A FURTHER INVESTIGATION INTO PLANCK'S QUANTUM THEORY CONCEPTS REVEALING THE FUNDAMENTAL INDIVISIBLE UNIT OF ENERGY WITHIN PLANCK'S CONSTANT h ERG SECOND

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This paper extends in greater depth the investigation and analysis of Planck's constant h, already dealt with in [1], with especial reference to the effect of any variation in the choice of the normal yet arbitrary time unit, the second. The undoubted long standing ambiguity of this so-called fundamental constant is discussed and clarified. As a direct result of this rigorous analysis the smallest fundamental indivisible quantised unit is revealed. It is equal to 6.62559×10^{-27} ergs of energy and also equal to h numerically but not dimensionally. This absolute quantized unit of energy is contained implicitly within Planck's action quantum h, and represents the real significance underlying Planck's somewhat mystical and ambiguous definition of h and of quantum theory in general and of energy quantisation in particular.

In 1967 the author discovered and developed a more general and unified form of Planck's quantum theory. This new theory was based on the discovery of the smallest indivisible unit quantum of energy, from which not only all the other larger and alleged indivisible radiant energy photons and quanta at all frequency levels are formed, but which it was shown also form the particles, energy fields, all matter and the entire universe itself. In addition, not only was the energy of this really indivisible sub-microscopic fundamental quantum unit clearly defined, but so also were all its other physical characteristics and properties, including its mass, length, breadth, depth, volume force, velocity, charge and gravitational constant, in numerical dimensional terms of mass, length and time.

These discoveries together with many others formed the basis and nucleus for a new unified quantum theory, that was published in book form in 1972, entitled **The Unified Quantum Field Theory.** A further book **The Eternity Theory** deals mainly with the implications of the new theory for philosophy and cosmology. This was published in England in 1974, followed at intervals by twelve papers that deal with the many inferences and implications stemming directly from the theory for modern scientific, philosophic and cosmological thought.

The present paper contains further explanatory details and proof of the precise nature of Planck's constant h erg second, with emphasis on the inherent

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absolute component of energy that is contained within this controversial constant, as compared to the mathematical ambiguity that was introduced when this quantised absolute energy component was divided by frequency and shown to be constant when the cgs system is used. It will be shown how the smallest indivisible quantum or unit of energy, as defined by h_e erg, equal to 6.62559×10^{-27} erg in the cgs system of units, may be obtained consistently and logically as the absolute indivisible constant of energy of the universe, regardless of any change in the man-made and hence arbitrary, unit of time.

Before coming to the main body and purpose of this paper, however, it is considered that a brief introduction to the evolution of the new ideas and principles that led directly to the formation of the concept of a unified quantum theory, will assist in their understanding. These new concepts enabled the currently accepted, yet misleading, concepts of Planck's many different sized, yet indivisible, quanta of radiant energy, as given by his quantised equation, $E = h\nu$, and the actual structure of Planck's constant h erg second, to be seen more clearly and in a less ambiguous light. This undoubted ambiguity stems from the fact that Planck's constant of action, as defined by Planck himself, consists of the ratio of a quantised amount of energy to the frequency of the radiation at which the energy was measured. Any given amount of quantised energy remains the same in the absolute sense, if and when it is expressed by recognized dimensional transformation processes into different mass, length and time units regardless of the particular value of each separate arbitrary M, L and T unit. In the conventional cgs system as used by Planck, and using the second time unit, it should be noted that Planck's constant h erg second, equals energy/frequency, equals

$$\frac{6.62559 \times 10^{-27}}{\text{unit cycle /sec}} \text{ erg} = 6.62559 \times 10^{-27} \text{ erg second per cycle.} \qquad (1)$$

In all the author's works [1, - 14] this energy in the numerator of (1), has been defined as h_e erg, the fundamental energy quantum unit, as distinct from Planck's action quantum h erg second. It is considered necessary and justifiable to emphasise that h_e erg represents a certain quantised absolute indivisible amount of energy in ergs, divided by unit frequency, that is, one cycle per second. It should also be noted that if and when the time unit is changed from one second to any other time unit, either larger or smaller, that the frequency unit, that is unit cycle per second, undergoes a change both in a numerical sense, and also in an absolute sense. For example, if we choose one minute in lieu of one second for our time unit, then one cycle per second becomes 60 cycles per minute, and unit cycle per minute does not equal unit cycle per second; it equals 1/60 cycle per second.

