

## Kinetics and the Conserved Photon Particle Assumption

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In the concordance cosmological model only 26% of the mass energy of the universe is matter, and only 4% baryonic. The majority, is 'dark matter', including small fundamental particles of plasma, the most abundant form of matter, of mainly unbound electrons.

So ~20% of the Milky Way should be matter as opposed to dark matter in the halo, yet find that observable matter in the galaxy is only 25% of that! <sup>[1]</sup> Are our most sophisticated observations still too insensitive? Whatever the reason, space is very different to that assumed by Einstein. There are 'obstacle courses' around galaxies for light to negotiate. Findings around clusters are similar. The Millennium simulation<sup>[2]</sup> and all semi-analytical models of the filament-cluster structure of the cosmos give similar pictures.

Our photon 'particles' have been crossing space for 10bn+ years entirely under their own steam without finding any of these haloes. Of course we know that is not true. Atomic scattering means that even when interacting and absorbed the photons energy re-emitted. But is it emitted as a *new* photon? or is it still the *old* photon? What may change? And is the energy of eternal propagation not held on board but drawn from the energy of the scattering particles? We postulate 'photons' as **not conserved**, and that light can be subtly changed on re-emission.

Kinetic effects on light from galaxy rotation were found in the 1960's with the Sunyaev Zeldovich effect and confirmed by the blue or red shift of the light interacting with haloes telling us rotational velocity. The halo kinetic state controls the wavelength of the re-emitted light. Combined with findings of gravitational lensing delay at galaxy and rotating cluster haloes it is then logically required that light passes through the halo at *c in the frame of the halo*, so arrives earlier from one side than from the other. This contradicts theory but we find it far more consistent with observations and it resolves a number of other poorly explained kinetic effects <sup>[4]</sup>. The stunning logical implication then is that the light changes speed to *c* with respect to the kinetic state of all the local media it meets including 'dark matter' haloes.

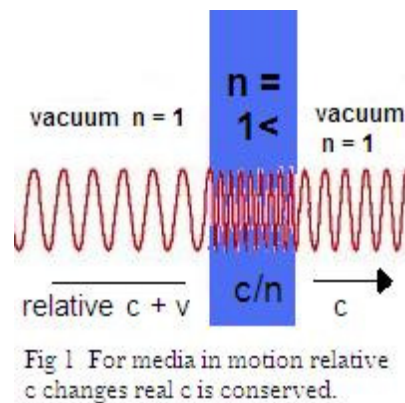
### *Why the Photon Particle?*

Roger Penrose<sup>[5]</sup> found there can be no unification with QM while conserved photons exist. So we should examine why the photon particle was invoked. The light corpuscle evolved from Max Planck's quanta of EM emissions of to help remove the absolute luminiferous ether rest frame, to explain observed constant speed of light (CSL) irrespective of observers speed. If light does *c* with respect to a background frame through which an observer is moving, it is argued, then it cannot also be doing *c* in the frame of that observer. Length contraction and time dilation finished that task. Conservation was then just assumed, and inherited by the gauge boson of QED.<sup>[6]</sup> But the apparent paradoxes remained. So the question is; is there another explanation for CSL avoiding the need for conserved photons? There is if light changes speed to do  $c/n$  in the local frames of the local particles it encounters, so is re-emitted at *c* in the rest frame of the lens of a detector. This far to simple answer can't be right can it? We find it can.

If light moves at  $c/n$  (+*v* of co-moving observers) through the lens of a detector approaching an emitter, then the postulates of SR hold, whether the (idealised rigid) lens contracts in length at

that moment or not. But if rigid bodies do NOT contract, but light changes speed to the new local  $c$  instead, **then the effects of SR are consistent with the quantum process**. Can a ballistic particle instantly change speed at a new medium? Perhaps so if absorbed as a particle or quanta and re-emitted at the new speed. Planck's loading theory is equivalent to gradual charge but quantised re emission, so works as well and *more* intuitively where propagation speed changes to give  $c$  in **both** media.

