

Opinion Article

Open Access

Universe Radius-Electron Relationship Shows Electron Creation is the Dark Energy Driving Quantized Universe Expansion

William S. Oakley

Retired Scientist, Valerio St. Santa Barbara, California, USA

Article Info

***Corresponding author:**

William S. Oakley

Retired Scientist

Valerio St. Santa Barbara, California

USA

E-mail: oakleyw137@gmail.com

Received: July 27, 2022

Accepted: August 19, 2022

Published: August 27, 2022

Citation: Oakley WS. Universe Radius-Electron Relationship Shows Electron Creation is the Dark Energy Driving Quantized Universe Expansion. *Int J Cosmol Astron Astrophys.* 2022; 4(1): 184-188.

doi: 10.18689/ijcaa-1000132

Copyright: © 2022 The Author(s). This work is licensed under a Creative Commons Attribution 4.0 International License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Published by Madridge Publishers

Abstract

A theoretical estimate of the number of electrons in the Universe exactly matches that estimated via cosmological observations. This implies a quantized Universe with a size determined by its electron content where the increasing Universe size implies ongoing electron creation. The notion of instant creation of all matter and a Universe energy content independent of its size conflicts with this discovery.

Considering the electron two orthogonal spin-half quantum loops each of 35MeV and rotationally relativistic by alpha, the fine structure constant, gives the electron rest mass energy 0.511MeV. The square of the "observed Universe diameter divided by the 35MeV wavelength" gives the same number of electrons in the Universe as derived from telescopic observation. The number of 35MeV quantum loop wavelengths across the Universe radius multiplied by the quantum loop cycle time gives the observed Universe age of 13.8 billion years.

Quantum fluctuations spontaneously form neutrons by co-creating electron-proton pair equivalents in a Universe of net zero particle energy. The proton anomaly of positive charge and mass is analyzed for a particle in internal mass-charge dynamic equilibrium with zero total energy as for the electron. Curved spacetime transit through a particle's event horizon reverses the curvature, with positive external mass effectively negative internally.

Ongoing matter creation is posited the "**Dark Energy**" driving Universe expansion. A proposed multi-stage creation process starts with formation of vast numbers of cold neutrons, then gravitational collapse and an explosive hot rebound to give today's Hydrogen dominated "Big Bang" Universe. With the Universe volume increasing a constant neutron formation rate per spacetime volume would cause Universe acceleration

Keywords: Cosmology, Quantum Universe, Dark energy, Electrogenesis, Universe acceleration, Event Horizon.

Introduction

Current cosmology considers the "Big Bang" occurred sometime after initial Universe creation [1] [2]. A pre big bang scenario posits neutron creation via a three-dimensional rotational quantum fluctuation of zero total energy formed astride a particle sized event horizon of closed geometry. The fluctuation immediately transitioned to a neutron with rotational relativistic quantum loops of $\hbar c/2$ on both sides of the event horizon, two in

observer space and one inside a geometrically closed event horizon. The transition of two quantum loops to $\hbar c/r$ in an α relativistic state created observer spacetime with the total kinetic and electric charge energy conserved at zero, i.e., $m_e c^2 - \alpha \hbar c/r = 0$. The single quantum loop inside the event horizon is not in observer space but forms a similar zero energy domain in equilibrium with a spin- $1/2$ loop relativistic by α^{-1} , i.e., a proton, localized within but not "in" observer space. Ongoing neutron creation and decay continually increase the number of electrons and protons in the Universe and neutron decay leads to a Universe mostly composed of monatomic hydrogen.

There are two different means to estimate the number of electrons in the observable Universe; empirically by cosmological telescopic data analysis or via a theoretical approach based on electron parameters, [3]. Describing the electron as two orthogonal relativistic quantum loops, each spin $1/2$ and 35MeV, enables the number of quantum loop wavelengths that fit the Universe diameter to be calculated and thereby the number of electrons in a quantum Universe. The theoretical electron count obtained exactly matches that estimated from empirical data.

As 'now' is not special the electron count match and increasing Universe radius imply ongoing electron creation via an energy conserving process. I.e., with the electron mass energy and charge energy equal and opposite, the net electron energy in the observer Universe is always zero. The proton net energy is similarly considered zero as described below via analysis of the proton mass anomaly.

An envisioned multi-stage creation process starts with vast numbers of cold neutrons created in proximity to each other, followed by gravitational collapse and an explosive hot plasma rebound. Cooling and ongoing neutron formation and decay have led to today's Hydrogen dominated Universe. Creation of each neutron requires creation of an associated finite sized spacetime. Continuous formation of neutrons and spacetime removes the infinities of the Big Bang conjecture, does not create antiparticles, and may be the 'Dark Energy' causing both Universe expansion and acceleration. Continuous neutron creation is shown compatible with conservation of energy and analysis of the proton mass anomaly shows a Universe of zero net particle energy across electron and individual proton spacetimes.

