

PHYSICS WITHOUT EINSTEIN

A Centenary Review

by

Harold Aspden

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Chapter I

A Century Introduction

The Electron

In the 19th century, the pre-Einstein era, physics progressed in leaps and bounds, particularly in the field of electrodynamics, culminating in 1897 with J. J. Thomson's discovery of the electron and then, in 1901, Kaufmann's discovery that its mass increased with speed.

He measured how the charge/mass ratio of the electron varied with increase of speed, speeds as high as 95% of the speed of light.

As a student of physics in 1945 I read about this in a book entitled *Electricity and Magnetism* by S. G. Starling that was presented to me as the School Physics Prize for that year. The data of Kaufmann's experiment were tabulated and his paper referenced as *Phys. Zeitschr.*, **4**, No. 1b (1902) and I mention this because the same data was quoted in several other books I later acquired, one of which quoted the earlier reference of *Gottingen Nach.*, **2**, 143 (1901).

In the second edition of a student textbook *Physics* by S. G. Starling and A. J. Woodall dated 1957 one reads on p. 1212 by reference to the same Kaufmann data the words:

'Considering the difficulty of experiment these results may be considered to confirm the results obtained on the theory of relativity.'

Now I do believe that a student might be deceived by such wording, given that Einstein's theory did not exist at the time of Kaufmann's experiments and that it is for experiment to confirm pre-existing theory since experimental findings can only be confirmed by further experiment. I am, you see, aiming to be critical here because students of physics must not be misled and should be encouraged to question what they are taught as they themselves may have a future in scientific research. Pre-Einstein theory, the electron theory advanced by J. J. Thomson and others had already provided the necessary explanation.

The fact that the mass-variation of an electron with speed is consistent with the formula $E = Mc^2$ does not mean that we must accept the doctrines preached by those who believe in Einstein's philosophical concepts of 'four-

space'. Physics in the years before Einstein was on-track and building on fact rather than conjecture, and we should not ignore what is on record in the pre-Einstein years of the 20th century (1900-1904). We shall return to this topic in chapter II of this work.

So let us now look at another 19th century problem.

Gravitation

Newton's law of gravitation had come under scrutiny owing to effects attributable to retardation, the thought being that gravitation propagates at the speed of light rather than at infinite speed associated with Newton's concept of instantaneous action-at-a-distance. The object was to explain the observed anomalous advance of the perihelion of the orbit of planet Mercury. Whereas Newton's theory does explain an orbital perihelion advance owing to gravitational interaction between the planets, observation of the orbit of the planet nearest to the sun revealed a small and puzzling discrepancy.

Several researchers attempted to solve this mystery and, still in the 19th century, but only just, a German schoolteacher named Paul Gerber in 1898 presented in *Zeitschrift f. Math. u. Phys.* **43** p. 93 a theoretical result giving the precise value of the anomalous advance of Mercury's perihelion as now measured by astronomical observation. He had assumed that the action of gravity propagates at the speed of light.

Physicists well know that Einstein, some 17 years later, claimed this result as a consequence of his General Theory of Relativity, so we will return to this theme in Chapter III of this work.

The Aether

Meanwhile, still considering the physics of the 19th century, let us now examine another problem related to the speed of light. The universally-accepted belief of the scientific community was that the speed of light c was regulated by the action of an omnipresent aether which provides a universal frame of reference relative to which the speed of light is constant. On that basis experiment should have allowed detection of the Earth's motion through enveloping space, but in 1887 when an experiment to test this was performed by Michelson and Morley no such motion was indicated. It was then evident that physicists had made a false assumption. The properties of the aether were not fully understood.

On this subject, dating back to Clerk Maxwell's research of 1861-1864 period, the concept of electric charge displacement as a property of the aether related to its ability to store electrostatic field energy and its electromagnetic wave propagation properties had underpinned faith in the reality of the aether.

The dilemma confronting physicists on this aether issue was rooted in an unresolved question as to whether the aether, though invisible, was a fluid medium or a rather subtle solid medium in that it exhibited properties that implied a measure of rigidity. The problem had, in fact, been complicated by the theoretical findings in 1839 of Samuel Earnshaw as reported in *Transactions of the Cambridge Philosophical Society* 7, pp. 97-114 (1842). It was logical for the aether to be regarded as a system of electric charges of overall-neutral composition, an aether that defied detection except by its ability to store energy and regulate the speed at which light propagates through space.

Note that a century before, in 1733, the Frenchman du Fay had introduced the concept that electricity was capable of flowing, as a fluid, this fluid then being deemed to be of two kinds as if in particle form, with like pairs repelling and unlike pairs attracting.

Earnshaw had, it seems, recognized the need for the aether, if composed of electric charges, positive and negative, in equal numbers, to define a kind of crystal structure as a frame of reference for light propagation. However, by his famous theorem of 1839 Earnshaw proved by rigorous mathematical analysis that such a stable aether structure was impossible given our understanding of the law of force known to be operative between discrete electrical charge forms. If the aether existed, chaos had to prevail, there being no orderly form that could be possible.

Sadly, just as there had been error in physicists merely assuming that the speed of light is constant and referenced on a universal frame defined by the aether, so Earnshaw had erred in his assumption that the aether is merely composed of electrically charged particles sitting in a void. There is an alternative he had not considered, but enlightenment on this all-important topic did not emerge in the pre-Einstein era.

Also, although there had been a major advance of knowledge on the subject of electrodynamics during the 19th century, that field of physics, founded as it is on experiments measuring interaction between electric current in closed circuits and electric charge in motion, lacked specific experimental proof for electrodynamic interaction between two discrete electric charges in motion. Here was a field of physics intimately dependent upon the aether in interpreting the action between electric charge in motion that offered scope for measuring the earth's motion through space. Yet, when an experiment involving a charged capacitor, and so two discrete spaced-apart charges deemed to share the Earth's motion through space, failed to detect that motion, it was immediately inferred that here again was proof consistent with the finding of the Michelson-Morley experiment that challenged belief in the

aether. The experiment was that performed in 1903 by Trouton and Noble in *Proceedings of the Royal Society*, **72**, 132 (1903).

So the scene was set giving Einstein in 1905 his reason and opportunity for advancing the notion embraced by his Theory of Relativity, the notion that what we observe in physics takes as its true frame of reference the frame defined by the observer, even though that observer is moving through enveloping space.

Now, if the reader well understands and, having checked every step in the mathematics involved, really believes what Einstein has presented by his Special and General Theory of Relativity, it is unlikely that he or she will be swayed by what is disclosed in the pages which follow.

However, if the reader admits to doubt and to being just a little mystified by Einstein's teaching, there should be interest in asking oneself, in this centenary year of 2005, how physics might have developed if we had never heard of Einstein or his theory.

To be sure, given, as we shall see, that $E = Mc^2$ was self-evident from J. J. Thomson's research and given the needed modification of Newton's law of planetary motion in the light of the prior efforts of Gerber and others, all that was needed to exclude Einstein doctrine was to reinforce the work of Clerk Maxwell on the question of the aether by correcting for Samuel Earnshaw's error. That error should have been so obvious, given that the aether had been seen more as a fluid than as a mere system of particles.

Now I well know that few physicists are likely to be familiar with Earnshaw's Theorem. I had never heard of it until, many years ago, a paper I had written was rejected on the strength of that theorem. I then traced Earnshaw's original work in the records at Cambridge University and saw that what I had been working on myself had a feature that made the theorem irrelevant. Soon thereafter, in 1966 and because it included an account of Earnshaw's Theorem, I purchased a textbook entitled *The Mathematical Theory of Electricity and Magnetism* published by Cambridge University Press in its fifth edition, its author being Sir James Jeans. On page 167 one finds that Earnshaw's Theorem is:

A charged body placed in an electric field of force cannot rest in stable equilibrium under the influence of the electric forces alone.

The proof is then given, but I knew when I read this that there was a flaw somewhere in the argument, one which I could see depends upon use of Laplace's equation. The proof depends upon whether an energy term in the analysis can have a true maximum or minimum and Jeans argues that this is impossible from use of the Laplace equation by reference to preceding

argument on page 43 of his book. This made reference to another theorem headed 'Deduction from Law of Inverse Square', the theorem being:

The potential cannot have a maximum or a minimum value at any point in space which is not occupied by an electric charge.

Jeans had missed seeing that Earnshaw's Theorem is only valid for interaction between discrete electric charges that exist within a void. Here was the flaw in Earnshaw's Theorem. We can contemplate an aether comprising a continuum of uniform electric charge density permeated by discrete charges of both polarities but with a surplus of those of charge polarity opposite to that of the continuum so as to render the aether electrically neutral overall. If the aether has such a form then one can have stable equilibrium between an array of charges such as might define a frame of reference.

Furthermore one can contemplate such frame-structured segments of aether latching on to a material body such as an atom or larger object and sharing the motion of that body with charges breaking away at collision boundaries between such moving segments of aether only to find their way to separation boundary regions and reform as part of the frame structure.

On page 168 of his book Jeans states:

One physical application of Earnshaw's Theorem is of extreme importance. The theorem shows that an electron cannot rest in stable equilibrium under the forces of attraction and repulsion from other charges, so long as these forces are supposed to obey the law of the inverse square of the distance. Thus, if a molecule is to be regarded as a cluster of electrons and positive charges, then the law of force must be something different from that of the inverse square.

Here the case then put by Jeans imposed limitations on the structure of matter as close-clustered compositions of elementary charge, all by appeal to Earnshaw's Theorem. The advancement of particle theory as well as aether theory has accordingly been badly affected by this adherence to a theorem that has erroneous foundation.

