

# The Phi-Wave Aether

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## Abstract

The Phi-Wave Aether theory is a non-mathematical description of reality that might, if correct, serve as a basis for the replacement of both Maxwell Theory and Modern Physics. It provides a novel idea on the nature of "forces": that, on the microscopic level, they all depend on the phase relationship of the basic aether waves (phi-waves) with the pulsating "wave centres" that are postulated as being the fundamental units of solid matter. The theory is in conflict with much of the experimental evidence currently taught as supporting Modern Physics. The discussion is therefore preceded by a section on this evidence, along with some comments on the role of mathematics. The quality of the experiments is all too often inadequate for their purpose, the results being either misrepresented or open to other, more plausible, explanations.

## Introduction

The Phi-Wave Aether (PWA) theory is a tentative Theory Of Everything that is based on the assumption that the whole universe is composed of aether, a special kind of fluid carrying "phi-waves" emitted by "wave centres". These centres spring into being and start pulsating when the intensity of the waves exceeds some limit. They need a continuous supply of incoming waves to keep them in existence. "Forces" are the net result of the manner in which a wave centre reacts to incoming waves, which varies according to the relative phase. If out of phase, the incoming wave pushes the wave centre; if in phase – if there is resonance – it does not. The phi-waves are longitudinal, but modulations of them can carry transverse patterns – "radiation".

The PWA theory, though independently invented, has features in common with many others. The latter range from those of William Gilbert and Roger Boscovitch several centuries ago to, for example, Roland Dishington<sup>1</sup>, Dimiter Stoinov<sup>2</sup>, Trevor Marshall (with his Stochastic Electrodynamics<sup>3</sup>) and (though they might not have recognised it) even Schrödinger, De Broglie and Dirac<sup>4</sup>. Dirac's universal sea of "virtual particles" is replaced in my theory by a sea of "phi-waves". Phi-waves, however, are real, and not in themselves particle-like. They are constantly moving in "open space", only transforming into quasi-stationary wave centres when they form "matter", and they do not just arise spontaneously out of the "vacuum": they come from other wave centres. An infinite, steady state, universe is assumed, so that the supply never varies significantly.

The PWA model is strongly influenced by the facts of modern technology, owing only modest debt to any existing mathematical theory. There is no intention of even attempting to build a mathematical theory until various areas that are currently but dimly understood are clarified. Maybe even then such a step would be unwise, seeming to place a mere man-made model above the underlying reality, providing a straitjacket that may well prove later too restrictive.

The present paper is divided into two almost-independent parts. Discussion of the PWA model is preceded by a section on the current state of theoretical physics. As taught at university and popularised by science writers, the latter includes some outright falsehoods with regard to experimental fact. So long as these remain unchallenged, there is little hope for acceptance, whether by established physicists or outsiders, of the radically different ideas that I feel to be needed.

## **Part I: Challenging the “Facts” of Modern Physics**

Suspect statements that are currently taught at universities and re-inforced by science writers include that “the Michelson and Morley experiments ruled out an aether”; “Hubble proved that the Universe is expanding”; “radiation is a purely transverse wave”; “radiation can only exist in complete ‘quanta’ ”; “radiation is produced as a result of quantum jumps between states”; “the Bell test experiments show that the laws that govern the quantum world really are counterintuitive, so it is hopeless to try and understand them” and “modern technology could not have been invented without the twin pillars of theoretical physics – Einstein’s Relativity theories and Quantum Theory”. Another obstacle in the path of true understanding is the obsession with mathematical models, so let us start our challenge with a discussion of their role.

### **The Role of Mathematical Models**

It seems to have been forgotten that a model is never as perfect as the real thing! Would anyone assume that his statue was a reasonable replacement for the man – that one could hope to deduce from it the state of his internal organs or his thoughts? There are relatively few predictions that can safely be made from a model. The few that work become well known, the remainder quickly forgotten and the theory patched up to accommodate reality. Even when a model is “successful”, does this mean much? Those who have met only school-level mathematics are ill-equipped to imagine the gulf between this and the methods of modern physics – the differential equations for which the boundary conditions have to be guessed using subsidiary information and intuition, with rarely the possibility of exact solution. Approximation methods are at the discretion of the user. The models cannot be fully tested.

Current interpretations of “classical” physics are almost as much at fault as modern theory, depending more heavily on mathematical models than its originators would, I think, have approved.

Could it be that the impression that Nature is ruled by mathematics is an illusion? The more we know, the more complicated it seems, despite evidence that at some low level it *must* be simple (how else could it come about that different atoms of the same element are so uniform in their properties?). The complication arises from the fact that in one respect the quantum theorists are right: everything depends on waves. Quantum theory is essentially a failed attempt to model interacting waves. Even if a complete mathematical model is possible, it is doubtful if it will be useful. All we can hope for, I think, is to improve by familiarity our ability to visualise wave behaviour. Possibly we can hope to produce some day good computer simulations, using just a few well-chosen rules, but the idea of ever succeeding along the lines that Schrödinger started, with an analytical formula supposed to model complete atoms, seems futile.

Maxwell and other physicists of his era placed their intuitive descriptions of mechanisms above any mathematical equations. His life-long friend, Lewis Campbell, reports in a biography<sup>5</sup> how casual Maxwell was about fancy mathematics. He quotes him as writing in a letter in 1872, “I am getting converted to Quarternions, and have put some in my book”. His ideas remained flexible. When

Hendrik Lorentz and others developed them into a comprehensive theory, it retained a large degree of fluidity. As Lorentz said (page 10 of his “Theory of Electrons”<sup>6</sup>), some physicists prefer to “arrive at important and beautiful results by means of a system of suitable equations”, but he made it clear that he did not think this was always the best approach. In relation to his ideas on forces on a moving electron, he apologised for even attempting a model:

*“I fear one will feel inclined to think I had better not try and enter into all these details ... speculations like those we have now entered upon, are at all events interesting, be they right or wrong, whereas they are harmless as soon as we may consider the internal state as a matter of little importance.”* (page 16 of “Theory of Electrons”)

Where the details are still a matter of speculation, mathematical models must be used with great caution!