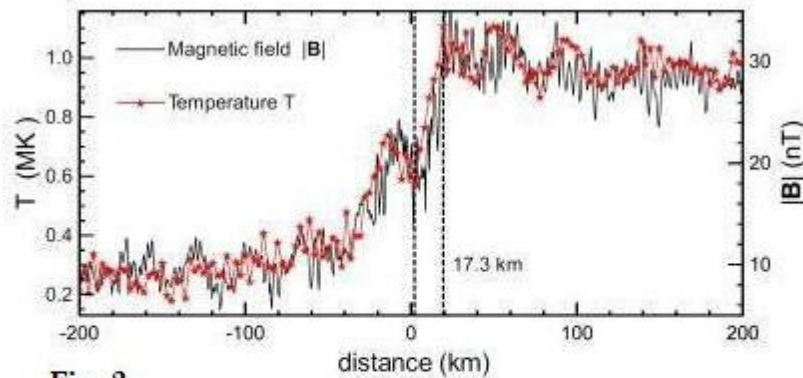
Fig. 1 shows the relationship when waves move between vacua and a medium. Wave number and pattern across the blue medium are constant irrespective of relative motion of that medium with respect to any observer in arbitrary motion, **or** equivalently movement of any observer with regard to the medium or whole system. That needs careful thought. Particles in the imperfect vacuum each side of the medium also form a medium, diffuse, but dense at the fine structure electrons near the medium surface. Einstein's big problem is then resolved without having to banish 'ether' frames, the precise solution he was trying to find. Light will always be found at  **$c$  locally irrespective of the motion of a detector**. If the observer moves past the medium at  $v$  towards the source, he still receives and measure light from both the source and the medium at  $c$ , the 'same' speed at which it is emitted, but at once a different **local**  $c$  in all cases.



### Falling Raindrops

Ballistic photon particles were retained to explain Stellar Aberration, where stars appear *ahead* of their true position as the Earth follows it's orbital path around the sun. The simplest and most common analogy used is then that of falling raindrops, with the telescope having to be tilted forwards to allow the photons to pass down the centre of the telescope. We suggest that this 19<sup>th</sup> century analogy is over simplistic, and also flies in the face of evidence from optical science. Atmospheric refraction has long been understood and accurately quantified and, despite simplistic assumptions, is inconsistent with the falling raindrop model. Refraction in the ionosphere has a similar effect to the atmosphere but has been less well understood.

The present '*Cluster*' probes of our ionosphere, bow shock and magnetotail, find high electron densities in a narrow band. The result of shock electron interactions are shown in Fig. 2 below. Characterised as electron heating it may be more consistently interpreted as light arriving at  $c$  in the solar (barycentric) frame being absorbed and re-emitted at  $c$  *in the planet's orbital rest frame*. Current theory does not support this possibility, which also resolves the theoretical issue behind the multiple scattering surfaces of  $\Delta f$  ( $\Delta\lambda$ ), evidenced by the CMBR and spectroscopy. The highest shock density is  $\sim 17.3\text{km}$  thick (Fig 2). The 'outer' particles are in the sun's or solar wind frame, mixing to the inner layer which is in the **Earth's orbital** frame. Wavelength shift is small due to the low  $29.7\text{km/s}$  orbital velocity compared to  $c$  and the solar winds, the solar particle emissions also at rest in their own frame.



**Fig. 2.**

NASA 'Cluster' data. S. Schwartz Imperial College London. Change in field strength electron density and EM wavelength and frequency at the Earth's Bow Shock. Reported as the electron temperature in the plasma 'surrounding' the shock.

We interpret the graph as showing propagation speed change from  $c$  in the barycentric frame to  $c$  in the Earth's orbital frame. The kinetics and quantum mechanics of this transform, equivalent to Doppler contraction as the Lorentz Transformation, constraining the constant  $c = f \lambda$  by  $\Delta f$  and  $\Delta \lambda$  to conserve  $c$  on transformation between kinetic states, are analysed by Jackson as defining 'discrete fields' (FQXi essays 2011 and 2012). A number of essays have similar themes including Castel and Tamari (FQXi 2012). Dickau's essay refers to a comment from Zeilinger that '*the corpuscular theory should not be considered...irrefutable fact.*' Here we limit the domain of  $c$  to **localities**, with limits, which then multiply it's domains almost infinitely. No assumption of a conserved unchanged photon '*entity*' is needed.

