the packing of waves by primary superimposition - be the unit in question a particle of mass-energy such as the electron, or a massfree particle. If an accelerating field is composed of massfree energy units, then the field is

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defined by a type of wavepacket. If two such fields are superimposed over the same space at the same time (ie "occupy" the same abstract space), then two distinct wavepackets are superimposed, and effectively this is a different form of superimposition, a *secondary* one, where energy is superimposed with energy, or the waves of one field packet with the waves of another. The secondary superimposition of massfree energy reflects the general property of massfree energy units - that they can coincide spatially and temporally on the same abstract locus. In fact, they may even superimpose any multiple of the same exact or different Space and Time functions on any abstract locus. This is what is meant by phase or secondary superimposition. Matter is excluded from having such a property, since two elements or particles of Matter, irrespective of whether they may or may not have identical Space and Time functions, cannot superimpose these functions on the same abstract locus of space, not without mutual destruction. It follows that kinetic energy states either arise by simple superimposition (ie juxtaposition of waves and energy terms), or by secondary superimposition (phase superimposition of waves and energy). In the wide sense of the term superimposition (when it encompasses juxtaposition), it is this property of massfree energy that permits any massbound particle to acquire kinetic energy, for the latter is nothing else than borrowed field energy that has adapted to the Space and Time constraints of the mass-energy of that particle of Matter either by a relationship of addition or by a phase relationship of production. Thus a particle of Matter can serve as the nexus for simultaneous juxtaposition and superimposition of diverse kinetic energy states.

5. **Feynman (1964), op. cit., p. 137.**

6. **de Broglie** assumed that every particle of light, whatever its quantum energy, has a certain rest mass m_0, see **French AP & Taylor EF (1978)"An introduction to quantum physics", WW Norton &CO, NY, NY, p. 56.** **A.S. Goldhaber** and **M.M. Nieto** placed strict upper limits on the rest mass of photons (**"Terrestrial and extraterrestrial limits on the photon mass"**, ***Rev Mod Phys*, 1971, 43:277**), but there is no evidence to this day that indicates that the rest mass of a photon is anything but nil.

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21. Vectorially opposed (antisense) but resonant with the kinetic energy of the moving electron according to the usual aetherometric proportionality of kinetic energy to photon energy, see [10].

 ISSN 1915-8408