

# Phi-waves and Forces

Caroline H Thompson, December 2000

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## Abstract

Suppose there exists just one substance, "aether", a very special kind of fluid that supports waves of change of state of its one basic property, "phi". Suppose further that when the local intensity of phi-waves exceeds some limit, the aether itself changes state so as to set up quasi-stationary wave centres that continuously pulsate at a standard rate. Let the wave centres obey the same kind of rules that we see when atoms are held in artificial light-traps, and a new understanding of the nature of the whole universe may be within our reach. This is my "Phi-Wave Aether" (PWA) theory of everything

## 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 told me was fluid. How can a fluid support the equivalent of a hill? The model I have arrived at seems consistent with what I have later come to know about the quantum world and astronomical observations. It has elements in common with those of Steven Rado<sup>1</sup>, Ross Tessien, "Glird"<sup>2</sup> and others – even with Dirac and his "vacuum fluctuations" or "sea of virtual particles". It is the vision that matters, not the maths, which he himself did not regard as the ultimate model<sup>3</sup>.

Conceptually, my model is perhaps closest to Stochastic Electrodynamics (SED)<sup>4</sup>, a theory whose essential element is the Zero Point Field (ZPF), replacing Dirac's virtual particles by real electromagnetic waves. SED developed in parallel with quantum theory and links fairly smoothly to Hendrik Lorentz' "Theory of Electrons"<sup>5</sup> and the electrodynamics of Maxwell and others in the 19<sup>th</sup> century. It has, however, incorporated a few suspect assumptions, including denial of the aether, and chosen to follow the accepted path of insisting on a *mathematical* model. I feel strongly that such a model is as yet beyond us and, indeed, may *never* be useful as a means of communicating understanding. I view all formalisms with extreme caution. They are apt to fossilise the imperfections of otherwise promising concepts, as the temptation to twist observations so as to fit their predictions seems almost irresistible.

Many of the problems in existing models are caused by the attempt to cover supposed features of the real world that do not actually happen. Features of the world that I consider to be unsupported by the evidence include the expansion of the universe, the

particle nature of light, the transfer of energy in fixed-sized units, the existence of “spin” of elementary particles as distinct from their angular momentum, the non-detectability of “aether drift” and the occurrence of “nonlocal” quantum correlations. Regarding aether drift, I have seen evidence – the experiments of Dayton Miller, as reported in his comprehensive paper of 1933<sup>6</sup> and quite unjustifiably rejected by Robert Shankland (in consultation with Einstein) in 1955<sup>7</sup> – that it *can* be detected, though it is not the drift that Michelson and Morley expected to see. Regarding nonlocality, I have found from my own studies that the supposed evidence (Alain Aspect’s Bell test experiments and similar) is riddled with *known* loopholes that have been swept under the carpet, as least so far as the public is concerned<sup>8</sup>.

Perhaps I should add here that, as a corollary of my conviction of the existence of an aether, the idea of transforming time or distance other than as temporary mathematical devices makes no sense. I am far from alone in insisting that absolute time is the only reasonable choice. The spatial frame is more flexible. In any given context there is a preferred one, but sometimes it is not clear what this is. This ambiguity, of course, hardly ever matters in practice, which is why Einstein’s Special Relativity so nearly matches reality.

The 20<sup>th</sup> century seems characterised by the determined pursuit of false models, constructed prematurely on flimsy evidence. Let us try and think from first principles (bearing in mind that the 19<sup>th</sup> century too had its faults) how this universe of ours really *does* work.

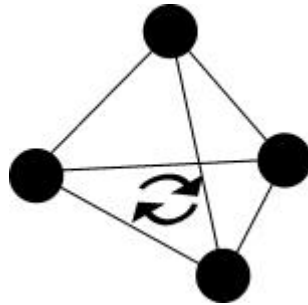
## **The Aether**

The aether, by definition, is the light-carrying medium. (In my model, 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 19<sup>th</sup> century they would have liked to be able to accept the idea of an aether, as the experiments of Young, Fresnel, Faraday and others had proved so convincingly that light was some kind of wave, but they were stuck. 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. Trying to build a plausible model based on the almost infinitely rigid solid aether that they thought needed to cope with the high velocity of light posed severe problems.