Indeed, as I stated at p. 88 in my book *Modern Aether Science* published in 1972:

The search for quarks seems to be an effort mounted in ignorance or defiance of the great work of the Reverend Samuel Earnshaw.

The modern notion that a proton comprises a stable union of three quarks seems to be forbidden by the teachings of Jeans based on Earnshaw's Theorem.

The reader might now well ask why it has taken the 166 years that has elapsed so far since Earnshaw announced his theorem but yet physicists are ignoring his error and not reviving interest in the aether. All I can say is that I have done my best to draw attention to this issue but the physics community does not listen. I am, however, not the first to discover the error, because I found that W.T. Scott wrote a paper entitled *Who was Earnshaw?* It appeared in the *American Journal of Physics* **27**, p. 418 in 1959. Later, in 1966, Scott wrote a book entitled *The Physics of Electricity and Magnetism* published by Wiley and one finds that at p. 41 he too records his discovery that there is a flaw in the derivation of Earnshaw's Theorem. He writes:

In a region of continuous charge distribution, a maximum or minimum could exist, but a continuous distribution is an idealization. We have to consider each electron or proton as an isolated charge, so that pure electrostatic equilibrium is impossible.

Whereas physicists in general have applied Earnshaw's theorem to deny that the aether can exist in a form containing a structured array of electric charges and so give us insight into the aether properties pertaining to electromagnetic wave propagation, Scott, aware of the flaw in that theorem was content with his assumption that charge can exist only if pervading a true void so excluding the possibility that charge, being self-repulsive, cannot spread to fill that void!

Surely we cannot just drift along by relying on our assumptions and, especially in this Einstein centenary year 2005, accepting a theory of relativity that is of no help in finding our way forward in the quest to discover a Unified Field Theory linking gravitation with our electrical underworld. The aether has to be revived, its structure formulated and the geometry of that three-dimensional structure deciphered so as to evaluate theoretically the one fundamental constant that is governed by the quantum underworld, meaning the aether. That constant, known as the fine-structure constant, which links electron charge, speed of light and Planck's constant as a mere numerical quantity, is the very signature of the aether. It has been measured with high precision but where, in accepted physics, is its theoretical explanation? It cannot be explained without probing the very structure of the aether.

That has been my personal quest, one which seemingly has now become that of leap-frogging 100 years, the Einstein Centenary (1905-2005), albeit taking notice of the evolution of quantum theory and discoveries in particle physics. Accordingly, this account becomes a two-fold introduction. Firstly, it introduces the reader to the state of physics of the pre-Einstein era, meaning the physics which Einstein claimed as his territory but which really had been discovered by others in earlier years. Secondly, it introduces the reader to this

author's work 'The Physics of Creation' which does provide the long-sought Unified Field Theory that eluded those adhering to Einstein's philosophy.

Apart from one final comment, this therefore concludes the introductory Chapter I of this work. Chapter II will be brief in showing how $E = Mc^2$ and the related increase in mass of an electron with speed, the torch bearer of The Theory of Special Relativity, featured in pre-Einstein thinking. Chapter III will show how pre-Einstein thinking can resolve the mystery posed by the anomalous perihelion advance of planet Mercury, the jewel in the crown that glorifies the General Theory of Relativity. This leaves the concluding Chapter IV to herald the way forward to the discovery of the Unified Field Theory that eluded Einstein.

Thereafter it is for the reader to decide whether he or she can contribute to the onward progress of physics, if only by teaching students to question and resolve doubt as they tread, step by step, along the thorny path that leads to the ultimate truth concerning the natural phenomena of our universe. The path has to lie in the real world and not the world of imagination described by Professor Paul Davies in his book *The Last Three Minutes* published in 1994. It was a book aimed at the educated but non-specialist reader and required no prior knowledge of science or mathematics. On page 20 of that work one is told that:

Einstein's General Theory of Relativity proposes that gravity is actually a manifestation of curvature, or distortion, of space (strictly space-time). In a sense space is elastic, and can bend or stretch in a manner that depends on the gravitational properties of the matter in it.

So there you have a picture of space according to Einstein, but do you understand what that means? Three pages later on page 23 Davies has introduced the notion that the universe is expanding and this is somehow illustrated in a figure which shows a curve relating 'size' with 'time', followed by the question "Are we justified in extrapolating the curve all the way back to the beginning?" You are left to answer this yourself, guided by his statement:

Remember that the expansion being graphed here is that of space itself, so zero volume does not mean merely that matter is squashed to an infinite density. It means that space is compressed to nothing.

He goes on then to say that 'the same basic idea applies to time' but I am sure the reader will share my view that this is all mere nonsense, even though addressed to the reader who has no command of mathematics. It is as if matter exists and space, whatever that is, is expanding and changing form around it. I have an adequate knowledge of mathematics to say with equal

force that the mathematics that one sees in Einstein's General Theory of Relativity as portraying space-time in four dimensions does not convey any real understanding of the nature of space or the action of gravity. Why, one must ask, is it necessary to formulate physics in a four-dimensional metric that one cannot visualize only then to transform its predictions back into the three-dimensional world in order to compare its results with what we measure? That is merely telling us to wear a pair of spectacles of special formulation in order to distort what we see naturally in the hope that it will clarify our vision of things.

Those who believe what they see by wearing those 'relativistic' spectacles ought to cast them aside and, with natural eyesight, read, after Chapter II, what I have to say in Chapter III.

Chapter II

E = Mc² : Pre-Einstein

Was the formula $E = Mc^2$ part of physics in the pre-Einstein era, i.e. before 1905? If so, why does the world regard $E = Mc^2$ as the symbol of Einstein's genius? Was the related notion that energy released by the destruction of matter and so reduction of mass of record before 1905?

I will not attempt to answer the second of these questions. Concerning the first and third questions, I merely refer to and quote from the book *The Recent Development of Physical Science* by W. C. D. Whetham published in 1904. Whetham was a Fellow of Trinity College, Cambridge, the venue of J. J. Thomson. Remember, as was stated in Chapter I, that J. J. Thomson discovered the electron in 1897 and then, in 1901, Kaufmann discovered that its mass increased with speed.

On page 283-284 of Whetham's book:

The property of mass is explained by electron theory as an effect of electricity in motion. The quantitative value of the effect has been calculated by Thomson, Heaviside, and Searle. Definite experimental evidence has been given by Kaufmann, who finds that the ratio e/m of the charge to the mass for the corpuscles ejected by radium diminishes as their velocity increases. The charge is almost certainly constant, and thus the mass must increase with the velocity. Theory shows that, for a slowly moving corpuscle, the electric inertia outside a small sphere of radius a , surrounding the electrified particle, does not depend on the velocity and is measured as $2e^2/3a$ where e is the electric charge on the particle. But when the velocity of light is approached, this electric mass grows very rapidly; and, on the assumption that the whole of the mass is electrical, Thomson has calculated the ratio of the mass of a slowly moving corpuscle, and compared these values with the results of Kaufmann's experiments.

In this remarkable manner has it been possible to obtain experimental confirmation of the theory that mass is an electrical or aethereal phenomenon.

Included here in the space between these paragraphs was a tabulation showing Kaufmann's measurements of speed and the ratio mass at speed to mass if slowly moving, the data ranging up to 95% of the speed of light. As

part of the tabulation Thomson's calculated mass ratios were presented side-by-side to show the agreement.

On page 280 of Whetham's 1904 book, following an earlier reference to Thomson's ideas concerning radio-activity, one reads:

A more fundamental suggestion has been made by J. H. Jeans, who imagines that radio-activity may result from the coalescence of positive and negative electrons. On this idea, the energy of radio-active atoms is supplied by the actual destruction of matter.

So you see, if visions of the atomic bomb and nuclear power arise as commendation in support of Einstein's greatness as encapsulated by the formula $E = Mc^2$, then just ask yourself why Jeans was not given credit for his 1904 idea. It was published in the journal *Nature* on June 2, 1904 at page 101 of volume **70**.

Jeans himself was quite modest in expressing an opinion as to who should be given credit for recognizing mass-energy transmutability. In his 1929 book *EOS or the Wider Aspects of Cosmogony* he states at page 36:

More than twenty years ago I directed attention to the enormous store of energy made available by annihilation of matter, by positively and negatively charged protons and electrons falling into and annihilating one another, thus setting free the whole of their intrinsic radiation. On this scheme neither energy nor matter had any permanent existence, but only a sort of sum of the two; each was, theoretically at least, convertible into the other.

When I put forward this hypothesis, I thought I was advocating something entirely revolutionary and unheard-of, but I have since found that Newton had anticipated something very similar exactly two centuries earlier. In his 'Optics' (1704) we find:

'Query 30. Are not gross bodies and light convertible into one another; and may not bodies receive much of their activity from the particles of light which enter into their composition? The changing of bodies into light, and light into bodies, is very conformable with the course of Nature, which seems delighted with transmutations.

Now, as to the formula $E = Mc^2$, a discerning reader having a modest background knowledge of physics based on the electrical system of units familiar to scientists of the late 19th century can easily show that an electric charge e contained within a sphere of radius a will have an external electric field energy of $e^2/2a$. Yet J. J. Thomson had reason to believe that the energy E of the electron was $2e^2/3a$ and that this energy accounted for its mass M . No doubt he arrived at this result by assuming that the magnetic field energy

owing to the motion of e at speed v is $(e/c)^2v^2/3a$ and regarding this as the kinetic energy $Mv^2/2$. Do the calculation yourself. It is a very easy task for any physics student who has been introduced to the theory of electromagnetism. The speed parameter c has come into the act owing to electrostatic units being related to electromagnetic units by the ratio c .