It is therefore fairly obvious that, due to the natural phenomenon of energy quantisation, that remains absolutely invariant with any dimensional change, which Planck, Einstein et al, have defined by the apparent indivisibility of any given quantum or photon of energy, equal to Planck's constant h multiplied by the particular frequency concerned, ($E = h\nu$), that while the energy that underlies and is inherent in Planck's constant, h, is quantised and constant and indivisible, and hence, must be absolute due to nature, and is not affected by any dimensional unit changes whatever, the frequency unit itself is definitely not quantised, and is not absolute, if and when the time unit is changed, and is directly affected by any change of unit in the absolute sense.

For instance, if the time unit is made equal to one minute, that is, 60 seconds, instead of one second, then the numerical value of the same absolute frequency will obviously be multiplied by 60; that is, one cycle per second equal. 60 cycles per minute and n cycles per second equals 60n cycles per minute. Also the speed of light, an absolute constant, will correspondingly be 60c cm/min, in minute time units, instead of the normal value, c cm/sec, in second time units. These transformations with any time unit are normal and correct and are perfectly

acceptable for normal continuous equations, mathematical functions and constants and scientific laws. However, the discovery of the undoubted quantisation of energy by Planck in 1900, and, more especially, his quantisation of h, together with his quantised equation E = hν, brought a quite definite ambiguity into the normally straight-forward mathematical process of transforming different time units into Planck's quantised constant h and equation E = hν. In a normal continuous and simple equation of the type y = ax, where a is a constant and x is called the independent variable, the graph or curve of the equation y = ax, is a straight line whose slope and first derivative dy/dx equals the constant a, and the curve extends from the origin: O, or zero of the x abscissa and y ordinate, in a straight line to infinity. In this continuous equation there is no such thing as quantisation to set definite limits to the equation because 'a' is a simple numerical non-dimensional constant § and both x and y may be varied at will from zero to infinity. The value of the constant term a may also be obtained anywhere on the curve by dividing y by x, that is, y/x = a. If a variable x is reduced continuously to values tending to approach zero, then y being a continuous function, will correspondingly also approach zero, via the continuous equation y = ax, so that y/x always equals the constant a, the slope or gradient of the curve.

However, if we are now informed by perhaps one of the greatest scientific discoveries by man, that this theoretical constant a does, in fact, exist in nature, and is fixed and quantised, and thay y consists of quantised amounts of energy in fundamental absolute indivisible pieces, blocks or bricks of energy, and thus cannot possibly approach zero continuously, while x is any frequency which can be varied continuously as regards the number of cycles in any chosen time unit, in the absolute sense, it can be perceived that a more fundamental concept of all radiation is provided by the fundamental and quantised and truly indivisible energy unit that makes each individual cycle, quite regardless of the frequency and time unit variation. Therefore, it is perceivable that the time unit itself, is the common factor and medium and means by which both the energy (numerator) and the frequency (denominator) are measured in the same units of time.

It is at this stage in the analysis of Planck's simple yet also complex and profound constant, that a certain ambiguity begins to appear. Planck's h erg second quantum of action consists of no less than three fundamental physical elements or ingredients that can be recognised as separate entities. These are the primary quantised energy, the individual cycle, and the time period or unit in seconds. It is more correct to reduce h into four units of mass, length, time and unit cycle. Thus it becomes fairly obvious that in order to reduce this ambiguity, Planck's constant must be more analytically, precisely and fundamentally defined than just as h erg second, its normal definition, by seeing it more clearly in its context in the equation, E = hν. It is more precisely defined by reforming the latter equation, thus:

$$h = \frac{\text{energy } E}{\text{frequency } \nu} = \frac{E \text{ erg}}{\text{cycle/sec}} = \frac{h \text{ erg sec}}{\text{unit cycle}} = \frac{h_e \text{erg}}{\text{unit frequency}} \qquad (2)$$