1. Background

The extensive data obtained on the visible Universe over the last century gives an estimated mass density $\rho_U = 9.9 \times 10^{-27} \pm 0.5\%$ kg/m³, an observable Universe radius of 13.80×10^9 light years at $R_U = 1.306 \times 10^{26}$ m, an age of 4.355×10^{17} seconds, (13.8 billion years), and an observable Universe volume of $V_U = 4\pi R_U^3/3 = 9.331 \times 10^{78}$ m³. This density and spherical volume give a mass $M_U = \rho_U V_U = 9.24 \times 10^{52}$ kg. The CODATA mass of a hydrogen atom (one electron and one proton), is $m_H = 1.6727 \times 10^{-27}$ kg., and the Universe mass M_U , including all heavier atoms, is equivalent to M_U/m_H Hydrogen atoms in the Universe.

$$M_U/m_H = 5.52 \times 10^{79} \pm 0.5\% \quad (1)$$

A majority of matter in the Universe is hydrogen suggesting electrons and protons exist in equal numbers and form simultaneously in proximity to each other via neutron decay. Due to synthesis of atoms with greater mass the observable Universe is now about 74% hydrogen, but synthesis into heavier atoms does not change the number of electrons or protons. And as hydrogen atoms contain only one electron the number of electrons in the observable Universe determined via empirical data is the same as if it were entirely hydrogen as in (1), $5.52 \times 10^{79} \pm 0.5\%$.

In the "Big Bang" conjecture the Universe size and the number of particles it contains are unrelated, with the Universe size increasing with time but its mass energy and electron count constant. This is not consistent with the theoretical electron count exactly matching observational data as noted below.

2. Analysis

The number of electrons in the Universe is theoretically estimated via two parameters, the observable Universe diameter $2R_U$, and the electron energy configuration. The electron comprises two orthogonal spin- $1/2$ quantum loops each of 35MeV, (i.e., a 70MeV photon), rotationally relativistic by α , the Fine Structure Constant ($\approx 1/137$), with a rest mass energy $(70/137)$ MeV = 0.511MeV, [3]. Astrophysical data give the Universe radius R_U and thereby the number, (N say), of 35MeV electron quantum loop wavelengths λ_{35} , that precisely fit the observable Universe diameter in each of two orthogonal dimensions,

$$N = 2R_U/\lambda_{35} \quad (2)$$

In principle the energy of each spin- $1/2$ quantum loop lies in a plane extending out from the loop to the far reaches of the Universe. The two orthogonal quantum loop planes of each electron in the Universe diameter thus extend to define, *but not fill*, three dimensions of the Universe. If **quantum exclusion** limits spacetime to a single λ_{35} quantum wavelength at each location per dimension, with N quantum loop wavelengths per Universe diameter the observable Universe contains N^2 electrons. With one electron per hydrogen atom this gives the equivalent number of such atoms.

$$N^2 = (2R_U/\lambda_{35})^2 \quad (3)$$

2.1. Calculating λ_{35} for the electron: The electron is considered a single spin-1 photon, localized in observer space by rectilinear relativistic propagation in highly curved spacetime of closed toroidal geometry [3]. The relativistic rotational energy circulates about a magnetic dipole axis, z, and follows a closed quantum path of α^{-1} turns per wavelength for phase closure, to give a photon loop of $2\alpha \cdot 35.0125$ MeV = 0.511MeV. The photon is relativistic to the observer by α and propagates just outside an event horizon with energy distributed as $(\alpha^{-2/3} \cdot \alpha^{-2/3} \cdot \alpha^{1/3}) \cdot 0.511$ MeV, nominally 13.58MeV, about the x and y axes. The energy propagates circumferentially about the z axis and essentially in an x-y plane which oscillates along

the z axis. The circumferential energy $\alpha^{2/3} m_e c^2$ couples into the z axis by α and oscillation along the axis forms a toroidal path. Including the cross coupled energy increases the total loop energy to 35.268MeV. The wavelength conversion factor λ , ($= 1.23985 \times 10^{-12} \text{m/MeV}$), gives the spin- $1/2$ quantum energy wavelength λ_{35} .

$$\lambda_{35} = 1.23985 \times 10^{-12} / 35.268 \text{MeV} = 3.51551 \times 10^{-14} \text{m} \quad (4)$$

The spacetime curved about the particle x and y axes extends outward from the particle forming a gravitational field, and thereby the observer notion of electron mass as described by Oakley [3].

