

The Aether : A Return to the Age of Reason. By

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John Rawls’s social contract account of justice, “justice as fairness,” set forth in *A Theory of Justice* , stipulates a concept that he describes as the “original position”. The ‘original position’ is designed to be a fair and impartial point of view that is to be adopted in our reasoning about fundamental principles of justice. As such I find that it is particularly relevant to the study of physics today. Essentially, the principle of the ‘original position’ is that the facts as they pertain to the original problem are examined, or more accurately re-examined, in as fair and impartial a view as possible; without all the baggage of alternative theories or disciplines that have subsequently been adopted, intruding.

Suppose, for instance, it is determined that it would be productive to re-examine the circumstances surrounding the existence or non-existence of the aether in the mid-1850’s in the time of James Clerk Maxwell. What did physicists of the time think about the aether before the introduction of theories such as the wave-function and special relativity gained widespread acceptance and respectability? What criteria did these physicists of the mid-nineteenth century use to decide what was acceptable from an epistemological point of view, and what was not?

Aether in the time of Maxwell

To give you an example in the change that physics underwent during this period in terms of reasoning and epistemology, look at the pithy saying that quantum mechanics so prides itself on: “At the level of the very, very small, things no longer behave in a way that can be understood at the macro level.” If enough attention is given to this saying, it is possible to see that for the first time in the history of the study of science, physicists have resigned themselves to accepting facts that have not been verified as fact. Even worse, they have resigned themselves to accept an unsupported ‘surmise’ as an established physical fact. In the words of Cummins and Jones:

"However, once scientists adjusted to quantum jumps, super-positions, and apparent action at a distance, they stopped asking why small things didn't behave like big things, and started wondering why big things didn't act like small things. The general conclusion was that macroscopic systems decohere rapidly, and that this dilution of quantumness is responsible for the apparently 'normal' behaviour." **Cummins and Jones Contemporary Physics 41, 387 (2000).**

Similarly, at approximately the same time as when quantum mechanics was delving into the working of the very small, Einstein was introducing his concept of special relativity, where both time and distance underwent changes depending on the frame of reference that was being used to view them. In one sense this was even worse than the quantum mechanics acceptance of a 'surmise' as an accepted principle of physics, because in this case it meant that the senses could no longer be depended upon to establish what was true and what was not. If the one way distance from London to New York was, as special relativity claimed, the same as the two way distance from London to New York, where did that leave our conception of measurement? Even more relevant to the issue is the question of where did this leave our senses?

If, both special relativity and quantum mechanics, leave something to be desired in terms of everyday level of thought and experience, is there an alternative? What were the criteria applied by physicists in the mid-1850's to determine the properties that the aether possessed?

An examination of many of the papers written on the subject of the aether in the mid and late nineteenth century, illustrates that physicists were quite level headed in their thinking about the aether. They tried to apply known methods in their attempts to try to discover what the aether might be and how it could be identified. The tried and tested methods used by physicists till this time, were based on observation, deliberation, hypotheses, experiment and theory. In other words the phenomenon being researched was first observed in depth, due deliberation was then paid as to how or why such and such a sequence of events related to the phenomenon took place, a hypotheses was then advanced as to why this might be so and an experiment devised to test the hypotheses.

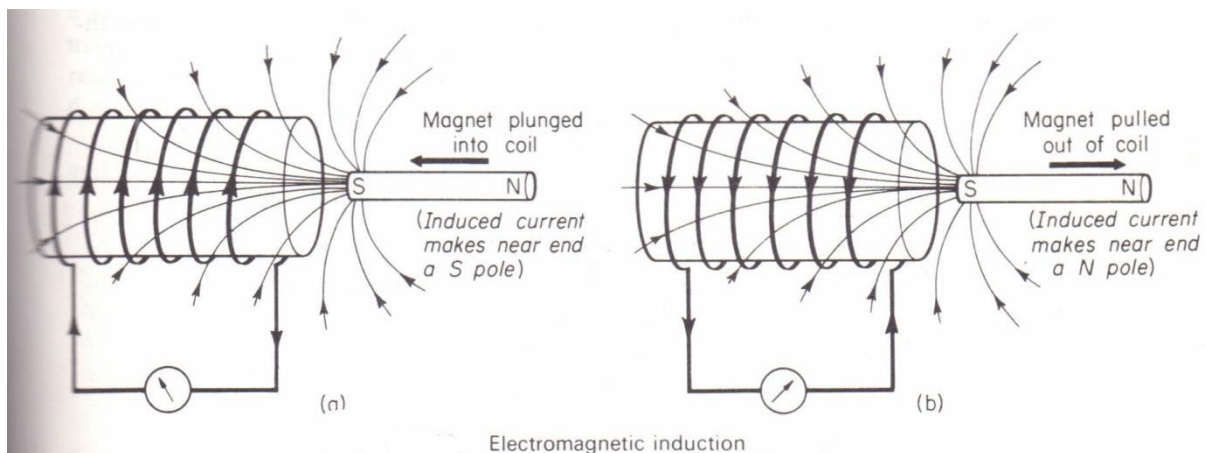
Lastly, if the experiment proved successful and a conclusion had been reached, a theory was put forward.

