The Phi-Wave Aether: a Wave Theory of Everything

Caroline H Thompson, October 2004, revised December 2005

Email: ch.thompson1@virgin.net
Web site: http://freespace.virgin.net/ch.thompson1/

The Phi-Wave Aether (PWA) theory is a tentative theory of everything, based on the assumption of a universal fluid aether. It embodies new ideas about forces, radiation and the nature of matter. The forces we observe are the effects of the interactions of "phi-waves", primitive longitudinal aether waves, with pulsating "wave centres", the basic units of matter. Radiation is not intrinsically a transverse wave but merely a pattern formed by modulation and interference of the phi-waves emitted by matter when it moves periodically. The theory conflicts with Einstein's ideas regarding the aether, relativity and the existence of the photon, and also with some of Lorentz', since it demands that, at least on the scale of the atom, the aether *must* move with solid bodies. It is fully consistent, though, with their ideas of local realism.

1. Introduction

The Phi-Wave Aether (PWA) concepts presented here originated in the attempt to understand what the electromagnetic fields really were, in particular how a stationary field could exist in an aether that my intuition suggested was some kind of fluid. How can a fluid support the equivalent of a hill? How can a field move instantaneously in parallel with its source (which, as I understand it, is what Einstein thought and what is currently taught)? Equally, how can a fluid aether support the kind of complicated mechanism that Maxwell envisaged, with its vortices interleaved with little ball bearings[1]? A theory is required that explains how electromagnetic fields and radiation can induce not only push and pull effects but also, on occasion, turning motion. If we reject out of hand the quantum theory notion that this is all achieved by exchange of particles, flying through the void and colliding with each other, what is the most plausible alternative?

The model I have arrived at seems consistent with what I have later come to know about the quantum world and the rest of physics. The theory assumes an aether that can flow and turn but I do not assume, as many aether theories do, that radiation necessarily has "angular momentum", so there is no need to envisage space filled with anything as complicated as vortex-like "photons". It is merely filled with longitudinal waves.

Where, as here, in the rejection of the idea that all radiation has angular momentum, the model conflicts with accepted theory, it is usually for good reason. The experimental facts are often open to alternative explanations. Not infrequently in Modern Physics, the accepted ones are nonsensical from the point of view of what might be called "physical logic". A complete essay could be written on experiments that have, in my view, been misinterpreted, but I shall refrain, relegating the ones I know most about – the "Bell test experiments", claimed to provide evidence of "quantum entanglement" – to the Appendix and mentioning others where relevant.

The PWA theory is not mathematical. I feel strongly that it is as yet beyond us to even attempt a mathematical model and, indeed, the attempt would be counterproductive as far as understanding and communication are concerned. The 20th century seems characterised by the determined pursuit of formal models, constructed prematurely on flimsy evidence and hampering real progress. In its initial formulation, in January 2000[2], the PWA theory may have looked sufficiently simple to model mathematically, but the more I have found out and the more actual phenomena I have tried to understand the more elaborate it has become and the less certain about some facets. The basic ideas, though, have so far stood the test of time.

2. The Aether and Phi-Waves

2.1 Evidence for a fluid aether

The aether, by definition, is the light-carrying medium. (In the Phi-Wave Aether theory it is more than this – it is the only substance in the whole universe.) In its basic state, it *is* the vacuum, and it is evident to our senses that we can move freely through it. In the 19th century physicists would have liked to be able to accept the idea of an aether, the experiments of Young, Fresnel, Faraday and others having proved so convincingly that light was some kind of wave[3], but they had reached an *impasse*. They knew that light could be polarised, and they thought that this implied that it was necessarily a *transverse* wave. A transverse wave cannot, they thought, propagate through a fluid, and for an elastic solid to be able to propagate transverse waves as fast as light it would have to be almost rigid. The aether would therefore have to be static, and this was ruled out towards the end of the

century by the Michelson-Morley experiments. Einstein, at the beginning of the 20th, felt justified in building a theory that ignored the aether completely. Later he brought it back again, but with the strange proviso that it could not be treated like an ordinary medium – like water, for instance, in which one can identify flow as distinct from any waves it may carry:

> "According to the general theory of relativity space without ether is unthinkable; for in such space there not only would be no propagation of light, but also no possibility of existence for standards of space and time (measuring-rods and clocks), nor therefore any space-time intervals in the physical sense. But this ether may not be thought of as endowed with the quality characteristic of ponderable media, as consisting of parts which may be tracked through time. The idea of motion may not be applied to it." Albert Einstein, 1920[4].

When evidence began to emerge from the experiments such as those of Sagnac[5] and Dayton Miller[6] that it might, after all, be possible to detect the motion of the aether, he chose either to ignore it or to dismiss it as experimental error[7]. I see no scientific justification for Einstein's attitude, despite the fact that in a sense he was right: many interactions depend almost entirely on the *waves* in the aether and are insensitive to its motion. Additionally, recent detailed observations of gravitational and tidal effects suggest that (as was tentatively put forward at the time) these could have played at least a part in Miller's results. The latter should not have been simply swept under the carpet, though. Other scientists, when he announced his main findings, agreed that there was need for further investigation. Lorentz himself declared that, whatever the cause, the results could not be explained by his theory alone[8].

Be that as it may, experiments seem to have shown that the aether wind relative to the Earth is small, and this indicates, to my mind, that the aether must move with the Earth. It is either completely dragged with it in its motion around the Sun or almost so[9]. Possibly it does not revolve daily with the Earth, but the experimental evidence here is open to more than one interpretation.

A major reason, though, for assuming a fluid aether is simply that without it the whole PWA concept, together with the possibility of reaching a deeper understanding of the mechanism behind forces, fails. Knowledge of how the aether moves on large scales is, fortunately, not critical to my main thesis, which is more concerned with the way in which forces work at the subatomic and ordinary every-day scales.

2.2 Introducing the Phi-Wave Aether

The Phi-Wave-Aether assumption is that the universe is entirely composed of a fluid aether, pervaded by very high frequency *longitudinal* "phi-waves", these being both emitted and received by all matter. "Phi" is a scalar measuring the "state" of the aether and possibly, though not necessarily, identifiable with the concept of "density". The name was chosen because of the close relationship between aether waves and the electric scalar potential, ϕ, of Maxwell's theory. The waves are not necessarily sinusoidal (see the suggested profile in Fig. 3). They are emitted all at the same frequency but, as with any other wave, become Doppler shifted when there is relative motion.

