Noesis

The Journal of the Mega Society
Issue 89
January 1994

THE ROBERT J. HANNON ISSUE

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It is therefore astonishing that his transformations, (B-1) and (B-2), are **not** linear. The strange fact that this has gone unremarked by mathematicians seems due to references to V, C, and τ as "constants". If all of those terms are indeed constant, they can **not** change; then x* and t* are **not** functions of V, and can not change relative to x and t when V is changed. Indeed, if V can change, it is **not** a constant.

To the contrary, it is a fundamental premise of Einstein's analysis that motion (at V) of an IFR relative to another IFR can affect the relationship between their corresponding metrics. This means that x* and t* must be functions of V. Indeed, it is the manner in which x* and t* change relative to x and t, as V is varied, that produces the unusual effects attributed to Special Relativity. It is obvious that x* = xF(V,C), and according to (C-5), then t* = tF(V,C).

(B-1) and (B-2) may be re-arranged to:

(D-1) $$x^* = x\tau - Vt\tau = xF(V) - tF(V)f(V)$$

and

(D-2) $$t^* = t\tau - Vx/C^2\tau = tF(V) - (x/C^2)F(V)f(V)$$

$F(V) = \tau = 1/\sqrt{(1-V^2/C^2)}$ is **not** linear.
$f(V) = V$ is linear. $F(V)f(V)$ is **not** linear.
Therefore (D-1) and (D-2) are **not** linear.

E) The transformations between x* and x, and between t* and t may be determined as follows:

(E-1) Let $x^* = xF(Z)$
(E-2) and $t^* = tf(Z)$

(E-3) Z = all pertinent variables, including V.
(E-4) $x^* = x$ when $V = 0$
(E-5) $t^* = t$ when $V = 0$

(E-6) Then: $x^*/t^* = (x/t)[F(Z)/f(Z)]$

Introducing the postulate that C is the same in all IFRs:

(C-5) $x^*/t^* = C = x/t$

(E-7) Then: $x^*/t^* = C = C[F(Z)/f(Z)]$
(E-8) Therefore: $[F(Z)/f(Z)] = 1$
(E-9) and: $F(Z) = f(Z)$
(E-10) Therefore: $x^* = xF(Z)$
(E-11) and: $t^* = tF(Z)$

Since $x^* = x$ and $t^* = t$ when $V = 0$:

(E-12) $x^* = x[1 + F(V)]$
(E-13) $t^* = t[1 + F(V)]$

F(Z) **must** be linear, that is, contain only first-order variables.

A linear function describes a straight line in Euclidian cartesian coordinates.

(E-10) and (E-11) tell us only that $F(Z) = f(Z)$, but offer no clue as to the equation represented by those symbols. To determine that equation we must look to the facts of nature. Is there any known relationship between x^* and x, and between t^* and t, which is a linear function of V? And in which $x^* = t$ and $t^* = t$ when $V = 0$?

Yes: the Doppler effect equations:

(E-14) $$f^* = f[C/(C \pm V)]$$

(E-15) or $$t^* = 1/f^* = (1/f)[(C \pm V)/C]$$

(E-16) therefore: $$t^* = t[(C \pm V)/C] = t[1 \pm V/C] = t(1 \pm \beta)$$

(E-17) and: $$x^* = x[(C \pm V)/C] = x[1 \pm V/C] = x(1 \pm \beta)$$

The specifications of F(Z) are satisfied by the Doppler function. $[1 \pm V/C]$:

* When $x/t = C$: $x^*/t^* = x[1 \pm V/C]/t[1 \pm V/C] = x/t = C$
* When $V = 0$: $x^* = x[1 \pm 0/C] = x$
  $t^* = t[1 \pm 0/C] = t$

* The relationship between x^* and x is linear when V is varied.

* The relationship between t^* and t is linear when V is varied.

There is another possible value of F(Z): that is $F(Z) = 1$.

Homogeneous space and time means space and time that have exactly the same physical properties everywhere and everywhen. x^*/x must be exactly 1, and t^*/t must be exactly 1, regardless of the locations of the two IFRs in space and/or time. Can those ratios vary with the relative linear speed (V) of any two IFRs, bearing in mind that V must be the same in the metrics of both IFRs?