From the equality:

$$Mv^2/2 = (e/c)^2v^2/3a$$

such a physics student will see that:

$$Mc^2 = 2e^2/3a$$

which is the energy E that J. J. Thomson recognized as that of an electron of charge radius a .

So, although the specific formulated prescription $E = Mc^2$ does not appear in the 1904 text by Whetham concerning the then-recent development of physical science, the physics it represents was there and had been well presented in mathematical terms.

Indeed, should the reader be puzzled as to the physics implied by the energy $2e^2/3a$ for an electron at rest, just accept that within the radius a the charge e is distributed so as to set up a uniform energy density distribution or pressure, with its internal electric field intensity being the same as that at its surface radius a . You will see that this adds $e^2/6a$ to $e^2/2a$ and so gives $2e^2/3a$ as the energy E , which from the forgoing equation gives us $E = Mc^2$.

In my opinion, therefore, there is no reason to attribute to Einstein's genius our acceptance that $E = Mc^2$. Nor, indeed, do I think that J. J. Thomson's formulation provides the ultimate insight into the physics governing this energy-mass relationship.

So, still looking at physics of the pre-Einstein era, I draw attention to the discovery made by Larmor in 1897 as reported in *Phil. Mag.*, **xliv**, p. 503. He presented a formula for the rate of loss of energy from a charge q having an acceleration f which has since been very widely applied in physics and astrophysics. The formula is:

$$dE/dt = 2q^2f^2/3c^3$$

a formula that can be used to calculate the rate of energy radiation from a radio antenna in which current oscillations are sustained by accelerating and decelerating a collective system of charge q formed by numerous electrons each of charge e .

Next have regard to the fact that 1897 was the very year in which J. J. Thomson discovered the electron by an experiment which measured its charge/mass ratio and note that the Larmor formula includes the acceleration f but no term representing mass. It was derived by calculating field energy in terms of current and by assuming that electromagnetic wave radiation occurs at the speed c and conveys energy at that speed.

A question of interest which surely should have then been considered in the light of these 1897 events was whether each individual electron making up that charge q shares in the act of energy radiation or whether the source of the energy radiated was the interaction field set up by the numerous electrons as a collective action. In other words, does Larmor's derivation of that formula, allow one to say that, q being Ne and N electrons sharing that acceleration f , the radiation energy rate is:

$$dE/dt = 2(Ne)^2f^2/3c^3$$

or should it be:

$$dE/dt = 2N(N-1)e^2f^2/3c^3$$

Quite obviously, since N , as it applies to electric currents strong enough to excite a measurable amount of energy radiation, will be truly enormous, there can be no experimental data allowing one to distinguish between these two formulations. So one is left to look at how the formula is derived. In this respect it is not sufficient to say "Let there be acceleration and let f signify its rate." Instead, one must provide an electric field that acts on the charge to account for the force which produces that rate of acceleration. That must introduce an electron mass term. Given the presence of such a field at the source of any wave radiation, that field must interact with the fields of the charge accelerated and so affect the calculation.

Larmor's derivation overlooked this requirement. Had it been taken into account it would have been found that there was a condition by which each individual component charge contributing to current flow would not radiate energy itself. That condition is that the self-action of the electric field of each charge e has a field energy E that is equal to the mass M of the electron multiplied by the square of a speed term, the speed being that at which a field disturbance propagates within the body of charge e owing to the acceleration.

In other words, if each individual electron reacts to an accelerating electric field so as to avoid radiating any of its energy then one obtains a formula of the form $E = Mc^2$. The Principle of Conservation of Energy is surely the true basis of that formula. Larmor could have derived that formula in that year 1897 had he explored this possibility, namely the need to allow for the cause of the acceleration rather than merely assuming a state of acceleration and considering the field energy of propagated waves in regions remote from the radiating source.

For readers interested in the analysis involved in correcting this omission see the section entitled **The Energy-Mass Formula** at pp. 80-84 in my book *Physics Unified* (1980) which is accessible on my website www.aspdn.org

Just consider the consequences that would have emerged from the realization back in 1897 that the electron's property of inertia arises from the electron's energy-preserving reaction to an accelerating field. It is not just the formula $E = Mc^2$ that would have made its debut but the relevance this would have had in supporting that hypothesis by Jeans in 1904 that there is transmutation of matter and energy, the forerunner of our insight into nuclear power. More than this, however, as the picture of the hydrogen atom emerged as a proton with a satellite electron subject to acceleration owing to its orbital motion, so it would be understood why its energy is not radiated. Quantum theory would not then have been seen as a mystery subject governed by empirical rules. The multi-electron atom would have been seen as a system of charge in which the electrons adopt orbits according to their energy level that are configured to allow them to avoid collective field interaction that generates energy radiation. I have discussed this in a paper that was published on my website in 1997. See Essay No. 6 in the technology section of www.energyscience.org.uk

So do not say "Quantum theory explains why an atomic electron does not radiate its energy" but rather say "Because $E = Mc^2$ arises from the energy conservation property of an accelerated electron, so this explains the very basis of quantum theory, and where an atom has more than one electron the orbital configuration is restricted and must be such as to avoid radiation according to the Larmor formula, $N(N-1)$ version."

Those years from 1897 to 1904 were indeed years of enlightenment in physics, sadly darkened by the demise of belief in the aether owing to that error in Earnshaw's Theorem.

It is, by the way, well established by classical electron theory, thanks to J. J. Thomson, that an electromagnetic field has momentum and that the momentum of any system is equal to its energy multiplied by the velocity of the centroid of its energy and divided by the square of the velocity of light. Student textbook instruction on this, quoting a book I had in my last school year (1945), namely p. 10 of H. A. Wilson's *Modern Physics: Second Edition* 1944, presents the momentum M as Ev/c^2 and defines the mass m of the particle as M divided by the velocity v so that $m = E/c^2$. Then if the energy E and mass m when the particle is at rest or when $v=0$ are denoted by E_0 and m_0 , the kinetic energy of the particle is given by $E-E_0$ or $c^2(m - m_0)$.

The argument then proceeds on the basis that, if a force F acts on such a particle along the direction in which it is moving, and we suppose that there is no loss of energy by radiation (the very basis of this author's derivation of $E = Mc^2$), then we have:

$$F\delta t = \delta M$$

and: $Fv\delta t = \delta E = c^2\delta m$
 so that $v\delta M = c^2\delta m$, or since $M = mv$, $M\delta M = mc^2\delta m$.

Integrating this gives $(M)^2 = (mc)^2 + \text{const.}$, so that, since $m = m_0$ when $M = 0$:

$$(M)^2 = (mc)^2 - (m_0c)^2 = (mv)^2$$

As can be seen from the latter part of this equation, this means that we have derived the standard formula for the increase of mass as a function of v , the formula that Einstein claims to be the result of his special Theory of Relativity. Yet we have not applied any notion stemming from Einstein's theory and all we have done is to quote the findings of classical electron theory.

Now the reason I have presented this analysis is to allow me to pose the question as to whether this so-called relativistic mass increase formula applies to a planet in orbital motion around the sun. Look at where v was introduced into the analysis. The argument began from the assumption that the particle was at rest with $v = 0$, but the word 'rest' implies a frame of reference. So what is that frame of reference for a planet in motion around the sun? Is it the sun or is it the galaxy to which the solar system belongs or can it be the hypothetical universal frame of reference that was assumed in the 19th century? Since energy is added by motion and none is radiated, the $v = 0$ condition applies at the moment when the particle was first created. That is an interesting point given the notion of Big Bang creation and an expanding universe.

The derivation of $E = Mc^2$ requires c to be referenced on the charge of the accelerated particle but v would be meaningless if we took that charge as its reference frame. So physicists have a problem. We are guided to the answer from the experimental evidence that electrons here on Earth exhibit the mass increase according to their motion relative to the Earth frame which I see as an aether charge lattice structure sharing the Earth's motion through space. Electrons, you see, do not have the structure needed to form their own aether lattice system. Atoms other than hydrogen do, but such atoms are electrically neutral overall and so cannot be tested experimentally to see if they increase in mass with speed, as they cannot be accelerated in a cyclotron. This suggests that our Earth cannot itself exhibit the relativistic mass increase.

The answer, however, must depend upon what is the true nature of kinetic energy. Given that an accelerated charge has inertia in just the right measure to preclude radiation of energy, if it moves owing to the action of an electric field it will have to store its kinetic energy in its field system. That involves charge displacement in the enveloping aether lattice, for both the electric and the magnetic fields, energy which is stored and which is

recoverable on slow down. I see that local aether lattice as essential if the energy added as kinetic is to be carried along with the source particle and thereby add to the mass in motion. A further point of interest, having that time of particle creation in mind, stems from the question of whether the charged particles that constitute matter have a finite lifetime and whether, upon decay, since surplus energy in the aether system is no doubt shed in creating protons in company with electrons, the matter now constituting body Earth has actually emerged by creation within the Earth's own aether lattice frame. Surplus energy in the aether surely is the energy source accounting for the creation of matter in the form of protons and electrons and it seems logical for our Earth to be subject to ongoing decay and recreation of matter. Even if the mean lifetime of a proton were 1,000,000 years that is minute compared with the age of our Earth.