Shwartz said of the above shock results <sup>[7]</sup>; "...the electron heating and smaller scale fields remain poorly understood & controversial." The kinetic physical frame model explains these findings consistently, and also the Flyby anomaly. Similar processes at the sun's bow shock explain the Pioneer and Voyager anomaly; the craft have only decelerated with respect to the heliospheric frame, not with respect to the background frame they're now in. Less well know is that Voyager 2 found many smaller such anomalies on the journey. These may be the local shocks at each orbit. Other less well known anomalies also then resolve, including re-ionization, lensing and kinetic decoupling.

The raindrop model endured because there was no consistent logical relativistic solution. However illogical, it was left 'holding the parcel' when the music stopped. There is also a geometrical falsification; If photons do  $c$  vertically then, according to the laws of geometry, if travelling at an angle (on the hypotenuse of the triangle formed by the 'tilt') they must travel at more than  $c$ . Length contraction only reduces aberration to zero. Another complex interaction process is going on to explain all, as found in geometrical optics with moving media. Apparent refraction is 'reversed', from the medium frame, by relative motion. Earth's atmosphere is in relative motion through the barycentric frame. The facts, logic and findings are clear. Only ancient assumptions on which established theory is based dictate that we ignore the facts due to the difficulty of assimilation.

### *Duality*

There are many conceptions of a photon of light. The particle may be made of waves which are made of particles each made of waves of smaller particles, for infinite regression both ways. We suggest natural constraints to scale invariance at particle and universe size. Background frames are now allowable because the reasons for the ban on the 'ether' have been lifted (by light

changing speed to LOCAL  $c$ ). Photons may then be emitted quanta which gradually merge into the fluctuations we call waves. Some may scream that calculations show this is not possible. But in any calculation just one incomplete or wrong assumption makes all that follows flawed. Such findings misguide, prove nothing, and should not be confused with the reality of nature. Nature remains the final arbiter, including of math, which must also defer to logic.

The twin slit experiment is explained by quanta emitted on interaction merging into waves, as happens to the initial 'soliton' wave from a pebble dropped into a pool. At the edges of the slits fine structure  $\alpha$  peaks as does static electrical charge as quanta are propagated by em waves, re-emitted, to merge into waves again, but interacting again at the backboard with quanta manifesting to make up the macro interference bands with the tiny dots of quantized energy found. No quantized 'entity' is conserved intact, and motion changes qualities, the energy is simply quantized at each re-emission, as Planck's loading theory and Regazzas (FQXi 2011).

Topology change promotes quanta at all scales. We resolve the reason surface charge focusses at sharp features as well as at high relative motion. A sharp mountain ridge as found at some places along the Rockies help long distance radio signal strength in comparison with flat ground or hills. An experiment we can all repeat is the 'part open door'. The results are similar for sound and light. Open a door slowly and record sound and light levels. The levels rise steeply at very small openings, but then level off. Tripling the opening from 10mm to 30mm will not triple transmission. The slit edges have more effect than the gap (and wavelength dependent).

A 'dual' form itself may be part of a nature in constant motion. Fischer (FQXi 2012) finds another route to similar conclusions to ours, Jacksons etc. who imply a corkscrew quantized soliton (Fig. 3). Recent optics findings also show photons 'changing' on interaction<sup>[16]</sup>. Drozdov (2008) found the same kinetic structure and described "*photon frequency as an inverse time of emission.*"