If: $$x^*/x = mt^*/t$$

then:

$$x^* = mxt^*/t$$

$$t^* = tx^*/mx$$

$$x^*/t^* = (mxt^*/t)/(tx^*/mx)$$

$$= (mx)^2 t^*/t^2 x^*$$

$$(x^*/t^*)^2 = (mx/t)^2$$

$$x^*/t^* = m(x/t)$$

which means that:

$$V = k(x^*/t^*) = km(x/t)$$

which means that V can not be the same in the metrics of both IFRs unless $m = 1$

Therefore V can not be the same in the metrics of the two IFRs x#/x does not equal t#/t. In homogeneous space and time:

(E-18) $x\#/x = 1$ and $t\#/t = 1$

(E-19) or: $x\# = x$

(E-20) and: $t\# = t$

(E-21) and: $x\#/x = t\#/t$

(E-22) and: $x\#/t\# = x/t$

and V cannot alter any of these relationships.

F) The Einstein-Lorentz equations (B-1) and (B-2) are **not** valid transformations because they are not linear.

Either (E-16) and (E-17), or (E-19) and (E-20) are valid transformations of coordinates as sought by Einstein; both sets meet all of his conditions.

Which set represents reality?

(E-16) and (E-17) are validated by the Doppler effect...or are they? The Doppler effect is but a useful illusion that arises from independently evaluating one of a set of two simultaneous equations. (E-16) is meaningless except in its relationship with (E-17) and vice-versa. (E-16) can be properly evaluated only simultaneously with (E-17) in accord with (C-5):

$$x\#/t\# = x\sqrt{(1\pm\beta)}/t\sqrt{(1\pm\beta)} = x/t = C$$

The same is true of (E-19) and (E-20):

$$x\#/t\# = x/t = C$$

The requirements of homogeneous space and time eliminate (E-16) and (E-17) from consideration, because they do not satisfy the requirement that x# must equal x, and t# must equal t, everywhere and everywhen.

G) All rigorous derivations of the Einstein-Lorentz Transformation are predicated on (C-5) or its equivalent. It is not logically possible to derive those equations without (C-5).

This fact makes it clear that the Einstein-Lorentz Transformation equations:

(B-1) $x\# = (x-Vt)\tau$

and

(B-2) $t\# = (t-Vx/C^2)\tau$

where: $\tau = 1/\sqrt{(1-V^2/C^2)} = 1/\sqrt{(1-\beta^2)}$

are incomplete, unfinished algebra. (B-1) contains the term −Vt; (C-5) defines t = x/C. (B-2) contains the term $-Vx/C^2$; (C-5) defines x = Ct. These definitions **must** be substituted into (B-1) and (B-2) to complete the algebra, yielding:

(G-1) $x\# = x\sqrt{[(C-V)/(C+V)]}$

and

(G-2) $t* = t\surd[(C-V)/(C+V)]$

which are the sole algebraically correct and complete results of all derivations of the Einstein-Lorentz Transformations. When the algebra is properly completed, (B-1) and (B-2) vanish, taking with them the entire mathematical foundation of the Einstein Theory of Special Relativity.

(G-1) and (G-2) are identical with the "relativistic" Doppler effect equations. As the end-results of all derivations of the Einstein-Lorentz Transformation, they also are invalid because they are non-linear.

H) CONCLUSIONS.

1) The Einstein-Lorentz Transformation is invalid in its entirety because it violates two of its fundamental predicates:

a) $x*/x$ and $t*/t$ must be linear.
b) $x*/t* = x/t = C$.

2) The Einstein Theory of Special Relativity is, therefore, invalid in its entirety.

3) All mathematical relationships derived from the Einstein-Lorentz Transformation are invalid, specifically including:

a) The Velocity Transformation: $v* = (v+V)/(1+Vv/C^2)$

b) The Mass Transformation: $M = Mo/\surd(1-V^2/C^2)$

c) The Relativistic Doppler Effect equations:

$$x* = x\surd[(C-V)/(C+V)]$$
$$t* = t\surd[(C-V)/(C+V)]$$

d) The Lorentz-Fitzgerald Contraction: $x* = x\surd(1-V^2/C^2)$

SPECIAL RELATIVITY and HOMOGENEOUS SPACE AND TIME

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26 Oct 93

ABSTRACT: The Einstein Theory of Special Relativity is entirely predicated on a set of simultaneous equations now known as the Lorentz Transformation (LT). Einstein's derivation of the LT is predicated on homogeneous space and time (HST). The LT is inconsistent with HST, and is invalid.