It was Einstein, through his invention of the “photon” and his non-physical postulate about the speed of light, who effectively (with considerable help from his followers and the whole modern system of education) sent fundamental physics up a blind alley. The photon was convenient. It made the application of mathematics possible, but it was not merely – as the current euphemism goes – “counterintuitive”. It was actually wrong. It really could not model the most basic property of light, its ability to suffer interference. Once you accept a false concept, it seems, you have little choice but to replace any attempt at understanding the real world by an attempt to force the world into compliance with your theory. This, in my view, is what is now happening, especially in the area of “quantum optics”.

Had Neils Bohr stuck to his guns and rejected the photon outright<sup>7</sup>, or Eddington’s 1919 eclipse data not been accepted by the media as establishing Einstein as a genius<sup>8</sup>, how different physics could have been! It would have made little difference to technology, which arises in practice from the application of intuition, experience, trial and error, as often as not handicapped rather than aided by theory<sup>9</sup>. The sanity of the educated world, though, might have been preserved. We would not now be subject to endless discussion on the Internet on the subjects of Schrödinger’s cat, the Twins Paradox or magical interactions between Alice and Bob enabled by “quantum entanglement”<sup>10</sup>.

The remainder of the section is devoted to discussion of some of the experimental facts that cast doubt on currently accepted dogma.

### **The Michelson-Morley Experiments**

For many years, the Michelson-Morley experiments<sup>11</sup> have been represented to the world as having produced a “null” result and, in consequence, ruling out an aether. They did not in fact do so. They effectively ruled out a *fixed* aether, but certainly not a fluid one. They showed patterns reflecting the Earth’s daily rotation and hints of the “cosmological” effects later confirmed in a much more comprehensive series of experiments by Dayton Miller, initially in collaboration with Morley. Miller’s results conflicted with all current theories, including Lorentz’s. He presented his main findings – fringe shifts that correlated well with cosmological factors – at a meeting in Pasadena in 1927<sup>12</sup>, attended among others by Lorentz and Michelson. The general feeling there was that the results were interesting, showing real effects, but needed further experimentation before a definite theoretical explanation could be given. Einstein, on the other side of the Atlantic, decided Miller’s data *must* have been flawed. He is on record as saying (1925<sup>13</sup>) that “if Dr Miller’s observations were confirmed, the Theory of Relativity would be at fault. Experience is the ultimate judge”, but in the event he seems to have decided his theory was more reliable than experience – this despite acknowledging Miller’s impeccable qualifications as an experimentalist. After ignoring Miller’s

evidence as far as he could he, with the help of his followers, eventually succeeded in discrediting it, effectively expunging it from the record. The stated reasons for rejection do not, as DeMeo's research shows<sup>14</sup> (and, indeed, anyone reading both Miller's 1933 paper<sup>15</sup> and Shankland et al's 1955 one<sup>16</sup> can readily find out for themselves), stand up to scrutiny.

Lorentz, incidentally, was probably too old by the time of the Pasadena meeting to get involved in modifying his own theory. He might have liked the PWA idea of a fluid "entrainable" aether. As he had said in 1916 re the whole matter of "Fresnel drag" and the Michelson-Morley experiments:

*"It must be noticed that all this could be accounted for at a stroke and without any mathematical formula by Stokes's theory, if only we could reconcile with each other its two fundamental assumptions."* (page 176 of "Theory of Electrons")

As far as I can tell, Stokes's assumptions were (a) that the aether moved with the Earth so that at the surface there was perfect equality of velocity of the aether and the Earth (remember, he thought he was explaining a completely "null" aether wind) and (b) that the motion was "irrotational". Lorentz, as an expert in hydrology, felt that these requirements were incompatible.

Miller interpreted his results as showing that, on the Galactic scale, there was an aether wind that was either pulling us along or against which we were pushing. The experiment was not able to resolve the ambiguity between a wind that was almost North to South and one almost South to North relative to the plane of the ecliptic. The apparent wind was not as strong as expected on the basis of a fixed aether, but, one way or another, he considered that his observations showed that the aether moved.

Regardless of the true explanation, Miller had shown that, contrary to current belief, it *was* possible to discover in a laboratory experiment something about our motion relative to a different frame. A preferred frame existed, so Special Relativity was wrong.

Miller had concentrated on the idea that the fringe shifts were entirely due to changes in light propagation speed, but, as Reg Cahill<sup>17</sup> has recently emphasised, they could be at least partly due to changes in actual lengths of the interferometer arms. Cahill assumes such a change would obey Lorentz's contraction law. He has realised that the refractive index of the medium through which the light propagates affects the results, and has found some data from experiments in which the medium was helium or the vacuum instead of air that seem to confirm his theory.

Though I do not agree with Cahill's interpretation, more experiments along these lines, using different media, seem urgently needed. They could give us vital information about the motion of the aether and about the effect of Doppler shift of the phi-waves from the rest of the universe due to our motion with respect to their sources. In my interpretation, any length contraction is a response to this Doppler shift, depending only on the speed of the apparatus relative to the sources, as against changes in propagation speed, which depend on refractive index of the medium and on motion of the aether. It should be possible to find out the relative magnitudes of the two effects.

### **Expansion of the Universe**

Hubble himself did not like the "expansion" interpretation of the cosmological red shift. As he said in 1937<sup>18</sup>, if the cosmological redshift does represent a Doppler effect,

*"...the observations as they stand lead to the anomaly of a closed universe, curiously small and dense, and, it may be added, suspiciously young. On the other hand, if*

*redshifts are not Doppler effects, these anomalies disappear and the region observed appears as a small, homogeneous, but insignificant portion of a universe extended indefinitely both in space and time”*

He preferred to say that we did not know the cause of the shift and new physics was needed. I agree. More recent data, I gather, does not even follow the right curve, or not until it has been transformed using various theories. Possible explanations of the actual observations include (a) an artifact of our instruments, related to the special coherence properties of the very weak light they are detecting, (b) a result of the inevitable mixing of the light of interest with progressively more background light as the angular diameter of the object gets smaller, or (c) the cumulative effect of a tiny imbalance in frequency caused by the Doppler shift when light interacts with various gas regions, some moving towards us, some away.