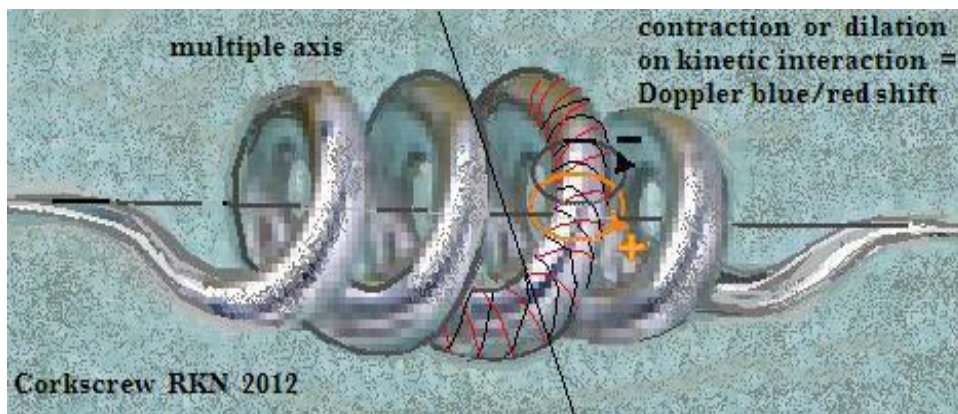


Fig 3. Translating toroid soliton wave/particle as implied by Jackson and consistent with others (FQXi 2010-12). The Chiral 'handedness' is consistent with Joy Christian's proofs.<sup>[17]</sup>

### Moving mirrors

The Light Box or 'Clock' is often considered for length contraction. If a pulse bounces up and down at  $c$ , then when the box is 'in motion' the light would exceed  $c$  on a diagonal path, assumed a violation of CSL. Length contraction of the box was then required.

But a naïve view unencumbered by assumptions may be that no light would ever have violated CSL in that scenario. In the rest frame of the box the light does  $c$  regardless of any relative motions of observers outside the box. The light scattered by the interactions with the particles in the box (the only way a pulse can be observed) also does  $c$  with respect to the box. Light passing through the glass walls, then the air or medium outside the box does  $c$ , or  $c/n$ , through

the glass and towards each observer. **Nothing violates CSL.** When reaching each lens the light changes speed to  $c/n$  through each lens to complete the picture for moving observers as well as emitters. If anybody can find any light anywhere in the scenario that moves at  $c <$ , then the assumption used for the Relativity is correct. There is none. The change is only of the source positions of the emitting particles in the box, consistent with Jackson's 'Discrete Field', Fedosin and others (FQXi 2012).

The logical form suggested also resolves the paradox of the pulses not reflected at  $90^\circ$  to the reflective plane with moving mirrors. The **are** of course reflected at  $90^\circ$ . If the box were removed and just the two mirrors moved in unison through the background medium, the pulses would then fly off into space. Length contraction is only required, as the contraction of non-'rigid' bodies and wavelength on acceleration between frames, also giving contraction (or dilation) of a particular 'duration' (time period) between frames. For dilation we may read expansion, which is Doppler red shift, and 'reverse Compton scattering'.

The surface fine structure of the *reflective* plane is then equivalent to that of the refractive plane and at Earth's bow shock, implementing the frame transition by re-scattering at the local  $c$  of each particle forming the shock transition zone. Scattering in a diffuse medium has long been well understood<sup>[8]</sup> if not interpreted consistently with inconsistent theory. The existence of such a fine structure zone at the surface of all matter is evidenced by the recent confirmation of the Dynamic Casimir effect<sup>[9]</sup>, where space is full of particles that just '*pop in and out of existence*'. Again characterised more in line with current theory, but consistent with a kinetic model. If a mirror moves at high speeds in a vacuum the EM field is 'excited' (in the same way as Earth's field excited by its relative motion), and the fine structure electrons or 'virtual photons' re-emit at  $c$  in the rest frame of the background medium electrons NOT in the rest frame of the co-moving mirror (also resolving this paradox). The result theoretically resolves the wavelength shift between the near and far fields of the Maxwell equations as suggested in Jackson's essay and consistent with Petkov (FQXi 2012), to be a frame transform implementing the new *local c*.