It would naturally be of great interest to us today, if we knew something of what conclusions the application of the system of methodology outlined above, led to for physicists of the mid-nineteenth century. The information that is current today vis-a-vis the aether is that the Michelson & Morley experiment had proven once and for all that the aether could not exist, and this statement, for the most part, has to be taken at face value, and accepted as being true.

One of the first things that scientists of the mid-nineteenth century noticed as the study of electricity and its properties came under increasingly more intense scrutiny was that the old theories and mathematical equations that were used to describe electric phenomena were not very accurate. For instance according to Coulomb's Law, the force applied to two charges is:

$$F = e_1 e_2 / r^2$$

This formula seems to state that a force, which is a function of the distance between the two particles, is experienced instantaneously regardless of the distance r between the two particles. This mistake takes place because the equation is an approximation and not an exact interpretation of what takes place.



In these theories it is found that the force acting between the two bodies is treated with reference only to the condition of the bodies and their relative position, and without any express consideration of the surrounding medium. This reference to forces acting at a distance is the same objection that was stated earlier on in criticism of Newton's Laws of Gravity by Huygens and others and which was also quoted later on by Einstein. Newton's explanation for this problem (AAD) was that he did not wish to hypothesise about something of which he was not completely sure.

Since action at a distance is not possible, as is evident by our own experience, it was thought that the medium surrounding the two particles must have some part to play in the mediation of forces. This is where the modern theory of the aether comes in and begins to occupy a central place in the discourse.

Here is what Maxwell has to say in his treatise on : "A Dynamical Theory of the Electromagnetic field"

"I have therefore preferred to seek an explanation of the fact in another direction, by supposing them to be produced by actions which go on in the surrounding medium as well as in the excited bodies, and endeavouring to explain the action between distant bodies without assuming the existence of forces capable of acting directly at sensible distances."

"The theory I propose may therefore be called a theory of the Electromagnetic Field, because it has to do with the space in the neighbourhood of the electric or magnetic bodies, and it may be called a Dynamical Theory, because it assumes that in that space there is matter in motion, by which the observed electromagnetic phenomena are produced.

The electromagnetic field is that part of space which contains and surrounds bodies in electric or magnetic conditions."

Maxwell then goes on to say that even the state that we consider to be a vacuum is in fact filled with the 'medium' that allows the propagation of light and heat:

"It may be filled with any kind of matter, or we may endeavour to render it empty of all gross matter, as in the case of Geissler's tubes and other so called vacua.

There is always, however, enough of matter left to receive and transmit the undulations of light and heat, and it is because the transmission of these radiations is not greatly altered when transparent bodies of measurable density are substituted for the so-called vacuum, that we are obliged to admit that the undulations are those of an ethereal substance, and not of the gross matter, the presence of which merely modifies in some way the motion of the ether.

We have therefore some reason to believe, from the phenomena of light and heat, that there is an ethereal medium filling space and permeating bodies, capable of being set in motion and of transmitting that motion from one part to another, and of communicating that motion to gross matter so as to heat it and affect it in various ways."

Thus, far from the frequently heard claims of modern day physicists that Maxwell had freed physics from the need of an aether (or ether as he referred to it) Maxwell had in fact, a total belief in the aether, based on his observations of physical phenomena and the deductions that he made from these observations. Maxwell's theory on the nature of Electromagnetic Radiation was therefore totally based on the existence of an aether. He was aware for instance, that the idea of perpetual motion was false and did not exist, if he were to believe that oscillating electric and magnetic fields were self-perpetuating over infinite distances and areas, he would in effect be stating that perpetual motion existed and that the Laws of thermodynamics did not apply to electric and magnetic fields!

Perhaps the best perception of what physicists of the time had of why an aether was necessary can be found in the work of A.E. Dolbear, *Modes Of Motion or Mechanical Conceptions of Physical Phenomena* (Lee And Shepard Publishers, Boston, 1897).

"All of our experience, without a single exception, enforces the proposition that no body moves in any direction, or in any way, except when some other body *in*

contact with it impresses its own motion upon it. In Newton's letter to his friend Bentley, he says:

"That one body should act upon another through empty space, without the mediation of anything else by and through which their action and pressure may be conveyed from one to another is to me so great and absurdity that I believe no man who has in philosophical matters a competent faculty of thinking can ever fall into."