It should also be recalled that Max Planck, a distinguished theoretical physicist, derived all his facts and experimental information from measurements of the black body radiation at different temperatures and frequencies, made by other scientists, using the conventional cgs system of units. It should also be recalled that these energy measurements, both the total energy and the separate energies at individual frequencies, actually measured the energy rate in erg per second, and that it was from this energy rate that the value of h emerged. It should also be perceived that if, for instance, the centimeter, gram, minute system had been used instead of the cgs system, that the energy emerging from the black body during one minute would have been 60 times that emerging during one second. However, that is not all, as in addition to this change, the size of the energy unit will also be changed. Let us call this new unit the minute erg, as distinct from the second erg. It will, in fact, be

§. A Mathematician's Comment: Hardly! If the x or y units are changed, so must be the quantity a, accordingly. Otherwise the line does not have the same geometrical slope.

1/60 x 1/60, or 1/3600 times smaller than the second erg. Or, in other words, 3600 minute ergs are equal to one erg in second units. Hence, the fundamental quantised indivisible energy quantum that has been identified in (2) above, will be transformed into 3600 h_e minute erg, but will remain the same in an absolute sense and equal to h_e erg.

The fundamental problem, together with its essential simplicity, although still wrapped up in a certain deceptive profundity, now emerges from the above concepts and relations. We may well repeat, as others have disclaimed before, that we are now at the crossroads, as it were, of scientific reality, and we have to make a choice in order to clarify the energy concepts enshrined within Planck's historical legacy of energy quantisation laws. Due to the dual or bifurcated nature of Planck's quantised equation, $E = h\nu$, and the undoubted fact that it can be conceived in both its continuous unquantised form (which is scientifically incorrect) and also in its correct quantised form, where, on the right-hand side of (2), the numerator h_e erg is definitely quantised and indivisible, and the denominator, unit frequency, is not quantised, but is man-made and is continuously variable at will, depending only on the choice of time unit, in the absolute sense.

There are, undoubtedly, two quite different methods, that each leads to very different results, by which Planck's constant may be transformed from the cgs system, which uses the second as its time unit, into any other time unit system, where the centimeter and gram remain unchanged but a different time unit to the second is employed. Only one of these two different methods is the correct one for the fundamental reality of energy quantisation, and it will be shown in the following discussion which method is the correct one. The importance of a correct scientific decision and interpretation at this crucial juncture cannot be overemphasised, as a correct and precise definition of the smallest indivisible quantum of energy (as distinct from action) that makes up the whole universe depends (almost as if by a hair) on this crucial judgement. The very misleading and incorrect alternative, which, unfortunately, is still prevalent and accepted generally, is to consider Planck's entire complex constant, h, to be a constant of nature in the absolute sense, that does not change its absolute quantised value if and when the time unit is changed. It has been widely and erroneously presumed, unfortunately, that Planck's constant may be energy, E erg, multiplied by the periodic time T, i.e. ExT, where both E and T may be varied continuously at will, while h itself remains absolutely constant. This equation is bound and limited by the same quantisation energy laws as the equation $E = h\nu$ and the energy quantisation behind Planck's action quantum h, and may not be treated either mathematically, logically or scientifically as a continuous equation or function.

Perhaps the most important concept that will help us to evade such errors and pitfalls in the pathways of our logical thought and intuitive vision, is that it is most certainly energy equal to ML^2/T^2 dimensionally that is fundamentally and absolutely quantised by nature, and energy is clearly conceived and familiar to man as a real physical entity in its own right, and is directly measurable, whereas Planck's action h is equal to energy divided by frequency, equal to ML^2/T dimensionally, is definitely not a physical entity in its own right, and cannot be directly measured as such, as energy can. It is a secondary mathematical ratio of quantised energy to non-quantised frequency, whose unit depends on our man-made and arbitrary time unit, and this non-quantised frequency unit varies with any change of time unit in the absolute sense.