In common with Steven Rado, and quite independently, I have arrived at the conclusion that light is a modulation of underlying *longitudinal* waves. The modulations carry transverse patterns, but these do not affect the mechanism of propagation. These longitudinal waves are my “phi-waves”, extremely high frequency waves (not necessarily sinusoidal – see Fig. 3) that carry not only light but all the forces. (“Phi” is my own invention, provisionally taken to be an independent scalar property of the aether, though it could possibly (as assumed by Glird) be simply “aether density”.)

The forces that Newton and Maxwell studied are the macroscopic ones, and these turn out to be the result of statistical imbalances and their values depend, I think, on the mean intensity of the phi-waves more than on their detailed properties such as phase and exact frequency. (Though all phi-waves in a given region are probably emitted at

the same frequency, motion induces Doppler shifts that gives them quite a broad bandwidth.) “Force” at atomic scales is somewhat different. Within the atomic nucleus, for instance, it seems likely that what we think of as the nucleons are formed at antinodes of standing (quasi-stationary) coherent phi-waves.



**Fig. 1: A small atomic nucleus comprising four “wave centres” (see later) trapped into resonance with each other. It may or may not physically rotate. The aether may or may not rotate with the wave centres. If it does not, this imposes restrictions on the allowable rotation rates – a basis for quantisation?**

They 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. In a sense, quantum theory has this right – that it is all a matter of the existence of “quantum wells”. While accepting this, and maybe even in the end taking over some of the mathematics of wave mechanics, I prefer to concentrate on my own *ab initio* approach.

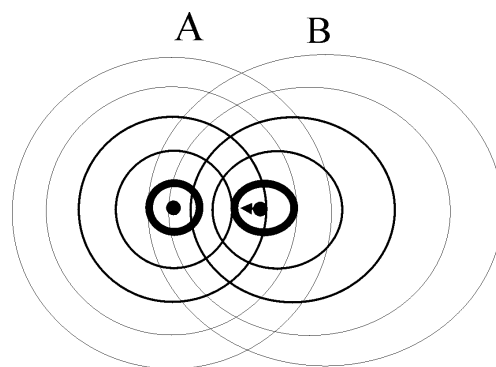
Thus the aether is a medium that carries phi-waves. The experimental results of Fizeau, Miller et al. seem to show that it can quite easily change its translational motion to suit its environment. Within an evacuated tube, for instance (as used in many of the attempts to detect aether drift), it moves almost totally with the tube. It seems very reluctant, though, to change direction. Optical gyroscopes depend on the fact that it carries on regardless, ignoring facts such as the daily rotation of the Earth. In its basic, vacuum, state, it seems totally unable to support any shear force.

My basic premise is that phi-waves and the light and other waves that they carry as modulations all travel in the vacuum at the same speed relative to the aether. This speed, however, is affected by some of the properties of the local phi-wave oscillations, which alter near solid bodies. Thus phi-waves travel slightly slower (or maybe faster!) near massive bodies and possibly considerably slower (or faster) within, say, the atomic nucleus. As the existence of the aether has been denied for the past 100-odd years, we are very ignorant about these matters. We need to look again at the experimental evidence, and I am not in a position to do this at first hand.

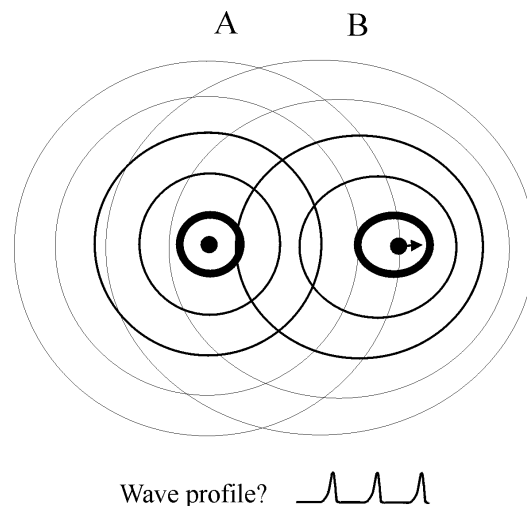
Though I make no attempt to say what the aether actually *is* – how it comes to have these marvellous properties that have led to the evolution of all that exists – I do feel, with Glird, that it has to be a continuous substance. Even if, at some lower level, it has yet more “particles”, behaving perhaps like Steven Rado’s aethrons, there is a continuous medium existing between them.