This may be speculation but it can explain why the kinetic energy of a planet is not subject to relativistic mass increase as a function of the planet's speed in orbit around the sun or, indeed, its speed relative to a universal reference frame implied by the anisotropy of cosmic background as evidence by its temperature.

$E = Mc^2$ arises from the conservation of energy when a particle is accelerated as we have found by correcting for the error in Larmor's formula. H. A. Wilson, in that book: *Modern Physics*, referenced above came close to seeing this error when, after deriving the Larmor radiation formula on pp. 15-16, he stated:

Electromagnetic radiation is obtained in practice from electrical oscillations produced by the discharge of a condenser through a wire. In such cases, in which enormous numbers of electrons are involved the radiation obtained agrees with that calculated by electromagnetic theory. Radiation from single electrons has not been observed, and according to the Quantum Theory, the electrons in atoms do not radiate when they are moving round orbits and so have an acceleration. The success of quantum theory makes it possible that the expression just obtained for the radiation from an electron is erroneous.

Here, you see, was a student textbook pointing to something needing correction but implying that quantum theory was the governing factor, whereas the student really needs to correct the error and apply the law of conservation of energy and thereby show that a single electron avoids radiation by having an inertia that requires E to equal Mc^2 and from that discover that $E = Mc^2$ derived in this way gives foundation for quantum theory.

The reader should now begin to see that the Einstein interlude from 1905-1916, having put mathematics on a mental plane taking precedence over physical understanding, then helped to make quantum theory appear as a kind of mystique defined by a set of rules rather than something governed by true physical factors common to the roots of $E = Mc^2$.

Such, therefore, is my verdict on Einstein's Special Theory of Relativity. It has reached its centenary and has explained nothing that was not amenable to explanation before Einstein appeared on the scene in 1905.

Let us now in Chapter III take stock of Einstein's General Theory of Relativity.

Chapter III

Concerning Gravitation and Planetary Motion

Angular Momentum

Here one must begin by noting that one of the greatest mysteries in science is the problem of how stars form and acquire their angular momentum. From the time of Isaac Newton we have accepted the fact that self-contained dynamic systems somehow contrive to conserve their angular momentum. The logical proposition is that, if stars form by matter condensing somehow from whatever it is that constitutes the aether, then the angular momentum is acquired by transfer from that medium which permeates all space, the aether. The illogical proposition adopted by most cosmologists is that there is no aether and that the universe emerged seemingly from nowhere at time 'zero' and in an event they call the 'Big Bang' with stars appearing with spins of opposite sense so as to have net zero angular momentum.

Either way the prevailing principle is that angular momentum is conserved, but, as noted in Chapter IV ahead, the truths governing the process of stellar creation can only be ascertained by probing the one route that is amenable to analysis, namely the pathway that eluded Samuel Earnshaw. For the purpose of this chapter it suffices to accept without question that the angular momentum of a stellar system, such as the sun and its planets, is conserved and that there is little or no exchange of angular momentum as between planets over the course of the 100 year period 1905-2005 since Einstein introduced his theory.

I well recall a meeting I had at Cambridge in an effort to put across my ideas about the aether. It was with Dr. Sciama and a few years on from the year 1954 in which we had both received our Ph.D. degrees from that university. He listened but his reaction was summed up by his words: "We all believe the aether exists, but we call it 'space-time'."

Quantum theory hides by its mathematics the physical picture of how fundamental particles, electrons, protons etc., are created, meaning their source and their acquisition of angular momentum when they form into atoms and there seems to be no way that Einstein's theory with its 'space-time' (or is it 'four-space'?) can get into that act. Therefore, I hold firm in saying that the truth is to be found by probing Earnshaw's vision of the aether based on a charge continuum permeated by the virtual particles, be they electrons, muons or taons that occasionally present themselves in a ghostly way in our particle experiments. Somehow also such aether particles are involved in the

storage of energy and angular momentum in what we see as empty space, be it a vacuum between the plates of a charged electrical capacitor or a vacuum region within the solenoid of a magnetic inductor.

For the moment, however, we will proceed by addressing the question as to how electrostatic action or gravitational action traverses the space between two interacting particles.

Propagation

35 years ago, in 1970, a book entitled *Relativity Reexamined* was published by Academic Press. Its author was Leon Brillouin. After discussing subjects such as the gravitational deflection of light, redshift of spectral lines in a gravitational field and the perihelion anomaly of Mercury, all derived from the same equation and purporting to be proof of Einstein's Theory of General Relativity, he concludes on page 55:

There is no experimental check to support the very heavy mathematical structure of Einstein. All we find is another heavy structure of purely mathematical extensions, complements, or modifications without any more experimental evidence. To put it candidly, science fiction about cosmology - very interesting but hypothetical. Altogether we have no proof of the need for a curved universe (space plus time) and the physical meaning of the theory is very confusing.

Now, of course, I could not resist drawing the reader's attention to the above verdict by an eminent scientist, having expressed similar views above by reference to that book by Paul Davies. 'Science fiction about cosmology - very interesting but hypothetical' - a comment that applies equally to the notion of a 'Big Bang'. However, before coming to that in Chapter IV, let us dispose of the General Relativity issue.

That book by Brillouin had a page between the Preface and the Introduction and at the bottom of that page one reads:

To form any notion at all of the flux of gravitational energy, we must first localize the energy. Heaviside - 1893

Oliver Heaviside was said by Brillouin (at page 103) to be 'the forgotten genius of physics, abandoned by everybody except a few friends'.

So, once again reverting to the physics of the 19th century and now paying tribute to Heaviside, I ask if physicists interested in the propagation of energy by gravitational action have tried their hand at the necessary calculation. It does not need the kind of mathematics that go with Einstein's theory - just the level of mathematics that I had been taught at school as a 17 year old.

Indeed the calculation is surprisingly easy (see the section entitled **Retardation** at pp. 24-25 in my book *Physics Unified* (1980) which is accessible on my website www.aspdn.org) if all one seeks to know is the mean range of interaction field energy deployment as referenced on either of the interacting bodies. If they are spaced apart by a distance R , there is zero net interaction energy within a sphere of radius R centred on either body. Beyond the radius R the net interaction energy decreases inversely with distance squared as does the self-interaction energy of either charge. What this means is that, if applied to sun and planet interaction, any change of kinetic energy of the planet as it describes its orbit must traverse the mean distance R in going to or from the field.

So, if we now make the normal assumption that energy propagation through so-called empty space must be at the speed of light c , we define a time retardation period T that is R/c .

Now, whereas that calculation is so simple, there is something of extreme importance that one has to consider but which has been overlooked for too long. We understand that a body moving under its own inertia and subject to no external force will continue moving at the same speed in a straight line. That is easy to comprehend and one might easily assume that no energy is being supplied to or shed by the moving body during such motion. The enveloping field energy shares the motion of the body and there is no interaction field energy involved.

That said, now consider motion about a centre to which the body is attracted by gravity, motion at a steady speed in a perfect circular orbit. Here we do have field interaction energy. The kinetic energy of the body is not changing but somehow the distribution of that field energy is changing. There are then two ways in which that energy can redeploy. Numerous elements of it may go directly to their new location as the bodies change position or the energy involved has to traverse the distance R from the field to one or other of the bodies and thence the same amount of energy has to traverse the same distance R in going to the new field position by a different route.

Without engaging in a quite extensive computer-assisted mathematical calculation it is hardly possible to estimate the retardation effect in the first of these cases. One could hope the answer might be identical to that of the second case, namely a mean retardation time of R/c but that question is left open. Alternatively we could proceed empirically and let experimental observation tell us what the time delay really is.

Let us see then how retardation affects the planetary orbit. Note that we have gravitational potential energy of GMm/R as the field interaction energy. Here G is the constant of gravitation, M is the mass of the sun and m the mass of the planet. Consistent with the force of attraction this energy is a negative

quantity, which means that if some of that energy is deployed in transit owing to retardation effects it has to be associated with a gravitational potential of higher magnitude. In other words G will be effectively increased in proportion to the amount of energy in transit.

Consider the planet moving along a linear axis x but deflected so as to progress in a direction y at right angles to x . The motion is in a circle of radius R but motion along x at speed v will be opposed by the action of a central force F resolved along x , meaning a force $F\cos\theta$, where $\cos\theta$ is equal to vt/R after a time t . The energy shed by motion in the x direction is then the time integral of $vF\cos\theta$ or of $F(v^2)t/R$, which is $F(v^2/R)t^2/2$ in time t , whereas the energy gained owing to accelerated motion in the y direction is that of the central force F acting through the distance $ft^2/2$ and so is $Fft^2/2$, f being the centrifugal acceleration rate. As can be seen, since f is (v^2/R) , these are equal quantities, meaning that the kinetic energy of the planet is constant in its circular orbit, but that the total amount of energy in transit at any instant is $F(v^2/R)T^2$, t having been replaced by the retardation period T .

With T as R/c this energy in transit becomes $FR(v/c)^2$ and what this means, since the force F is GMm/R^2 , is that the gravitational energy potential GMm/R or G , effectively, is enhanced by that factor $(v/c)^2$.

So now we are in a position, based purely on classical physics of the 19th century, to understand how the Newtonian equation of planetary motion can be affected by retardation in the propagation of gravitational action.

Taking a basic equation from a book by A. S. Ramsey entitled *Dynamics*, published by Cambridge University Press, another school textbook I have had since my final school year in 1945, the Newtonian differential equation of the planetary orbit is:

$$d^2u/d\theta^2 + u = \mu/h^2$$

when expressed in polar co-ordinates (R, θ) where R becomes $1/u$. Here h denotes the velocity moment vR and μ is proportional to G .