It should be possible to perceive, therefore, that if and when any transformation process is undertaken, using different time units to the second, where Planck clearly determined and proved that energy divided by frequency, both measured in the second time unit system, equal to a constant, h, was really only constant, quantised and absolute in the cgs system, and could not be sub-divided but only multiplied by integers, that rather more than the usual rigorous logical care and intuitive insight will be necessary, when h is transformed into different time unit systems. This care is necessary because the numerator of h equal to energy (from the

h = energy/frequency relationship) is definitely quantised, whereas the denominator, frequency, equals cycles per second, is not quantised by nature, but is man-made and the unit of frequency changes in the absolute sense when the time unit is changed. It is very important, however, to note that unit cycle itself, is an absolute unit that does not change, regardless of any and all time unit changes and frequency changes.

In order to clarify this problem, the two quite different processes of transforming h into different time units will now be defined and detailed. The normal transformation considers the alleged absolute constant dimensional value of h erg second only, namely, ML^2/T, as derived from the equation:

$$h = \frac{\text{energy}}{\text{frequency}} = \frac{ML^2 \times T}{T^2 \times \text{unit cycle}} = \frac{ML^2 \times 1}{T \text{ unit cycle}} \qquad (3)$$

It should be noted that normally the term cycle is ignored because it is non-dimensional. The transformation equations for one minute time unit in lieu of one second time unit are simple and as follows:

$$1 \text{ min} = 60 \text{ secs} \qquad (4)$$

$$1 \text{ sec} = 1/60 \text{ min}$$

Let T_s and T_m equal the respective time units in seconds and minutes; then by this method h, equal dimensionally to ML^2/T_s, would normally appear to transform into:

$$h_m = \frac{ML^2}{1/60T_m} = 60 \text{ h minute erg minute} \qquad (5)$$

This transformation would encorporate a numerical change in the energy unit, from erg units into minute erg units, where the latter are equal to 1/3600 erg units, or 3600 minute cgm units are equal to one erg cgs unit. Also one cycle per second equals 60 cycles per minute and one cycle per minute equals 1/60 cycle per second. It should be noted, especially, that the one second frequency unit does not equal the one minute frequency unit, i.e., 1 cycle per second does not equal 1 cycle per minute. However, the common factor is undoubtedly the one cycle unit in each different time unit frequency. Also a change in the time unit does not bring absolute energy into existence or create it or change it. The proper function of the time unit is to measure both energy and frequency. It can be seen, therefore, that the transformed value of h erg seconds into minute erg minutes is equal to 60 h min erg min, which, according to this first method is equal to h erg sec and is consistent with the transformed and quantised value of 3600 h minute erg of energy being divided by 60 cycles per minute, which equals 60 h min erg min/cycle, as above. However, in view of the foregoing preliminary analysis of the nature of Planck's constant it would not be surprising if some considerable misgiving is experienced about the process of dividing Planck's indivisible h erg sec, equal to 3600 h_e minute erg (which is correct in the absolute sense) by 60 cycles per minute, or for that matter, by any other larger time unit frequency unit, as there is obviously no limit to whatever time unit we care to choose, as the time unit is not quantised by nature but is man-made and arbitrary. So that, by this method, Planck's indivisible constant h may be chopped up into an infinite number of pieces together with the indivisible energy in the numerator of this controversial constant. Which is not only absurd and nonsense in both the scientific and the quantised energy absolute sense, but also in the areas of common sense logic and imaginative intuitive insight and vision.

Before we deal in detail with the second method of transforming Planck's h, let us freely admit, without any doubt or reservation whatever, that the mere changing of the time unit does not change either the absolute energy underlying any particular and absolute frequency of radiation, or the absolute frequency itself, nor would it be reasonable to think that it changed the amount of radiant energy contained within each indivisible individual cycle of any frequency. None of these vital

points would be changed in an absolute sense. It also becomes obvious that the unit cycle itself, i.e. each individual cycle, which has tended to be regarded as relatively unimportant and almost non-existent, as Planck did not mention it in the definition of his action constant h erg second only (with no apparent reference to unit cycle) has, in fact, a most important function, as without unit cycle, radiation energy would be non-existent whatever time unit was used. It is very important, therefore, to note that the cycle has an absolute significance and importance as a physical entity in its own right as a non-dimensional unit, and is hence unaffected, in the absolute sense, by change in any of the dimensional units at any one frequency.