## Wave Centres

The aether in open space does not do much except propagate phi-waves, but “solid matter” is also composed of aether. It is primarily within solid matter that phi-waves have their (indirect) interactions with each other, and it is here that fresh sets are generated. My hypothesis is that the aether is able to propagate waves only up to a certain maximum amplitude. Exceed that threshold and it is forced to change state. It sets up a “wave centre” that acquires a certain degree of autonomy. It starts pulsating (maybe in a smooth sinusoidal fashion but maybe in sharp pulses with pauses in between). Though the wave centre has at least temporarily some identity, the facts that motion in the vacuum is so easy, and that momentum tends to be conserved, seem to indicate that, as Lorentz thought, it is not tied to any particular “piece of aether” but is continually reforming from new aether as necessary. It continues pulsating so long as sufficient incoming phi-waves supply it with “phi-energy”.



**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.**

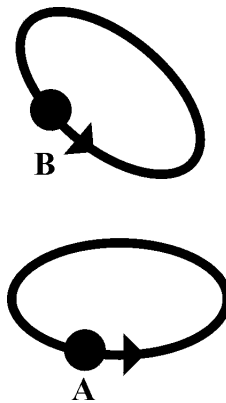
Phi-energy is not itself energy that we recognise. It can be thought of as the basic food-stuff of wave centres and hence of atoms. It is everywhere, taken for granted. It

is only when groups of phi-waves acquire periodic patterns on a rather larger scale that we begin to call them energy.

Now, the basic idea is that wave centres take random waves in and send regular spherical ones out, but in order to continue in existence for any length of time they need to have at least part of the input in “pre-digested” form. They can exist for long periods most easily if they sustain each other in neat – or maybe not so neat – groups. I visualise the atomic nucleus, for instance, as composed of tightly packed wave centres arranged rather as in a crystal (see fig. 1) except that they may be moving in intricate patterns. Or they may be stationary relative to each other and the whole set spinning. Whether nuclei really spin or whether there are merely waves of phase states (as in a “Mexican wave” at a football match) circling them is an open question. Some may spin, others not. In either case, sufficient phi-waves escape the nucleus to create (moving or stationary) interference patterns around it.

“Electrons” will be happy to occupy antinodes of such patterns. I am provisionally identifying them as simply wave centres that are not closely bound together. When attached to an atom they may occupy one of the possible antinode positions; when in a phi-wave-rich environment in a metal, say, they may form a loose cloud, but when they are in “free” states 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.

## Forces



**Fig. 4: 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.**

It is only on the macroscopic scale that forces act in the way Newton *et al.* told us. On the scale of the wave centre, I think what happens is mainly a matter of the centres adjusting their positions so as to maximise their degree of resonance with incoming phi-waves. The mechanism is intuitively simple (see Figs. 2 and 3) though it does have its subtleties. Phi-waves will vary in the extension of their peaks as well as in frequency when relative speeds vary. Motion relative to the aether produces a difference or order  $v^2/c^2$  in the frequencies sensed by A and B. It will also have an effect on the “hardness” of the waves, and the net result may be that when there is relative motion action and reaction are not *quite* equal.

This tendency for wave centres to move into resonant positions explains how they come to be at antinodes of standing wave patterns within the nucleus. It also explains how a magnet can induce magnetisation in another atom and cause attraction.

The magnet contains circling currents, i.e. phase-related sets of wave centres, either physically circling or with circling phase relationships. These emit their phi-waves, and the combined set carries enough of the circular pattern of the sources to be able to influence a circling wave centre in another atom. The new wave centre finds it advantageous to orientate its path so that it moves parallel to the source wave centres. Depending on the geometry of the situation, it may find it even more advantageous to move in close, into the regions of higher amplitude. If it is unable to orientate itself in this way, it may find its own pulsations frequently clashing with those of the incoming waves, and it is then effectively pushed away by them. One could say that it is repulsed. I am not sure to what extent the opposite effect can be termed true attraction, as it may well be that it is more the result of repulsion by phi-waves from the rest of the universe.

