A New Universe Emerging From the Old Electron and a Better Electron Emerging From the Good Old Universe *

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Abstract

The Bohr atom and the orbiting electron are examined for the purpose of finding a blueprint of the universe's geometry. The absorption of a signal is found to take place sequentially in the electromagnetic wave, which hints at the electron having sub-structure. Notably its rotation and angular momentum allows it to see the atom's nucleus as an orbiting body smeared out over a spherical boundary which defines its microcosmos. This is taken as the universe's blueprint and examined from various aspects and compared with Standard Big Bang Cosmology focusing on the fundamental theoretical implications of such a model and on how some of the well-known problems in Standard Cosmology could be avoided. Examples of fundamental consequences of the present model of the universe are that velocities carried by distinct physical processes do not necessarily obey the vector addition rules of elementary mathematics and that mass appears simultaneously in local and non-local form. The arguments, which build on previous quantitative and numerical results lead, for example, to the fascinating conclusions that the electron is capable of managing the perception of time as well as the transfer of matter from substance to wave.

1 Introduction

The present and previous work in this series, e.g. [1], [2] [3]is based on identifying a non-local observer as being perpendicular to a local observer who is only capable of observations on a linear momentum axis. Descriptions of non-locality in physics have so far mostly been based on phenomenology, like the famous Alice's and Bob's signal perceptions but many other empirical observations indirectly invoke some kind of non-locality (examples compiled in [1]). In addition to the Alice and Bob phenomenology and the theoretical perpendicular axes approach pursued by the present author one may get an intuitive understanding of non-locality by contemplating how a light signal leaves its vast

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two-dimensional wave front and by considering the vanishing of the adjacent Stokes curl. The latter is especially relevant for the 'invisible' nodes of electromagnetic radiation, where the curl of both the electric and magnetic fields is expected to be maximal since the rates of change of the field strengths are maximal here. It has recently been shown [4] [5] [6] [7] that Maxwell's equations as hidden in the Faraday tensor can be rearranged in conformity with the herein proposed geometry such that the emitter of the signal is local whereas the non-local absorber appears in the wave front and turns local upon absorbing the signal. This solves the century-old problem of understanding the non-locality of the wave-front *versus* the source of the signal, the latter of which always appears to be local. Most recently [7], both the wave and the absorber could be followed respectively identified graphically by implementing this local *versus* non-local geometry. The behavior of the absorber (the electron, that is) in the wave could be studied merely by postulating that it first catches the signal in the non-local wave-front and then completes the absorption by interacting with the classical electric field in the wave's anti-node. Thereby, since separate longitudinal and transverse components (of the field) transform differently in scenarios of different to-and-fro velocities of emitter and absorber, such cases will cause a phase mismatch between transverse and longitudinal components of the field, which the electron will have to compensate.

A plain graphical construction then shows that the electron is capable of compensating the phase mismatch by tilting its axis relative to the approaching wave. Both forward (compensating approaching relative velocities) and backward tilting (compensating receding velocities) results in the unit circle being squeezed onto the perpendicular time axis which is thus dilated. Hence 'relativistic effects' can be ascribed to the wave-matter interface where, for the first time, the behavior of the electron during absorption may be followed.[1] This discovery hints at the fascinating possibility that the perception of time is managed mechanistically by the electron[2]. The well known uncertainty principle relating position to momentum or energy to time is not a problem in this connection since it applies to a third (outside) observer measuring what takes place whereas in the present case there is no measurement being performed. Therefore, one is free to examine the consequences of implementing the geometry as just described. In the present paper these ideas will be carried further, focussing on the universe. The reasoning leading to this problem revolves around the electron in the following manner [7]: Firstly, it was shown that if the atomic orbiting electron is entrained to the velocity of light, c, *via* the factor αc (fine structure constant) then it would also be capable of engaging the atomic nucleus, notably the latter's surface, into an oscillatory movement entrained to the charge shadow of its Bohr ground state (or inner) orbit. The velocity of the charge shadow on the nucleus would be such that the nucleus would be capable of generating a matter wave slightly outside of or at the atom's electron cloud. The question then arises if the atomic nucleus should be regarded as a local point mass or if and to what extent it might share its mass with that matter wave. Such factors could be the reason why different methods of determining the proton's radius (including other than its charge radius) give different results (briefly reviewed in [7]). A good context for discussing the possibility of a nuclear matter wave outside of the atom was [7] set out to be the empirical baryonic Tully-Fisher relation of rotating spiral galaxies where the axial rotation depends on the number of baryons, as if the galaxies' dark (matter) halos didn't exist while the latter nevertheless exert gravitational attraction that straightens out the

[1] Of course, besides frequency shifts of electromagnetic radiation many other 'relativistic effects' have been described in work spanning more than 100 years but the conjecture is here that many, if not all of them will be possible to describe equally well using the time dilatation of the present theory which also accounts quantitatively for non-locality. Another advantage, which has been demonstrated several times in previous papers in this series, is that physical units can be ascribed to either the local or the non-local frame so that upon rearrangement of terms, plain descriptions-measurements turn into displays of physical processes taking place upon frame transfer.