I do not try to explain what the aether really "is", though I tend to assume that it is a continuous substance. Even if at some lower level it is, as in Steven Rado's model[10], in fact composed of particles, in order to interact these would need to be embedded in a continuous medium. The difficulties encountered in any theory that tries to explain everything just by physical contact between particles and the exchange of momentum seem to me to be insuperable.

The experimental results of Fizeau, Miller and others seem to show that the aether can quite easily change its translational motion to suit its environment. Within an evacuated tube, for instance (as used in many of the attempts to detect aether drift), it moves almost totally with the tube. Indeed, I now think that fast motion of a solid body through the aether would not be possible if, for the most part, the aether did not travel with it. At least in open space, though, the aether seems very reluctant to change direction.

Optical gyroscopes depend on the fact that light carries on regardless, ignoring facts such as the daily rotation of the Earth. Whether or not this really proves the aether does not turn, though, is a moot point. It is possible that the direction of light is influenced by its interaction with other phi-waves. The "fixed stars" and the whole of the rest of the universe provide phi-waves that in themselves give a reference frame, not always coinciding with the local aether rest frame. The phi-waves from ahead are all blue-shifted when a body such as the Earth moves in relation to their sources, so that the Earth's "phi-wave frame" is not isotropic.

This is a recurring problem in any aether theory: the experimental distinction between the effects of aether motion and those of waves carried by the aether is very difficult. For the time being, we often have to leave the question open.

3. Radiation and electromagnetic energy

When a wave source (or, more often, a group of wave sources) moves periodically, corresponding patterns (modulations and interference patterns) will form in the emitted phi-waves, and these patterns are what we sense as either "force fields" or radiation, depending on the

frequency and the scale of the source motion. Whether or not the emitted pattern has transverse components depends on the motion of the source. Which components are detected depends on the instrument used.

An elegant animation showing the generation of transverse waves from longitudinal ones can be seen on Gabriel LaFrenière's web site. He is amongst several who have discovered this idea independently.

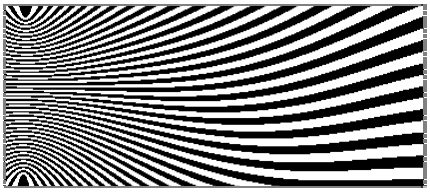

Fig. 1: The generation of light: The pattern is formed from the superposition of two sets of longitudinal waves, coming from sources at top and bottom left of the picture. The sources oscillate gently right and left, 180° out of phase. (*A frame from LaFrenière's animation*[11]*, with permission*.)

These ideas about light completely supersede Maxwell's. It is not reasonable in my view to describe light waves as oscillating transverse electric and magnetic fields, propagating by means of a series of induction interactions. As I explain later, the electric vector does have some physical meaning, but the phi-waves underlying ordinary light just flow, essentially without interaction, carrying their associated patterns with them. The ideas conflict, of course, even more drastically with the quantum theory notion of light as particles. [The invention of the photon, not the cosmological constant, was, to my mind, Einstein's greatest blunder! He invented it on inadequate grounds, and it had devastating consequences for the rational development of physics. But I shall not dwell on this here.]

My premise is that in general phi-waves and the light and other ("force-field") waves that they carry as modulations all travel in the vacuum at the same speed relative to the aether, apart from variations as follows. Firstly, the basic speed is affected by the general intensity of the local phi-wave oscillations. The phi-waves, when intense, can cause changes in the aether itself, effectively increasing its refractive index and slowing the speed of phi-waves near solid bodies. Thus phi-waves travel slightly slower near massive bodies and possibly considerably slower very near their sources. Secondly, there may be some direct interaction between phi-waves, causing additional focussing of the incoming waves onto wave sources and also causing propagation to be slower when it is against, as opposed to with, the dominant phi-wave direction. Thirdly, phi-waves may be similarly retarded when flowing against others that are mostly blue-shifted by Doppler effects.

As the existence of the aether has been denied for the past 100-odd years, we are very ignorant about these matters. More experimental evidence, together with re-interpretation of existing material, is needed. The various factors influencing the apparent speed of light (aether wind *plus* the above, not to mention possible distortions of the measuring apparatus) make the interpretations of all experiments exceedingly difficult.

Phi-waves carry "phi-energy", but this is not in itself energy that we recognise. It can be thought of as the basic food-stuff of "wave centres" (see next section) and hence of atoms. It is everywhere, taken for granted. It is only when groups of phi-waves acquire periodic patterns on a rather larger scale that we begin to call them energy. Matter itself is built of phi-waves, which makes the equivalence of matter and phi-energy self-evident, though quite whether or not this means $E = mc^2$ is another question.

4. Wave Centres

The PWA theory assumes an infinite universe in which (in our local region at least[12]) phi-energy is continuously recycled, random waves of highly variable amplitude and short coherence length being converted into coherent ones by matter, which is itself composed of aether. When the local intensity of phi-waves happens to exceed some threshold value, the aether changes state to become a stationary (or perhaps slowly moving) "wave centre", pulsating at a universal fixed high frequency. Phi-waves propagate out from it. In earlier versions of the PWA theory I assumed that the ease with which solid bodies move in the vacuum indicated that, as Lorentz thought[13], wave centres were not necessarily tied to any particular "piece of aether" but might be continually reforming from new aether as necessary. I now think that the stability of small particles is dependent on the aether always moving with them (see later). Either way, the centre continues pulsating so long as sufficient incoming phi-waves supply it with "phi-energy".

The interaction of a wave centre with incoming phi-waves depends mainly on two factors: the relative phase of incoming wave and wave centre and the amplitude of the centre's pulsations. If the amplitude is "standard" then the centre will tend to be pushed unless it is nearly in phase with the incoming wave. When there is almost a phase match, the centre can move either forwards or backwards so as to achieve an exact match. The "in phase" positions, where there is resonance, are points of stable equilibrium.

It would be satisfying to be able at this point to present a mechanical model to illustrate the above – the way in which the arrival of phi-waves at an existing centre leads automatically to the suggested effects – but unfortunately this is not the case. There are (see later) some real

situations that do possibly illustrate the effects, but they are not part of every day experience.