### **The Transverse Nature of Light**

We are told that radiation is a transverse wave (that is, of course, when we are not being told it consists of “particles”), but it is perhaps worth looking harder at the evidence for this. Early ideas about the wave nature of light assumed that it was more like sound – a longitudinal wave. It was only when physicists such as Christiaan Huygens (1629-95) started looking at the double image produced by a crystal of “Iceland spar” that they began to think it might be “polarised”<sup>19</sup>. The light associated with the two images had different directional properties, showing that if it was, as Huygens already thought, a wave, it was in some sense at least a transverse one.

However, did this necessarily mean that *all* light was transverse, and did it mean that something really had to wave from side to side in the same kind of way that a surface water wave moves up and down? The experimental evidence does not prove this to be the case. Radiation could sometimes be a purely longitudinal wave. A polariser could sometimes impose a transverse pattern on a longitudinal input. Light that we call “unpolarised” might sometimes be, as current theory tells us, a mixture of pulses that each have a definite polarisation, or it might sometimes be genuinely “unpolarised”, varying from one case to the next according to the method of production.

Basically, polarisation arises from the oscillation of the source. It is a transverse pattern, but this can be formed without any need to assume that the aether itself is oscillating transversely. If a source of longitudinal waves moves from side to side, a transverse pattern will be detectable in the output. In my view, this is all that there is, so far as propagation in “open space” is concerned. It is only when light passes through solids that it may indeed induce transverse motion – the patterns can be “interpreted” by suitable solids, the transverse “information” that was coded into the longitudinal waves being extracted.

Longitudinal waves can propagate in just about any medium, travelling much faster than transverse ones. They do not require the very stiff elastic solid that 19<sup>th</sup> century physicists were forced by their transverse model to try and accommodate in their aether theories. They do not require anything like Maxwell’s complicated ideas, with electric fields inducing magnetic ones which induce more electric ones, and so on to explain their motion.

This is one case where perhaps we *can* legitimately take our cue from mathematics: Around 1900, Hendrik Lorentz was interested in mathematical models in which transverse waves arose from potential fields caused by circling charges<sup>20</sup>. No transverse motion was assumed in the course of propagation: the potential simply moved out from the charge at speed  $c$ <sup>21</sup>. If he had gone one step further, and suggested that the field was caused by a set of high-frequency waves, he would have

arrived at the essence of the Phi-Wave Aether theory (see later).

### **The Quantisation of Radiation**

The idea that all radiation comes in “quanta” (“photons”) originated from Einstein’s individualistic and highly controversial interpretations of just a few observations. He invented the photon in the light of two experimental results: the shape of the blackbody radiation curve and the photoelectric effect<sup>22</sup>. The argument, however, is somewhat circular. Planck’s blackbody radiation curve formula does not (as Planck himself was only too aware<sup>23</sup>) on its own tell you anything about the nature of light. The reasoning behind it is confused to say the least – it was changed several times<sup>24</sup> – and the formula does not, I feel, deserve to be treated as anything more than an empirical one. “Einstein’s photoelectric equation”, again, is in fact simply an empirical relation between the energy of radiation and that of electricity. It only confirms a one-to-one relationship between photons and electrons *if* both light and electrons are discrete entities. Millikan, the man whose experiment was taken as definitive confirmation of the *equation*, consistently emphasised the inadequacy of the photon *interpretation*<sup>25</sup>. It cannot explain interference effects satisfactorily.

In modern physics, Compton’s gamma ray scattering experiments<sup>26</sup> are taken as further confirmation of the particle nature of light. Yet further evidence is claimed from analysis of the spectra emitted by gases – series of lines such as the “Balmer” series.

Alternative explanations for Planck’s curve, not assuming quantisation, have been proposed from time to time right from the start. A modern example has been given by Tim Boyer and others, using the theory of Stochastic Electrodynamics<sup>27</sup>. Though I do not fully support this particular explanation, preferring to treat the black body curve as just an empirical fact – similar to the Normal Curve of statistical theory, for which theoretical justification, though possible, is not necessary for those who use it – the existence of these alternatives means that Planck’s formula does not *compel* the assumption of quantised radiation.

I maintain that Compton’s “quantum” interpretation of his observations would never have been considered had Einstein not by then (1923) attained god-like status and infallibility. A wave interpretation, along the lines suggested by Schrödinger<sup>28</sup>, is considerably more plausible. What is actually observed is little more than a spectrum – a wave phenomenon. The experimental evidence regarding the motion of the electron is almost entirely absent, with no convincing demonstration of one-to-one relationship of input gamma “photon” with a pair of outputs – one “photon” and one “electron”.

Regarding atomic spectra, this opens up further controversial questions. When a certain spectral line is observed to have a certain intensity, under Einstein’s interpretation this is determined by two factors: the frequency and the number of atoms responsible. However, there is always an alternative possibility. Instead of a fraction  $f$  of the atoms “changing state” and emitting light, it could equally be the case that *all* the atoms are emitting (on average) at a fraction  $f$  of their maximum possible intensity. Another possibility worthy of consideration is that what we observe is not the raw frequency emitted but the beat between two much higher frequencies, each too high for our instrument to detect. This would provide a simple explanation of the fact that the Balmer series etc. are found to be related to *differences* in terms.

As to the photoelectric effect, I have my own interpretation for that too. Sometimes, in particular when light is emitted by “radioactivity”, the quantity of energy involved may well be fairly constant

(though the idea that it is always in units of  $h\nu$  may be more a matter of faith than anything else) and the emission may be in a narrow beam that could, when detected, be mistaken for a particle, but most kinds of radiation are emitted with unquantised energy and, in any event, there is no reason to believe that radiation ever *remains* in discrete energy units. The appearance of quantisation is, as I am not alone in thinking, caused by the method of detection. A common belief (in “semiclassical theory”<sup>29</sup>) is that radiation is unquantised while propagating but that quantum theory takes over at the moment of detection, a “quantum interaction” being involved in the emission of an electron. I have never seen experimental evidence for this. My own description would be that the electric field of the incoming radiation begins to couple with the field of the material of the detector. Oscillations are set up which may, at some point, exceed a natural threshold, leading to the event that is interpreted as the emission of an electron. All we really know, though, is that something happens that enables an electric current to flow. We have no direct evidence that the current is formed by discrete electrons, and in my view it is probably not.