[2] May be not so remarkable after all, since all observations are made by electrons

galaxies' spiral arms. This brings the electron up to the scale of the universe and it was postulated [7] that an electron rotating while orbiting around the atomic nucleus would perceive the nucleus, not as a point, but a horizon, notably a horizon similar in many respect to the cosmological horizon.

Pursuing these counter-trend ideas about the geometry of the universe is motivated by the many grotesque speculations that are embedded in the big bang cosmology. For example, it is assumed that the universe does not have any fixed extension but continues into infinity. Claiming that the relativistically allowed maximal look-back time exactly corresponds to the moment of the big bang is also an assumption that underpins standard cosmology, this is related to its assertion that the universe has undergone a violent evolution comprising nucleosynthesis and galaxy (thermo)dynamics through 13.7 billion years to reach a present likewise dynamic state wherein it (empirically,... thanks!) neither collapses nor falls apart. The latter is also known as the 'closure' problem, recently [8] 'flatness' problem. Big bang cosmology also claims that the visible and sometimes palpable baryonic matter in the universe is a tiny fraction, a residue of a much more energetic matter-antimatter 'fireball' that once upon a time was concentrated in a single point of space - likewise grotesque speculations formulated to fit the theoretical requirements of Big Bang cosmology. Then there is the problem of the ontology of space-time, in other words if space-time existed before the 'world' appeared or *vice versa*. Big bang cosmology undauntedly chooses the former alternative, which is a speculation in itself[3]. Its choice in this respect makes it possible for it to freely manipulate space-time as if the world did not exist, and so it does with a vengeance - in its 'inflationary' scenario of the early universe. Here space-time is allowed to expand at a rate surpassing that of the velocity of light - a speculation within a speculation in order to fit its theory to the appearance of real world. This is said to solve the problem why the universe is equally hot in every direction despite purportedly having had such a violent history - a solution to a problem created by - a speculation. In addition to these rather obvious clashes with common sense, big bang cosmology also has many intrinsic inconsistencies which are recognized as such by experts in the field. These include the cosmological constant problem[4] and the dark matter - dark energy problem[5]. The red line traversing all these theoretical superstructures is the surrender to the belief that nonetheless, general relativity theory must in some way or another describe the universe, and common sense is peripheral towards that end.

2 Results

In now addressing cosmology, the present paper constitutes a further elaboration of the recent discovery [7] that the electron's mechanistic behavior in an electromagnetic wave, when compensating a phase mismatch of a two-stage absorption involving separately longitudinal and transverse components of the wave may cause time dilatation. This not only provides a very concrete explanation for so called 'relativistic effects', previously attributed to the 'natural geometry' of SR-GR, but also challenges the energy concept of the wave. Namely, in previous work on electromagnetic radiation

[3]The glossary meaning of 'speculation' is intended here not its economic market one, like real palpable gold (eqv. 'the World') *versus* gold ETFs (eqv. 'theories about the World')

[4]The 'cosmological constant' is required to have a low numerical value in the Big Bang cosmology but is calculated to have a very high numerical value in the physical vacuum, problem is discussed in e.g. [9]

[5]In Big Bang cosmology, the universe must have a higher mass than what is actually observed which necessitates introducing a 'theoretical' invisible mass. From time to time more sources of mass are discovered by observation but it doesn't suffice. The 'dark matter' problem also appears in the galaxy halos, this was discussed in terms of baryonic source -matter waves in the author's most recent paper, triggering the herein presented research.

the 2-dimensional wave front of the signal has largely been neglected and very little studied except in terms of interference patterns displaying the wave's antinodes *after* the absorption has taken place. As mentioned in the previous section the new idea here is that the invisible nodes, with their maximal non-local curl, contribute with equal importance *before* the absorption. For absorption to take place as rendered herein, the electron must first catch the signal in the wave front, then perform some mechanical operations so that both the curl and the field components are taken into account and only then will absorption take place. This leads to the notion that the transverse and curled energy components of the wave are not plainly manifestations of 'energy' but they are functionally non-equal. This separateness of the curl and the field would be lost in much of contemporary work in optics, which often describes focussed beams, like lasers, and is based on interference patterns and treated theoretically in terms of oscillations of the wave's field component only.

Recall Fig. 1, taken from [7], which describes graphically the absorption and the behavior of the electron when placed in the local-nonlocal geometry of this theoretical framework. In the upper part of the drawing (A) the electric field, represented by black, is zero at the point of maximal curl, the kinetic energy harboring the curl is represented by red. The electron absorbs or senses the curl (vertical red bar) when it is maximal in the non-local part of the wave at which instant it is unable to see the local part of the wave (green dashed line). The wave then proceeds from right to left until the local field component of the wave is absorbed (horizontal green bar) at which instant the electron is unable to sense the wave's non-local part (its curl) represented by the horizontal dashed red line. The yellow bar stretching a distance $\pi/4$ yields a time scale takes the absorption to be complete. In the lower part of the drawing (B) the electron is represented by an oblique green line at the position $\pi/4$ capable of adjusting the pitch of its frequency-receiving axis by tilting forward or backward in the wave. The electron's time axis (red dashed line in (B)) is stretched (dilated) by both these tilting operations since the (unit) circle preserves its area.