For mathematical purposes, it has sometimes been convenient to treat a problem as if one object could act upon another without any physical medium between them; but such a conception has no degree of rationality, and I know of no one who believes in that as a fact. If this be granted, then our philosophy agrees with our experience, and every object moves because it is pushed, and the mechanical antecedent of every kind of phenomenon is to be looked for in some adjacent object possessing energy; that is, the ability to push or produce pressure." [4, p.11]

The Irish physicist Agnes Mary Clerke in her book *Modern Cosmogonies* (Adam & Black, London 1905) lends substance to this theory.

"Ether is the fundamental postulate of physics. [...] A great deal is demanded from it. [...] If 'action at a distance' be inadmissible (as Newton himself held it to be), the pull of gravity must be exerted through a medium; and common-sense insists upon its identification with the transmitting medium of light, as well as upon the identification of that with the transmitting medium of electricity. A genuine conformity to these demands of reason is vouched for, not only by Hertz's discovery that an electrical explosion [spark] starts an undulatory disturbance indistinguishable, except in scale, from luminous waves; but also by Dr. Lorentz's indicated conclusion that strains of the same ethereal essence bear the all-pervading mandates of gravity." [3, p.183]

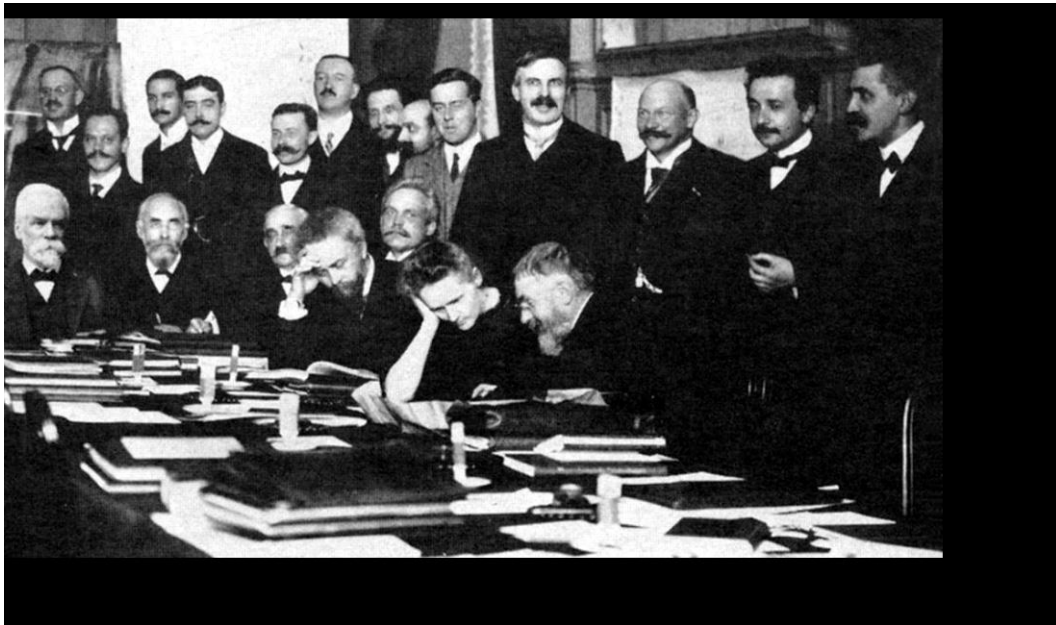
Sir Oliver Lodge raises some interesting ideas on the aether , he can even be thought of as being responsible for putting forward the first rudimentary conception of the photon

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".....while the units of negative charge appear in some cases with a separate existence, perhaps carrying with them part of the atom, in which case they might be called corpuscles, – having a material nucleus; perhaps pure disembodied electricity, whatever that may be – an electrical charge detached from matter,"

Epistemological problems facing the formulation of special relativity and quantum mechanics:

During this time, a time when both quantum mechanics and relativity were being mulled over by physicists all over the world, a very disturbing development was taking place in the interpretation of physics. I am referring to the Solvay Conferences that were held to discuss important developments in physics and the sciences. From 1911 to 1927 the Solvay conferences were chaired by Hendrik Lorentz a pre-eminent mathematician and physicist of the time. Nineteen of the invitees to the Solvay conferences went onto become Nobel laureates.