The general idea can, however, be understood intuitively. The way I see it is that, since wave centres "evaporate" when starved of new phi-energy, they naturally gravitate towards positions of resonance, where they can be relatively sure of a constant supply. This need not, incidentally, be true resonance, with both emitter and receiver fixed and exchanging phi-waves. True, two-way, resonance is only feasible between very close sources, since thermal and other motion means that in general the separation of any two wave centres is constantly varying. The resonance can be, and more often is, one-way and short-lived – simply the temporary agreement in phase of a wave centre with incoming phi-waves. The source of the phi-waves may be nearby or distant. The phi-waves may come primarily from one source or be the combined waves from many. Newtons' law of the equality of action and reaction, incidentally, does not apply here, since one and the same phi-wave can produce different effects on a receiver, depending on circumstances.

When the pulsation amplitude of a wave centre is not standard, or when there is net motion relative to the aether, the rules are effectively slightly different. For the moment, though, let us consider a pair of standard wave centres, one of which is stationary with respect to the aether.

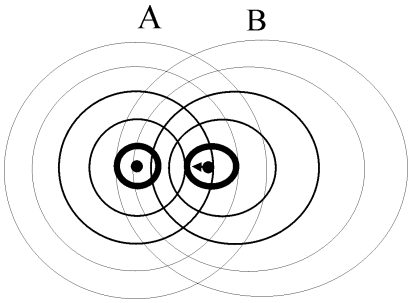

Fig. 2: Wave centres approaching: Phi-wave peaks arrive too frequently for resonance. If one arrives at the "right" time, the next will arrive too soon and be already past before the centre has reached maximum. The centre will tend to shift towards the position of resonance, i.e. away from the phi-wave source. There will be repulsion. (Distortion of waves on entering the high-intensity central regions is not shown. There will be a degree of focussing due to the higher refractive index of **t**he medium there.)

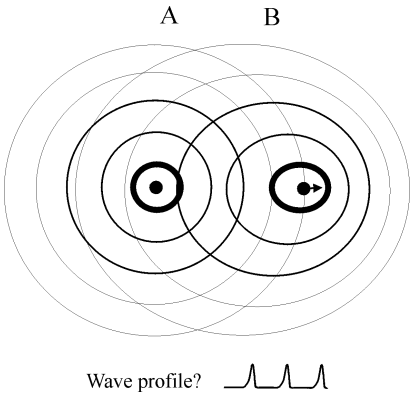

Fig. 3: Separating wave centres: These will exchange "softer" and lower-frequency phi-waves and the relative motion will slow until they are in resonance. There will be attraction. This may be simply a direct effect of the phase differences between arriving wave peaks and the centre's pulsation, but may be partly the net result of the pushing effect of waves from the rest of the universe. If the wave profile is non-sinusoidal, as shown, the waves will produce strong "forces" and firm phase-locking.

The rules for interaction of two wave centres in close proximity are quite simple, and covered by Figs. 2 and 3. If a neighbouring wave centre moves away, the phi-waves coming back from it will be red-shifted, the frequency too low for resonance with a stationary wave centre. Therefore it will be advantageous for the latter to follow. Likewise, if a neighbouring wave centre comes towards a stationary one and threatens to get too close, its phi-waves will be blue shifted and at too high a frequency for coupling. It will be advantageous to move away. The effects are achieved partly by a gradual adaptation to the phase of the incoming wave, partly by the net effect of other phi-waves. [Note that this description is slightly different from my original. At first I assumed all interactions were either push effects or zero, with attraction being *entirely* due to push from waves from the rest of the universe, in the manner of Le Sage's explanation of gravity[14].]

These rules lie behind at least certain kinds of electric current, where wave centres follow each other nose to tail. They also account for the behaviour of electrons associated with atoms and the structure of the atoms themselves. Wave centres can exist for long periods most easily if they sustain each other in neat – or maybe not so neat – groups. They might sometimes, for instance, form tetrahedral groups, as shown in Fig. 4, where all the pulsations are synchronised, all four centres in resonance with each other.

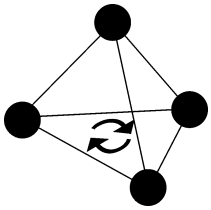

Fig. 4: A small unit of "matter": Four wave centres are trapped into resonance with each other. The unit may or may not physically rotate. The aether may or not rotate with the wave centres. If it does not, this imposes restrictions on the allowable rotation rates – a basis for quantisation?

The wave centres are effectively held in their relative positions by the requirement to stay in resonance with each other, so the "force" between any two is not simple attraction or repulsion. Boscovich had a similar idea a few centuries ago[15], now carried over into the quantum theory notion of "quantum wells" where particles can be in equilibrium.

In early versions of the PWA theory I suggested that the wave centres themselves might correspond to nucleons, so that Fig. 4 would represent a whole atom. I now see this as too simplistic. The nucleons are more likely, according to chemical and other evidence, to be "magnetic"[16], which, in the PWA model, means that they must be formed by rotating systems, possibly pairs of wave centres chasing each other's tails but more likely three-dimensional structures such as the above tetrahedron.

Somewhere in the picture of atomic structure another analogy seems compelling: the standing wave patterns that can be obtained on the surface of a fluid when a vibration is applied to the container. In a circular container, groups of stationary "wave centres" form at the centre under certain conditions, the strongest being at the corners of a square, in two pairs of opposite phase. Wave centres of opposite phase can perhaps be identified with electrons and positrons, though clearly the definition is only relative, specific to that location.

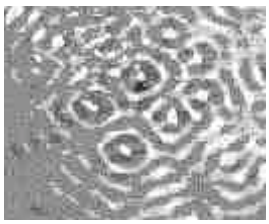

Fig. 5: A group of four wave centres: These formed on the surface of water in the centre of a circular container subject to vibration. The upper and lower centres are of one phase, the left and right ones opposite. (*Part of a video frame by Ray Tomes[17], with permission.*)

The true composition of solid matter is probably sufficiently complex to allow for a number of different structures and mechanisms to be involved at different scales. The PWA theory is at an embryonic stage here, with its own *impasse*: how to link the existence of the primary pulsating wave centres, with their fixed natural separations and non-rotating nature, to the supposedly magnetic nucleons, complete atoms, molecules and crystals. The arrangement of atoms in crystals suggests that these obey rules not unlike those of individual wave centres, in that equilibrium occurs at fixed separations.