Hence, the implementation of the proposed local-nonlocal theoretical framework leads to a detailed mechanistic description of the electron's whereabouts and its absorption just by placing it in an electromagnetic field. The classical energy level description adequately explains the energy levels *per se* in terms of electron waves but not what happens *during* emission or absorption. The latter is still 'Terra Incognita' in the study of electromagnetism. The curl component of the field will now be analyzed against the present theoretical background (c.f. 'Introduction') and against the background of some experimental evidence indicating that the atomic electron's angular momentum is separable from its charge flux [10] [11] [12]. Such a separation of the electron's angular momentum and charge may fit very well to the herein proposed separateness of the wave's transverse and longitudinal components. Furthermore, it is often stated that the electron's angular momentum is a quantum mechanical entity unrelated to classical spin around an axis, however, its spin is indeed coupled to the atom's angular momentum *via* phonons [13] and this mechanical picture of its spin will be used herein.

The purpose is now first to identify the longitudinal component of the electromagnetic field, which causes a phase mismatch when source and sink of the signal approach or recede from each other at relativistic speeds. As illustrated in Fig. 2 the curl component of the field immediately clashes with relativity theory or its postulates, (left in the drawing, A), since the wave front (spherical or semi-spherical or anything less while the wave propagates) spreads with the velocity up to 2, which is super-luminal. Thus, the signal in its wavefront environment is in a state where it, when absorbed somewhere, may be capable of vanishing from an arbitrary long distance in an instant. Furthermore (Fig. 2 B), since the node propagates forward with velocity c its curl components parallel to

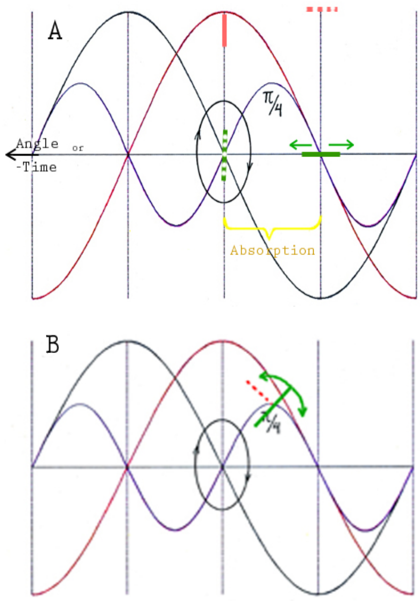

Figure 1: Schematic illustration as described in the main text of the two absorption events in the electromagnetic wave (A) and the electron's behavior in the wave (B, green), from ref. [7]. The yellow bar indicates the time scale required for the absorption. In the drawing, transitional excitations are intended, not ionization. The plausibility of the mechanism of absorption illustrated in the drawing arises from the Lyman series of absorption-emission bands of the hydrogen atom. Here, an excitation of the electron from the ground state into infinity takes place at $\leq 91.935\ nm$ which corresponds to a wavelength period of $\tau_{wave} = 3.04 \times 10^{-16}\ sec$ whereas the electron orbits the nucleus with speed αc in $\tau_e = 1.52 \times 10^{-16}\ sec$. This means that the electron and the wave are 'at scale' to interact within half a wavelength of the radiation and for any smaller (or higher) value of τ_{wave} the two points of interaction of the wave and the electron can be evaluated as shown in the drawing. This is allowed in the sense that both electron and the signal are regarded as quantum-mechanical waves (superpositions) and no third observer outside of the waves is involved. The absorption mechanism in the drawing is compatible with the wave description of electromagnetic radiation (Huygens), the wave's slowing down in denser media (refractive index), and with the electron acquiring angular momentum upon absorption. In contrast, the photon-energy level description of absorption relinquishes any means of studying the details of absorption (discussed in [6])