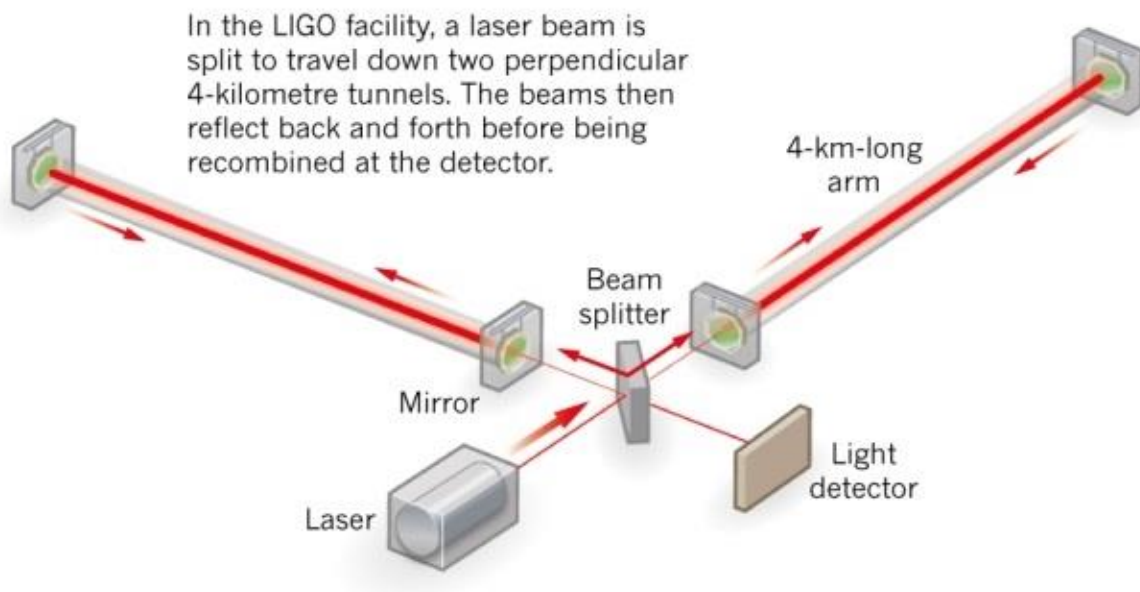
The central problem with the Solvay conferences was that they were used as an arbitration platform, where important issues in physics were discussed and settled. On the face of it, this might have seemed to be an enlightened development: bringing together the greatest minds in physics from every country in the world, in order to discuss and decide upon, developments in physics. Unfortunately, a collection of

minds is not always better than a single mind when it comes to making new discoveries in science. The father of modern day scientific method Galileo Galilei had this to say:

"In questions of science the authority of a thousand is not worth the humble reasoning of a single individual." "See now the power of truth; the same experiment which at first glance seemed to show one thing, when more carefully examined, assures us of the contrary."

It would seem that even a cursory examination of the state of modern day science may prove to show that Galileo had been prescient in his observation. The Solvay committee was full of contrary opinions, jealousies, prejudices and of course strongly biased in favour of well-known and influential men. Yet, it was the Solvay conference that gave to physics the concept of wave-particle duality, or more accurately, gave its stamp of approval to the concept of wave-particle duality. Wave-particle duality is in many ways the very foundation on which quantum mechanics has been built. The acceptance of the precepts of special relativity might be thought of as having a similar albeit, not so pronounced genesis. In the case of special relativity, there is an added and perhaps even more disturbing element than the mere issuing of decrees on scientific principles by committee. For, in the case of special relativity, it had the misfortune of being adopted officially by the Government. The successful building and deployment of the atomic bomb might be thought of as being the ultimate physical manifestation of Einstein's famous equation $E = mc^2$. The successful development of the atomic bomb and the prospect of nuclear energy being used for peaceful purposes providing an unlimited amount of energy to the world, served as a catalyst for the US Government to ruthlessly adopt and advocate Einsteinian physics. Any scientist who even whispered negatives thoughts about special relativity or General Relativity, were ruthlessly blacklisted, often losing their tenure and their employment and left with no prospects. The same ruthless rules prevailed against those scientists who protested against quantum mechanics or who wished to question or ascertain findings or postulates that they found suspicious. One result of this kind of rail-roading is that science advanced from this point along well marked lines. Very few new lines of thought were followed, everything that has evolved has evolved from something that was already known. The problem is that since much of the original knowledge on

which this research is based was questionable, a lot of effort has been wasted in proving, what often turned out to be, the unprovable. Take for instance the famous LIGO experiment that was devised to detect gravitational waves.



While the development and construction of the LIGO experiment was undoubtedly a landmark technological achievement that is unrivalled in its precision: in terms of practical usefulness, it left a lot to be desired. The LIGO experiment was supposedly designed to detect differences in measurement 10,000 times smaller than the diameter of a proton! This means that the LIGO experiment was designed to have a sensitivity of approx. 8.4×10^{-19} m . Since this far exceeds the accuracy of any known instrument of measurement by several million times, what is the justification of spending over a billion dollars in the construction of such an experiment?