The photon has its uses as an accounting device but is little but a hindrance for fundamental understanding. It poses problems wherever it is mentioned, and demands extreme contortions of the imagination when applied to radio waves. The assumption that *all* radiative energy comes in units of  $h\nu$  may be responsible for errors ranging from the unnecessary invention of new “particles” and the illusion of “nonlocal” quantum effects to the apparent “anomalous absorption” of energy by the atmosphere<sup>30</sup>, affecting our models related to global warming!

### **Quantum Jumps**

In practice, physicists are well aware of the fact that no change ever takes place instantaneously. Schrödinger went as far as to suggest that maybe the whole notion of atoms remaining in “stationary states” was false. He is quoted by Franco Selleri<sup>31</sup> as saying in relation to atomic transitions:

*“ ... the emitting system is busy all the time in producing the trains of light waves, it has no time left to tarry in the cherished ‘stationary states’, except perhaps in the ground state.”*

Light is produced not while atoms “change states” but for the whole duration of the “excited state”.

### **The Weirdness of the Quantum World**

Since writing my contribution, “Loopholes and anomalies in actual Bell tests”, to Pope and Chubykalo’s book on instantaneous action at a distance<sup>32</sup>, things have gone from bad to worse. Not only is the myth that quantum theory has been confirmed becoming yet further entrenched, Aspect’s 1981-2 experiments<sup>33</sup> now being supported by many others, but papers are now proliferating that try and get the best of both worlds: by arguing that Bell’s logic was flawed they claim to reconcile quantum theory with local realism. My attempts at publication in mainstream journals have made no progress<sup>34</sup>.

In their desperation, scientists are clutching at straws. Among those claiming to refute Bell’s proof, becoming ever more lost in webs of irrelevant logic and probability theory, not to mention impossible physics, are respected physicists such as E.T. Jaynes<sup>35</sup>. The repercussions of a falsehood make it more and more difficult to set physics back on track. To do this, it must be recognised that in the Bell test situation quantum theory has met its match: it is actually *wrong*.

A common argument against Bell’s reasoning is based on the misunderstanding of the true role of the “hidden variable”. Bell himself unwittingly led the way, concentrating on hidden variables that

determined the outcomes *completely*<sup>36</sup>. Though it is possible to do this, it is absolutely vital in practice to recognise that the variables fall into two sets: those fixed at the source and those that are not determined until after the particles have separated. I tend to think of the latter as being “noise”, associated with the individual detectors. In the real experiments using light, it is when signal plus local noise exceeds some threshold intensity that you get a “detection”. The signal in question is the light pulse as it emerges from the polariser, reduced in intensity according to the standard cosine-squared law. The noise is random, independent by definition on the two sides of the experiment, since any components responsible for correlations at this stage can instead be regarded as “source” variables.

Once this is understood, Clauser and Horne’s important paper of 1974<sup>37</sup> becomes comprehensible. The first kind of hidden variable, set at the source, can be held temporarily fixed, while the second determines the actual outcome. Clauser and Horne in fact call their theory an “Objective Local Theory” rather than a hidden variable one, and perhaps the world would do well to follow suit. Their hidden variables are just the first group, determining not the actual “outcomes” but merely the *probability* of each, the final say resting with the local conditions at the detector. Few who are trained in quantum theory are able to fully comprehend their ideas. To do so requires not only abandoning the belief that the source and detector settings completely determine the result but also the indivisibility of the “photon”. If the photon is not divisible, it means that all that arrive at a detector are identical, their individual “intensities” not even defined. Under quantum theory, the selection of which photon to detect and which to miss cannot be determined by the manner in which it went through the polariser. All must have the same chance of detection, given by just the one parameter, the “quantum efficiency” of the photodetector.

The photon concept is at the heart of the apparent weirdness.

## **Part II: The Phi-Wave Aether**

### **Introduction**

The Phi-Wave Aether theory is based around the assumed existence of an all-pervading fluid aether possessing, in addition to motion, one scalar parameter, “phi”, at every location. In contrast to most similar theories, the basic aether waves are not necessarily assumed to be simple compression ones but waves of change of “phi”. I assume very little about the structure of the aether or, as yet, its motion. The critical feature of the theory is its postulate of “wave centres” – centres that spring into being whenever the local “intensity” (some measure of amount of oscillation rather than mere value of phi) exceeds a threshold. These wave centres pulsate, emitting phi-waves continuously and “feeding” on incoming ones. The universe is a perpetual motion machine, infinite in time and space, for ever recycling “phi”. The wave centres interact with incoming waves in a manner that varies according as to whether they are in phase with them or not. This concept leads to ideas on the nature of forces that differ both from Maxwell’s fields and from the quantum-theoretical “exchange of particles”.

“Forces” all depend on the fact that if incoming phi-waves are in phase with a wave centre they do not push it; if out of phase they do. At the level of wave centres (conveniently termed the “quantum” level, despite my aversion to the very notion of the quantum!) the net effect of the interaction is to produce forces that cannot be said to either just push or just pull: their effect depends on the relative positions of source and receiver. The waves from neighbouring wave

centres will tend to nudge the centres into preferred relative positions, the ones at which they are all in phase as nearly as possible with as many as possible of their neighbours. They form natural “collectives” for their mutual benefit, for they can absorb phi more efficiently if they are able to stay in resonance with the source. The theory was originally conceived as an explanation for macroscopic forces and radiation, yet this idea, giving such a natural explanation of the regular spacing within crystals (and within the atom?) emerged from the woodwork! It enables all the forces to be unified.

The basic phi-waves are not necessarily sinusoidal in profile. The wave centres probably build up phi then release it in short bursts (where I say “release” phi, it is to be understood that what I really mean is “cause an increase in the surrounding phi-value”.) This nonsinusoidal profile means that the effective bonds between wave centres that are very close are very strong. A slight perturbation will immediately encounter an effective “restoring force” as the system regains its “desired” (phi-efficient) state.

The macroscopic forces are the net effect of many of these primitive ones and have quite different properties. Groups of phi-waves cause them, and these groups – patterns of closer and wider-spaced ones – will tend to be sinusoidal, since they tend to be caused by sources oscillating under simple harmonic motion. Macroscopic forces, as well as “radiation”, are the net results of *modulations* in the patterns of the phi-waves that are constantly emitted by all the particles in the universe.