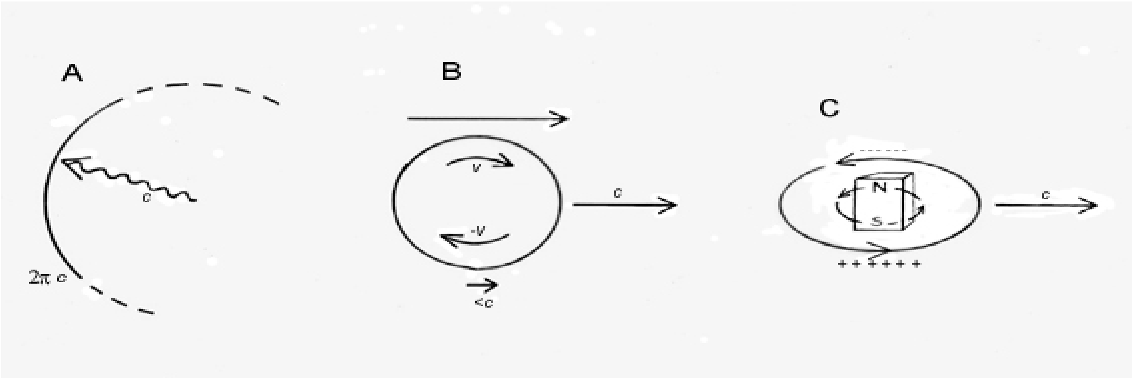

Figure 2: Schematic illustration of the signal and its wavefront (A), the curl at the electromagnetic wave's node with some of its velocity components (B), and the transverse appearance of a dipole in a circuit moving at relativistic speed (C, compiled from Figs. 71 and 74 in [15]), all as commented on in the main text

that direction propagate at lower speed (antiparallel) or higher speed (= c, parallel). This applies whether or not the mutually perpendicular magnetic and electric components at the node cancel in their effects of producing a curl of charge, since it is known that the canceling of forces in classical mechanics produces strain proportional to the forces and the longitudinal strain *per se* may be the true manifestation of the velocities in Fig. 2 B. In the case that the curl is carried by a point in space these velocities oscillate as deduced by an observer of forward momentum. If the source of the signal moves at relativistic speed along the momentum axis then some appropriate longitudinal relativistic corrections would be applicable here. The antiparallel velocity component would be capable of canceling the forward velocity to such an extent that the signal may, in principle, stay at its source while propagating. In previous work on another, related problem, the appearance of a passing sphere [14], it has been shown that at velocities close to c formidable distortions appear. The cases in Fig. 2 A and B are valuable to keep in mind since they provide concrete though unexamined possibilities for communication within the wave, something which is not understood at all except in terms of phenomenology (The 'Alice and Bob' story and similar phenomena). The 3:rd way (Fig. 2 C) in which the curl at the nodes may touch relativity theory is by reference to the transverse dipole arising *via* the Lorentz force from both a magnet-contained and electric curl moving discus-like forward at relativistic speed [15]. Again, this applies whether or not the two types of curl cancel on average because of the possibility of quantum fluctuations and 'strain'. A transverse dipole is not observed at the node but well at the antinode where it emerges gradually from the node. Even though the Lorentz force acts transversely, longitudinal effects can not be excluded (besides fluctuations parallel to the curl(s), torque may also be important). It is also possible to consider velocity-parallel and antiparallel components of the curl at some distance from the node where the emerging transverse components may rip part of the curl out of order. An interesting coordinate where this may occur is at the coordinate $\pi/4$ from the field peaks where the rates of change of the fields are maximal (discussed in [6] [7]).

It suffices for the sequel to have found that the longitudinal component of the signal's frequency may possibly be read by the electron. In the present theory the curl is assigned to a non-local frame of observation which is invisible to the local observer until it is brought into the local frame *via* a Lorentz transformation at which moment both the longitudinal and transverse components of the wave must fit to the same frequency. As shown [2] [4], the curl just described is amenable to a quantitative description by rearranging the Faraday tensor -version of Maxwell's equations. However, the everywhere canceling Stokes curl within the 2-dimensional wave front may also efficiently hide that the curl ever takes place. The electric and magnetic curls have another important property, namely they provide two velocities (circular vectors) that do not necessarily in the general case add by vector addition since they represent qualitatively different processes. Adding two more such circular vectors to the ones just described in order to cancel the signal's polarization and still another 4 waves to cancel the signal altogether one arrives at a four-wave conception of the, now dark indeed, invisible non-local frame, which fits well with the well established 'Dirac equation'.

A partly similar discussion has already been had in another context, namely in Standard Cosmology, talking about the distant horizon and its quantum fluctuations of dark matter purportedly nucleating the universe's visible matter. This sets the scene for the subsequent description of the electron's job herein of telling the story about the universe's geometry.