This seems to make magnetism make sense. Electrostatic forces are a little more difficult to understand and I'm not so sure about them. My 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 I explain in terms of wave centres why positive charges should move one way and negative the other? I'm not sure what a "positive charge" is! I have provisionally identified electrons with wave centres, and it seems reasonable that they should be pushed towards regions of lower phi-wave amplitude, but why should anything move the other way? The only way out I can see at present is to become even more anthropomorphic and suggest that a positive charge is the same thing as an atom without its full complement of electrons. It is "hungry" and goes in search of sustenance!

Perhaps this picture is wrong, but it is as likely that the idea of Coulomb force is wrong as that I am. After all, there is getting to be a body of evidence that electrons *don't* always repel each other. When they move there is a natural tendency for one to follow the other, at a discrete distance – a natural explanation for superconductivity and also for those perpetual currents within magnets and for the perpetual circling of orbital electrons in atoms.

The rules for one wave centre following another are quite simple. If your neighbour moves away, the phi-waves coming back to you will be red-shifted and too slow for you to resonate with. Therefore you will be better off if you follow! Likewise, if your neighbour comes towards you and threatens to get too close, its phi-waves will be blue shifted and too fast for you to couple with. Your best bet is to move away. There will always be other phi-waves around to help push you.

I'll come back to that other force, gravity, later. Meantime allow me to make a slight digression, presenting some analogies and experimental results that may aid the intuition.

## **Analogies and Experiments**

### **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 my 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. 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*<sup>9</sup>:

#### **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, yet it brings out a few interesting points. For one thing, 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. I'm not at all sure that there are any “dipoles” involved, though as we are dealing with large scale phenomena there may be. I think that at the wave-centre level you get the same effect with no dipole, just a (scalar) pulsation. There is a tendency of motion to be such as to counteract the detuning. If the incoming wave is “too red”, move towards it so that

the Doppler shift “corrects” it in the blue direction; if it is “too blue”, move away. Move until it is just right – until you are “trapped”, pulsing in unison with the dominant pattern of your environment.

### **Birds, aircraft and snowflakes**

How is it that the aether is so difficult to detect? Why, considering that Miller showed that there is drift in a roughly north-south direction of about 10 k/s at the surface of the earth, does the atmosphere not fly off into space? We believe, of course, that the atmosphere is held there by gravity, but at the fundamental level what is happening? Perhaps we should think of the gas molecules as like birds, keeping in a flock, almost in the same place despite a steady breeze. To maintain the system, all they need is communication with each other and a small input of energy, the occasional extra flap of the wings to counter the effect of the wind. The birds do not need to be consciously aware of any motion of the air that affects the whole flock. All they are concerned with is their neighbours and the territory below.

It’s all a matter of geometry, making adjustments so as to keep roughly equidistant from your neighbours. At this level, the exact phases of the sound and light waves that are used to convey the necessary information are immaterial. If instead we had aircraft flying in tight formation, there is a sense in which those phases *do* matter! If they are relying on radio waves to keep to their places, it may well be important to maintain constant phase relationships, though only on the scale of the waves they are using.