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Einstein's Theory of Special Relativity is predicated entirely on the Einstein-Lorentz Transformation (LT), a set of simple simultaneous algebraic equations. The LT is predicated on two Principles:

1) **The Principle of Relativity:** "The laws by which the states of physical systems undergo change are not affected, whether those changes of state be referred to the one or the other of two systems of co-ordinates in uniform translatory motion." (1)

2) **The Principle of the Constancy of the Velocity of Light:** Any ray of light moves in the 'stationary' system of co-ordinates with the determined velocity C, whether the ray be emitted by a stationary or by a moving body." (2)

PLUS a very important fundamental assumption: **"In the first place it is clear that the equations must be linear on account of the properties of homogeneity which we attribute to space and time."** (3)

The "equations" to which Einstein refers are the LT, which he was then in the process of independently deriving.

What does "homogeneity" mean? "The state of being homogeneous": "homogeneous: 1: of the same or similar kind or nature. 2: of uniform structure or composition throughout." (4)

Definition 2, above, is is very close to the physical meaning of "homogeneous" as applied to space and time: uniformly the same, everywhere and everywhen.

"Homogeneous space" means space which has the same properties regardless of the place or the time at which those properties may be examined.

What properties does space possess?

a) emptiness,
b) electric permittivity, εo,
c) magnetic permeability, μo,

d) three orthogonal geometrical dimensions, each possessing identical metrics ("standards of measurement"). Einstein also specifies "Euclidian geometry."
e) continuity.

Einstein requires his space to be empty, via his definition of C as "the velocity of light in empty space." (5)

"Emptiness" is the state of being empty. "Empty" means "containing nothing," (6) which is unequivocal: no matter, no fields, no anything. Empty space is an absolute void.

ϵ_0 and μ_0 are the properties of empty space which, according to Maxwell, determine the velocity of propagation of electromagnetic radiation (which includes light):

(1-1) $$C = 1/\sqrt{\epsilon_0\mu_0}$$ (7)

If the product of the values of ϵ_0 and μ_0 is not exactly the same everywhere and everywhen in empty space and time, then C can not be the same everywhere and everywhen. Einstein **assumes** the velocity of light in empty space "to be a **universal** constant". (8) "Universal" means, "1: including or covering all or a whole collectively or distributively without limit or exception 2a: present or occurring everywhere b: existent or operative everywhere or under all conditions." (9)

It should be noted that we do not know that ϵ_0 and μ_0 are actually properties of **empty** space, nor that they are the same everywhere and everywhen. It is generally **assumed** that they are and that (1-1) is universally valid.

The three orthogonal ("mutually perpendicular") dimensions of space are given various names, such as length, width, and height. In physics and mathematics they are most often assigned the symbols x, y and z. x, y, and z are absolutely perpendicular to each other. As a group, we can move them around in space, and rotate them in any direction, but they can never depart in the slightest from orthogonality in homogeneous space.

If we have a rigid rod exactly 1 meter long (or any other "standard of measurement") in the x-direction, and another the same length in the y-direction, and another the same length in the z-direction, and we superimpose them all together, in any direction, we will find that all three rods are exactly the same length. We can do this any place in homogeneous space and at any when in homogeneous time.

The continuity of space refers to the absence of points, areas or volumes in which the properties of space do not exist. So far as Einstein knew (or we know), space is continuous in all directions.

* **All of the properties of homogeneous space must be the same everywhere and everywhen.**

2

"Homogeneous time" means time which has the same properties regardless of the place or time at which those properties may be examined.

What properties does time possess?

a) direction of progress or "flow",
b) continuity,
c) a metric or standard of measurement. Time appears to have two different "measurements", but they are just different aspects of the same thing: 1) the instantaneous value of time read from a "clock" of some kind; this is actually an "elapsed time" or "interval" measured from some arbitrary standard of reference. 2) "elapsed time" or "interval" or "duration", which is the difference between equal successive instantaneous values read from the same clock or from synchronous clocks. The latter is the true measurement defined directly in terms of the metric of time, which we have named the second.