Consider Fig. 3, a schematic illustration of the electron in its atom environment. When looking forward it sees the nucleus as an object but when rotating as shown by the arrows and looking to the right it sees the nucleus as a 'horizon' since the nucleus seems smeared out in the direction of observation. For this to be true literally, not merely as an illustration of the geometry, the electron must have sub-structure - a self-radius along which it observes the nucleus. Then let the additional circles to the right represent the same electron at other positions, equally spaced on the circumference so that each location is equivalent in every respect. In this 'microcosmos' the electron may jump from position to position and conclude that its microcosmos looks the same from everywhere and that it has a boundary constituted by the smeared out nucleus. The electron may travel from one to the next of its copies repeatedly until it is back at its original position, performing a 'string journey' spanning its entire microcosmos. However, it is not necessary to go all this way (beyond the circle's origin) to establish that every position is geometrically equivalent. Furthermore, on observing these other ghost-copies of itself they will seem to orbit like the nucleus such that their signals look more smeared out perpendicular to the axis of observation the further away they are. Depending on the observer's position relative to any one light signal from these copies of itself the signal would look more or less smeared out, something which would be a graphical version of relativity theory's assertion that its geometry knows the signal-absorber's relative velocity ahead of time. This is of course dismissed here but there will be a reverse effect of position in terms of the width of the wavefront hitting the signal absorber, which is realistic. However, taking this into account would yield a counter-intuitive graphical illustration and can therefore be forgotten for the moment. Hence, returning to Fig. 3 and its string of objects along the electron's path it is obvious that if the universe is smilarly constructed one would hope to find an explanation why there is abundant string-like[6] large scale structure, e.g. [16] and evolutionary heterogeneity [17] since the matter appears in strings on looking back in time not necessarily synchronously in bulk over the entire cosmological horizon as it is in Big Bang scenarios.

On applying this model to the universe many would object that the universe does not at all rotate and is not at all discus-like anisotropic. However this objection was already anticipated in the preamble above. First of all, it is the electron that rotates, not only in the primordial atom but in every object, every living creature and every measuring apparatus set up to measure a signal and the new idea was that its rotation plays a crucial role in absorption of the signal, starting at the signal's node. The anisotropy objection is met by realizing that not all velocities add by vector addition like

[6]only the dictionary meaning of the word 'string' is intended here, not as used in contemporary advanced so called 'string theories' of the universe

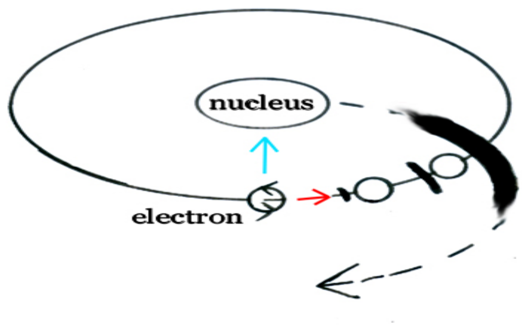

Figure 3: Schematic illustration of a (Bohr) atom with its nucleus in the center and the smaller circle representing the orbiting electron. The latter may perceive the nucleus as a point-like object when looking forward along the blue arrow but when it is rotating around its own axis and looking to the right along the red arrow the nucleus may instead look 'smeared out' since it then appears to be orbiting around the electron. If there were identical copies of the electron in the rightward direction they would look more smeared out the further away they are located. This may seem to be a re-iteration of the heliocentric *versus* Earth-in-the-center debate of the 17:th century at a higher orbit velocity, but it is not (see text).

in elementary mathematics as already pointed out and by contemplating the Dirac equation with its four waves. One may then have rotations in several directions simultaneously without there being any anisotropy. For example, one may imagine additional rotation axes in Fig. 3 and that the electron observes the smeared out nucleus in a centripetal direction of many these various rotations simultaneously. Then one arrives a cosmological model similar in some respects to the black hole described in [9] but without any literal expansion of the universe and without any Big Bang or singularity at the origin. In [9] the absence of inertial drag at the boundary of a black hole was taken as proof that any rotation had been cancelled, leading to a solution of the cosmological constant problem and such an absence of drag is phenomenologically rather similar to the perpetual (friction-less) orbiting of the electron and the rotating electron's seeing the nucleus smeared out perpetually. By reference to cosmology nomenclature the present rough model of the universe could be named an 'inverted black hole' [7], keeping in mind though that well-defined spinning black holes in the literature rotate themselves parallel to their event horizon -surface and do not appear as a result of their constituents at the event horizon rotating perpendicular to the black hole's surface. So one can start thinking about the details of the model in Fig. 3, first the cosmological line increment and then the gravitational pull.

In order to see the cosmological line increment approximately equal along the line of sight in Fig. 3 there are three solutions. First, one may imagine the signal traveling on the surface of the shell along the electron's equally spaced (now geometrically intended 'bosonic'!) ghost copies in Fig. 3, like on a 'geodesic', which would correspond to the universe's center spreading out and exerting gravitational pull on the signal from one direction or equivalently, bending the signal because of higher refractive index, the latter known to increase roughly with mass. If the universe's mass at its horizon rotates around the celestial object, then it exerts gravitational pull around the rotation axis, which straightens out the curved line and this may happen in 3 spatial dimensions at the same time since the rotation velocities are carried by distinct physical processes that do not add like vectors in elementary mathematics. The second possibility to stretch out the signal's path and get rid of the curvature in

Fig. 3 might be to sum many different signal paths like in Fig. 3. They may be summed one time once and for all or sequentially while the universe generates more bosonic matter as the orbit in Fig. 3 is traced over and over again (more hydrogen and more young stars-galaxies). A third possibility is to leave the signal path in Fig. 3 to Fermat's principle and conclude that the universe accelerates however slowly, but the observational evidence that it accelerates is of course very scanty and still contested by some astrophysicists. In any case, inviting the tiny electron as a light signal guide to the geometry of the universe as described herein hints at solutions to some problems in Standard Cosmology. The next detail to be resolved in the present model is the distant gravitational pull of the heavy body that the electron (the nucleus, that is, and its equivalent in the universe, presumably an entire galaxy) senses while rotating around its own center.