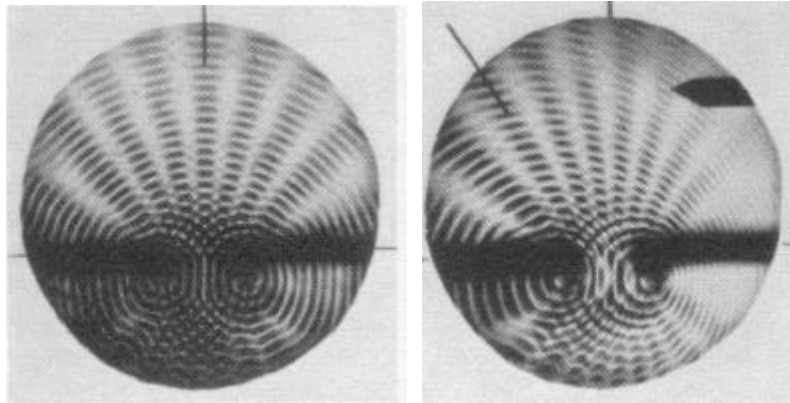
I am not sure that the birds are a good analogy for gas molecules, but a phalanx of aircraft in formation could be adapted as a reasonable analogy for a snowflake! Suppose the radio by which they coordinate their positions were to have an actual mechanical effect, causing pressure towards the desired position? Something like this I imagine to be happening when a snowflake is built up: each atom in the existing crystal is sending out a complicated pattern of phi-waves, so that the whole crystal is surrounded by an interference pattern – probably an interference pattern of phi-wave intensities at this scale, rather than individual waves. These act as an almost deterministic template for the position of the next molecule.

### **Interference patterns in moving media**

In the “good old days”, there was much interest in real interference patterns. They feature, for example, in Max Born’s 1935 book, “The Restless Universe”<sup>10</sup>. Some demonstrations that might be of fundamental importance are presented in Ives and Stilwell’s 1941 paper on “Interference Phenomena in a Moving Medium”<sup>11</sup>. They did experiments using periodic jets of air played onto the surface of a bath of mercury. The patterns were amazingly robust – when illuminated using stroboscopic light it was almost impossible to tell whether or not the mercury was moving.

They considered their results as confirming that the Lorentz transformations of time and distance made sense. Personally, I’m not sure they were right – they do not seem to have been aware of Miller’s positive results – but those photos are valuable all the same, even if it is only within the atom that speeds of this magnitude are reached. Ives and Stilwell were investigating situations in which the equivalent of  $v/c$  was 0.5

or more. It seems possible that the complete atom in the snowflake is never subject to more than about 10 k/s, or  $v/c$  about 0.00003.



**Fig 5: Ripples caused by puffs of air on mercury. On the left, the mercury is stationary; on the right it is moving from right to left at speed  $v$  such that  $v/c$  is about 0.7**

## **Motion in the Aether**

It is matter of observation that a snowflake is able to exist, despite a 10 k/s wind blowing through it! I don't think this is, to any significant extent, a matter of the aether being compressed or diverted around it: it just passes straight through, *becoming* the snowflake and then returning to "the vacuum". There may be a tiny "aether pressure", but this is evidently easily matched by the random buffeting by the phi-waves from passing molecules and the overall bias related to "gravity": the influence of the great bulk of the Earth.

So the snowflake is no problem – unless I have understated some of the rotational features of the system. There *is*, though a problem at the surface of the Earth: almost certainly the effect of its bulk is to bring the aether to a halt, so somewhere aether has to be compressed. This is a mystery, but all is not lost! It is, after all, only "vacuum".

Our everyday experience tells us that the effort needed to compress a vacuum is negligible. Perhaps, though, the compression *does* have an effect, contributing to the "aether resistance" factor that seems a necessary part of my explanation for our motion around the Sun (see below). How about the motion of the whole Solar System, though – the motion that Miller's data suggest as responsible for the main component of that 10 k/s drift? I don't think there is any insuperable difficulty here, but more facts are needed before completing the theory. Miller's results need confirmation at different locations, along with checks for any *vertical* component to the aether wind.

If Miller was right, a 10 k/s wind is flowing past and the amount flowing *through us* would appear to be negligible, as the wind within an enclosed region is almost undetectable. What really happens? Compare the situation with rain falling on the Earth, which can seep into the soil or can trickle away laterally. So far as "aether" is concerned, though, the apparently solid rock is seething with activity. The aether

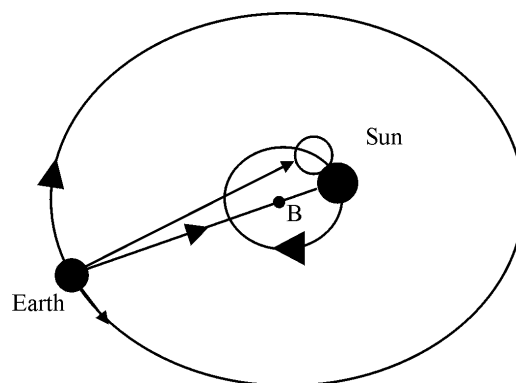
might first be compressed then behave like drops of oil falling into violently moving machinery, quickly dispersing all over the place! The average downward speed would be low, the same total “amount” per unit time flowing out as in by virtue of its compressed form. (Sufficiently compressed to form extra wave centres? I wonder!)