Returning to the matter of the spin of nucleons, and assuming provisionally that each is a tetrahedron of wave centres, the question arises as to whether the constituents really circle or whether there are merely waves of phase state (as in a "Mexican wave" at a football match). Some may spin, others not. In any event, it seems that sufficient phi-waves escape the nucleus to create (moving or stationary) interference patterns around it.

If (again provisionally) we identify electrons with wave centres, they will be happy to occupy antinodes of such patterns. Thus electrons attached to atoms may occupy one of the possible antinode positions, whilst in the phi-wave-rich environment in a metal, say, they may form a loose cloud. When in "free" states, though, distant from nuclei, there are two other possibilities: they may cling together in groups or they may disintegrate and travel as pure, concentrated, phi-waves, reforming as electrons only when they interact later with "solid matter", i.e. with other compact groups of wave centres. This, I suspect, is what happens in experiments such as Tonomura's of 1989[18], demonstrating electron interference when only a single electron at a time is supposed to be present in the apparatus. Perhaps in reality there are none.

Before moving on the to discuss how the every-day forces of classical physics work, let us look at some experimental facts that may support the PWA basic idea.

5. Experimental confirmation?

5.1 Atoms in optical traps

Now atoms consist of many wave centres, and the light used in optical traps is on a relatively large scale, but it seems that atoms controlled by laser light obey much the same rules as wave centres and phi-waves. Perhaps, even, the behaviour of wave centres is the underlying cause of the macroscopic effects? My view is that the behaviour of the atom is determined by that of its constituent wave-centres but not quite "deterministically". Myriad pushes and pulls act on individual centres and the whole atom is seen to move, but this is an average effect, achieved after a considerable amount of feedback and mutual adjustment. Thus the observed behaviour of trapped

atoms is an analogy rather than an exact portrayal of the behaviour of a wave centre, but it may be helpful.

The following passage is taken from the December 2000 edition of Physics World[19]:

5.2 Light Force

> Radiation pressure is probably the best known of the forces that light can exert on an atom. In this case [coherent coupling of a single atom and single photon in a cavity], an atom absorbs resonant light and receives a momentum kick in the direction of the laser beam. Although the atom's momentum changes again when it spontaneously emits a photon, this second kick is in a completely random direction and therefore averages to zero after many absorption-emission cycles.
>
> Induced transitions, on the other hand, lead to a so-called dipole force. This force can be understood classically by noting that the electric field of the driving laser induces a mechanical oscillation of the atom's electron. The oscillating dipole moment that is produced experiences a force in a light field with an intensity gradient, such as a standing wave.
>
> The sign of this force depends on the "detuning" of the laser with respect to the atomic-transition frequency. For example, when the laser frequency is lower than the atomic frequency, the induced atomic dipole oscillates in phase with the driving laser field, and the atom is attracted towards regions of high intensity just like a small piece of paper is attracted towards an electrically charged object. Hence, the dipole force can trap particles in the focal region of a "red-tuned" laser beam. For a "blue-tuned" laser (i.e. when the laser frequency is higher than the atomic-transition frequency), the dipole oscillates out of phase with respect to the laser, so the atom is repelled from the high-intensity regions.

The passage may contain small elements of pure fiction (the mechanism might work equally well assuming only pulsating sources and longitudinal waves, without any oscillating dipoles), yet it brings out a few interesting points. The final paragraph is the most relevant. It seems to make a nonsense of the idea of "radiation pressure", since this can be either push or pull, but the main point for me is that here we have a case in which motion is *caused* by "detuning", i.e. by whether the waves are blue or red shifted with respect to some natural frequency. There is a tendency of motion to be such as to counteract the detuning. If the incoming wave is "too red", the atom moves towards it so that the Doppler shift "corrects" it in the blue direction; if it is "too blue", it moves away.

5.3 "Energy-sucking antennae"

Regarding the focussing of incoming phi-waves onto wave centres, observations of the behaviour of radio waves near antennae may be relevant. Radio waves appear to be focussed onto antennae, especially if the latter are already emitting at the same frequency, in which case they amplify the signal. Perhaps they are in fact focussed onto any solid body. It seems possible that focussing is not just a matter of general increase of refractive index as the body is neared but of active interaction between the (spherical) patterns of phi-waves going out and the incoming waves.

Bill Beaty has done some interesting investigations into such matters[20], though he does not quite support my hypothesis. As he says, "Classical theory shows that radio waves are focused onto antennae, but only because the latter are already emitting (scattering) at the same frequency, resulting in amplification of the energy which a tiny antenna could otherwise absorb"[21].

5.4 The Mössbauer effect

In the "Mössbauer effect", gamma radiation directed onto a crystal at very low temperatures produces resonance, with the emitted light being at the same frequency as the absorbed light. This contrasts with the more usual case, in which the target is a gas and the source frequency has to be increased slightly, for instance by fast motion and Doppler shift, before resonance is achieved. The argument is that in the usual case the energy input is required to produce a recoil in the atom as well as oscillations. In the Mössbauer case, in the accepted explanation, recourse has to be made to quantum theoretical assumptions about the probabilities of neighbouring molecules acquiring a vibration[22].

I am doubtful about the interpretations of all these "resonance fluorescence" experiments, since in the PWA theory it is not assumed that the energy or radiation is always $h\nu$, so the arithmetic and energy-balance arguments of quantum theory do not apply. There may, in the usual case, be an explanation in terms of the ordinary theory of forced oscillations and, especially in the case of a gas target, Doppler shifts – I am no expert in this. However, the special case in which input and output frequencies are identical (which Mössbauer himself termed the "recoilless" case), might well be an illustration of the lack of either push or pull effects of the input when the receiver is able to get exactly in phase. With a wave model it is easy to explain the strength of the resonance, since a given incoming wave can stimulate many atoms at once, and the atoms may well stimulate each other in a chain reaction.