So far as Einstein knew in 1905 (or we know now):

> time flows only from the past toward the future. Mathematically, the flow of time has only a positive direction.

> time flows continuously at the same rate, everywhere and everywhen.

> physical time has a fixed metric or standard of measurement of its duration, everywhere and everywhen. A second (or any multiple of a second), is exactly the same, everywhere and everywhen in homogeneous time, and in homogeneous space.

If the rate of flow, or the duration of the metric of time could change from place to place, or from time to time, without an exactly compensating change in the metric of space, then it would not be possible for C to be a universal constant.

*** All of the properties of homogeneous time must be the same everywhere and everywhen.**

Contrary to a common belief, in his 1905 paper "On the Electrodynamics of Moving Bodies", Einstein did not look upon space and time as "space-time", nor did he consider Ct to be a physical dimension orthogonal to x, y, and z.

Einstein's assumption of the homgeneity of space and time is a logical and mathematical necessity: if space and time are not homogeneous, it is impossible to know the relative geometries and metrics pertinent to various points, areas, volumes and durations in space and time. It would then be futile to attempt to mathematically relate ("transform") systems of coordinates, because it is impossible to relate unknowables.

Non-homogeneous space and time would present a logical conflict with both of the Principles, cited above, on which Einstein predicated his analyses.

3

Einstein assumed that HST requires only that his transformation equations must be linear, that is, contain only first-order vriables. That infers that it is possible, in HST, for x^*/x and t^*/t to depart from 1 as some linear function of V. He offered no logic to support that belief. He then proceeded to derive transformation equations which are not linear, in direct contradiction of his stipulation, and according to those equations x^*/x and t^*/t also depart from equality as V departs from 0.

$$x^*/x = (1-Vt/x)/\sqrt{(1-V^2/C^2)}$$
$$t^*/t = (1-Vx/tC^2)/\sqrt{(1-V^2/C^2)}$$
$$(x^*/x)/(t^*/t) = (1-Vt/x)/(1-Vx/tC^2)$$

Thus according to Einstein's transformation equations, $(x^*/x) = (t^*/t)$ only when $V = 0$ or $x/t = C$. However, Einstein tells us that $x/t = C$ is a universal constant; therefore:

$$\begin{aligned}(x^*/x)/(t^*/t) &= (1-Vt/Ct)/(1-VCt/tC^2)\\ &= (1-V/C)/(1-V/C)\\ &= 1\end{aligned}$$

Therefore it is not possible for x^*/x to be unequal to t^*/t, if $C = x/t$ is a universal constant, as stipulated by Einstein.

It is clear that the properties of homogeneous space and time must be the same, everywhere and everywhen. If so, is it possible for the velocity of some region of space and time, relative to the rest of space and time, to locally alter those properties, as must be the case if the LT is valid?

In homogeneous space and time we may choose two samples of the spatial metric at random and call them x and x*, and we may choose two samples of the temporal metric at random and call them t and t*. Those samples need have no particular relationships in space or time. By definition, we know that:

(1-2) $\quad x = x^*; \quad x/x^* = 1$
(1-3) $\quad t = t^*; \quad t/t^* = 1$

and we also know that:

(1-4) $\quad x/t = x^*/t^*$

and, according to Einstein, we also know that:

(1-5) $\quad x/t = C = x^*/t^*$

Now we will choose a region of three dimensional space of arbitrary size, containing x* and t* (and excluding x and t), and place it in motion in the direction such that it's x*-direction (x*-axis) is parallel to the x-direction of the rest of space and time. The velocity of any point on the x*-axis relative to any point on the x-axis is V.

By which standards of measurement is V determined? According to

Einstein's logic, the magnitude of V is the same measured in terms of x and t or in terms of x^* and t^*.

Can x/x^* and/or t/t^* vary with the relative linear speed (V) of any two regions of space and time, if the magnitude of V must be the same in the metrics of both regions?