### *Evidence for Special Relativity*

There's a difference between evidence for the SR postulates and evidence for its formulations. Studying the evidence carefully we find, surprisingly, that the most physical evidence is only **for the postulates**, which appear to defy logic. The formulations are mathematical artifacts with no mechanism. Length contraction as found can be explained in terms of Doppler shift. Shapiro's delay from Venus radar ranging is discredited as 'drowned out' by atmospheric refractive effects confirmed by *Venus Express* and, replaced by more consistent theory.<sup>[10]</sup> The other foundation of time dilation, Hafele-Keating's 'flying clocks', turns out<sup>[11]</sup> to have been largely propaganda by their mentors. The actual results were not published (1972). Hafele's said in 1971<sup>[12]</sup>

*"...those who doubt the validity of conventional relativity theory and there are many people in this category, probably will not be converted by the results shown in Figure 4. Indeed, the difference between theory and measurement in Figure 4 is disturbing."*

A point made by some is that all good relevant evidence cited in support of SR is also evidence for the model of dynamic background frames, not requiring an ether for its primary mechanism, or requiring the idealised perfect vacuum and rigid bodies required for SR. Galilean Relativity is re-organised with mutually exclusive spaces arranged hierarchically, or 'nested', in a potentially infinite kinetic structure of three dimensional volumes, bounded by plasma<sup>[13]</sup> as 'dark matter'<sup>[14]</sup> beyond the domain of Cartesian vector space.

### *Problem Solving*

If we're able to escape assumptions of text book science and the implicit need to learn 'facts' to pass exams, we can then re-appraise the little we really do know about nature, the "1,000<sup>th</sup> of 1%" estimated by Einstein, and reconsider all assumed relationships. One of the most

damaging attitudes to this process may be the over use of the old 'apples and oranges' argument, where just because we have been taught things under separate heading does not mean they are not secretly closely connected.

In looking afresh at much of physics and astronomy it is apparent how many things simply do NOT fit together within current theory and the Concordance cosmological model. For instance it would only take a small 'vacuum resistance' to light propagation to completely destroy the theory of accelerating expansion of the universe. This scenario is no longer forbidden in the kinetic model. Findings in astronomy regularly seem to defy prediction, needing infinite patches on patches on patches to old theory. We must assume that somewhere underlying all the confusion is a coherent and logical theory, consistent with all findings. The kinetic model seems able to offer all the elements, only indoctrination with assumptions making it hard to rationalise.

We suggest that the way to find the coherent solution is to focus and zero in to the major problem areas, whether 'swept under the carpet' like most or better aired. This technique will then provide a collection of lumpy 'nodules' that won't fit together. On stripping these of all assumptions and layered 'patches' we may find they can actually be rather different in 'shape' than we assumed. We then have a game. Child's play as nicely analogised by Dickau (FQXi 2011) with a three dimensional jigsaw puzzle of building blocks. The mainstream view in most branches of science has a tendency not to 'wash it's dirty washing in public'. Perhaps progress is damaged by this view as much than anything else.

Tamari (FQXi 2011) imaginatively characterised current theory as a badly constructed house. If we re-examine each problematical component we may then 'pattern match' to fit them together in new and better ways. A common theme well argued by many FQXi 2012 essays is that we are too trusting of present math. Schlafly, Smith, Yan, Perez, Blumschein, Reiter, Mackinson, Jackson, Hahn, and I'm sure, others agree. Some suggest that Logic, Dynamic and 'Truth Functional' should trump math, giving consistent logic of discrete kinetics. Macken, Malfarina, possibly Silberstein and others give consistent models. Mathematician C Regazas agrees about math, and has described (2010) a Photoelectric Effect without Photons.<sup>[15]</sup>

Most minds are not practised at projecting kinetic cause & effect, relying on Cartesian 'points', in vector space. But motion is an invalid concept in geometric space, while ALL bodies in the universe are in motion with respect to other bodies, and a body would not be a body if it only occupied a 'point'. A line similarly has no thickness so does not exist in reality. Perhaps then the development of math has held up development of human understanding, at least of those who rely totally on math. Ken Wharton's essay cites Smolin's suspicion of the present "Newtonian Schema" in mapping math back to reality and discusses a Lagrangian alternative. We agree, rely on logic, and point out that there's no infinity at a centre of mass in this case. A 'Lagrangian point' is a point of equilibrium, or **zero** gravity. The torus is then consistent as a model, as found at Active Galactic Nuclei (AGN's), familiar as black holes. Tori may then be scale invariant. (see Fig. 3).