The basic phi-waves are never detected by our instruments. Their frequency is too high and they interact with everything. They are busy keeping atoms in existence, and it is just as well that we are unaware of their presence. To be sensitive to them directly (and not just patterns carried by them) would be to be flooded with an infinite amount of information. (I do not use the term “infinite” lightly here: the universe is, I believe, truly without bounds and contains a boundless number of wave centres, all of which produce phi-waves. We are influenced by the rest of the universe, though not, I hasten to add, by its state at this current instant but by the state of each part at the instant at which phi-waves started their journey to us.)

### **What is “solid matter”?**

An individual wave centre will “evaporate” if unsupported by any near neighbours. In order to form a particle that exists for any length of time we need a linked group of them. A very stable group can be formed from four, at the vertices of a regular tetrahedron, as illustrated in fig. 1.

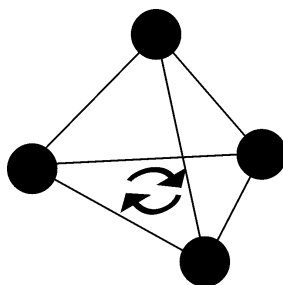


Fig. 1: The basis of “solid matter”: a group of wave centres at a spacing of one wavelength of the basic phi-waves. The arrows suggest the possibility of the unit spinning. The aether may well spin with the wave centres.

Such a group might form an atomic nucleus. It will be surrounded by the interference pattern set up

by its wave centres, and within this pattern there will be places favourable to the creation and/or capture of other wave centres. There might, thus, be some reality to the notion of an “electron” as a wave centre that is not so tightly bound to a particular group as those forming the nucleus.

**What is “electric current”?**

Wave centres, provisionally identified with “electrons” will naturally tend to follow each other. (This conflicts with the traditional ideas on the subject, but is compatible with later ones on superconductivity. The notion of electrons repelling each other comes from macroscopic experiments, to be discussed later.) The reason they follow each other is not hard to understand – it is really the same reason that any group of wave centres attains stability – and is illustrated by figs. 2 and 3.

If the electrons keep at constant spacing they will stay in resonance with each other. Other phi-wave sources in the surroundings tend to push them into this condition.

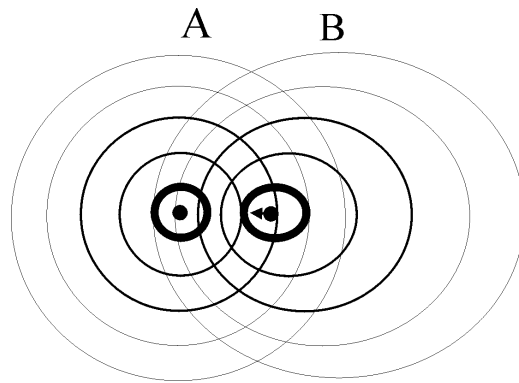


Fig. 2: Wave centres approaching: Phi-waves push the wave centres unless they are in resonance, so there will be repulsion. (Distortion of waves on entering the high-intensity central regions is not shown. There will be a degree of focussing.)

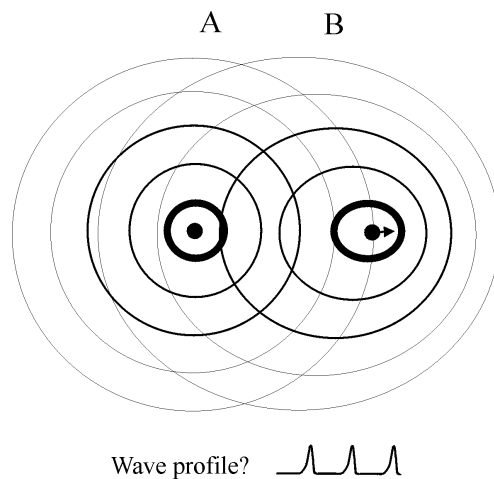


Fig. 3: Separating wave centres: These will exchange “softer” and/or slower phi-waves and will be pushed together by waves from the rest of the universe until they are in resonance. Non-sinusoidal waves will produce strong “forces” and firm phase-locking.

However, that is not to say that *all* electric currents take the form of streams of electrons. Many currents may be just coordinated phi-waves. Some may be not so much currents of waves as currents of phase-relationship in the pulsations of a series of wave centres. All that really identifies “electricity” is that energy goes into a system and is transported to another without visible motion of anything solid.

100 years of the electron does not seem to have elucidated all the possibilities. On the one hand we have the nanotechnologists, claiming to be able to produce currents in the form of transfer of single electrons, on the other physicists such as Carver Mead treating superconducting currents entirely in terms of “phase” of the “wave function”<sup>38</sup>. It seems safer to talk in most instances in terms of “electric energy” rather than “electrons”.

### **Radiation**

Radiation is a pattern of phi-waves formed when the sources oscillate in a coordinated manner. The idea is not entirely new. As explained in Part I, it is embodied in the mathematical modelling of the Coulomb field, even if this is assumed to flow out radially, once you allow for the possibility of the source oscillating. It is doubtful if radiation is ever formed in the manner prescribed by the quantum theorists, as a result of *change* of “quantum state”. It can be formed in a great number of different ways, ranging from the effect of “electric current” changing direction in a wire to beat effects between waves emitted by atoms that are oscillating at two frequencies at once. It is doubtful, as explained in Part I, if all radiation can be said to be “transverse”. When it does have a transverse component, this is merely a transverse pattern superposed on sets of phi-waves – very high frequency longitudinal waves.

### **Electric “charge”**

The “electric field” of Maxwell theory is a measure of the gradient of the intensity of the phi-waves that cause it. A “negatively charged body” is one that is emitting more, higher-amplitude or more coherent, phi-waves than a neutral one. Its emitted phi-waves push on a body whose wave centres are (due to other phi-waves from other directions) unable to adapt; they push less hard on bodies whose wave centres are not already fully constrained, since these can move so as to get into temporary resonance. Thus I envisage the wave centres of a solid body as being in a state of stress, some held strongly in fixed positions, others jostling for the right to occupy the remaining favoured sites. In a negatively charged body there are more of these “others” than there are suitable stable sites. In a neutral body, all is as stable as it reasonably can be, considering that at all times there are random incoming phi-waves, causing jiggling. In a “positively charged” body there are vacant sites and the wave centres are under less stress. They can wander around more freely, adapting to influences from outside as well as the constraints imposed by their immediate neighbours. The various laws of attraction and repulsion follow, once you allow for the fact that there are always other bodies surrounding any experiment.