In the atom it is of course the electron's orbit around the nucleus that keeps it in place by classical forces as known from the Bohr theory. So the question arises what may keep its equivalent in the universe, the galaxy, from being sucked towards and smashed onto the cosmological horizon claimed, in the present theory, to be an inverted black hole with its terrible singularity? The clue to a solution to this problem lies in the tiny atom. As shown quantitatively, by virtue of the charge shadow cast on the surface of the atomic nucleus, the orbiting electron defines a velocity which fits to setting a matter wave just outside the atom's electron cloud. In doing so it transfers part of the nucleus' mass to outside of the atom where it, now the form of a wave, will always be prepared to nucleate macroscopic matter waves and superfluid rotations. Besides matter-waves and superfluidity, this idea offers a plausible path to an explanation for the so called 'Baryonic Tully-Fisher Relation', the galaxies' rotational speed being dependent on baryonic mass while simply disregarding total apparent mass, cf. [18]. By accepting the notion that the baryonic mass is the local substance set in place by the non-local bulk matter wave one may also get a handle to understanding aberrant gravitational behavior in the universe, such as 'dark matter halos' around galaxies. The cosmological equivalent of the canceling of classical forces sensed by the orbiting (and rotating) electron is thus that the horizon is perceived, not as an orbiting black hole singularity but as a wave having an extension, its width being the entire horizon of the universe and this very massive wave (or waves) sets in place the local objects in the universe. Furthermore, just like in the case of the atom's boundary constituted by the orbiting electron or the nucleus seeming to orbit around the rotating electron, there is a boundary at the cosmological level. In the case of a galaxy that boundary would be the event horizon of its black hole and, as argued in previous papers in this series, in the case of the entire universe, the boundary would be its relativistic horizon. And just like the electron is capable of shuttling the matter back and forth across its orbit-boundary [7] similar ideas also exist in 'Black hole' physics like, for example, its concept of tunneling into the 'ergoregion'.

Thereby the electron has demonstrated its capability to be a guide to the geometry of the universe and it has emerged stronger than ever from the analysis since it has proven itself to be able to manage not only our perception of time (Fig. 1) but also matter flux across a boundary.

3 An Evaluation of 'Big Bang' Cosmology *versus* This Model

By reference to the results presented in the previous section it is now possible to evaluate systematically, one after the other, the shortcomings of Standard Cosmology and how they can be circumvented in the present model of the universe. The issues that have been raised against Standard Cosmology (most of them noted and admitted by experts in the field) are summarized in Table I. Numbers below refer to Table I.

1. The universes spatial extension is postulated to be infinite in Big Bang cosmology since it has no mechanism of defining a boundary. In the present model the situation is different as can be easily deduced from Fig. 3. Here the boundary is set by the rotating singularity turned into a wave and the boundary is equivalent of the universe's relativistic horizon. This can be evaluated numerically by factorizing the Planck length [1] yielding 13.7 billion years for the universe's age and a radius of 1.296×10^{26} m. The cosmological line increment is the inverse of the latter, 7.714×10^{-27} m/ms[7] equal to 71.36 $km/second/Mparsec$

2. The Big Bang hypothesis has no inherent means of defining the origin of the universe's time axis other than postulating *ad hoc* that is starts at a moment of creation somewhat prior to its 'inflation' scenario. In the preset model, however, the universe's time axis starts at its relativistic horizon, which simply means that it is defined by way of the linear cosmological expansion rate reaching the velocity of light there. In Big Bang cosmology, which is based on relativity theory with its Minkowsky space-time, the time axis plays a very important role but this is not so in the present model. Here, the interval of observation is important so that every object acquires its own time axis based on its own internal dynamics and the roughly synchronous evolution on looking back into the universe's past is merely a consequence of the finite velocity of light. From time to time exceptions to the Big Bang-expected synchronous evolution of celestial objects are found, for example older than expected galaxies, e.g. [17]. This is a big problem in Big Bang but not a problem in the present model of the universe, as just explained.

3. The closure-flatness issue of Big Bang cosmology derives from its not having a boundary onto which the expanding universe may ultimately reach static equilibrium, and from the presumed 'Bang' itself. It is obvious from Fig. 3 as explained in the text in the previous section that there is no such ambiguity in the present model. The closure problem does simply not exist since the universe's boundary is fixed once and for all.