6. Macroscopic Forces

6.1 Parallel currents

If wave centres of standard amplitude are moving in parallel and are not already close, they will tend to move closer, to relative positions in which they exchange

stronger phi-waves and hence (if they can remain in phase with each other's waves for significant periods) achieve greater stability. This may sometimes be by a process of "evaporating" at one spot and reforming at the next favourable spot, one wavelength nearer to the other, sometimes by a more gradual adaptation. The force between wires with parallel currents, for instance, is caused by the wave centres in each tending to draw closer to those of the other when both currents are in the same direction. Due to the Doppler shifts of the phi-waves, they have more chance of resonating with electrons moving in the same general direction than with stationary ones in the rest of the environment.

The wires will carry on drawing closer until distances of a few wavelengths are reached, when closer proximity becomes difficult unless the two currents can get completely in phase, which is most unlikely to be the case. When the currents are in opposite directions, Doppler shifts have an adverse effect and there will be repulsion.

6.2 Magnetism

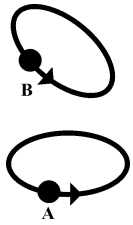

Fig. 5: Magnetism: A and B are wave centres, both constrained to move in circles. Phi-wave interactions (including those with the rest of the universe) will nudge them so that their paths are, if possible, parallel. If the initial paths are constrained to be opposite, there will be repulsion since resonance is impossible.

The force between two magnets placed end to end can be viewed as a special case, since a magnet contains circling currents. Currents in two magnets attract each other if both are circling in the same sense and repel if opposite (see Fig. 5). Other magnetic phenomena are a little more difficult to explain. Account needs to be taken of the phases of individual wave centres and the fact that when, as happens in a "magnetised" body, many atoms are "spin-aligned", the phases of wave centres within each spin domain are likely to be related. It is interference patterns between various waves, combined with interactions between pairs of iron filings in which magnetism has been induced, that lead to the appearance of "lines of force" when the filings are slightly shaken.

This covers the basic mechanism of magnetism. Even the induction of magnetism around a current-carrying wire can be seen as yet another variant on the basic phenomenon of currents aligning themselves wherever possible so as to be parallel. Here the magnet is assumed to contain small circling currents that align themselves so that the part of the current nearest to the wire is parallel to that in the wire.

6.3 Electrostatics

Electrostatic forces are a little more difficult to understand. The original inspiration for phi-waves was as an explanation for the Coulomb force, which was to be determined by the gradient of their amplitude, but how can we explain in terms of wave centres why positive charges should move one way and negative the other? What is a "positive charge"? Indeed, what is a negative one?

The wave centres discussed so far have been "standard" ones, effectively neutral, and assumed provisionally to be identifiable with electrons. There seem to be two options here: either negative charge is associated with high levels of phi-oscillation (whether due to increased number of wave centres per unit volume or to increased pulsation amplitudes[23]) or with low. After many years of assuming the former, I now favour the latter. Electrons that are not in tight clusters are (within reason) always "hungry" for as much "phi-energy" as they can get.

One factor influencing this choice is that I model atomic nuclei as close groups of wave centres, and these will emit high-intensity phi-waves, though with strong interference patterns. Nuclei are conventionally taken to be positively charged, so it can reasonably be assumed that the high phi-intensity output is attractive to free wave centres, i.e. to electrons. When a nucleus has its full complement of electrons it becomes electrostatically neutral, which poses somewhat of a problem. Perhaps the outer electrons are so placed that they absorb effectively all the surplus phi-energy from the nucleus and re-radiate it as spherical waves. Because these outer electrons are relatively far apart, there are no regions where there is strong constructive interference between their phi-emissions. They have effectively plugged the phi-energy leaks. [I realise this is rather far-fetched. Perhaps it would be wiser to say that this is one of the areas not yet covered by the theory.]

So far we have assumed that incoming phi-waves *push* wave centres unless they are almost in phase. It is now time to clarify what we mean by "almost". Could it be that when the pulsation amplitude is very high, the wave centre has to be very nearly exactly in phase if it is to avoid being pushed, whilst if the pulsations are below par it is more adaptable, moving more readily either forward or backward so as the achieve resonance? This would mean that a "negative" (below-par) centre would more often move towards a phi-wave source than a "standard" one would.

Let us reconsider what is happening to make a wave centre move. The centre, after all, only really exists as such for part of its cycle, when the phi value is high. Phi

then decreases to zero and the centre re-forms, possibly in a slightly different position. It has not really been pushed or pulled at all, just regenerated in a new place. There is thus no reason why there should not be an actual pulling effect, even if the phases are not approximately matched. By re-forming a little nearer to the dominant phi-wave source (which presumably is relatively "positively charged", having strong pulsations), a weakly pulsating centre will become stronger. It can either adjust its position slightly or move by a complete wavelength. Similarly, a strongly-pulsating wave centre may be unstable unless it reforms further away from another source of strong phi-waves. [It must at all costs avoid receiving more than some maximum phi, but this should almost always be possible, since changes in incoming phi-intensity will almost always be gradual.]

Thus we have a reasonable model for both electrostatic attraction and repulsion. My earlier idea remains a possibility: that there are only push forces and the difference between positively and negatively charged bodies is due to the fact that the wave centres in negatively charged ones are more free to move to vacant sites and hence more often able to get in phase with incoming waves.

6.4 Gravity

The force of gravity is also carried by phi-waves, and is perhaps best treated as the result of a net imbalance between repulsive and attractive magnetic and electrostatic forces. In my original formulation of the PWA theory I placed great emphasis on the fact that the coherence lengths of phi-waves from very distant objects would necessarily be much shorter than those from nearby ones, and tried to account for gravity as an entirely as a pushing force, assuming a Le Sage type shadow effect. Short wave trains almost always push wave centres since there is no time to establish resonance, whilst longer wave trains more often couple with them and do not push.

I still think coherence properties play an important part, but now think that it is more likely that there is a positive attractive force as well. The attraction can be thought of as mainly electrostatic, due to the fact that wave centres near the surface of a body will tend to be slightly starved of phi-energy, receiving it strongly only from within the body. External massive bodies will be better sources of phi-energy the nearer they are. Even if in fact neutral, other things being equal, a near body is a better source than a more distant one since its phi-waves will be stronger and of longer coherence length.

6.5 "Optical spanners"

For a few years now it has been possible to manipulate small objects, for example on microscope slides, using lasers. A recent development allows the laser to cause turning, as well as lateral motion[24]. A beam is produced in which ordinary circular polarisation is exaggerated artificially, in one way or another adjusting the phases of different parts of the cross-section to give a larger-scale circular pattern to the phase differences.