However, it must be admitted that this is not the whole story. It is hard to see why there should be symmetry between positive and negative charge (are we sure there is?). Some of the phenomena that I currently attribute to wave centres (alias electrons) may be due to pulsations of complete atoms, in which it is possible that there are no definable wave centres, just waves.

### **Magnetism**

Magnetic attraction is a consequence of the tendency of wave centres to copy each others’ motion wherever possible, this being the result of the operation of the basic rules of phi-wave and wave

centre interaction. It is associated with circular motion of wave centres, which produce circular patterns in their emitted phi-waves. Other wave centres that are already circling tend to be nudged into a parallel motion, slotting into the emitted pattern at some point and then tending to be pushed towards regions of higher intensity of that pattern, i.e. towards its source. If constraints do not allow them to establish parallel motion, not even the beginnings of resonance will be possible. Waves will mostly be out of phase with wave centres and there will be, on average, mutual repulsion.

I do not pretend to have resolved in detail any of the problems of Maxwell theory, but I do suggest that some of them may become more tractable when viewed in relation to an aether and phi-waves. Having for many years denied the existence of an aether, it is time we started investigating how it might be moving and whether or not its motion affects phenomena. Magnetism might be associated with actual circling of the aether.

### **Gravity and Inertia**

Gravity can be thought of as the effect of a tiny imbalance between positive and negative magnetic and electrostatic forces, though it may be preferable to think of it more directly in terms of the interaction of phi-waves and wave centres. When one “solid body” is near another, each will to some extent be able to adjust its wave centre positions so as to get in resonance with the other. They will not, except at atomic distances, really be able to get into genuine resonance, but only a “one-way” kind – the same, I imagine, that is sometimes found on a cosmological scale, when we apparently have natural masers that operate on a single pass (“unsaturated” ones<sup>39</sup>). When wave centres are able to adjust, even if only for an instant, this means they are pushed less. The further a given wave centre gets from a massive body, though, the less pattern there is in the waves it receives from it. The waves become less coherent because they are each individually weakened by distance and more of them, from more individual sources, as superposed. The possibility of slight beginnings of coordination of phases becomes less and less, so the net attraction (reduction in push) decreases. It is not unreasonable to suppose that the decrease will at first follow an inverse square law to good approximation, but at great distances gravity, if I have understood it correctly, will cease entirely. Other forces, perhaps large-scale aether flows, will take over.

Inertia is a measure of the speed with which a group of wave centres responds to changes in the incoming phi-wave patterns. Response will be slower for a large body because more “negotiating” needs to be done to make those centres not directly affected by the change adjust to it via influences from their neighbours. It will clearly be related to our idea of the quantity of matter in the body. It will also clearly be related to the matter in the rest of the universe, in the manner of Mach’s principle, though not, as in some interpretations, with any implication that it is the universe as it exists at this current instant that matters. Due allowance has to be made for the propagation times of the phi-waves that are responsible.

### **“Aether Resistance” and the Stability of Planetary Systems**

One argument that can be raised against any aether theory is that there would be expected to be resistance to motion. All bodies would slow down unless acted on by a countering force, and, in particular, planets would slow down, eventually falling into their suns. As far as we know, this does not happen. Why?

Though I do not pretend to have the whole answer, it does seem that with a wave theory there are at least more possibilities than with a basic “Le Sage” theory, in which gravity is caused purely by the exchange of momentum of bombarding “gravitons” or whatever<sup>40</sup>. It is not certain that the aether

itself presents *any* resistance. It is, after all, only our familiar “vacuum”. There would be expected to be, however, a resistive force due to the Doppler shift of the phi-waves from the rest of the universe. Those from ahead would be expected to push harder, since they are blue-shifted, those from behind less hard.

The simplest answer to the puzzle is that the force concerned may be exceedingly small – small enough to be balanced by the exceedingly small acceleration that will be caused by the time-lag of the gravitational influence of the sun between source and planet. This possibility is illustrated in fig. 4.

Other possibilities include motion of the aether itself and various effects involving interactions of the phi-waves with the outer reaches of the atmosphere – conversion of phi-waves into new wave centres, perhaps. The fact that the Earth spins on its axis could be important. By the time the effect of “aether resistance” has crossed it, might the Earth have spun so that the effect was moving in a totally different direction? Remember, we not dealing with simple rules of transfer of momentum. It is not certain that phi-waves can be considered to have momentum, in view of the fact that their effect on a wave centre depends on relative phase.

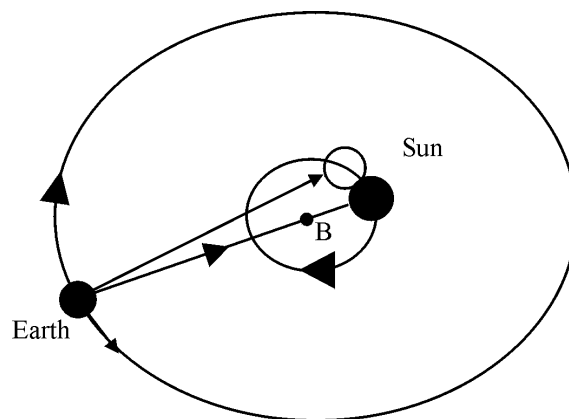


Fig. 4: Gravity plus aether resistance. B is the Earth-Sun barycentre. The open circle is the Sun at the moment when the phi-waves being received by the Earth at the current instant left it. Large arrows show directions of motion, smaller ones forces, the medium one being the resultant of the two smallest. Gravity acts so that there is a small “propagation delay force” in the forwards direction. Could it be that aether resistance provides the necessary backwards force to make the resultant point towards the current position, as required to satisfy Kepler’s “equal area in equal time” law?

An interesting speculation in this context is whether there might be some special circumstances in which a blue Doppler shift actually increases “pull”. Could it be that part of the reason the Earth keeps spinning on its axis is that, once started, the Sun tends to “pull” more on the parts that are moving towards it?