However, having made these points regarding unit cycle as an entire individual entity, in the absolute physical sense, it must be remarked that the structure of any one cycle does change when the frequency changes in the absolute sense, as distinct from a time unit change. The principal feature is that the wave length changes in accordance with the equation: wave length equals velocity of light divided by frequency. The shape of the wave cycle, namely, its amplitude as a sine wave, also changes with frequency, but not with time unit change. These changes to each individual cycle do not effect the present considerations of the absolute energy content that is contained implicitly (yet unspecified for almost a century) within Planck's constant, but the physical structure and energy content of each individual wave or cycle at any frequency has great importance, and has been detailed in [1 -14] and successfully applied, although as yet unrecognized, to the resolution of many of the principal and long-standing problems and enigmas in both science and philosophy.

The second and correct method of transforming Planck's constant will now be detailed and justified. That this is the correct and only realistic process is based entirely on Planck's famous and historic discovery of the quantisation of energy in the absolute sense and of his quantised indivisible nature of h in particular, in the cgs system of units. If now we consider the De Broglie equation:

$$E = h\nu = mc^2 \tag{7}$$

and if we use the suffix s and the suffix m after each component to signify the second and the minute time unit respectively, for the sake of clarity, we will arrive at the alleged correct transformation of this indivisible extension to Planck's quantised equation $E = h\nu$, thus:

$$E_s = h_s\nu_s = E_m = h_m\nu_m = m_s c_s^2 = m_m c_m^2 \tag{8}$$

Then according to Planck and Einstein, the same indivisible quantum or photon of energy at the same absolute frequency ν_s, which equals ν_m, remains the same after transformation into the minute time unit system, as in (8). We now approach the simple yet also profound depth that has been referred to in resolving this particular problem. Planck's constant h_s in the seconds time unit system is exactly equal and equivalent to h_m in the minutes time unit system, in the absolute energy content sense, otherwise it would not be an indivisible constant in any time unit system. Obviously h does not change in this energy content respect just because of a change in the time unit. However, as we have already noted unit frequency, one cycle per second, does not equal unit frequency, one cycle per minute, either in the absolute sense or in any other scientific or philosophic sense. It is obvious, therefore, that, if and when the time unit is changed that the absolute quantised indivisible energy numerator portion of Planck's constant must remain unchanged in the absolute sense, but that the infinitely variable unit of the frequency denominator portion of it does change in the absolute sense from one cycle per second into one cycle per minute. It is this absoulute change in the frequency unit from one cycle per second into one cycle per minute that has resulted in the logically and scientifically unacceptable and erroneous division of Planck's indivisible energy content, from 6.62559×10^{-27} erg in the numerator of h, equal also to $3600\times6.62559\times10^{-27}$ minute erg in the absolute sense when expressed in minute time units. By 60 cycles per minute resulting in the erroneous transformation, by the first method above, which is equal to 60 h minute

erg minute, or 60 times h minute erg minute. If we now multiply 60 h minute erg min by one cycle per minute, we obtain only 60 h minute erg instead of the correct and also absolutely invariant and constant energy content, which we have shown to be 3600 h_e min erg, equal absolutely to h_e erg.

Therefore, if we choose the first method then the absolute energy content of Planck's h erg second will be incorrectly reduced and will vary absolutely and in inverse ratio with the choice of the time unit. If we chose to make the latter one million seconds in lieu of one second, then the scientifically correct indivisible energy content of Planck's h would be reduced to one millionth of h_e erg. The now obvious absurdity of the first method is due to the error of keeping the frequency denominator constant and absolute but permitting the absolute energy content of Planck's h to vary because of this numerical frequency increase. Whereas the frequency unit itself must be held constant together with the energy content of h, while permitting the frequency itself to vary in the absolute sense, with change of time unit. That this latter procedure is correct is also obvious because by this second method of transformation, both the absolute energy content numerator and the unit frequency denominator of Planck's h will remain constant and absolute regardless of any time unit change. That is, the unit of frequency is the same numerically and one cycle per second numerically equals one cycle per minute, (or, of course, also equals numerically one cycle per day, or per year, etc.) one cycle per unit time is always equal to unity regardless of time change.