Incidentally, the fact that the wind at the Earth’s surface is only 10 k/s and not the 300 or more that is now, in the light of the spectrum of the cosmic background radiation, thought to be the speed of the Solar System relative to the fixed stars, is probably due to effects happening mainly out at the heliopause – the boundary of the whole system – and perhaps also at the magnetosphere that surrounds the Earth.

## Gravity

On the scale of wave-centres, gravity does not exist! (I forgot to mention that “mass” is not even defined!) Gravity is a macroscopic effect, a result of statistical imbalance. It follows from the fact that the phi-waves coming from a nearby mass will tend to have greater coherence than those from elsewhere, and, as explained above, wave-centres tend to move to the places where they can best get into resonance with incoming phi-waves. The basic wave-length involved is the very small one of the phi-waves themselves, but the phi-waves tend to be grouped – modulated – to form the “energy waves” with which we are familiar. It seems possible that coupling at *any* wavelength can contribute to “gravity”.

The total force that controls the motion of planets, though, may be more than this. As Newton deduced from Kepler’s laws<sup>12</sup>, it must be “central”, acting through the barycentre, but could it be the resultant of gravity and another force? It may be the combined effect of the above net attractive force (which will be pulling slightly forwards, as it comes from where the Sun was at the time of emission) and an aether drag that depends on all sorts of features of the planet – its atmosphere and magnetic field in particular.



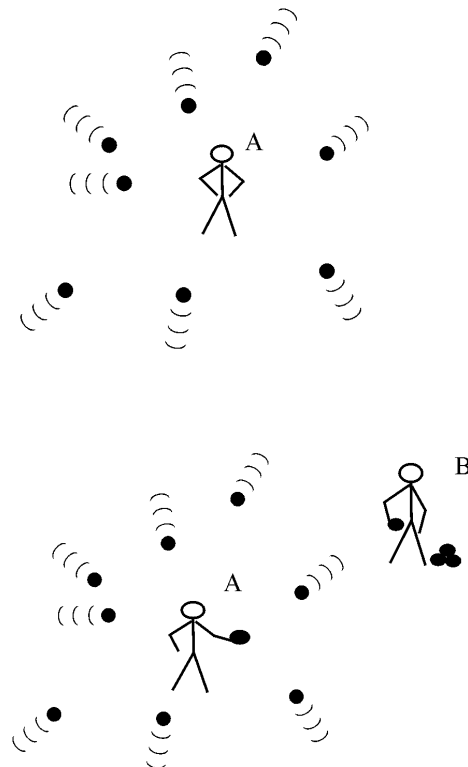
**Fig. 6: Gravity plus aether resistance.** B is the Earth-Sun barycentre. The open circle is the Sun at the moment when the phi-waves being received by the Earth at the current instant left it. Gravity acts so that there is a small “aberrational force” in the forwards direction. Could it be that aether 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?

So far as I know, our estimates of planetary masses are based on the assumption that Newton’s law is valid. They could be wrong. I do not think we know much at all

about the “masses” of objects in the heavens, and in any case their electromagnetic properties are likely to be just as important, along with the almost totally unknown properties of the invisible aether. We do not know what the aether in the Solar system is doing. It may, for all we know, be helping to push us around our orbit. Thus Newton’s Law of gravity (and Einstein’s, which is not that different numerically) may be wrong in that it uses a false measure of mass. It is probably approximately right in using an inverse square law, if only because this law seems to crop up naturally in so many situations. If gravity depends on the “degree of coherence” of phi-waves, however, it seems most likely that there is some lower limit below which it just blends into background “phi-noise”. Its range, therefore, is not infinite. Aether flow effects are likely to be doing the large-scale sculpting of the universe rather than gravity.