[7] s= geom, sec=SI

Kind of Problem	Big Bang Cosmology	This Cosmology
1. Spatial Extension	Infinite	Finite
2. Origin of Time Axis	Fitted to theory	Relativistic horizon
3. Closure-Flatness	Undetermined in theory	Inherently 'flat'
4. Ontology of Space-Time	Space-time first	Real world first
5. 'Inflation'	By necessity	N.A. (not applicable)
6. Infinitely Hot Singularity	Necessarily	N.A.
7. Smoothness of Horizon	Equation- and curve-fitting	Inherent
8. Equivalence in every coordinate - position	Yes, by prophesy	Yes, as shown
9. Cosmological Constant	Incompatibility of GR and QFT	N.A.
10. Dark Matter - Dark Energy	Required by theory	N.A., allowed if empirical
11. Heterogeneity of Evolution	Inconsistent	Not inconsistent
12. Surface Brightness	Miraculously consistent	Consistent and more
13. Large scale structure	*a posteriori*	Inherent

4. In Big Bang cosmology space-time is assumed to exist on its own right so that the research community is free to disregard the real world and apply any kind of ideas that ultimately yield some description of the real world. It has settled on relativity theory and general relativity in spite of the facts that these theories lack any notion of 'non-locality' in space and that velocities can be defined other than those defined by relativistic frame referral (discussed in [7]). That mathematical descriptions can be ambiguous and many theories may yield the same end result is amply shown by the history of descriptions of black hole radiation (briefly reviewed in [19]). In contrast to the 'space-time first' approach of Big Bang cosmology the present model of the universe is the result of strenuous efforts to first learn from the real world, notably the geometry of the atom (preceding section) and its quantitative description in terms of the Bohr ground state, e.g. [1] [20].

5. The inflation scenario of Big Bang cosmology is a specimen example of applying space-time first as just described, in order to trim the theory to fit the real world. Consequently, such an (inflation) issue related to the literal expansion is not applicable in the present model of the universe.

6. As for the Big Bang itself, its hot singularity at the origin of time, would anyone really believe that all the energy of an infinitely large universe could ever have been concentrated in a point in space? - Not only all the universe's own energy but several-fold of that in order to account for both matter and antimatter together. Needless to say, this is not an issue in the present model. Here, it is envisaged, a tiny little hydrogen atom may pop into existence any time along the orbit in Fig. 3, then contributing to star formation while excess matter is recirculated into various black holes probably thereafter re-emerging on the universe's cosmological horizon. That is of course a speculation too, but it is not required for the present model of the universe to be valid in terms of its geometry only. Evidence of increased temperature due to CMBR at remote locations nicely fitting Standard Cosmology has been obtained [21] [22] but the measurements are difficult because of contributions from many sources of excitation and absorption by dust and laser-like absorption-emission cycles. In the present, much simpler model of the universe a hotter earlier epoch is possible but it would not be a strained necessity and could be ascribed to emission from an abundance of stars in an earlier epoch of stellar evolution. Besides all the technical difficulties involved in measurements at such long distances, it is still an open fundamental question how the signal's wavefront behaves at very large

cosmological distances (discussed in the 'Results' section).

7. The smoothness of the cosmological horizon as measured from the cosmic microwave background is another example of a bad guy turned into a good guy in order to fit the theory (cf. 'inflation', 5 above). Since the CMBR is thought to originate from the universe's edge it was not understood at first how its smoothness in every direction could be made to fit to the purported violent Big Bang in the dawn of time. The remedy to the smoothness problem was set up in the 'inflation theory', which describes how the universe expands, not as a slowly expanding bubble but as a rapidly expanding bubble. This smoothening was necessary in order to maintain General Relativity in its central role in Standard Cosmology. In the present model however, the smoothness follows inherently by tracing the electron's path in its microcosmos and, by the way, the CMBR is not at all smooth since it has its 'cold spot'. The cold spot can not be explained in the expansion scenario (except by roughening it out) but it might well be possible to understand if the universe is an 'inverted' black hole with an axis.

8. The rough equivalence of every observer's position in the present model of the universe was demonstrated in the preceding section by tracing the electron. But in Standard Cosmology it is an *ad hoc* assumption,...... ...'a prophecy' that is.

9. The Standard Model's cosmological constant problem was dealt with in [9] (discussed in the preceding section) and solved there [9]in terms of a.... rotation, and rotations are the fundamental concept upon which the present model of the universe is built.

10 The requirement for dark matter in Standard Cosmology has lead to many a particle hunt without any catch. It is required both for the overall expansion scenario and for explaining local aberrant gravitational behavior. Wherever in the universe there is baryonic matter there also seems to be 'dark matter' (or at least, was, according to recent observations) and this is termed the coincidence problem. The so called dark matter (which no one knows what it is) is supposed to have brought forward ordinary baryonic matter in an early epoch of the universe's evolution at a distance beyond what can be observed. This is not so in the present model of the universe. Here, substance always comes together with matter waves and bulk, the plausability of which can be demonstrated quantitatively based on the simple hydrogen atom [7]. In the present model the coexistence of baryonic matter with bulk gravity is the most natural thing.