It is therefore now possible to perceive that the normally accepted equation (8) above is basically incorrect, if and when the unit of time is changed. If h_s is maintained equal and absolutely equivalent to h_m in (8) above, it can be seen that $h_s\nu_s$ will not be equivalent to $h_m\nu_m$, and so energy E_s will not equal E_m, and $m_sc_s^2$ will not equal $m_mc_m^2$. This conclusion follows from the fact that frequency ν_s will not be equal to ν_m as the latter will be 60 times ν_s. Also since by this second method of transformation where h_e erg is transformed into its absolute equivalent, namely, 3600 h_e minute erg, and unit frequency is allowed to remain constant, that is: one cycle per second becomes one cycle per minute, then it follows that $h_m\nu_m$ will be equal to 60 times $h_s\nu_s$. For the same reason the mass m_m of the same radiation flowing for one minute will be 60 times the mass m_s flowing for one second, and $m_s\nu_s^2$ will be 1/60 times $m_m\nu_m^2$. This rather startling discovery is due to the fact that we have deliberately held the basic and fundamental energy at unit frequency, constant and absolute so that at one cycle per second $h_s\nu_s$ is equal to $h_m\nu_m$ at one cycle per minute. It therefore follows that by this correct method, that retains the energy content of Planck's h regardless of time unit change, so that the energy contained in the $h_s\nu_s$ or $h_m\nu_m$ at unit frequency, that is, one cycle per second, or one cycle per minute, etc., remains the same in the absolute sense. It can now be perceived from the above considerations that follow directly from the correct second method of time unit transformation, that (8) above becomes two separate equations that may be easily related by the time unit ratios, as follows:

$$E_s = h_s\nu_s = m_sc_s^2 \tag{9}$$

$$E_m = h_m\nu_m = m_mc_m^2 \tag{10}$$

$$E_m = T_m/T_s > E_s \tag{11}$$

Some care is still required when using (9, 10, 11) as while h_s is equal to h_m in the energy content absolute sense, both are in different units, one in erg seconds, the other in minute erg minutes. Also, while the mass of one cycle of radiant energy remains constant and absolute, the total mass of the cycles flowing during one second will obviously be less than the cycles for one minute duration and will be in the same ratio numerically as ν_s is to ν_m. Hence the numerical value of energy E_m will be 60x3600 equal to 216,000 times greater than energy E_s. The factor of 60 comes from the numerical increment of cycles per minute over cycles per second, although the absolute frequency is the same. Therefore, it is emphasized that in (11) energy E_m is an absolute ratio and in this case will be 60 times E_s.

The obvious yet also profound truth that emerges from this rigorous analysis of Planck's constant and quantum theory concepts, is that this vital absolute difference in the fundamental units of frequency must be taken into account when transforming Planck's h into different time units, or error and grave misinterpretation will ensue and persist. The pathway through this long-standing dilemma is provided by Max Planck's quantised law that stated implicitly the quantised indivisible energy in h_s must remain equal to the quantised indivisible energy in h_m, as it must also remain completely unchanged, constant, absolute and indivisible for any and all changes in the arbitrary time unit. If this were not so, Planck's constant h together with quantum theory would not only be ambiguous and controversial, it would also be meaningless and quantised energy would not be the most outstanding fact of 20th century science. How could the absolute quantised value of the energy content of Planck's indivisible quantised constant h be affected by a mere change in the time unit, by means of which both this quantised energy content and the non-quantised frequency are measured? It becomes logically and scientifically obvious, therefore, that the indivisibility aspect, and hence, the quantised absolute portion of Planck's h resides entirely in the numerator of h equal to E/ν, equal to h_e/ unit frequency and that the denominator, namely, frequency, chosen by Planck in 1900, with some misgiving and reserve, to define his most famous constant, was, most unfortunately, neither absolute nor indivisible because the absolute value and meaning of unit frequency varies absolutely with any and all changes of time unit.