On the same page of that book, page 175, Ramsey presents the corresponding Einstein Law of Gravitation and goes on from there to show how this leads to the value of the anomalous perihelion advance measured for planet Mercury. The Einstein version is:

$$d^2u/d\theta^2 + u = \mu/h^2 + 3\mu u^2$$

provided, as Ramsey notes, v is measured in units of the speed of light but, of course, this Einstein law must still apply even if the planetary orbit is not elliptical.

We are still looking at a truly circular motion to consider the effect of retardation. Consider then the effect of enhancing the energy potential represented by G and so μ by that factor $(v/c)^2$. Note then that $(v/c)^2$ is proportional to $(h/Rc)^2$ and gravitational energy potential is proportional to

$1/R$, which means that in terms of force, the basis of derivation of the equation for the planetary orbit, we find, owing to having to differentiate with respect to R the $1/R^3$ factor introduced by that $(v/c)^2$ term to convert energy to force, that $3(v/c)^2$ is the factor needed to enhance μ in the Newtonian equation to allow for the retardation effect. One then can see that:

$$(1 + 3(v/c)^2)(\mu/h^2) = (1 + 3(hu/c)^2)(\mu/h^2) = \mu/h^2 + 3\mu u^2$$

when c is taken as unity.

Note that h is has been assumed to be constant, consistent with angular momentum being constant and the mass of the planet being deemed not to depend upon v for the reasons discussed in Chapter II.

So there we are. We have derived the same formula as Einstein without the imaginary mathematical excursion into the mysterious dimensions of four-space or space-time and have merely adhered to 19th century physics.

If the planetary motion is not truly circular then, provided one can measure the advance of perihelion implied by the extra term, as we can for planet Mercury, then we can by the reverse argument deduce that the retardation time T is, in fact, R/c , thereby verifying that the gravitational action is subject to propagation at the speed of light.

It was in 1898 that Gerber, the German school teacher mentioned in Chapter I, wrote his paper entitled: "The Space and Time Propagation of Gravitation" and derived in it a formula for the anomalous advance of the perihelion of planet Mercury that was exactly the same as the one presented by Einstein in 1916 in support of his General Theory of Relativity. This led in 1917 to a still unresolved debate between Seelinger and Oppenheim. See *Ann. d. Phys.*, **52**, 415 (1917), **53**, 31 and 163 (1917), **54**, 38 (1917). The debate was on whether speed-of-light retardation in gravitational action really accounts for the phenomenon observed. It is curious therefore that Einstein did not acknowledge Gerber in his writings on the same subject, as, for example, by questioning how Gerber had derived what he claimed.

One surely must question the sense of accepting Einstein's notion that what we perceive so clearly as space having three mutually-orthogonal dimensions is really space distorted into four dimensions by an imaginary time factor, when a retarded force action based on classical physical concepts can provide a full account of what is observed. Gerber may have erred in his mathematical analysis of the problem, but that merely opened the challenge for someone to complete the task. Instead we have embraced Einstein's theory and now, some 90 years on from 1915 when Einstein first wrote about Mercury's perihelion anomaly, we remain defeated in our attempts to discover that Holy Grail, the Unified Field Theory.

I, as author, must exclude myself from that term 'we' in view of what I shall disclose in Chapter IV. It will, I am sure be seen as justification for this

critical attack on Einstein's theory. As to that 'Holy Grail', the assumption has been that a Unified Field Theory will connect gravitation and electromagnetic theory, whereas the argument followed above has been based on a field energy distribution that is the same as that of the electrostatic action. Analysis of the magnetic field energy distribution in the interaction field of two moving electric charges reveals a different distribution pattern which implies less travel distance for energy in transit and so would not result in the Einstein equation for planetary motion. See my joint paper with Dr. D. M. Eagles, published in *Acta Physica Polonica*, **A57**, 473-482 (1980).

Electrodynamic Retardation

Physicists of the mid and latter part of the 19th century interested in the effects of speed-of-light retardation of electrodynamic action did arrive at the following formula for electrokinetic potential:

$$P = (qe/R)(v/c)^2$$

for the interaction of two electric charges q , e in relative motion at a separation distance R , v being their relative velocity and c the speed of light.

This was used by Maxwell to derive the Neumann potential by appeal to the Fechner hypothesis and so the onward formulation of possible laws of electrodynamics based on a choice of different assumptions. These assumptions concerned action and reaction balance either in a linear sense or in a rotational sense or both as per Ampere but seemed to omit the one that matters, namely whether there is energy transfer as between other moving charges present and the charge pair under consideration.

It is not surprising, therefore, that an analogous formula:

$$P = (GMm/R^2)(v/c)^2$$

where G is the constant of gravitation and M , m are the masses of sun and planet respectively, was applied to account for the anomalous perihelion advance of planet Mercury. The formula, in effect, enhances G by the factor:

$$1 + (v/c)^2$$

thereby giving the same basis for modifying Newton's law of gravitation as that derived above. Indeed, as Whittaker tells us in his classic historical work on aether theory, *History of the Theories of Aether and Electricity* (Part I of 1951 edition, pp. 207-208) it was back in 1872 that Tisserand (*Comptes Rendus*, **lxxv**, p. 760), basing his analysis of retardation effects at the speed of light in electrodynamic theory, derived a figure of 14 seconds of arc per century for the perihelion advance of planet Mercury.

It was too small in comparison with what was observed and so there were other later attempts to solve the mystery in the years before Einstein claimed it to be the result of his General Theory of Relativity.

What Tisserand presumably failed to take into account was the fact, as we saw above, that this increase of G was in respect of energy potential (a function of $1/R$) and that planetary motion is expressed in terms of force (a function of $1/R^2$). The conversion makes the factor:

$$1 + 3(v/c)^2$$

and so modifies the Newtonian force equation:

$$d^2u/d\theta^2 + u = GM/h^2$$

to give the Einstein equation:

$$d^2u/d\theta^2 + u = GM/h^2 + 3GM(u^2/c^2)$$

these equations, as before, being in polar coordinates u, θ where u is $1/R$ and h is vR . However, here we have not used units for v expressed as a factor of the speed of light c and μ has been replaced by GM , M being the mass of the sun.

That 14 seconds of arc then becomes 42 seconds of arc, precisely the value of the anomalous perihelion advance of Mercury observed by astronomers.

Had this simple error in analysis been noticed back in 1872 the course of science history over the past one hundred years would have been very different. In the event it was Gerber who, in 1898, as already noted, did make a case for the 42 seconds of arc figure in terms of gravitational action being retarded at the speed of light, but even this was ignored as Einstein's four-space theme was embraced by the physics community.

Yet, our conclusion here supports Gerber's case by correcting his analysis of the retardation involved in energy transfer between field and planet and thereby proving that the physics governing gravitation need not involve Einstein's four-space concept.

The problem, however, that now arises from our above argument, founded as it is on deriving Einstein's equation of planetary motion by two different methods, both of which are based on purely classical pre-Einstein physics is that we now have to decide which method is correct. The second method, the one based on Maxwell's electrodynamic analysis using Fechner's hypothesis, would support the case for gravitation being an electromagnetic phenomenon but involves hypothesis at its roots and does not satisfy the correct retardation conditions associated with energy in transit at the speed of light besides denying gravitational action unless there is relative motion between the interacting bodies. For this reason the first method has to be favoured, meaning that a truly unified field theory will associate gravitation with electrostatic action rather than electromagnetic action.

This suggestion might raise a few eyebrows amongst the scientific community but remember that, in correcting Earnshaw's error, we have recognized that space contains an electrical charge continuum with no voids.

Atomic matter is coupled with the structured charge components of the aether that define the local electromagnetic frame of reference and when combined with coextensive charge continuum is electrically neutral overall. The only scope for gravitational action drawing that atomic matter together depends upon whether some other charge form, existing in pairs of opposite polarity and so neutral overall, has (a) freedom of motion, but (b) exists in amounts somehow related to the mass of nearby atomic matter, and (c), by its displacement of continuum charge, reduces the effect of electrostatic self-repulsion within that charge continuum. That, as we shall see in Chapter IV, is the answer to the mystery of gravitation which we find is a quantum theory of gravitation which tells us that the taon, the third member of the charged lepton family, besides the electron and the muon, is a key actor in its role as a graviton.

Suffice it here to conclude that Einstein's theory has nothing to offer so far as gravitation is concerned. Physicists who still wish to defend it must decide on that question of whether a body such as a planet is subject to increase in mass according to the teachings of Einstein's theory, meaning the relativistic formula for mass increase with speed. If not, why not? Can it be that relativistic mass increase with speed only applies to charged particles in free motion such as protons, pions, electrons, muons or taons?

Surely one must see that those who adhere to Einstein's doctrine must face up to the fact that either the General Theory of Relativity is wrong or his Special Theory of Relativity is wrong in suggesting that all bodies, charged or uncharged, experience mass increase with speed. See further comment on this in Chapter IV by reference to time-dilation.

I will now, in Chapter IV, outline the scope for progress as implied by the title words of this work *Physics without Einstein*, my preoccupation for many years, so be prepared to understand how Nature determines G, the constant of gravitation, and how Nature creates the proton and determines its mass, neither being possible if one adheres to Einstein's doctrines.