11. The occasional evidence of heterogeneity of evolution within the same epoch of the universe's evolution was mentioned in (2) above. This can not be explained by a uniform 'Big Bang' taking place once only but it can be explained in the present model of the universe where the apparent evolution of the universe is a result of the limiting velocity of light transmitting information about distant events and hydrogen atoms may be created at any time by a mechanism surely not yet understood but at least not hidden from observation like in the Big Bang scenarios.

12. It was probably the measurements of surface brightness of distant galaxies in the early-mid 20:th century that flopped the research community into accepting the literal expansion scenario. The galaxies seemed to be receding while the light signal approached so that they looked fainter than they ought to be. However, line increments interpretable as Hubble expansion are also present in the present model of the universe but here they are due to the signal popping into the local frame of observation from a non-local one. The present model also deals with the possibility that the signal seems altered because it is received by a rotating body not just by a point at an abstract energy level.

13. There is plenty of large scale structure in the universe, which Standard Cosmology attributes to dark matter fluctuations shortly after the Bang to the effect that the universe's evolution turns deterministic once those quantum fluctuations have once and for all been fiddled with at the moment of creation. This is not so in the present model. Here, the orbit (like in Fig. 3) may produce hydrogen and galaxies at times that are not necessarily synchronous. Nevertheless, it is being kept in mind that the age of the universe herein agrees roughly with the age of some elements' radioactive decays and with that of the Standard Model.

There are of course many more aspects of the universe that need to be addressed in a comprehensive theory, for example the origin of the CMBR. The CMBR was actually the electron's first call to writing this paper since its energy density is $3.44 \times 10^{-58}\ m^{-2}$ which is almost precisely half the mass-equivalent energy of an electron $6.764 \times 10^{-58}\ m$, which is a remarkable coincidence in a world with one spatial dimension only. However, the purpose of this paper was just to evaluate the geometry of the universe in the simplest possible way.

4 Conclusions

If these or similar ideas about the geometry of the universe take hold in funded and quoted research it is clear that the contemporary Big Bang cosmology will, in the future, be considered the biggest ever debacle in the history of science and this will be blamed on relativity theory and on transferring the ambiguities of the early 18:th century phlogiston idea into the concept of 'energy'. As argued in the present paper light is more than just a mathematical reference of coordinates since it actively reshapes the 'energy' into and out of a non-local frame of observation where it has geometrical properties distinct from those in the local frame. Apparently, the starting shot for the Big Bag presumed debacle was the surface brightness measurements of distant celestial objects, which seemed to support the notion of receding velocities. Subsequently one theoretical superstructure after the other had to be built in in order to rescue general relativity theory, with a ferrocity and logic similar to a military operation where a bad result is a good result and the badder the better until the system squeezes out a statement which is an obvious lie but nevertheless enforced as a proof of dominance and 100% control.

However, the surface brightness argument relies on the plain $\propto r^{-2}$ dependence of the intensity emitted and that absorbed point-like at a distance. The new idea triggering the present piece of research was that the signal is perceived, not by a point, but by a rotating body and this adds geometrical ambiguities to the above plain proportionality argument. The concept of two-stage absorption taking place in a light wave is compatible with, for example, Huygens wave construction and the refractive index of materials increasing roughly proportional to their density. A tell-tale at the molecular level might be any periodicity of refraction index appearing over the wave-length spectrum. One could also employ the fact that the orbiting electron (like in the shape of its matter-wave in the Bohr atom) and the electromagnetic radiation have calendars with different wavelength pitches and possibly different offsets and trace back the same absorption event(s) on these two scales.

At the large scale of looking back at stars and galaxies no one knows what takes place in the wave front before and during the absorption of the signal or how the waning node of the ever more spreading signal interacts with the electron, and this weakens the surface brightness argument. Besides, an apparent line increment is also contained in the present geometry but it is generated, not by a literal expansion of the universe, but by the visible signal (and the world?) popping out of the non-local world. The latter quantitative description [1] suggests a duality of the real world where an observer may settle both at the origin and the circumference of a circle at the same time. Such is the mathematical foundation for the ideas about the geometry of the universe presented herein.

Besides, one may arrive at similar conclusions by rather simple geometrical arguments. Take for example the cosmological line increment, in other words the roughly linear Hubble expansion upon which the Big Bang house of cards relies, and consider again Fig. 3 with its celestial body (previously, the electron) looking to the right. Then, assuming that space is isotropic, let the emitter and absorber of the signal switch locations. As the transverse signal from its neighbors in space (Fig. 3) is stretched proportional to their distance from the rotating observer (linearity!) it is obvious that in order not to distort the signal it *has* to appear elongated in the radial direction, hence red-shifted. And this stretching and elongation of the signal may be allowed as long as the signal is contained in a circle sector having a transverse extension of no more than $2\pi c$ at the universe's relativistic boundary, which is where the material observer is located in the present theory.

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