PAPER 2

Why the universe appears homogeneous & light isotropic, and the manner in which the speed of light might be made variable, and its resulting relation with the passage of time, and some similarities of these proposals to the Absorber theory..

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Abstract

Further to the assumptions made in paper 1, another is made that there is an edge to the bounded universe expanding out at light velocity from the original burst of radiation energy, beyond which is singularity without dimensions of time or space. A further assumption is made that the velocity of any source of EM radiation will be drawn out in all directions to exactly duplicate the outward action of this large singular rim. This renders the universe to appear isotropic and homogenous to an observer based within the universe on any planet system moving out, whereas viewed externally this would not be the case which reinforces the argument set out in part one, this being contrary to current evidence suggested by the cosmic microwave background. An implication of such a scenario is that were the rate of expansion of the universe to alter so would then light velocity. The Absorber Theory is then briefly explained which requires for its operation that the universe be enclosed in an opaque container, which would be a result of a finite and closed universe. Similarities of the Absorber Theory with the current subject proposals are discussed along with some crucial differences. The variation and possible reversal of the expansion of the universe with the implications for passage of time and the retention of symmetry are proposed.

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Arthur Milne was an eminent mathematician at Oxford, and controversially at the time he argued that under Einstein's special relativity it was impossible for an expanding universe to have homogeneous matter distribution. He also proposed the universe does have an outside edge, and that the whole universe was created at a single point in flat space-time, and thereafter occupies the interior of a bubble that expands at the speed of light into previously empty space. This Milne model is also isotropic so that there was no difference between the fast moving galaxies near the rim and galaxies at rest near the centre of the bubble, since any galaxy and its neighborhood will subjectively appear to the occupants to be at the centre by the Lorentz transformation. This is remarkably similar to the assumptions made in the first section above. An implication is that if this outside edge is moving out at light speed its time will not have changed since the moment of big bang.

Together with the assumptions made in the first paper, if two further are made, then the behaviour of Electromagnetic radiation can be qualified in a manner in many respects similar to the results of the Absorber Theory by Wheeler and Feynman in 1945. The first assumption is that there is an outside edge to the finite universe formed of radiation that was first emitted at the initial moment of the big bang. Within this volume the universe has the continua of space and time with which we are familiar, but beyond there is nothing of which we have knowledge: no time no space, in other words a huge singularity. The big bang has created a universe of time and space the outer edge of which is EM radiation which I call the singular rim for convenience, and which is expanding out at light velocity. The second assumption is that the EM radiation generated by every source or oscillation of charged particles within the universe is drawn out to exactly duplicate the action of this outer rim of expansion from the first moment in time. There is a rationale for this assumption which is not included in this paper for reasons of brevity but it results in such a simple clarification of the isotropy of light that the possibility ought to be hard to ignore.

Consider an oscillating charge generating electromagnetic waves, (or a light source from a fluorescent tube) near the centre of the universe. If we assume that the outer edge is expanding out at light velocity, the motion of the generating source close to the centre will be minimal compared to that of the periphery, although it will be expanding slightly outwards. The EM waves will duplicate the action of the singular rim exactly in all directions, and will radiate out in the form of a slightly squashed

sphere (an ellipse?), flattened along the line of motion, as far as a notional observer outside the universe is concerned. This is represented by position A1, in diagram 1. At position A2, halfway between the centre and the rim, the generating source will be moving outwards at about 1/2 C, half the velocity of the singular rim, C, and as a result, the wave front of EM radiation will not be so spherical, but more ellipsoidal, or squashed and lengthened along the line of motion. At position A3, very close indeed to the singular rim, the source is traveling at, say nine tenths C, the EM waves in the line of motion between the source and the nearest point of the singular rim, will be traveling at a velocity only slightly greater than that of the source. This will result in a compression of wave fronts, and a large extension on the other side of source towards the furthest point of the singular rim.

The above observations are all made by a hypothetical external observer outside the system, and stationary with respect to the centre of the universe. To an observer inside the system, things appear differently, due to the law of relativity. If a particle is traveling at .95 light speed, very close to the singular rim, then to an observer in the immediate vicinity, also close to the singular rim, the wave fronts would not appear squashed, but rather perfectly spherical (B on Diagram 3). This is due to the Lorenz contraction and the time dilation effect, or nothing more than an application of the familiar Doppler Effect. As far as the hypothetical external observer outside the universe is concerned, the wave front in between the source and the nearest point on the singular rim is moving at only 5% faster than the source, whereas the corresponding wave front diametrically opposite furthest from the source, is moving away from the source at 1.95 times light velocity.

Hence the external observer, stationary with respect to the centre of the universe, would see the wave fronts traveling at .95C very much flattened and distended (Diagram 3 C). However, as far as an observer based on the moving source is concerned, the position does not appear distended like this at all. This would appear to account for the fact that the universe currently appears to be isotropic and homogeneous as illustrated by results of the cosmic microwave back ground observations and the conclusion that the universe is expanding outwards evenly in all directions, but which is incorrect if this assumption were proved valid.