Now the production of a transverse force is not easy to explain using wave theories, but it can be done. The force involved is partly what I might term the "lemon pip effect", whereby the pip is squeezed and shoots off sideways, but partly, perhaps, an effect due to the ability of wave centres to track incoming phi-waves with which they are in resonance. The force could be (and doubtless usually is) just the transverse electric potential gradient ***E*** that classical radiation theory has assumed since Maxwell's time, but in reality the field in this direction is quite different from the radial ***E*** field produced by a charged body. It is composed of waves that are propagating orthogonally to the gradient, yet a pattern of changing intensity and phase is moving in the assumed direction of ***E***.

Perhaps this kind of transverse force deserves a new name? It is not quite an electrostatic one, not quite an ordinary magnetic one. The force illustrated by macroscopic optical spanners is presumably of the same kind as the turning force already known to be associated with circularly polarised radiation[25], but very much stronger.

7. Motion in the aether

Evidence regarding the motion of the aether is currently confusing, with a century of denial hindering progress in interpreting experiments. The facts, as far as I can tell, seem to show that the aether moves readily with solid bodies insofar as it shares their translatory motion, but whether or in what circumstances it changes direction is far from clear. Miller's observations, which he took as evidence of a small aether wind due mainly to the motion of the Solar System relative to a wider aether frame, might have been, at least in part, evidence of the direction of light being influenced by the "*phi-wave frame*" determined by the fixed stars and the rest of matter in the universe. This is consistent with the basic facts of a Foucault pendulum, and with observed "sighting deviations" – the fact that when you view an object through a telescope its apparent position shows periodic daily variations[26].

Lack of major aether motion relative to the Earth is also evident from lunar ranging experiments, in which light reflected off a suitably orientated mirror on the Moon returned always sufficiently close to its point of origin to be detected[27]. The aether must be moving with both Earth and Moon around the Sun. The lunar ranging apparatus was not sufficiently sensitive to have shown whether or not the aether revolves daily with the Earth.

7.1 Linear motion

The PWA theory shows that motion of a solid body relative to the aether at any appreciable speed will destroy its internal phase links. Mere "length contraction" and/or "time dilation" does not alter the fact that two wave centres that would, in a stationary aether, have synchronised phases, will not be able to continue to be phase linked unless the leader has a suitable phase delay relative to the follower.

To see why this is so, consider two linked wave centres, A and B, at rest in the aether and one wavelength apart. They will be emitting wave peaks simultaneously. Now assume an aether wind in the direction B to A. This will stretch out the phi-waves from B so that peaks pass A before A is ready for them. To accommodate B's waves, A would need to move *further away*. But, assuming for the moment that it does not, and continues blindly emitting in synchrony with B, A's waves travel slower against the aether wind and the peaks arrive at B too late. B would need to move *nearer* to A to catch them efficiently. In other words, if A and B persist in producing synchronised pulses they will no longer be in resonance unless they both move in the direction of the aether wind. If, on the other hand, they alter their phases so that B reaches maximum phi a fraction after A, all can continue very nearly as smoothly as before, a Lorentz contraction being sufficient to average out the tiny differences.

The situation is slightly more flexible if we consider larger scales, where the distance between wave centres is several wavelengths. There will be certain separations and certain speeds relative to the aether such that there are n complete wavelengths between them in one direction, $n+1$, say, in the other, with no need for any length contraction.

An interesting consequence of the "phase adjustment" idea for linearly-moving systems might be the production of radio waves associated with the rings of Jupiter. These, as I understand it, have slight linear polarisation. The PWA theory would predict that this would be parallel to the direction of rotation of the rings. The radio waves would be caused by waves of phase relationship amongst the particles of the rings, the waves being a natural consequence of motion relative to an aether that is *not* revolving with them.

7.2 Circular motion

I have so far dealt only with effectively linear motion, and wave centres very often seem to move in circles. Lorentz, in his 1904 "relativity" paper[28], did not, I think, really solve the problem. In view of the fact that he assumed a static aether and worked only from Maxwell's equations, without allowing for the wave nature of the force fields, I fear his arguments are almost entirely irrelevant. I think he underestimated the problems associated with circular motion on the scales at which the wave nature of matter comes into play, and hence the difficulty of atoms even remaining in existence unless the aether moves with them.

The easiest assumption is that the aether *does* in general move with solid bodies, and revolves with atoms when they spin. The latter is not the only possibility, though. Certain velocities relative to the aether give rise (as hinted in the caption to Fig. 4) to stable situations, and perhaps Nature sometimes chooses these, the aether staying still while the constituents of the atom revolve, but alternatively one can question whether atoms do really spin at all.

Perhaps actual rotation of wave centres is rare, apparent rotation more often being achieved by rotating "phase waves". These, however, would in general give only one-way linkages, but perhaps that is enough to keep the wave centres supplied with their phi-energy. There would still, for stability, need to be a fixed whole number of wavelengths around the circumference of the circle, so that all wave centres could be in phase with waves from one neighbour. [Due to our lack of knowledge about the way in which refractive index behaves near atomic nuclei, this does not tell us much about the absolute size of the circuit.]

8. Aether boundaries

If the aether moves freely with moving bodies, the question arises as to what happens when two aether regions meet. Assume for the sake of argument we have a body and accompanying region of aether moving into a static region. My current hypothesis is that the aether ahead of the body is compressed, which increases the phi-wave oscillation intensity, making the production of new wave centres likely and thus nullifying the excess pressure. The aether behind, on the other hand, is rarefied. The phi-waves in it are spread out and weaker than normal. Wave centres at the rear of the body are likely to be starved of phi-energy and evaporate.

In other words, the body acquires a "charge" of some kind in front, an opposite one to the rear. If it is a conductor, a current should appear from "nowhere" and flow through it, though which way it would flow is not obvious. Probably surplus wave centres from the front would migrate to the rear.

9. The PWA and Einstein

The aether concept can readily explain several phenomena currently covered by Einstein's theories. It has no use for their more mathematical aspects, rejecting the idea that it is reasonable to devise "covariant" laws of physics, the same in all frames of reference. I consider here just a few phenomena that I re-interpret.