A modern theory of the aether

There are several troubling aspects of the modern day mainstream physics theory for the propagation of light, that are sufficient to justify an introspective re-examination of the foundation on which these theories are based. Special relativity seems to be content with Maxwell's interpretation of the propagation of light, by attributing it to electric and magnetic fields that pervade the Universe. The irony of this situation is surely apparent? Einstein, who had so vehemently opposed the existence of a universal aether that pervaded the Universe, had in the same breath, postulated the existence of not one but

two all-pervasive fields. With time the number of these Universe pervading fields would proliferate to an almost farcical degree, when a field was being ‘discovered’ for every particle and anti-particle. A time was reached when Robert Oppenheimer was quoted as saying:

“You could give a Nobel prize to the physicist who did not discover a new particle that year.” Michio Kaku, particle physicist, City College of New York.

Unfortunately, Maxwell’s theory on the propagation of electromagnetic radiation does not comply with the quantum mechanics interpretation that all energy is quantized. Thus quantum mechanics finds itself on the wrong side of both classical physics and relativity. The theory of the propagation of light as theorised by quantum mechanics is even more problematic than that which applies to special relativity, because quantum mechanics is trying to explain something that does not lend itself to an explanation based on the quantum mechanics interpretation of things. For instance (and this is one of the more bizarre aspect of things), quantum mechanics states that light as it propagates from A to B does not exist as something ‘real’ but as an abstract mathematical wave function:

“There’s no way to chart the photon’s trajectory from the source to the detector. The photon is not real in the sense that a plane flying from San Francisco to New York is real. Werner Heisenberg, among others, interpreted the mathematics to mean that reality doesn’t exist until observed. “The idea of an objective real world whose smallest parts exist objectively in the same sense as stones or trees exist, independently of whether or not we observe them ... is impossible,” he wrote. (Scientific American , “What does Quantum Theory actually Tell us about Reality?” Anil Anthaswamy. Sep3 , 2018)

Even when viewed in the context of a simple laboratory experiment, this theory that light is something abstract and unreal is unacceptable: on the scale of the universe it is totally untenable. From a purely practical point of view it does not conform to our observed knowledge of the properties of light. If the quantum mechanics explanation of how light propagates is untenable and, from a purely logical point of view, unjustified, what is the

answer? One of the avenues of research that might be extremely productive to explore, is to re-examine the possibility of the existence of an aether.

How could the presence of an aether like medium solve the problem of the propagation of light? Almost every physicist of the late nineteenth century and even many of those of the twentieth century were completely convinced in the existence of an aether. This was because the aether, if it could be detected, explained every phenomenon to do with light in a straight forward and uncomplicated manner. For instance, the aether explained how light travelled as a wave; with an aether present there would be no problem in explaining that light travelled through the aether just as any other wave travelled through their own particular medium. As for instance, waves travel through water or sound travels through air. The presence of an aether would also account for why the speed of light was constant, regardless of the motion of any observer. There would be no discrepancies; every property of light would be explained including the fact that light, just like waves of water or sound, follows the inverse square law of dispersion. Similarly, light also, just like any other wave, undergoes both diffraction and interference. Even the fact that individual particles of light, retained their energy or identities intact after traveling over great distances, can be attributed to the behaviour of *all types* of waves. It is only the intensity of the total wave that is reduced, not the identity of individual molecules taking part in the process. Also from a more modern view point, the aether is a perfect explanation for dark matter. It was because the Aether was such a seamless explanation for both the properties of light and for its propagation, that scientists of the time were almost unanimously in favour of the Aether theory.

Yet, physicists of the time were baffled. Max Planck had proved conclusively, that all electromagnetic radiation was quantised. He had supported his theory with reproducible experiments, yet somehow all the evidence seemed to point to the fact that electromagnetic radiation had wave like properties. Now is the time to ask: was the adoption at this point of time when no solution was seemingly in sight, for physicists to resort to unsupported assumptions that had no basis in reality? Surely, this was a time to sit back and retrospect, a time to think along the lines of: “We have reached a point that is beyond the limits of our present knowledge.” ? The normal course of action that was adopted in such a situation, as exemplified for instance by Newton, was to set the

problem aside and to hope that an answer would arrive in due course of time. The idea was to wait it out, regardless of the time it took, until a solution presented itself. How then could the quantum mechanics advocacy that an electron or a proton, something with both mass and momentum, be a wave at one moment and a particle at another be given credence? Obviously this was a deduction that was based solely on guesswork, it had absolutely no place in the scientific lexicon and yet here, under the influence of peer pressure and the support for the theory by well-known and respected names, the proposal for wave-particle duality was resoundingly adopted by the world of physics.