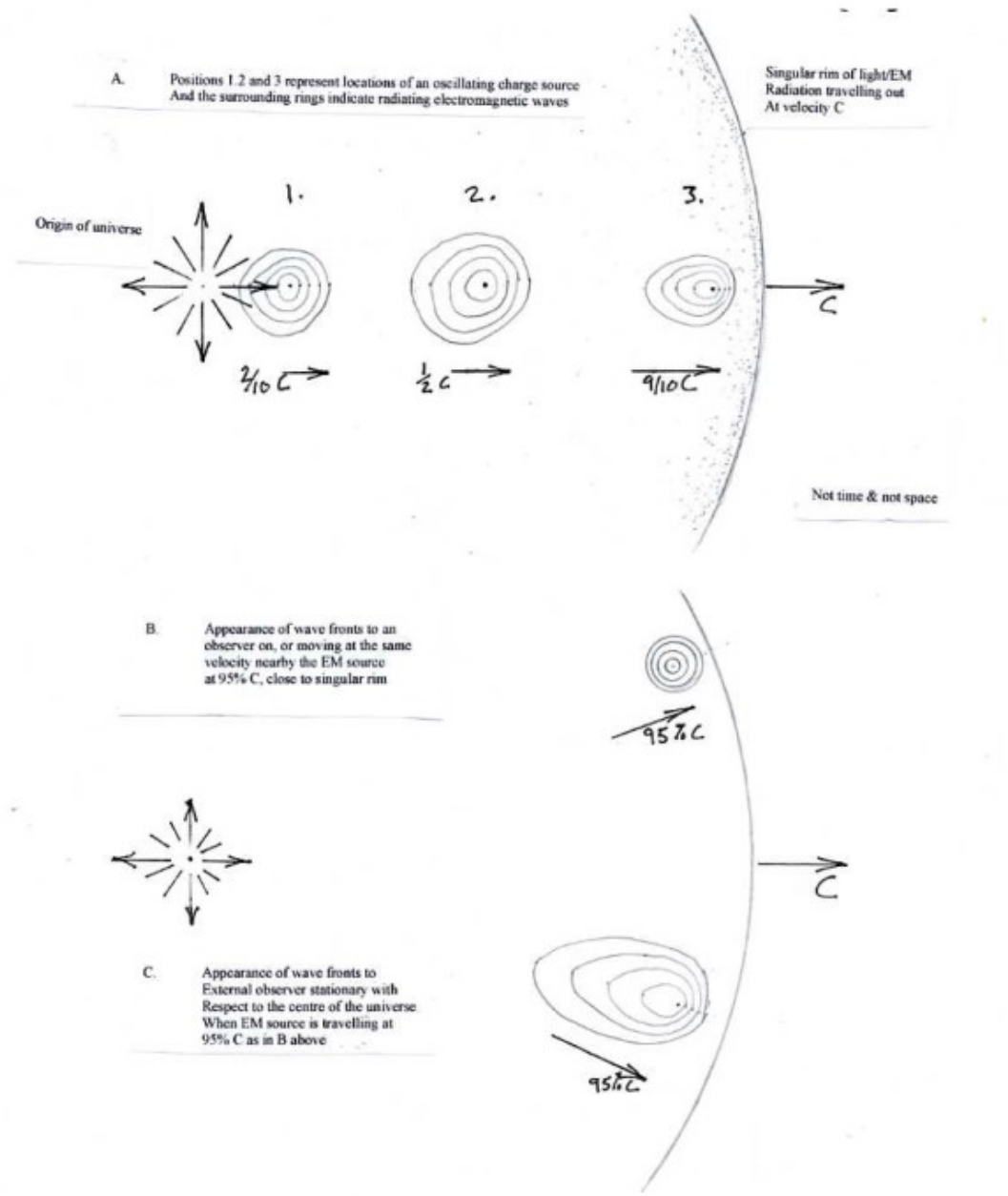

Diagram 1

If the singular rim of radiation on the edge of the universe is traveling at light velocity then time will have stood still for this edge from the moment of the big bang. If it were to slow down, and with it, ex hypothesi, that of light velocity within, then the passage of time will presumably change and slow down pro rata within the universe. If the expansion were to reverse into contraction then by this supposition time the passage of time would also reverse, as would also all EM radiation to perfectly duplicate its earlier actions. Such a scenario would produce an exact reversal of all activity in the universe to ultimately dissolve back into the big crunch

of a singularity. This would bring about the satisfactory conclusion of symmetry being achieved, both in time and space. Our current observation and understanding of the way in which EM radiation acts does not easily allow for such a symmetry to be established, even though Maxwell's basic equations indicate it should be. This lack of symmetrical behaviour was one of the reasons why Feynman and Wheeler sought to produce their Absorber Theory to reconcile this difficulty, as discussed later below.