Chapter IV

The Way Forward

The Aether: A Preliminary Note

The aether was pronounced ‘dead’ by Doctors of Science obsessed with the belief that it provides a universal frame of reference for light propagation rather than containing such frames of reference dragged along by bulk matter. They had erred is not seeing the error in Earnshaw’s Theorem and erred in not being able to conceive a aether containing a multiplicity of adjacent domains containing independent charge structures that can define different electromagnetic reference frames, structures that can dissolve at collision boundaries and with the vacating aether charges reappearing at boundaries of separation.

It was in 1913 that a book entitled *Modern Electrical Theory* by N. R. Campbell was published in its 2nd Edition by Cambridge University Press. At p. 388 and concerning the above notion about a multi-structured aether one reads:

This is the simple way out of the difficulties raised by the Michelson-Morley experiment. If from the beginning we had used a plural instead of a singular word to denote the system in which radiant energy is localised (or even a word which, like ‘sheep’, might be either single or plural), those difficulties would never have appeared. There has never been a better example of the danger of being deceived by arbitrary choice of terminology. However, physicists, not recognising the gratuitous assumption made in the use of the words ‘the aether’, adopted the second alternative; they introduced new assumptions.

Campbell here meant that they turned to heed Einstein’s preaching on the subject of relativity. The result, as we have seen, is that physicists have raced ahead, making assumption after assumption, only to find themselves in a world permeated with Black Holes but have lost their way in an attempt to link the phenomenon of gravitation with electrodynamics.

Yet, the aether exists and is alive because it exhibits a heartbeat at the Compton electron frequency and because it is full of energy. 19th century physicists well knew that it can store energy by displacement of its intrinsic electric charge, as its positive and negative charge are held apart by setting up an electric field. Its pulse rate, that Compton electron frequency, was not discovered until some years after Einstein appeared on the scene, but Faraday

had shown that it can also store magnetic energy and here was the clue that should have revealed one of the aether's secrets. Whetham in that 1904 book mentioned earlier explained on p. 173 how 'magnetic force is produced at right angles both to the length and direction of motion' of 'tubes of electric force' carried along by a charged particle. So, if the aether consists of neutral cells of electric charge having motion, negative charge displaced from and moving around positive charge, it will react to an applied magnetic field. Whittaker in his book *The History of Aether and Electricity* at p. 262 tells us that Maxwell investigated this in the 'Cambridge Mathematical Tripos for 1869'. He pictured atoms deemed to 'occupy small spherical cavities in the aether, the outer shell of each atom being in contact with the aether at all points and partaking in its motion.'

One could from this picture how the effect of a magnet might act on aether charge describing an orbit in such an aether cavity and conclude that the motion of that aether charge would set up an opposing magnetic field which partially offsets the primary action of the applied magnetic field. For optimum energy storage one then finds that the reaction would halve the applied field.

Sadly, it was not until 1908 that O. W. Richardson (*Physical Review*, **26**, p. 248) suggested that when the magnetism in a pivotally mounted ferromagnetic rod is reversed, the rod should sustain an angular momentum change. It was predicted that the gyromagnetic ratio, the ratio of the change of angular momentum to the change of magnetic moment, should be $2mc/e$, where e/m is the charge to mass ratio of the electron. Curiously it was Einstein and W. J. Haas who first observed the effect in 1915 (*Verh. d. Deutsch. Phys. Ges.*, **17**, p. 152) but it was not until 1923 that W. Sucksmith and L. F. Bates (*Proc. Roy. Soc. London*, **104A**, p. 499) found that the effect was only one half of that predicted. Here was the clear evidence of the aether reaction but what did physicists then do? They still ignored the aether and invented yet another notion, the notion of 'half-spin', another arbitrary idea serving to side track genuine research into the realm of fantasy rather than reality.

Bates was later to be one of the two examiners of my Cambridge Ph.D. thesis on a magnetic energy loss anomaly and it was my first step on my aether quest following those research years to see how that factor-of-2 anomaly proved the existence of the aether by showing how it optimizes that reaction to govern magnetic field energy storage. The point was that if the free conduction electrons in a ferromagnetic rod react to half-cancel the applied magnetic field then a similar action must occur for a magnetic field set up in a vacuum, which indicates that there must be free charge in motion in the aether. See the strong evidence in support in my paper 'Crystal

Symmetry and Ferromagnetism', *Speculations in Science and Technology*, **1**, pp. 59-63 (1978).

Analysis of Aether Structure

During my Ph.D. years, essentially experimental, just as a matter of interest I delved into how electrons of adjacent atoms in a ferromagnetic crystal might interact electro-dynamically to set up mechanical strain and satisfied myself that ferromagnetism stemmed from the 3d-state electrons and the fact that iron, for example, had sufficiently high tensile strength to tolerate the stress attributed to that strain.

The analysis involved in this made it easy to contemplate an aether having a somewhat similar cubic-structured form as one sees in a ferromagnetic material, though whereas energy deployment in the crystal of a ferromagnetic material admits negative field energy density conditions, I ruled that out of consideration for the aether. The interacting charges could then not be at rest and had to be displaced in unison from centres to which they were attracted by electrostatic forces. From then on, having good reason for regarding aether structure as simple cubic in form rather than body-centred or face-centred cubic, it was a straightforward mathematical exercise to derive the parameters of the aether, charge spacing, radius of charge orbit in relation to that spacing, period of revolution of the charges in their circular orbits etc. This allowed me to picture the photon as seated in a disturbance set up by a tiny 3x3x3 cubic array of aether charges spinning and so having an angular momentum quantum proportional to the frequency of waves radiated.

The numbers that emerged for the value of the fine-structure constant $2\pi e^2/hc$ checked exactly with those found in precision measurement and so I knew I had the right picture of the aether.

The aether charges were not electrons, as one might have hoped, but were charges having a mass a little greater than 0.04 of the electron mass. The immediate spin-off, however, revealed that the energy of each cubic cell of the aether had a mass-energy equivalent of about 413 electrons and I said "Eureka" to myself as here was evidence that a lepton pair, a pair of virtual muons, the heavy-electrons of particle physics, actually constitute the aether.

The picture then began to form that these muons, so-called mu-mesons, being of mass intermediate the electron and the proton might account for the creation of primordial matter.

So whereas I was aware of Einstein and the Special and General Theories of Relativity I was drawn into the struggle for acceptance of these findings, by having to face the attitude of a physics community that says "You must be crazy to suggest revival of the aether with its three space-dimensions now that we all accept Einstein's theory and 'four-space'."

Now, much of my published work on this theme is included or referenced on my web sites www.aspden.org and www.energyscience.org.uk so, before saying a little more about proton creation and gravitation, I will now just express a few thoughts concerning the more topical themes that are claiming attention.

The Creation and the Death of Stars

Cosmologists, lacking insight into the structure of the aether, have missed seeing the important analogy that can be drawn between the aether and the ferromagnet, namely its domain structure. Just as magnetic polarization is reversed in adjacent magnetic domains within iron, so the electric polarization is reversed in adjacent domains in space. The evidence comes from the sequence of geomagnetic reversals that have geological record in the Earth's crust, evidence which tells us that periodically our Earth traverses along with the sun a space domain boundary, such boundaries being spaced at distances measured in hundreds of light years.

At creation stars are born, one per domain, or possibly as twins, a binary pair, one pair per domain. Gravity in one such domain does not extend beyond the range of the domain boundaries and so it is only matter created in such a domain that coalesces to create the star or binary pair. The analogy with ferromagnetism prevails, because just as non-magnetized iron cools through its Curie temperature and the energy conditions favour onset of domain structure and the associated magnetism so the cooling of the universe and its associated space medium, the aether, assumed its domain structure with its associated gravitation.

This is all explained and justified in Chapter 8 of my book *Physics Unified* on record on my website www.aspden.org and I see no need to repeat it here. Now, as to the death of stars, just consider the very rare event when a star, carried in a galactic orbit in which, like our sun, it makes a full revolution once every 270,000,000 years, just happens to traverse a space domain boundary with its orbital path just overlapping that boundary. The crossing would not be rapid, but could be quite prolonged with the star being partially in one domain and partially in the adjacent domain. Gravity does not act between matter in adjacent domains to hold the star together. It may even be anti-gravitational over a short range in its effect between matter in adjacent space domains. The result, I suggest, for such a rare happening is a supernova as the star blows apart.

Fortunately, our sun has avoided such a traumatic event so far but it does have a slow traversal of space domain boundaries four times in its galactic cycle and so, as is of record, there is evidence in our Earth's

geological structure of related traumatic events. J. Steiner in *Geology*, p. 89 (1973) writes:

If Phanerozoic geological history incorporates any periodicities, they are of the order of 60 or perhaps 70 million years The galactic periodicity of the solar system is, however, approximately 274 million years, representing the length of the cosmic year, or one revolution around the galactic centre.

Apart from the pattern of geomagnetic reversals in the Earth's history, what better indication can one have of a large scale cubic structure of space itself, meaning the aether?

When, one must ask, will cosmologists wake up to the reality of the aether with its domain structure limiting the range of gravity? 'Dark Energy' is now said to be one of the world's greatest unsolved problems. It is discussed in John Vacca's book *The World's 20 Greatest Unsolved Problems* (Prentice Hall Professional Technical Reference, 2005). Quoting from p. 134:

A mysterious force called dark energy seems to be wrenching the universe apart. This is called the Big Rip Since 1998, dark energy has become one of the central and apparently unavoidable features of the cosmos. It has been the surprise question mark at the top of every scientist's list. It undermines what physicists presumed they understood about space, time, gravity, and the future of the universe. Type Ia supernova serve as markers in space. New efforts by astronomers intend to harvest hundreds or thousands of supernovas, where in the past, astronomers could only base their conclusions on observing a few dozen of them.