If wave-particle duality is not an acceptable solution as to the manner in which light propagates, what is the alternative? Obviously a return to logical investigative methods might help. A lesson can be taken in this regard from the science of bio-chemistry. For decades bio-chemists had been trying to figure out how genes carried out the complex task of carrying hereditary information. The minimal size of the DNA molecule, led many scientists to believe that its structure was too simple to carry out the tasks attributed to it. Crick and Watson decided to leave all theoretical solutions aside and to investigate the problem through direct observation and experiment. This resulted in the unravelling of the true structure of the DNA molecule which was shown to be complicated enough to be the 'master molecule' of life. It was hoped that a similar course if followed with regard to the photon would yield positive results.

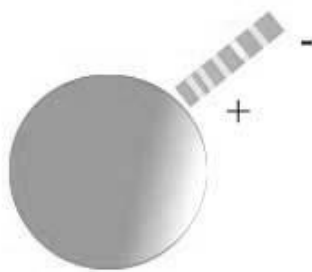
It was decided to tabulate all of the properties that were known about the photon and electromagnetic radiation. Here is a basic list of properties of the photon:

- 1) A photon has no mass.
- 2) A photon is never still it always travels at the speed of light c when it is in a vacuum.
- 3) A photon is electrically neutral.
- 4) A photon has a fixed energy that it maintains intact.
- 5) A photon can be emitted and absorbed by electrons.
- 6) Photons can be present in trillions of frequencies and wave lengths.
- 7) Photons with a frequency of the visible spectrum and above are emitted directly by electrons.

8) Radio-waves are formed by a different process and can reach lengths of 5,000,000 m or more.

These are a few of the properties of photons that were used in order to determine the probable form that a physical structure of a photon might take.

When photons are examined with regard to electrons, it is found that in any interaction between electrons, photons are always the mediator. This was proved conclusively both by Einstein in his work on the photoelectric effect and by Neils Bohr in his investigation and solution to the hydrogen spectra. This being so, and electrons being charged particles, one has to wonder whether the electrons are emitting and absorbing electrical energy. Taking this idea a bit further, is it possible that electrons emit electric energy in pulses. Thus the first hypothesis that is raised is that the photon is primarily made up of pulses of electrical energy emitted by electrons. However, if this is the case what is it that holds the photon together and gives it form, is the question that follows in the natural course of things? Obviously there must be some mechanism by which the photon achieves a stable configuration. Look at the diagram below to see what the pulses of energy emitted by an electron might look like:



Pulses of electrical energy emitted from electron are polarised

One of the effects that immediately comes to mind is that these pulses of electrical energy that are emitted by the electron appear to be polarized, with the initial pulses of energy being stronger than subsequent pulses of energy. Could it be possible that the pulses of energy take on the form of an electric dipole because of the polarization of electrical energy that has taken place? Look at the next image:



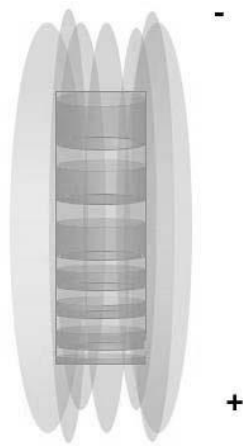
Solenoidal field takes shape around pulses of energy forming a photon

Thus the photon now appears to be an infinitesimal electric di-pole made up of pulses of energy that are polarized and which settle into a stable configuration. Since the pulses of energy are separated by a dielectric (empty space) the whole structure functions like a capacitor or electrical condenser that can maintain its energy intact for practically ever. This formation is electrically neutral and possesses no mass. Thus the first part of the task is achieved; here is a quanta of energy that may be described as an infinitesimal, discrete, packet of energy. But how does this photon propagate? In order to understand how a photon propagates it is necessary to first study atomic clocks.

Gestalt Aether Theory: A new physics

Gestalt Aether Theory, which is what this new theory of physics is called, is a new theory of the aether. The word Gestalt means something that is greater than the sum of its parts. Gestalt Aether Theory considers that the whole of the Universe is permeated by a 'virtual photon' aether. What are these 'virtual photons'? They are exactly the same as the photons whose structure is discussed above, except that they possess such low energies on the order of 10^{-40} J that they for all purposes don't exist, they are undetectable. Thus they are absolutely permeable to all matter and vice-versa, no atom can possibly have any use for photons of such low energy, as a result the photons of the virtual photon aether can pass through matter as if it didn't exist, the virtual photon aether can pass through a planet like Saturn or the sun as if it to all purposes did not exist and vice versa which means the sun, the stars and the planets can pass through the 'virtual photon aether' as if it did not exist, experiencing no interaction whatsoever! In fact the virtual photon aether has such small interaction with matter that it could pass through a layer of lead a light year across without undergoing any noticeable interaction. Thus according to Gestalt Aether Theory, the Universe is filled with these virtual photons which to all purposes are infinitesimal, almost stationary electromagnetic di-poles. Because of this electromagnetic property of