Does this view of gravity have anything in common with that of Le Sage, with the force being caused by pressure from incoming particles? It does in one way: incoming phi-waves are almost certainly needed to provide “push”, the outgoing, more coherent, ones merely providing a reduced push. Because incoming pressure is needed, it would appear that the universe must be infinite. I personally imagine that it is also eternal, and (with Hubble himself<sup>13</sup>) that the cosmological red shift has some other cause than expansion. It could, for all I know, be just an experimental artifact – something that happens when our instruments try and measure the spectra of exceedingly dim light!

### **How coherence can affect motion**



**Fig. 7: Snowballing on ice. Note: snowballs represent waves, not particles. Random impacts leave A on average at the same spot. Balls that are caught gently cause less motion, so that a regular supply from friend B replacing the random ones may cause A to drift towards B**

All forces beyond nuclear ones depend, I believe, on statistical effects. Even at the nuclear level, random effects are a necessary part of the picture, as the fact that there are random inputs and that the system is evidently self-correcting, adapting flexibly to them, is crucial to the long-term survival of atoms, but at this level one might assume that wave centres are rarely pushed away from their preferred positions by more than a fraction of a wave-length. Above the nuclear level, when we come to the forces recognised in every day life, this is by no means the case. A molecule in a gas is subject to great individual motion, yet the general trend is for the whole cloud to obey “gravity”.

Why should the *coherence* of the incoming phi-waves be the factor that counts?

I have not tried this myself – whether it is global warming or just the nature of the Welsh climate here near the sea, we rarely experience sufficiently low temperatures – but suppose you stand on ice, and suppose various people throw snow-balls at you. A ball that simply hits you will make you move, but one that you catch carefully, cushioning its impact, may not! Friction may be sufficient to hold you still. If you have a partner who supplies you at regular intervals with balls, you may be able to adapt to the system and catch them all. Meantime, other missiles will have been hitting you from all other directions. Might you not tend to drift towards your partner?

“Coherence” implies periodic repetition, regularity of supply. This is what enables you – even if blind and deaf – to adapt.

### **Why “Scalar” Waves?**

Why should Nature chose to use scalar, longitudinal waves, as her basic construct rather than transverse ones? Because there is less to go wrong! Waves carrying angular information can be constructed from longitudinal ones more simply than the other way around.

Quantum theory assumes that every “photon” has *angular* momentum, but this is not entirely logical. To obtain the *zero* angular momentum of a linearly polarised ray of light you have to assume that it is a superposition of a right circular and a left circular wave!

In my PWA theory, matter emits waves and these spread out, decreasing in amplitude. When “radiation”, i.e. a periodically modulated group of phi-waves, is detected at a distance from its source, the chances are that what is really detected comes from a great number of sources. If these produced random mixtures of right and left circular polarisation, the information would be lost by the time all the waves were added and detected. What would remain would be the frequency information, weakened by subdivision of the waves into units of very short coherence length but still recognisable, in the same way that the colour of ordinary light is unchanged whatever its polarisation, however many sources are contributing. The only way that circular polarisation can remain detectable at a distance is if all the sources had correlated angular motion, which could conceivably happen if all were caught up, say, in a spiralling flow of aether.

Incidentally, when radiation interacts with matter the process is always, I suspect, similar to the detection of radio waves by a tuned receiver. Nature is adept at extracting the particular “Fourier component” that is most relevant.

## Conclusion

20<sup>th</sup> century physics saw forces in terms of smoothly-varying fields at the macroscopic level, and “potential wells” at the quantum one. I think the apparently smooth fields are the statistical average effects of quantum level influences, but these latter are not really controlled by potential wells. They are controlled by the intrinsic nature of the aether – by the nature of wave centres and phi-waves.

Could my model be “true”? It is clearly incomplete, but I feel that the picture I give of how forces work may be close to reality. The ideas could be used as a basis for replacement of the sterile particle zoo of the “Standard Model” with a world view that enables biological phenomena – life itself – to be smoothly integrated with physics.

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