It should now be possible to perceive that the ambiguity, anomaly and a certain mystery regarding the actual nature of h is undoubtedly due to the fact that unit h erg sec is only quantised and indivisible and absolute in the numerator energy part of its content and is variable in the absolute sense if the cgs time unit, the second, is changed to any other time unit. It is now obvious that Planck was justified and correct in stating that his h erg second unit was quantised and indivisible in the second time unit system, as both his energies and his frequencies were measured in second time units. But the variation in the absolute sense of the unit frequency portion of his constant, the denominator portion of equation h equals energy/frequency, when the time unit is changed, undoubtedly alters the absolute-quantised meaning of h, unless extreme care and mathematical and scientific rigour are all brought to bear on this profundidty. It is also quite obvious that while Planck, Einstein, Dirac, Schrödinger, Bohr, Born, De Broglie, Heisenberg et al., were aware of a certain mystery and bifurcation inherent in their quantum theory, they all appeared to be unaware of the basic cause of this rather unscientific phenomenon, and hence, quite at a loss regarding the relatively simple resolution of this long-standing problem. This rigour, as distinct from an automatic and dogmatic acceptance of both Planck's indivisible quantised unit h equal to his quantised energy unit divided by unit frequency, and his indivisible quantised but different sized units of energy, equal to h times the frequency, (E = hν), is able to perceive that both of these postulates cannot possibly be true in the absolute sense if the time unit is changed. If the energy portion of h is constant and absolute, regardless of time unit change, as it must be, or the whole of quantum theory would be worthless, then this salient fact must be maintained in any time unit transformation, while maintaining unit frequency as the denominator in the new time unit, whatever value of time unit is used. There can be only one correct interpretation of these rigorous facts that lie hidden beneath the surface of Planck's apparently quite simple constant and its many successful applications in the cgs system. This interpretation is that it is the absolute indivisible quantised energy unit h, numerically, that is quantised per cycle, regardless of any arbitrary choice of time unit. It also means that, due to Planck's use of the frequency unit for his denominator, which varies in the absolute sense with change of time unit, that his constant will also vary absolutely from its original meaning and concept.

The simple, yet profound, resolution of this long-standing anomaly is now revealed in all its simplicity by the second and irrefutably correct method of

transformation, as detailed above, which proves that the energy E referred to by Planck in his equation E = hν, was, in fact, an energy rate, that he obtained from the black body energy rates measured in the time unit of seconds. What his famous constant and his equation E = hν actually provided, unbeknown to Planck and many famous quantum theorists for over 80 years, in a rather ambiguous form, was the most fundamental quantised indivisible unit of energy h_e erg that is undoubtedly contained in every single unit cycle of radiation, regardless of any time unit or frequency change. The anomaly and ambiguity and mystery surrounding Planck's definition of h erg second and equation E = hν, are now resolved by the most fundamental relations and equations of nature and the universe.

Nature's fundamental indivisible energy unit is seen to be:

$$h_e = \frac{\text{h erg sec x one cycle}}{\text{unit cycle one second}} = h_e \text{ erg} \qquad (12)$$

Transforming this into minute time units gives:

$$h_e = \frac{h_{min} \text{ erg min}}{\text{unit cycle}} \times \frac{\text{one cycle}}{\text{one minute}} = h_m \text{ min erg} \qquad (13)$$

where h_e equals h numerically, and

$$h_m = 3600\ h_e \text{ minute erg} \qquad (14)$$

and no energy quantum or absolute indivisible energy unit less than h_e erg exists in nature. Also the equation E = hν is now transformed into the quantised equivalent $E = nh_e$, where n is the number of cycles travelling at velocity c, that would pass through any given point in either one second, one minute, or any other chosen arbitrary and man-made time unit. It follows automatically from the foregoing that contrary to Planck's quantum concepts the only indivisible quantum unit, piece, brick or link of energy is equal to h numerically, namely, 6.62559×10^{-27} erg, which has been defined symbolically as h_e erg in the foregoing, to distinguish it absolutely from Planck's famous, yet enigmatic and mystical constant h erg second, which A. S. Eddington described somewhat humourously and ironically, in his chapter on Quantum Theory, in his well-known book **The Nature of the Physical World**, as the *origin of the trouble*.

In conclusion, the author begs permission to hope that the purpose of this brief paper as expressed in the summary has been fulfilled and that Eddington's trouble has been resolved, or at least clarified. There are, undoubtedly, many problems or troubles remaining but as the new theory, which has been called the absolute theory, has already resolved some of the most difficult ones of 20th century science and philosophy, the author feels justifiably confident that the cutting edge of the absolute theory will prove equally fruitful for all mankind facing the 21st century.

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