1. **Gravitational bending of light** is a consequence of change in the refractive index of the aether with change

in phi-wave intensity, though much of the observed bending may be due to the fact that there is no a true vacuum in "space" and ordinary gas density increases near massive bodies[29].

2. **The "photon"**, as has been mentioned, does not exist, being completely replaced by the phi-wave-modulation model. Einstein invented it on the basis of:
   (a) Planck's black body radiation formula, and
   (b) the photoelectric effect, using
   (c) Compton scattering as confirmation.
   Planck's formula, though, was really just an empirical one that he had fitted and tried to interpret, making some implausible assumptions about heat and matter. Planck himself objected to the idea of the photon[30]. The actual experiments supposed to confirm Einstein's photoelectric theory did not involve single photons or electrons and Millikan, the experimenter who did the definitive versions, described Einstein's interpretation as "reckless"[31]. Compton scattering was interpreted in terms of photons and electrons only, as far as I can discover, because, after Einstein's acclamation by the media regarding the gravitational bending of light, such ideas were in vogue. Schrödinger and others worked on alternative, wave, explanations[32]. The people who are now regarded as the Founding Fathers of quantum theory resisted the photon idea on the basis of the facts – as true now as they were then – that it cannot explain interference effects and has no real place for the concept of frequency. I could go on! The photon idea has led to some absurd interpretations of a great number of experiments, and to the inability of modern theorists to make any mental distinction between "energy" and "frequency".
3. **Equivalence of mass and energy**: Clearly, since matter is made of wave centres, there is a close relationship between matter and phi-energy. Whether there is a fixed relationship with "useful" energy, though, is not so certain. It seems to me doubtful whether the actual $E=mc^2$ formula is true.
4. **Relativistic mass increase**: Since all forces are due to waves that travel at speed c, push ones will become less and less effective as the body being acted upon moves faster and faster away. Pull ones, on the other hand, are likely to convert to push when Doppler effects destroy resonance. At the same time, aether resistance (the effect mainly of the blue Doppler shift of incoming phi-waves from ahead) will increase. Altogether there will be an apparent increase in the mass, though not necessarily according to the accepted formula.

   A limiting speed is likely to be reached well before the body achieves the speed of light. Gravity, for instance, will not cause a body to accelerate indefinitely. The fast-moving body will not *necessarily* disintegrate at great speeds. Instead, the aether ahead of it may become compressed and generate new wave centres. Within, the aether may be travelling with the body, which will, as mentioned earlier, become electrically polarised.

10. Related theories

The PWA theory was developed completely independently of other similar theories, but has now been found to have elements in common with a great number. Many people have noted the similarity with Stochastic Electrodynamics (SED)[33], though in point of fact the mathematical approach, together with denial of an aether and various other features, represent important differences. Milo Wolff's "Wave Structure of Matter" theory is perhaps more closely related, though in its initial formulation, as set out in his book[34], it contains some outrageously implausible assumptions, based sometimes on quantum-theoretical ones, sometimes on acceptance of false interpretations of experiments. The theory is currently being modified in discussions on the internet[35].

11. Conclusion

Could the PWA theory be "true"? It is clearly incomplete, but I feel that the picture I give of how forces work may be close to reality. It is the kind of theory the quantum theorists might have liked, had they been able to escape from the photon and from the obsession with mathematics. The photon led to the absurdity of all forces being due to exchange of particles. The mathematical bias led to deducing ridiculous "possibilities" such as backward-flowing waves from Maxwell's equations. A phi-wave can only move forwards. Its profile is not even necessarily symmetric.

The PWA theory has the potential to enable biological phenomena – life itself – to be smoothly integrated with physics.

Appendix: False evidence in support of quantum theory

There is currently a general belief that the phenomenon of "quantum entanglement" – the phenomenon to which Einstein, Podolsky and Rosen famously objected to their 1935 paper, involving apparently *instantaneous* effects of one body on another separated one – has been experimentally confirmed, with the unfortunate consequence that the quantum world cannot be described by the kind of local causal mechanism that has hitherto been taken for granted.

I have found from my own studies that the supposed evidence (Alain Aspect's Bell test experiments of 1981-2 and similar) is riddled with *known* "loopholes" that have been swept under the carpet, at least so far as the public is concerned[36]. On the rare occasions when they are mentioned, they are dismissed as being unlikely to be important – just inventions by people attempting to save local realism[37]. (Some undoubtedly are!) Despite the

absence of any proposed mechanism for entanglement, the "experts" use the apparent total success of quantum mechanics in other areas to argue that it *must* be correct here.

The truth is that the experts simply do not understand how even the best known loophole really works, and they are unaware of the fact that, once due allowance is made for the likely behaviour of real, imperfect, apparatus, there is no difficulty in providing ordinary "local realist" explanations for the observations. The loopholes mean that the "Bell tests" they use are not valid, and no matter how many times, or by how many standard deviations, an invalid test is violated it makes no odds. The experimental results do, it must be admitted, closely match the quantum mechanical prediction, but the public is not being told the alternatives – the local realist theories that can make remarkably similar predictions.

Until I came on the scene, the loopholes were not even mentioned in the pages of wikipedia[38] (a free online encyclopaedia) in their coverage of the matter. I have now (December, 2005) somewhat improved the situation. Despite some hostile editing of my contributions (anyone has the right to edit any page), this particular reference source no longer states that there is incontrovertible evidence for entanglement.

I have been struggling for the past 10 years to publicise the facts, but the odds seem stacked against me. Journal editors, like everyone else, now believe in entanglement, and besides making good copy for the media it is now used as justification for a considerable number of posts in "quantum computing" and such like.

Experimental evidence has never been quite as objective as one might desire. The distortion of scientific method by believers in "Modern Physics" mean that now, more than ever, it is worth challenging it where it appears to conflict with alternative, more plausible, theories.