So, you see, here we are 100 years after Einstein came along and began to tell us about space, time and gravity, but having to admit that such teaching is now 'undermined'!

Nuclear Fusion

Nuclear fusion is said to be the source of the sun's energy. It is not! The reason is that physicists have ignored the fact that when hydrogen atoms are pushed into one another by gravity they ionize. This means that protons and electrons become separated. Then, since two protons experience a mutual attraction at a rate of gravitational acceleration that is 1836 times that which exists between two electrons, the inner ionized body of the sun must be in state of balance throughout as an excess of protons will create a repulsion exactly balancing the gravitational attraction. The sun will have about the same mass density throughout its whole form as one finds for an atomic

hydrogen gas in which the outer K-shell electrons of its atoms are in close contact. At 1.41 gm/cc this seems to be the case.

This precludes nuclear fusion. So where does the sun's energy come from? Well it comes from the process just described. Gravitation creates ionization by freeing the electrons of adjacent atoms as they crash into one another. Energy is radiated and the free electrons lose speed, but those electrons will, since only a small proportion are free at any instant, recover energy as they are recombine with a free proton to reform the hydrogen atom. The ultimate energy source is whatever it is that governs the quantum state of the electron in its motion around the hydrogen nucleus, the proton. The source of energy is the omnipresent 'something' that regulates quantum activity. In other words the energy source is the aether, the aether that physicists say does not exist!

The Big Bang

Before astronomers began to probe that new notion they call the 'Big Rip', the universe was supposedly expanding as if everything began at a point in time and a point in space several billions of years ago. The only evidence in support of this is the red shift phenomenon, that is the observation that light from distant galaxies exhibits a lower and lower frequency the further remote the source.

Where, one must ask, is the physics that explains the spectral red shift of light emitted by stars? Yes, the physics is there from that modification of Newton's law of gravity owing to retardation at the speed of light. This explains a small red shift attributable to radiation from a source of large mass such as the sun. However, the large red shift that implies an expanding universe is attributed to the Doppler effect. This involves the assumption that a light wave, in its passage through space, even after travelling for billions of years at the enormous speed of light does not really lose frequency but is only 'seen' to alter its frequency because the frequency is referenced on a relatively-moving source.

Somehow the mathematics of Maxwell's equations suffices to assure physicists that electromagnetic waves travelling through interstellar space cannot suffer loss of frequency. They imagine packets of energy called photons travelling at the speed of light and talk about wave-particle duality. Yet when a photon sheds energy it sheds frequency as well. Physicists cannot say what a photon is physically - it merely has an energy quantum $h\nu$, where h is Planck's constant and ν its frequency. So, logically, if there is nothing in space to intercept those photons, no energy can be shed and so the frequency is sustained.

Now just consider the alternative scenario, an aether that is trying to create matter but, having reached a state of equilibrium as between matter and aether energy, succeeds only in creating everywhere in space a very sparse transient presence of protons and electrons. We could call this 'missing matter' or 'dark energy'. It would obstruct electromagnetic waves by presenting a Thomson cross-section absorbing energy from the wave and then dissipating that energy by radiation so that it is absorbed back into the aether. If only we knew how the proton is created then we could estimate the rate at which energy is absorbed in its passage through space. So you see, proton creation and understanding the physics of the photon that determines the fine-structure constant pose issues vital to our understanding of the universe.

Such theory should explain the proton/electron mass ratio as well as the fine structure constant, both mere numerical quantities since no units are involved. My theory of the aether has delivered such results, but physicists in their wisdom regard such claims as merely the game of playing with numbers by pressing keypad on some electronic device. So they turn away and bury themselves in Einstein's theory as they dig their Black Holes and trace remnants of the Big Bang.

The Hubble constant can be calculated using aether theory and without reference to the notion of an expanding universe, as I have shown elsewhere. See my paper 'The Steady-State Free-Electron Population of Space-Time', *Lett. al Nuovo Cimento*, **41**, 252-256 (1984). The photon, by the way, does not travel at the speed of light. Rather it is an event in which that small 3x3x3 cubic group of aether particles spins to set up an electromagnetic wave and impart a related momentum to aether lattice structure. Where such waves are intercepted by matter that reciprocates by inducing a complementary photon spin in the aether, energy along with momentum is absorbed. The transient presence of quasi matter, the ongoing attempts by the aether to produce protons and electrons throughout space causes both energy and frequency to be shed by waves in transit. The process does not cause frequency dispersion and so explains the Hubble constant and the red shift phenomenon that has erroneously been interpreted as indicating an expanding universe.

The Creation of the Proton

The proton is created from aether energy in the form of virtual muons and in a rather unique manner. Two muons of opposite polarity merge and, governed by the energy associated with that Thomson formula $Mc^2 = 2e^2/3a$, they come into surface contact and one of them immediately alters form (charge radius) to conserve the energy of the total pair, namely $Mc^2 = 4e^2/3a$. The charge that contracts alters its radius to $a/2$, half that of the virtual muon, and so doubles in mass energy, but there is then a negative electrostatic interaction energy that is exactly that of the single virtual muon and so energy is conserved overall in this process.

Then, moments latter, this charge pair decides to shed energy and adjusts to a minimum energy state with the charge of radius $a/2$ keeping its form and the other charge expanding its radius until the energy of the combination is at a minimum value. Onward impacts of more and more muons separate these two charges by freeing the charge of smaller energy and forming a new much heavier charge form (denoted P) of even smaller charge radius in surface contact with that of radius $a/2$. The result is a system of three charges, which for proton creation involve two of charge +e and one of charge -e. But the governing criterion then is that P will be such that it is already paired in a minimum energy association with the charge of radius $a/2$ and the combined energy of the pair, allowing for their interaction energy, is less than that of P alone by exactly the amount of energy of that third charge. One then has a final state in which those three charges can merge to form a single charge version of P or revert back to the three-charge condition without loss or gain of energy. Thanks to that Thomson energy formula it so happens that this almost incredible scenario is actually possible with a uniquely valued odd integer input of virtual muons feeding into that original muon pair. The result is the form of matter we know as the proton and one can further see that it has features by which, when subject to high energy particle impact, it can exhibit a three-quark state.

The author's aether theory allows the energy of the virtual muon to be calculated with high precision and consequently one can deduce the proton-electron mass ratio with the same high precision. The result is very slightly greater than 1836.152 and there can be no better testimony in support of the aether than this finding which is well within a few parts in ten million of the measured value.

I note with some pride, pride I share with a colleague in advancing this theory, that when the leading experts, R. S. Van Dyck, Jr., F. L. Moore, D. L. Farnham and P. B. Schwinberg, involved in making such measurements reported in 1985 their findings in *Int. J. Mass Spectrometry and Ion Processes*, **66**, p. 327 they stated:

The value that they [Aspden and Eagles] calculate is remarkably close to our experimentally measured value (i.e. within two standard deviations) This is even more curious when one notes that they published this result several years before direct precision measurements of this ratio had begun.

They had measured the proton-electron mass ratio to within a precision of 41 parts in a billion and this measurement was reported some 10 years after we had presented the theoretical value derived from aether theory.

Should a student of physics reading this seek to check the above claim it is a simple but interesting exercise to work out what that odd number is, but I will not make it easy by here presenting the value of the virtual muon mass indicated by my theory. Rather I leave that for the student to work out both quantities from that figure above for the proton/electron mass ratio. Then the reader can look up the full theoretical derivation by accessing, for example, my book *Physics Unified* that is presented in full on my web site www.aspden.org.

The message is: “Accept the aether is real and has structure and you can understand how matter is created - but ignore the aether and you live in ignorance!”

Determining G

The next message is: “Accept the aether is real and contains a system of electric charges that have a common circular motion which is shared by matter present and you will see the need for something that provides dynamic mass balance. That something is a system of gravitons and they are what governs G, the constant of gravitation. Ignore the aether and you have no way of understanding how G might be evaluated and so resolve the mystery of Unified Field Theory.”

Unlike electromagnetic force, which acts at right angles to charge motion, gravity is a simple direct inverse-square of distance force, as is electrostatic action. Yet we struggle and fail to forge a link between gravitation and electromagnetism. Can it be that what is seemingly impossible, mutual electrostatic action between matter that is uncharged electrically, is the true answer to the mystery of gravitation? Here I will show that there is a strong case in favour of this proposition.

The result is a quantum theory of gravitation, a theory which requires us to recognize that there are two basic graviton forms that act in concert in setting up the gravitational action, gravitation not being a force which acts between particles of matter but a force which acts between gravitons present in the aether. By virtue of the induced association of gravitons in the presence of matter as needed to assure dynamic balance and their dynamic coupling,

that force of gravity acting on gravitons is effective between particles of matter.

Gravity arises thanks to the existence of that charge continuum in space that eluded Samuel Earnshaw and its neutralization by a structured array of charges of opposite polarity and which governs quantum phenomena and determines basic physical constants. One then finds that continuum charge is displaced by the presence of a graviton population associated with matter present and here one discovers the physical basis of gravitation.

Note now a key point at issue. Electrostatic force between two like polarity charges is repulsive but here we are concerned with charge displaced by the presence of gravitons and that implies the effect as if there were voids in a background charge continuum and so mutual attraction between the gravitons creating those voids as the enveloping charge seeks to spread by pushing the gravitons together.