the virtual photon aether, when a real photon is emitted by an electron, the photons of the virtual photon aether line up in the direction of the propagation of the real photon forming a line whose ends rest on the shoulders of infinity and the energy of the real photon travels along this line of aligned virtual photons. The same kind of effect is seen as when a line of metal filings aligns with a magnet, and in fact this aligning of iron filings is a manifestation of the alignment of the virtual photons of the aether. It is important to note that it is the energy of the real photon that travels along the line of virtual photons and not the photon itself. As the real photon travels forward it disperses energy laterally also, so that dispersion takes place according to the inverse square law. Here is what both a real photon and a virtual photon might look like:



If you have been following this line of reasoning, it becomes clear that the photon doesn't possess a physical structure in the sense of a real particle, it has no mass. What it does have is a stable configuration that enables it to maintain both its structure and its identity (energy) intact. The fact that it possesses a fixed energy and a fixed structure means that it has some of the properties of a particle: yet this is a particle that has no mass! Ultra-sonic sound waves that are used in lithotripsy to shatter kidney stones, can also be considered as waves that are part particle, since they are waves that can shatter physical objects. The structure of the photon is the reason that the photon can and does travel at the speed of light; it is a natural corollary to travelling in a medium. This brings us back to the question that was left unanswered earlier on of how photons came to permeate the entire Universe forming the medium through which light could propagate that we had formerly called the aether.

Frequency of electromagnetic radiation:

To gain some idea of how virtual photons came to permeate the entire Universe, it is first necessary to examine in detail another of the out dated concepts of quantum mechanics. This is the concept of the frequency of a photon. According to quantum mechanics:

“Photons don’t have a frequency. Frequency is a wave property and is a property that applies only when you look at light as a wave. A photon has an energy, which is related to, but different from, frequency. So we sometimes use the term ‘the frequency of a photon’ but really as a short hand for “the frequency of the wave that will manifest later as a photon”.

Another way of stating this is by $f = \frac{e}{h}$ this means that if you know the energy of the photon it is possible to determine its frequency by dividing the photon energy by h , Planck’s constant. Whatever the answer might be it is fairly obvious that the quantum mechanics concept of what the frequency of a single photon might be is shrouded in obscurity; due to the wave-particle duality there can be no definite answer to the question. One has to again ask the question, is it right to treat something so fundamental as the frequency of light as something abstract, an artifice whereby it is possible to calculate its energy? To my mind there can be no compromise, such a conjecture (that the frequency of a photon is an abstract concept) is a concept that is far removed from reality: an abstract mathematical function cannot represent or replace a physical reality.

Frequency of a photon

The frequency of a photon (or lack of it) presents a problem when looked at from a purely mechanical point of view. The problem arises as follows, if one looks at a modern day smart phone one is aware that it is processing data at the rate of several gigabits per second. Consider what the term **processing** denotes, it means taking input data, evaluating it and outputting the result. If a smart phone can manipulate data at the speed of gigabits per second one has to consider that the electron is miniscule in size and that the distances over which it has to oscillate are even smaller, this should make oscillation of the electron at hundreds of trillions of hertz perfectly natural. It is then only natural that the electron should oscillate at frequencies of several hundreds of terahertz and emit photons at that rate. In fact not

to do so would be odd. Gestalt Aether Theory, therefore, takes the concept of photon frequency away from the fuzzy abstract notions of quantum mechanics where it is an abstract vague property of the photon and puts it on a sound practical basis.

Therefore, when we talk of an electron emitting photons with a frequency of 600 THz it means exactly that.

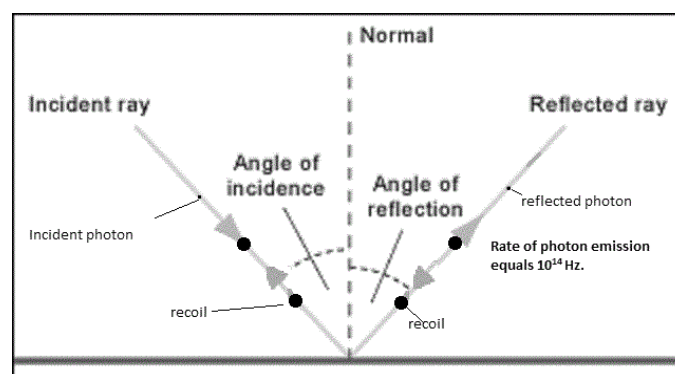
The electron is emitting photons at the prodigious rate of 600,000,000,000,000 photons per second.