The velocity of light is known to be a constant of huge significance and I have often questioned why it should be at this specific velocity. In this respect I understand that measurements are being undertaken to enquire whether it is constant or variable and that there is quite a body of papers and books on the subject of VSL or the variable speed of light, especially notable being those by Physicist Lee Smolin and also Joao Magueijo of Imperial University, London.

The results of such assumptions produce a fairly clear explanation of what we observe to occur in nature. It provides a very simple explanation for the isotropic way in which light behaves, and then it would also dispose of the problem of renormalisation that the physicist Dirac so disliked. This resulted from the fact that electrodynamics based on Maxwell's theory requires that EM waves should be symmetrical through time. However, as we currently observe and understand them, waves of radiation are only spreading out one way in time, and this lack of symmetry is the cause of mathematical difficulties which have yet to be resolved.

The Absorber Theory of Wheeler and Feynman, first published in the Review of Physics 1945, attempted to deal with this problem. When I first read about it this elegant and short paper I was struck that one of the conditions required for its operation was that the universe be enclosed in an opaque container. This might have seemed somewhat obscure to many, but I saw at once that my notion of universe bounded by a rim of singularity fitted other considerations I had about cosmology, and I considered the subject further.

The theory expounds a novel manner in which the universe might operate and which did not depend on the notion of causality that is required by exchange particles or photons in physics today. I found the theory to be best explained in a book 'Space and Time in the Modern Universe' by P.C.W.Davies, who was then Lecturer in Applied Mathematics at Kings College London. Davies explains that radio or EM

waves travel forward only in time, whereas electrodynamics based on Maxwell's theory requires that EM waves should be symmetrical through time. However this lack of symmetry causes formidable mathematical difficulties which have always plagued the descriptions of the interaction of charged particles with the EM field. Wheeler and Feynman sought to resolve these problems by analysing what would happen if an accelerating charged particle emitted radiation equally onto the past and future. Clearly this type of behaviour is in contradiction with experience, but they found the following remarkable result. Suppose a single, charged particle in empty space, when set into motion, radiates symmetrically one half advanced waves into the past, and one half retarded waves into the future (the latter being ordinary radio waves with which we are familiar). Then that same particle, when placed into an opaque box, will only fully radiate fully retarded waves into the future. Open the box and the advanced waves will reappear for reasons which are ably explained Davies's book.

A development of this argument showed that electromagnetic waves could be considered as perfectly symmetrical in time, and it also showed that, instead of the concept of the electromagnetic field, this would have to be replaced by the concept of direct action-at-a-distance between the charged particles. This latter would probably not be the instantaneous type, which characterises Newton's theory of gravitation, but a delayed action, propagated at light speed. This action would operate both forwards and backwards in time. An implication of this Absorber Theory can also be shown to be that the universe will collapse back to a point, reversing the big bang.

The assumption given above on the way in which light velocity is mediated presents a different hypothesis to that put up by Wheeler & Feynman, but there are still some similarities, and my version is much easier to visualise with the notion of advanced waves being hard to conceive. The closed universe as I have described it is effectively an opaque box as required by the Absorber Theory, all the more so if for whatever reason the universe started to contract rather than expand: all EM radiation within would also reversed and presumably run backwards through its original course of actions. Effectively time would be reversed except for that of the outside rim of the universe, which with its motion at the mediating speed of light, would never have progressed from the first moment of big bang. If the universe eventually contracted back to nothing then the action of EM radiation would have been perfectly symmetrical as required by electrodynamics and Maxwell.

One final quotation on the subject of constants, variable or not, which is relevant to the above and is worth quoting from Paul Dirac is as follows:

"*One field of work in which there has been too much speculation is cosmology. There are very few hard facts to go on, but theoretical workers have been busy constructing various models for the universe based on any assumptions that they fancy. These models are probably all wrong. It is usually assumed that the laws of nature have always been the same as they are now. There is no justification for this. The laws may be changing, and in particular quantities which are considered to be constants of nature may be varying with cosmological time. Such variations would completely upset the model makers.*"

References

- E.A. Milne, Relativity, gravitation and world-structure, Oxford: Clarendon Press 1932
- Davies, PCW Space and Time in the Modern University Cambridge, Univ Press 1977.
- Wheeler, J & Feynman, R: Interaction with the Absorber as the Mechanism of Radiation," *Reviews of Modern Physics*, 17, 157–161 (1945).
- Paul Dirac, "On methods in theoretical physics", June 1968, Trieste.
- Lee Smolin, The Life of the Cosmos, Oxford University Press 1997
- Joao Magueijo, new Varying Speed of Light Theories, Astro-physics, Oct 2003