Before leaving the subject of aether resistance, a quick word about a matter that has recently gained considerable publicity: Tom Van Flandern’s arguments in favour of an almost infinite speed to “gravitons” in a Le Sage-type theory<sup>41</sup>. After lengthy discussion spread over several years, it has become clear that his central argument re the observed stability of planetary systems involves a misunderstanding of Laplace’s argument<sup>42</sup> of 1805 or so. Laplace had realised that the problem was

that the aether (or gravitons) would create resistance to motion. Van Flandern has persuaded himself that the problem is that “aberration” would cause acceleration of the Earth along its orbit, causing it to fly off into space! I shall not confuse the reader by going into details. Suffice it to say that, even if you go along with his definition of aberration and his conviction that it is the same thing as the “propagation delay” effect discussed above, the resistance to motion of the gravitons that he (consciously) ignores – the ones that are *not* directly responsible for the attraction between Earth and Sun – will far exceed any aberrational effect. It’s a matter of geometry: the solid angle subtended by the Sun is very much smaller than the solid angle of the remainder of the Heavens. As argued above, the situation when we have waves rather than particles responsible for gravity is in any case different, with more options available.

## Conclusion

The important features of PWA theory are the presence of a universal fluid aether, the absence of any “photon” concept, and novel ideas regarding the mode of action of “forces”. These involve the replacement of both the smooth “field” and the quantum-mechanical “particle exchange” explanations. As far as the subatomic structure of matter is concerned, and detailed descriptions of features such as the motion of the aether, much remains to be discovered. At the subatomic level, none of the macroscopic parameters such as mass, charge, momentum or energy are even defined. All that exists are waves and wave centres, interacting in ways that I have, hopefully, made some progress towards discovering.

What is needed now is for some practicing physicists to take over -- so long as they do not immediately stifle the idea by converting it into equations! The aim of the PWA theory is not the production of formulae from which physicists can make numerical predictions. It is improved understanding, accessible to all, of both natural and man-made phenomena, leading hopefully to more rational management of our planet.

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<sup>1</sup> Dishington, Roland H., *Physics 2001*, Beak Publications, P.O. Box 333, Pacific Palisades, CA 90272, (2001).

<sup>2</sup> Stoinov, Dimiter, “On the nature of electromagnetic waves”, *Galilean Electrodynamics* **14** (1), 17 (2003).

<sup>3</sup> De la Peña, Luis and Ana Maria Cetto, *The Quantum Dice: an Introduction to Stochastic Electrodynamics*, Kluwer 1996.

<sup>4</sup> Dirac, Paul A. M., *Directions in Physics*, John Wiley and Sons 1978.

<sup>5</sup> Campbell, Lewis and William Garnett, *The life of James Clerk Maxwell*, Macmillan 1882, page 383.

<sup>6</sup> Lorentz, Hendrik A., *Theory of Electrons*, Teubner 1916, page 16.

<sup>7</sup> Hendry, John, *The Creation of Quantum Mechanics and the Bohr-Pauli Dialogue*, D Reidel Publishing Company 1984. For example (page 28), Bohr said at the 1921 Solvay congress:

*“[The hypothesis of light quanta] presents insuperable difficulties when applied to the explanation of the phenomena of interference ... [it] excludes in principle the possibility of a rational definition of the conception of a frequency.”*

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- <sup>8</sup> Collins, Harry and Trevor Pinch, *The Golem: What everyone should know about Science*, (Cambridge University Press, 1993).
- <sup>9</sup> Carver Mead related a few years ago in an interview for the Spectator how Bohr and Von Neumann thought the laser impossible until one was demonstrated to them by Townes. See <http://freespace.virgin.net/ch.thompson1/People/CarverMead.htm>
- <sup>10</sup> Thompson, C. H., “The Tangled Methods of Quantum Entanglement Experiments”, *Accountability in Research*, vol. 6, no. 4, pp 311-332 (1999), <http://freespace.virgin.net/ch.thompson1/Tangled/tangled.html>
- <sup>11</sup> Michelson, A. A. and E. W. Morley, *Philos. Mag. S.5*, **24** (151), 449-463 (1887), <http://www.aip.org/history/gap/PDF/michelson.pdf>. Michelson and Morley published at least one other paper on drift detection. Similar experiments during the 20<sup>th</sup> century are all, apart from Miller’s and some very recent ones, reported as having fully confirmed the 1887 report.
- <sup>12</sup> Michelson, A. A., “Conference on the Michelson-Morley Experiment”, *Astrophysical Journal* **68**, 341 (1928).
- <sup>13</sup> Einstein, Albert, *Science* (1925).
- <sup>14</sup> DeMeo, James, “Critical Review of the Shankland et al Analysis of Dayton Miller’s Aether-Drift Experiments”, <http://www.orgonelab.org/miller.htm>, (2000). DeMeo has since been able to recover from Case Western University much of Miller’s original data, which had been lost.
- <sup>15</sup> Miller, Dayton C., “The Ether-Drift Experiments and the Determination of the Absolute Motion of the Earth”, *Reviews of Modern Physics* **5**, 203-242 (1933).
- <sup>16</sup> Shankland, R. S. et al, “New Analysis of the Interferometer Observations of Dayton C Miller”, *Reviews of Modern Physics* **27**, 167-178 (1955).
- <sup>17</sup> Cahill, Reginald T. and Kirsty Kitto, “Michelson-Morley experiments revisited and the Cosmic Background Radiation preferred frame”, [http://www.scieng.flinders.edu.au/cpes/people/cahill\\_r/processphysics/HPS9.pdf](http://www.scieng.flinders.edu.au/cpes/people/cahill_r/processphysics/HPS9.pdf)
- <sup>18</sup> Hubble, Edwin, *Roy. Astron. Soc. M. N.* **17**, 506 (1937).
- <sup>19</sup> Whittaker, Sir Edmund, *A History of the Theories of Aether and Electricity*, 1910. 2<sup>nd</sup> edition: Nelson, London, 1951.
- <sup>20</sup> Lorentz, H. A., *Problems of Modern Physics*, Dover 1927.
- <sup>21</sup> A recent experiment gives what I consider to be a rather neat confirmation of the nature of radio waves together with the fact that the potential propagates at speed  $c$ . See R. I. Tzontchev, A. E. Chubykalo and J. M. Rivera-Juárez, “Coulomb Interaction does not Spread Instantaneously”, *Hadronic Journal* **23**, 401-424 (2000).
- <sup>22</sup> The opening sentence of Einstein’s famous 1905 “Relativity” paper reads:

*“It is known that Maxwell’s electrodynamics – as usually understood at the present time – when applied to moving bodies, leads to asymmetries which do not appear to be inherent in the phenomena.”*

He seems to have been of the opinion that Lorentz Invariance had been established experimentally (which I do not believe to be, even now, the case). If LI were absolutely true, then a theory in which light is emitted as particles, at constant speed relative to the emitting body, would have some advantages. Thus some of his assumptions about the facts of electrodynamics would have contributed to the invention of the photon.