---

[1] Maxwell, James Clerk, "On Physical Lines of Force" (1861)

[2] Thompson. C. H., "Phi-waves and forces", presented at "The First International Workshop on Field Propulsion", Sussex University, January 20th to 22nd 2000, published in *Journal of New Energy* **6** (1), 153-161 (2001), and available electronically at http://freespace.virgin.net/ch.thompson1/Papers/phi-waves.htm

[3] Mach, Ernst (John S Anderson and A F A Young trans.), *The Principles of Physical Optics*, (E P Dutton and Co., Publishers, New York, 1926)

[4] Einstein, A, "Ether and the Theory of Relativity", address delivered on May 5th, 1920, in the University of Leyden, http://www.tu-harburg.de/rzt/rzt/it/Ether.html

[5] Sagnac, M G, "L'éther lumineux démontré par l'effet du vent relatif d'éther dans un interféromètre en rotation uniforme", *Comptes Rendus* **157**, 708-710 (1913)

[6] 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)

[7] DeMeo, James, "Critical Review of the Shankland et al Analysis of Dayton Miller's Aether-Drift Experiments", http://www.orgonelab.org/miller.htm (2000)

[8] Michelson, A A et al, "Conference on the Michelson-Morley Experiment", *Astrophysical Journal* **68**, 341 (1928)

[9] It is possible that, as in Reich's "orgone" theory, the aether takes the lead, effectively pulling the Earth around the Sun and the Solar System through the Galaxy. See James DeMeo's article, http://www.orgonelab.org/MillerReich.htm

[10] Rado, Steven, *Aethro-Kinematics*, http://www.aethro-kinematics.com/ (1996)

[11] Gabriel LaFrenière's animation of the generation and propagation of light can be found at http://www.glafreniere.com/images/lumiere10a.gif. For his explanation see http://www.glafreniere.com/sa_light.htm.

[12] Though the universe is infinite, in my current version of PWA theory is it not necessary to assume that it has all been "developed". The region containing solid matter may be constantly expanding, not in the manner of Big Bang theory but by the conversion of raw aether into solid matter. It is possible that the total "energy" (organised phi-energy) is steadily increasing.

[13] Lorentz, Hendrik A, *Theory of Electrons*, (Teubner 1916)

[14] Edwards, Matthew (ed.), *Pushing Gravity*, (Apeiron 2002), http://redshift.vif.com

[15] Thomson, J J, "Cathode Rays", *Philosophical Magazine* **44**, 293-316 (1897), reproduced in Steven Wright's *Classical Scientific Papers*, (Mills and Boon, London 1964)

[16] O'Keeffe, Robert P, "Absolutely Aether", http://home.iprimus.com.au/longhair1/frontpage.htm

[17] Tomes, Ray, http://homepages.ihug.co.nz/~ray.tomes/cymatics.htm and private communication (June 2002)

[18] Tonomura, Akita, et al., "Demonstration of single-electron buildup of an interference pattern", *American Journal of Physics* **57**, 117 (1989)

[19] Rempe, Gerhard, "Quantum Mechanics with single atoms and photons", *Physics World*, December, 37-42 (2000)

[20] Beaty, William, " 'Energy-sucking' Radio Antennas, N. Tesla's Power Receiver", http://www.amasci.com/tesla/tesceive.html (1999)

[21] Beaty, William, private communication (September 2004)

[22] Mössbauer, Rudolf L, "Recoilless nuclear resonance absorption of gamma radiation", Nobel Lecture, 1961, http://nobelprize.org/physics/laureates/1961/mossbauer-lecture.pdf

[23] The idea that the charge *e* of an electron is in fact a maximum, threshold, level, not a constant applying to all electrons, has a history dating back at least to the beginning of the 20th century. Until Millikan's oil drop experiments [Millikan, Robert A, "The electron and the light-quant from the experimental point of view", Nobel Lecture, http://www.nobel.se/physics/laureates/1923/millikan-lecture.pdf (1923)] were declared to give conclusive proof that it was constant, a rival "loading" theory had existed. Not everyone accepts that the latter has ever been convincingly refuted [Reiter, Eric, "An Understanding of the Particle-like Property of Light and Charge", http://www.unquantum.com/theory/theoryforpdf2.pdf (2003)].

[24] Padgett, Miles and Les Allen, "Optical Tweezers and Spanners", *Physics World*, p35 (September 1997)

[25] Beth, R A, "Mechanical Detection and Measurement of the Angular Momentum of Light", *Physical Review* **50**, 115-125 (1936)

[26] Allais, Maurice, "The experiments of Dayton C Miller (1925-1926) and the theory of relativity", *21st Century Science and Technology*, 26-34 (Spring 1998)

[27] Kehr, Webster, "The Detection of Ether", http://pages.sbcglobal.net/webster.kehr/ (2003)

[28] Lorentz, Hendrik, "Electromagnetic Phenomena in a System Moving with any Velocity less than that of Light", *Proceedings of the Academy of Sciences of Amsterdam*, **6** (1904)

[29] Arthur S Eddington, wrote in 1920 (page 109 of *Space, Time & Gravitation*): "We can … imitate the gravitational effect on light precisely, if we imagine the space round the sun filled with a refracting medium which gives the appropriate velocity of light."

[30] Parisi, Georgio, "Planck's Legacy to Statistical Mechanics", http://arXiv.org/abs/cond-mat/0101293 (2001)

[31] Millikan, R A, "A Direct Photoelectric Determination of Planck's 'h'", *Physical Review* **7**, 355-388 (1916)

[32] Schrödinger, E, *Collected papers on wave mechanics*, (Blackie & Son Ltd., 1928)

[33] Peña, Luis de la, and Ana Maria Cetto, *The quantum dice: an introduction to stochastic electrodynamics*, (Kluwer 1996)

[34] Wolff, Milo, *Exploring the Physics of the Unknown Universe*, (Technotran Press, California 1990)

[35] Discussions of Milo Wolff's Wave Structure of Matter theory and related ones, including PWA, can be found at http://groups.yahoo.com/group/Wave-Structure-Matter/

[36] Thompson, C H, "The Tangled Methods of Quantum Entanglement Experiments", http://www.aber.ac.uk/~cat/Tangled/tangled.html and *Accountability in Research*, **6** (4), 311-332 (1999)

[37] Laloë, F, "Do we really understand quantum mechanics? Strange correlations, paradoxes and theorems", *American Journal of Physics*, **69**(6), 655-701 (2001), http://arXiv.org/abs/quant-ph/0209123

[38] See for example: 'Bell test experiments', *Wikipedia, The Free Encyclopedia*, 14 December 2005, 12:12 UTC, http://en.wikipedia.org/w/index.php?title=Bell_test_experiments&oldid=31318325