Another key point which needs consideration is the question of how a quantum theory of gravitation which implies a graviton form as a unit of gravitational action can account for weak gravitation forces that still depend upon G but arise from mass or its energy equivalent that is much smaller than the graviton mass. The answer to this is found by recognizing that gravitons, being leptons, can exist in charge pairs and can exchange energy as between themselves and another associated particle form. On a steady gravitational basis we find the taon dominates this action according to the charge continuum volume displaced but on a transient basis minor fluctuations in volume of a heavier graviton form cater for the balance.

How then do those gravitons feature in the spectrum of particle physics? Research shows that they mainly comprise the taon - the mystery lepton particle that sits alongside the muon and the electron in the bottom line of the standard quark picture of the particle grid. As to that heavier graviton form it is somewhat elusive but has been detected at around 2.587 GeV in the particle spectrum and is best referred to as the 'Japanese H-quantum' reported in 1971 by S. Hasagawa et al, (*Prog. Theor. Physics*, **47**, 126). It exists in anti-particle pairs alongside two anti-particle taon pairs, meaning that there is one such heavy graviton for every two taon-gravitons.

How is all this justified? Simply by derivation of G , the gravitation constant, in terms of the taon mass. Now here I cannot justify giving the full details of my aether analysis as of record elsewhere so I will simply summarize what is involved.

Step 1: Determine σ , the charge density of the space continuum. Do this by delving into the quantum properties of space, as evidenced by the Bohr Magneton $e r$, e being the charge of the electron. With r having the value $h/4\pi m_e c$ we then account for the photon in terms of spin of a $3 \times 3 \times 3$

component of that structured charge array mentioned above. This gives us the equation:

$$hc/2\pi e^2 = 144\pi r/d$$

where r is the orbital radius of charge motion, h is Planck's constant, c is the speed of light and d is the cubic spacing of those charges. Accordingly:

$$\sigma = e/d^3$$

We now know the value of σ because we can eliminate h/r and deduce that:

$$m_e c^2 = 72\pi e^2/d$$

m_e being the rest mass of the electron.

Step 2: For encouragement at this stage note that we could digress to find the ratio r/d simply by analysis of electrostatic interaction energy density of the space medium and arguing that it cannot be negative, thereby accounting for charge being displaced from sites at which they would be at rest and so determining r and telling us that the quantum underworld must have that jitter motion postulated by Heisenberg. The analysis is of early record elsewhere but first, by joint authorship with Dr. D. M. Eagles of the CSIRO National Measurement Laboratory in Australia, in a mainstream physics publication in 1972. It allows precise determination of the fine-structure constant, a quantity explained by no other theory (*Physics Letters*, **41A**, 423).

Step 3: We now formulate the link with G in terms of the taon and the heavier graviton form, of masses m_τ and m_g and volumes V_τ and V_g , respectively:

$$\%G(2m_\tau + m_g) = \sigma(2V_\tau + V_g)$$

Next we need to use again that crucial formula of J. J. Thomson that dates back to the pre-Einstein era :

$$mc^2 = 2e^2/3a$$

which applies to the electron and also relates the mass m of our two particles with their charge radius a and so their volume. This assumes that the charge e is distributed within the sphere of radius a so as to have uniform pressure or energy density.

The volume to mass ratio of the two-taon and heavy graviton combination must match the corresponding volume to mass ratio for transient fluctuations in which a pair of heavy gravitons annihilate one another to share the volume of three such gravitons in a single charge. The same condition arises for the case where energy is exchanged between the field system of matter and the heavy graviton with, for such minor fluctuations, the preservation of gravitational potential overriding the need for perfect dynamic balance. In the latter case the slight expansion of graviton volume increases just enough to match the mass-energy added to the system of matter, thereby

keeping gravitational potential unchanged. The relevant volume to mass ratio which has to equal:

$$(2V_{\tau} + V_g)/(2m_{\tau} + m_g)$$

is then:

$$3V_g/m_g$$

Since charge volume is inversely proportional to the cube of the related mass one finds from the above equality that:

$$(m_g/m_{\tau})^3 - 3(m_{\tau}/m_g) - 1 = 0$$

which, upon solution, gives:

$$(m_g/m_{\tau}) = 1.452627$$

This allows us then to write:

$$\%G = \sigma(3V_g/m_g)$$

Step 4: One can now evaluate G based on the measured value of the taon mass-energy, which is 1.781 GeV or 3485 electron mass units, to find that the heavy graviton becomes 2.587 Gev or 5063 electron mass units.

Note that d is $72\pi e^2/m_e c^2$ and so is 108π times the electron charge radius, the latter being 5063 times the charge radius of the heavy graviton. Given that σ is e/d^3 we then find that:

$$\%G = 4\pi(e/m_e)/(108\pi)^3(5063)^4$$

and, e/m_e being 5.272 esu/gm, this tells us that G has the value 6.67×10^{-8} dynes.cm².gm⁻².

So-called ‘Time Dilation’

One of the most puzzling aspects of conventional physics teaching concerns the notion of ‘time dilation’ as introduced by Einstein’s theory. The only experimental evidence in support of this theme stems from accelerating leptons, muons, to energies well in excess of their rest-mass energy. That evidence merely shows that the decay lifetime of such particles increases in proportion to energy. Now, if it were found that human beings live longer when travelling at a high speed, the medical profession would approach the problem by first establishing why it is that one dies naturally when living a life where one is not travelling at enormous speed. They might then infer a cause by extrapolating theory on the basis of that prior knowledge. So, I maintain that, until physicists can explain why a slow-moving muon, the mu-meson, has a mean lifetime a little below 2.2 microseconds they should not enthuse on the subject of time itself passing more slowly, the faster one travels.

If the reader thinks this muon lifetime phenomenon is proof in support of Einstein’s theory, he or she needs to think again, after reading my paper explaining the phenomenon in terms of aether theory. This is to be found in

Lett. al Nuovo Cimento, **38**, pp. 206-210 (1983) in its full text form on my website www.energyscience.org.uk .

Note that the muon lifetime is limited by the virtual particle activity within the aether as muons that are part of that aether, in their random migration by creation and decay at the Compton electron frequency have a statistical chance of an encounter with the real muon as a target and this triggers its decay. The muon moving at high speed has its energy deployed statistically between different states and this makes it elusive and harder to hit as a target. My theory allows that microsecond lifetime quantity to be determined as a function of the evaluated aether constants and shows that lifetime does increase with speed in close accord with the relativistic formula, at least at very high speeds. At speeds around half the speed of light my theory gives a result that is a few per cent different from the relativistic value, so maybe one day experiments on muon lifetime at such lower values will prove me right.

Conclusion

Physicists, and notably V. F. Weisskopf (*Physics Today*, 69-85, Nov. 1981), have been puzzled as to the role played by both the muon and the taon, the heavy electrons of particle physics. As denizens of the aether their role is now quite clear. One accounts for the creation of the principal constituent of matter, the proton, whereas the other accounts for the force of gravity. So you see, we have here a Unified Field Theory, all because we have adhered to the belief in an omnipresent aether and have bothered to track back, check and correct two crucial steps taken in error in the 19th century by two physicists, Earnshaw in connection with his theorem for assuming that the aether constituted particle immersed in a void and Larmor for considering electron acceleration without an interacting electric field as its cause, thereby not seeing that an electron exhibits inertia because it seeks to avoid radiating its own energy. Here was the basis of $E = Mc^2$ as we have seen above, all without any contribution from Einstein. As to Einstein's own insight into the physical cause of inertia, since my object in writing this text has been to challenge Einstein doctrine by showing the simple alternative physics that is based on 19th century teaching, I will add a few further comments here.

It was in December 1954 that Einstein completed the 5th Edition of his book *The Meaning of Relativity*. Although he claimed to understand the basis of that formula $E = Mc^2$ he did not see that the proper derivation of this famous equation is actually founded on the inertial property simply because an accelerated electrical charge will so react as to conserve its energy. In his book at page 100 one reads:

The theory of relativity makes it appear probable that Mach was on the right road in his thought that inertia depends upon a mutual action of matter.

So even by mid-century, some 50 years after introducing a theory that is supposed to explain gravitation, the key question as to the physical nature of inertia had proved elusive.

Relevant to this was the subject of Dennis Sciama's Ph.D. dissertation as recorded in the 1953-1954 *Abstracts of Dissertations* of the University of Cambridge. Note that Sciama was later the tutor supervising the research of the now famous Stephen Hawking. Sciama's dissertation was entitled *On the Origin of Inertia* and I read that a principal chapter of that work was:

.. devoted to Einstein's work, which shows that inertia is connected with gravitation. However, as Einstein himself was the first to point out, general relativity does not fully account for inertia. Thus a new theory of gravitation is needed.

I can quote this because, as I noted earlier, I was a contemporary with Sciama in my own Ph.D. research and my dissertation is included in that 1953-1954 set of abstracts.

Surely, given that 'a new theory of gravitation was needed' back in 1953-1954, why has the physics community chosen to ignore the overwhelming case concerning gravity, the aether and the derivation of the equation $E = Mc^2$ as the physical foundation of inertia linked to energy conservation? My theory has the answers and is the long-awaited Unified Field Theory.

Readers interested in knowing more about my research on this subject including full analysis of the aether structure and copies of, or references to, my published work should refer to my web site www.aspdn.org .

This 38 page monograph was posted on the above web site on January 1st 2005. Hopefully it will serve as an up-dated introduction to my theory as a whole and particularly to my much longer work 'The Physics of Creation' already of record on that web site several months ago. A few amendments to the latter are needed and so it will be revised in the months ahead.