Good visualisation skills are needed to rationalise the motions of bodies and EM fluctuations as waves, NOT as conserved particles, through an interaction process changing over time, and with yet unseen consequences. Jackson terms this 'temporal evolution of interaction' with non zero masses, which, with multiple bodies, is beyond current computation. Dynamic 'cause and effect' is a difficult concept but it does seem to be at the heart of a rational theory of nature.

### *The Log Jam*

Our way of thinking evolved from conserved photons and point particles. We propose that removing these most established assumptions is akin to finding and removing the log which releases the log jam. Some lumberjacks have developed the skills to identify and remove this log. We must develop the new skills to identify key problems in a dynamic universe, not keep covering theory with patches. The key 'log' in this case may be the assumption that maths

using point particles, and motion in vector space, can describe how nature really works. The 'temporal evolution' of wave particle interaction may be that 'key log'. However, all the time the mainstream 'police' have control of the logjam then the lumberjack with the skills to identify the key log may be ignored. The longer the log jam is in place the greater may be the damage down the main stream once released.

Change of ruling paradigms is rare and can either be evolutionary or revolutionary. If the first is prevented, the second may be inevitable. Every academic in physics education has a significant investment in his knowledge base. Can we face the thought of text books having to be thrown away and re-written? Or old papers shown up as mostly wrong due to incorrect assumptions? Even with lip service paid to the concept that all theory is provisional, hostility and entrenched resistance to fresh ideas and concepts is natural. The limitless flow of unfalsifiable 'ideas' is easy to write off as 'crackpot' without scrutiny, so none get scrutinised. So how do we sort the wheat from the chaff? Perhaps only better use of logic and less use of assumptions can allow the essential falsification and advance in science. This means simply better application of the scientific method.

The test of logical consistency is not necessarily apparent mathematical consistency. Logic is not a great strength of physicists, but we suggest it should become so. Alongside this the process of falsification by weight of evidence, or consistency with observation must also be improved, i.e, ***not the present judgement against past assumptions and interpretations.*** The big problem we have is then the subject of these essays, assumptions. How can we know when we are judging against unseen assumptions, or avoid judging against what we feel we know is true, even though it is just current theory. Even greater improvement is needed.

### *Conclusions*

Am I then suggesting that much of physics is as 'belief based' as religion? No. I suggest that almost all is, and must be so. We must recognise this and modify our assumptions accordingly. Religion has evolved to ever greater realism where physics has not, but we are human and we can only ever judge anything against our experience. So we must then modify our experience. Learn to seek out all the assumptions we'd forgotten we used, identify them and develop an ability to challenge them as a natural approach to problem solving.

Some results from this process can be reported. In analysing findings and theories over wide areas of physics and many years, a pattern emerges from relative kinetics with consistent logic and evidence. Predictions emerged, and most found to already have been proven but poorly interpreted and often termed 'poorly understood'. The emergent basis is as explored by many in FQXi 2012 essays, is fully falsifiable. No falsification based on consistent assumptions has yet succeeded. The Smolin/Wharton/Jackson (and others) challenge to assumptions about maths and motion has shown clear signs of success. The consistent theoretical foundation found is wide reaching, does not require conserved light quanta, and assumes non point particles. It's parts are spread liberally about this competition, consistent with Christians view of Bells theorem <sup>[17]</sup> (well analysed by T Ray here). Some is brought together above but most awaits construction into a full unifying version of SR. Better math and logic than presently applied in physics are needed. A prerequisite of recognition is also learning a new way of thinking to that commonly used. What use is finding a way to release the log jam if the main stream has frozen forever in the old configuration, never to advance again? Perhaps only different thinking can bring the spring.

And it may be wise to be aware if and when the logs regain their kinetic energy.

RKN

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