Assume that: $m = F(V)$ $\qquad \beta = V/C$

$$x^*/x = m(t^*/t)$$

then: $m(x/t) = x^*/t^*$

In one region: $V = Va = \beta m(x/t)$ and $Ca = m(x/t)$

In the other region: $V = Vb = \beta(x^*/t^*)$ and $Cb = x^*/t^*$

and: $Va = mVb$ and $Ca = mCb$

which means that V (and C) can not be the same in the metrics of both regions of space and time unless $m = 1$

Therefore V can not be the same in the metrics of two regions of space and time if x^*/x does not equal t^*/t. In homogeneous space and time:

$$x/x^* = 1 \quad \text{and} \quad t/t^* = 1$$
$$x^* = x,\ y^* = y,\ z^* = z$$
$$t^* = t$$
$$x^*/x = t^*/t$$
$$x^*/t^* = x/t$$

and V cannot alter any of these relationships.

CONCLUSIONS:

The sole possible "transformations" of coordinates or dimensions or metrics in homogeneous space and time are:

(1-6) $\quad x^* = x$
(1-7) $\quad y^* = y$
(1-8) $\quad z^* = z$
(1-9) $\quad t^* = t$

which are consonant with the Principle of Relativity, the Principle of the Constancy of the Velocity of Light, and with homogeneous space and time.

The Lorentz Transformation is not consistent with the properties of homogeneous space and time, and can not be valid.

Einstein's Theory of Special Relativity is predicated on the invalid Lorentz Transformation, and is itself invalid in its entirety.

NOTES:

1, 2, 3, 5, 8: Albert Einstein, "On the Electrodynamics of Moving Bodies", Annalen der Physik, 17, 1905: English translation in "The Principle of Relativity", Einstein, Lorentz, Weyl, Minkowski: Dover Publications Inc, New York NY, 1952.
4, 6, 9: Webster's Seventh New Collegiate Dictionary, G&C Merriam Company, Springfield MA, 1969.
7: Lorrain and Corson, "Electromagnetic Fields and Waves", Second Edition, WH Freeman and Co, New York, NY, 1962, P 461.

WAVE-PARTICLE DUALITY AND THE PHOTON

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ABSTRACT: Physicists generally believe that all "particles" (objects possessing mass) have "wave-equivalents", that is, quanta of electromagnetic waves, and vice-versa. Most believe that all particles (and all masses) can, under certain circumstances, be completely transformed to their wave-equivalents, and that waves (electromagnetic wave quanta) can also be completely transformed into particles having mass.

This phenomenon is known as Wave-Particle Duality (WPD). There are certain observed phenomena which are generally accepted as proof of the interchangeability of energy in the form of particles and energy in the form of electromagnetic waves, and that particles do behave as though they **are** waves, and that waves do behave as though they **are** particles.

The origin of the concept of WPD, the deBroglie equation, is presented, as are reasons why the WPD concept is a misinterpretation of that equation.

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In 1924-5, a French graduate student, Prince Louis deBroglie, did some simple algebra. There are two very different stories told as to what he did.

A) In one story, deBroglie had the idea of equating the internal energy, E(q) of a Planck quantum of electromagnetic radiation (EMR) to the Einsteinian internal energy E(m) of a mass at rest, as follows:

Internal Energy of a quantum of EMR: $E(q) = hf$
Internal Energy of a mass at rest: $E(m) = mc^2$

Let: $E(q) = E(m)$
Then: $hf = mc^2$
(1-1) or: $f = mc^2/h$
(1-2) or: $m = hf/c^2$

h = Planck's constant [6.63x10^(-27) erg-sec], c = the speed of light in a vacuum [3x10^10 cm/sec], m = rest-mass in grams, and f = the frequency [in cycles/sec or Hertz (Hz)] of the electromagnetic (EM) waves involved.

deBroglie had no premise for assuming that these two utterly different forms of energy are physically identical and interchangeable, except that many others had done so before him. Nor for presuming that the energy of but a single quantum of EMR would equate to the energy of a mass of any magnitude.

Since the wavelength (L) of an EM wave is equal to c/f, deBroglie went on to say:

(1-3) $$L = c/f = ch/mc^2 = h/mc$$

There was no logical necessity for deBroglie to change the equation from its frequency (f) form (1-1), to its wavelength (L) form (1-3). The only apparent reason for this step is to reduce c^2 to c.