In what direction are these photons emitted? These photons are emitted in a single direction as a line or ray of photons of the same frequency, wavelength and energy.

Why? If one looks at the physics behind the emission of a photon, it is apparent that the electron absorbs energy and mediates its energy by emitting that energy in the form of a photon, the process involves the force of recoil. To cope with these forces of recoil the electron rebounds against the nucleus absorbs more energy and again emits this energy at the exact same position as before but in the opposite direction, hence photons are emitted as a line of photons in a specific direction. Consider the disparity in size between an electron and the nucleus, on average the nucleus is 2000 times the size of the electron.

Therefore, if one has an electron that is 1" in diameter, the nucleus by comparison would be 167 feet across. Thus, to all purposes the nucleus represents a perfectly smooth, perfectly flat surface that is a perfectly solid and inelastic surface from which to recoil.

This is why reflection takes the form where the angle of reflection is equal to the angle of incidence. Look at the diagram below:



Thus the nucleus represents a perfectly smooth, perfectly flat, perfectly solid surface to the electron and the electron recoils from the nucleus according to the classical rules of reflection. At the same time the frequency at which these reflections, namely absorption,

recoil, emission, recoil absorption take place are at the rate of hundreds of trillions of occurrences per second. Because the photons are obeying the classical laws of reflection it means that as long as they are being irradiated with energy from a certain direction the emission of photons will conform to the angle of incidence but in the opposite direction. Thus we have straight rays of light made up of hundreds of trillions of photons being emitted in every possible direction because on average each gram of substance contains 10^{24} atoms out of which every atom will have at least one or two electrons absorbing and emitting at different frequencies.

Proof that this is indeed the case can be seen in the working of any atomic clock. The second in a Caesium 133 atomic clock is the duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state of the caesium-133 atom when irradiated with microwave radiation of that frequency. In other words when the Caesium 133 atom is irradiated by microwave radiation at 9,192,631,770 Hz, the valence electron begins to oscillate at exactly the same frequency between two states of the hyperfine structure. This demonstrates that frequency is directly related to the rate of irradiation of an electron by a certain frequency and it results in the emission of photons by the electron at that frequency or to put it another way by the electron's rate of oscillation. There exists ample evidence that this theory of how photon frequency is linked to rate of emission or oscillation of the electron is correct demonstrated in the working of atomic clocks.

The universal virtual photon aether

We are now in a position to understand the concept of a Universe completely submerged or steeped in a sea of virtual photons. Having established that photons are emitted and absorbed at phenomenal rates, it is time to return to the first moments of the Big Bang that is thought to have occurred out of a singularity more than 13.7 billion years ago!

Although it is generally accepted that the Big Bang was not a bang in the accepted sense of an explosion but that it involved a rapid inflation or expansion, opinion is almost unanimous that light must have been present also. It is almost a corollary that if matter was present light (or rather photons) must have been present also, although light might not at this early stage of the Universe have been able to propagate. The question is what

happened to all that light? Look at the matter to photon ratio; for every atom of matter, photons were being emitted at the rate of hundreds of Terahertz per second (10^{14}) per second. What happened to those photons? Emitted not over seconds but hundreds of thousands, even millions of years? They could not have escaped over the borders of the Universe because by definition nothing exists outside the Universe, so they must have been contained in some way within the Universe. This is the aether it occupies the entire Universe and consists of infinitesimal electric dipoles of very low energy (10^{-40} J). These virtual photons are more or less fixed in place but possess 360^0 of freedom of orientation. The fact that this virtual photon medium possesses energy (albeit very low energy) means that the energy of a real photon is transported without loss of energy, in a frictionless manner.

Gestalt Aether theory introduces a paradigm shift in physics away from the abstract statistical approach of quantum mechanics and towards a more rational empirical approach. New concepts of almost every branch of physics are explained using this new paradigm. New theories on the propagation of light, the formation and propagation of radio-waves, the propagation of current in a wire, new theories of magnetism and super conductivity and last and perhaps most importantly a new theory of gravity are introduced. The theory of gravity introduced by Gestalt Aether Theory closely follows Sir Isaac Newton's theory of gravity and in essence gives body to the Newtonian theory of gravity. For, although Newton was able to explain in some detail how gravity worked, he was never able to explain why gravity worked in the way that it did.

For those who are interested in gaining further information on Gestalt Aether Theory physics, my book: "The Electromagnetic Universe: A New Physics" is available on Amazon.