- <sup>23</sup> Kangro, Hans (ed.), *Planck’s Original Papers in Quantum Physics*, Taylor & Francis Ltd., London 1972.
- <sup>24</sup> Parisi, Giorgio, “Planck’s Legacy to Statistical Mechanics”, <http://arXiv.org/abs/cond-mat/0101293>.
- <sup>25</sup> Millikan, in the very paper acclaimed as having established the reality of the photon, wrote in the introduction:

*“It was in 1905 that Einstein made the first coupling of photo effects and with any form of quantum theory by bringing forward the bold, not to say reckless, hypothesis of an electro-magnetic light corpuscle of energy  $h\nu$ , which energy was transferred upon absorption to an electron.”*

By the end of the article, and in his 1923 Nobel Prize speech, he had not changed his mind. The idea of light as corpuscle was not justified by this evidence. See Robert A. Millikan, “A Direct Photoelectric Determination of

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- Planck's 'h' ", *Physical Review* **7**, 355-388, 1916; *ibid.* "The electron and the light-quant from the experimental point of view", *Nobel Lecture*, May 23, 1923, <http://www.nobel.se/physics/laureates/1923/millikan-lecture.pdf>
- <sup>26</sup> Compton, Arthur H., "A quantum theory of the scattering of X-rays by light elements", *Physical Review* **21**, 483-502 (1923).
- <sup>27</sup> Boyer, Timothy H., "Derivation of the blackbody radiation spectrum from the equivalence principle in classical physics with classical electromagnetic zero-point radiation", *Physical Review D* **29**(6), 1096-8 (1984).
- <sup>28</sup> Schrödinger, *Collected papers on wave mechanics*, Blackie & Son Ltd., 1928, pp 124-129.
- <sup>29</sup> Clauser, John E., "Limitations to the validity of semiclassical radiation theories", *Physical Review A* **6**, 49 (1972).
- <sup>30</sup> Maurellis, Ahilleas and Jonathan Tennyson, "The climatic effects of water vapour", *Physics World*, p 29, May 2003.
- <sup>31</sup> Selleri, Franco, *Quantum Paradoxes and Physical Reality*, A. Van der Merwe, ed. (Kluwer Academic, Dordrecht, 1990).
- <sup>32</sup> Thompson, C. H., "Loopholes and anomalies in actual Bell tests", pp 345-361 of *Instantaneous Action-at-a-Distance in Modern Physics: 'Pro' and 'Contra'*, N. V. Pope and A. E. Chubykalo (Eds.), (Nova Science, 1999); <http://www.amazon.com> .
- <sup>33</sup> Aspect, Alain *et al.*, *Physical Review Letters* **47**, 460 (1981); **49**, 91 (1982) and **49**, 1804 (1982).
- <sup>34</sup> See among others: Thompson, C. H. "The Chaotic Ball: An Intuitive Analogy for EPR Experiments", *Foundations of Physics Letters* **9**, 357 (1996), <http://arXiv.org/abs/quant-ph/9611037>; *ibid.*, "The Tangled Methods of Quantum Entanglement Experiments", *Accountability in Research*, vol. 6, no. 4, pp 311-332 (1999), <http://freespace.virgin.net/ch.thompson1/Tangled/tangled.html> ; "Subtraction of 'accidentals' and the validity of Bell tests", various versions submitted to *Physical Review Letters* and *Physical Review A* and rejected, 1998-9, now published as: *Galilean Electrodynamics* **14** (3), 43-50 (May 2003), <http://arXiv.org/abs/quant-ph/9903066> ; C. H. Thompson and H. Holstein , "The 'Chaotic Ball' model, local realism and the Bell test loopholes", <http://arxiv.org/abs/quant-ph/0210150> , submitted to *American Journal of Physics* October 2002 and rejected after an initial favourable review.
- <sup>35</sup> Jaynes, Edwin Thompson, "Clearing up the mysteries (the original goal)", the opening talk at the 8<sup>th</sup> International MAXENT Workshop, St. John's College, Cambridge, England, August 1-5, 1988: pages 1-27 of the proceedings volume, *Maximum Entropy and Bayesian Methods*, J. Skilling, Editor, Kluwer Academic Publishers, Dordrecht-Holland 1989.
- <sup>36</sup> Bell, John S., "On the Einstein-Podolsky-Rosen paradox", *Physics* **1**, 195 (1964), reproduced as Ch. 2, pp 14-21, of John S. Bell, *The Speakable and Unsayable in Quantum Mechanics*, Cambridge University Press 1987.
- <sup>37</sup> Clauser, J. F. and Horne, M. A., "Experimental consequences of objective local theories", *Physical Review D*, **10**, 526-35 (1974).
- <sup>38</sup> Mead, Carver A., *Collective Electrodynamics: Quantum Foundations of Electromagnetism*, MIT Press 2000.
- <sup>39</sup> Cohen, R. J., page 65 of White, R E, *Observational Astrophysics*, Institute of Physics Publishing 1992.
- <sup>40</sup> Both the original Le Sage theory and many other variations – some not that much different from PWA theory – are covered in this comprehensive collection of papers. Newton himself was interested in such ideas: *Pushing Gravity*, Matthew Edwards (ed.), Apeiron 2002, <http://redshift.vif.com> .
- <sup>41</sup> Van Flandern, T., "The speed of gravity – What the experiments say", *Physics Letters A* **250**, 1-11 (1998), [http://metaresearch.org/cosmology/gravity/speed\\_limit.asp](http://metaresearch.org/cosmology/gravity/speed_limit.asp)
- <sup>42</sup> Laplace, P. S., *A Treatise in Celestial Mechanics*, Volume IV, Book X, Chapter VII, translated by N. Bowditch, Chelsea, New York, 1966.