It is vital to understand that the c^2 in $E = mc^2$ has nothing to do with motion of the mass. It enters the equation via some fairly complicated algebra, and, in Einstein's derivation, by way of the Lorentz Transformation. Nevertheless, contrary to that fact, deBroglie decided that because a particle possesses mass, it can not move at c, thus the particle's actual velocity, v, must replace c in equation (1-3), resulting in:

(1-4) $$L = h/mv$$

which is algebraically invalid. c has a very specific definition in $E = mc^2$: it is the constant velocity of propagation of electromagnetic radiation in a vacuum. c has nothing to do with the velocity of motion of the mass involved. c has a known, specific, fixed, constant numerical value. Correct algebra does not allow deBroglie to simply replace c with v, which can have any arbitrary value and which has no logical, mathematical, or physical relationship to c in this specific situation.

It is very interesting to note that deBroglie didn't make his decision to substitute v for c until after he had used c to convert frequency (f) to wavelength (L), compounding the illegitimacy of that decision. What he did, in effect, was to change $E(m) = mc^2$ to $E(m) = mcv$:

$$f = mc^2/h = mcv/h$$

and then: $L = c/f = c(h/mcv) = h/mv$

Saying, in effect that a mass can travel at c for the purpose of conversion of f to L, but can not travel at c for the determination of the value of L. Why did deBroglie decide that the algebra had somehow altered the physical situation from the original premise of a mass at rest to one in which the mass is in motion? One can only guess, but it probably was because the term mv (mass times velocity) is conventionally called momentum, and that the algebraic juxtaposition of those two symbols implied to deBroglie that momentum is necessarily, physically, involved. This is an example of how misleading mathematical conventions can be.

Despite these egregious violations of its basic premise, (1-4) became the famous deBroglie "wave-particle" equation, which is interpreted to mean that every mass has an equivalent EM wave of wavelength L [as determined using (1-4)] and every EMR quantum has an equivalent mass, m [as determined using equation (1-2)]. This was a revolutionary idea, and physicists quickly sought to verify it experimentally. It was soon found that electrons, previously considered to be hard little particles of mass, can appear to be diffracted by certain crystals, just as though they are EM waves. The wavelength of those "electron-waves" was found to agree with deBroglie's equation (1-4). As a result of these experimental observations, it has since been assumed that all particles have a "wave equivalent", and all waves have a "particle equivalent". This is often called the "wave-particle duality" paradox, because it is not understood how anything can be both a wave and a particle.

The wavelength [about 10^(-8) cm] of the "electron waves" observed in electron diffraction experiments is tremendously different from the wavelength [about 10^(-21) cm] of the waves that would arise from the conversion of an electron's rest-mass to a wave. Plainly, actual conversion of electrons from particle-form to wave-form is not involved in that situation.

While proofs that particles can behave as though they have some of the properties associated with waves are readily found in the literature (electron diffraction is an example), there seems to be a dearth of direct proof that waves can behave as though they have properties associated with particles. The two examples that I have found are:

a) Einstein's explanation of the photo-electric effect, in which he seems to treat EM quanta as particles ("energy packages", which are not necessarily different from "quanta"). While Einstein's ideas are a possible explanation of the effect of EM quanta on emission of electrons from metals, they are only theoretical.

b) The Compton Effect, in which it appears that energy can be transferred from EMR quanta (at a specific x-ray frequency) to a mass (an electron). This is interpreted to mean that the EM waves comprising the x-ray quanta necessarily have to behave as though they are particles in order to transfer energy to a particle. Almost all physicists believe that only particles can actually transfer energy to particles. The opposite rationale, that the EM waves (fields) of the x-ray quanta interact with the wave-equivalent (fields) of the electron, is not applied.

It appears that direct experimental proof that waves can behave as (or be converted to) particles is scarce, at best. Yet it is assumed to be true because of the supposed symmetry of the deBroglie equations. It is a unique "symmetry" that requires one equation (1-4) for particle-wave "conversion" and another equation (1-2) for wave-particle "conversion".

Neither a) nor b) positively demonstrates the actual conversion of a wave to a particle. Electron diffraction and similar phenomena do not demonstrate the actual, physical conversion of a particle to a wave. These phenomena demonstrate only that particles sometimes behave as though they have some wave-like properties, and vice-versa.

There is only one situation that has actually been observed in which particles (actually two specific, electromagnetically-opposite, particles must be involved) are apparently transformed entirely into waves: the electron-positron annihilation phenomenon. In that situation, an electron and a positron (which are, so far as we know, identical except for their opposite electromagnetic polarities) collide. The two particles completely cease to exist as such, and are replaced by two (presumably) identical quanta of gamma radiation. We are told that the frequency of the resultant gamma quanta agrees with (1-1):

f = 9.1x10^(-28)x9x10^20/6.63x10^(-27) = 12.35 x 10^19 Hz.

although it is not clear how that frequency may be measured in any single annihilation.

Physicists call the deBroglie "particle" equivalent to an EMR quantum a Photon. It is also often called "a particle of light". Physicists assume that Photons are real, use them as the bases for some theories, and deal with them as physical objects in explaining various experiments. The energy of a single quantum of visible light is about 5x10^(-12) erg or 5x10^(-19) joule (or watt-second); which is a very small amount of energy. The mass of a Photon created from one quantum of visible light would be about 5.5x10^(-33)g, or about 0.6x10^(-5) electron-mass.

Despite the supposed conversion of its wave-energy to mass-energy, scientists assume that the Photon retains other properties (such as "polarization") peculiar to the wave from which it was converted.

There are some good reasons to believe that the Photon is a mathematical fiction that has no real existence:

1) According to the Law of Conservation of Mass-Energy the total energy contained in an EMR quantum can not change as it travels through empty space. When an EMR quantum is created by emission from an atom, it propagates empty space as a hollow spherical wavefront whose radius increases at the speed of light (c). All of the unchanging total energy of the quantum is always uniformly distributed over the surface of the sphere. For this reason, the energy **per unit area** of the spherical wavefront decreases as the square of the radius of the sphere (which is the distance from the source of the quantum). This is the reason for the well-established inverse-square law of the propagation of EMR.

If the energy of an EMR quantum were contained in a Photon, that energy could not change as the Photon moves through empty space. Whether it is measured within a few meters of its source, or many light-years away from it, the internal energy of the rest-mass of a particle can not change. Presuming a Photon has a fixed diameter like all other particles, the energy per unit area of a particle moving through empty space can not change, thus a particle of light can not behave in accord with the inverse-square law.

Those who espouse the physical reality of the Photon explain this anomaly away by telling us, without evidence, that the inverse-square law is a large-scale effect associated with large numbers of identical Photons emitted simultaneously in all radial directions. The implication of this rationale is that the inverse-square law will become less and less valid as the number of simultaneously-emitted Photons decreases. There is no experimental evidence to that effect. It also implies that there are areas on the surface of any sphere in space centered on an emitter of Photons, where no Photons will be present unless an infinite number of Photons is always being emitted. Then the usual "probabilities" of quantum mechanics, along with the Heisenberg Uncertainty Principle, are invoked to rationalize that problem away.

2) According to the deBroglie equation, a Photon must possess mass = hf/c^2. If so, according to the Theory of Special Relativity, a Photon can not move at the speed of light, c.

3) Conversion of all of its quantum energy (hf) to mass = hf/c^2 leaves the Photon with zero energy of motion (kinetic energy, $mv^2/2$). Thus a Photon is motionless (v=0) at the instant of wave-to-particle conversion, and must remain motionless unless it interacts with some external source of energy. According to current dogma, that source of energy must take the form of some particle in motion.

4) deBroglie's logic was inconsistent. He started off equating the internal energy of rest-mass ($E = mc^2$) with the quantum energy of EMR ($E = hf$). When he reached $L = h/mc$, he abruptly changed premises, arbitrarily substituting v for c. His final equation $L = h/mv$ does not involve the internal energy of rest-mass, but rather the momentum of a particle; and that particle is not at rest, but in motion at v. If deBroglie had started off equating energy of motion (kinetic energy) with quantum energy, he would have found:

$$hf = mv^2/2$$
$$f = mv^2/2h$$
$$L = c/f$$

(3-1) $$L = 2ch/mv^2 = 2(c/v)(h/mv)$$

which is very different from:

(1-4)

(to be continued in *Noesis* 90)