2.2. A Quantized Universe: From (2) and with an observable Universe diameter of $2R_U$, the number of 35MeV loop wavelengths λ_{35} , that fit the diameter is $N = 2R_U / \lambda_{35}$ ($= 7.430 \times 10^{39}$). And from (3) the Universe contains

$$N^2 = (2R_U / \lambda_{35})^2 = 5.52 \times 10^{79} \text{ electrons} \quad (5)$$

The theoretical Universe electron count, N^2 in (5), is the same as obtained in (1) from empirical data!

2.3. Quantum Loop closure time: The quantum wavelength $\lambda_{35} = 3.5151 \times 10^{-14} \text{m}$ as in (4) gives the time t_q to close a quantum loop at velocity c , ($= 2.99792458 \times 10^8 \text{m/s.}$), and a Universe time before which electrons could not exist.

$$t_q = 3.5151 \times 10^{-14} / c = 1.1725 \times 10^{-22} \text{ seconds} \quad (6)$$

The observable Universe radius $N t_q / 2 = 4.356 \times 10^{17}$ light seconds $= 13.80 \times 10^9$ light years, the observed Universe age.

3. The Dark Energy Source?

The electron count match and Universe expansion suggests ongoing matter creation with electrons increasing in number in relation to the Universe expansion rate, (5). This implies **electron formation is driving the expansion of a quantized Universe**, which pertains to the notion of Dark Energy.

The conjecture of instant creation of all matter in the Universe conflicts with the electron count match and ongoing matter creation. As ongoing matter creation produces the essential features of an expanding universe the perceived "Big Bang" may be no more than a consequence of ongoing particle creation as above in 1.0. In a quantized Universe an increasing number of electrons require increasing space and time. Current astrophysical data indicates the Universe expansion rate is increasing. If the rate of electron creation is constant per unit volume of space an *increasing Universe volume indicates an increasing rate of matter creation and an accelerating Universe*.

The electron count match implies continuous matter formation, (CMF), throughout the Universe causes spacetime to expand and carry outward all matter embedded within it, consistent with the Friedmann–Lemaître–Robertson–Walker (FLRW) cosmological equation and a co-moving coordinate system.

The expansion of the Universe by the continuing accumulation of electrons and protons shows the energy density of spacetime is constant over all time.

4. The Mass Creation Issue, the Proton Mass Anomaly

The critical question for ongoing matter creation is "where does all the mass energy in the Universe come from?" The electron mass energy and electric charge energy are known to sum to zero with the total energy of all electrons in the observer Universe thereby zero, regardless of their number. But this seems not true for the proton which exhibits both positive charge and positive mass energy. The proton mass anomaly is related to the particle's lack of observer domain interactions compared to those for the electron which enable all of chemistry and atomic physics. To address this further it is necessary to consider the nature of mass.

Current Physics describes gravity as arising from curved space-time due to the presence of mass. This assumption requires restating as: *the notion of mass is due to the existence of gravity which is due to the curved space time required to spatially localize electromagnetic energy*. The observer spacetime around a particle is convex to the observer. A spacetime concave to the observer would imply negative mass and gravity but cannot exist as concave spacetime curvature would not localize electromagnetic energy in observer space.

4.1. Symmetry suggests a third 35MeV component: With the observer Universe scaled in two orthogonal axes by 35MeV quantum loops symmetry suggests a third 35.268MeV loop component may exist related to the third dimension. Consider an electromagnetic (EM), quantum fluctuation not in observer space comprising rotations at velocity c in three dimensions, thereby forming a closed event horizon momentarily comprising three mutually orthogonal quantum loops, [4]. Consider that localizing the quantum loop's energy alters the local spacetime metric index causing the quantum loops to instantly separate and become relativistic but remain concentric, with two loops moving out from the event horizon into observer spacetime and the third loop moving inward into the spacetime inside the event horizon and away from observer space. Radial movement of the quantum loops away from the event horizon in opposite directions with equal volume changes cause opposite EM radial strains in the surrounding spacetime, i.e., opposed electric fields. If the volume enclosed by the two loops in the observer domain increases by a factor $1/\alpha$ (~ 137), the observed radial metric strain (electric charge), will decrease by α , and if the loop in the proton inner domain decreases volume by α , the particle would comprise two concentric equal but opposite electric charges, e.g., $e^2 = \alpha \hbar c$, with both outer and inner energy circulations possessing mass due to their relativistic rotational state.

Neutron mass localization requires both inner and outer circulations exhibit a convex spacetime curvature relative to the observer. It is important to note only the outer two-loop electron circulation is 'in' observer space. The single proton loop circulation inside the event horizon is localized within the observer domain but is not 'in' observer space due to the intervening event horizon. The radial spacetime strain due to the relativistic circulation inside the event horizon is posited

to pass directly through the event horizon into observer space unchanged so the three-loop particle would exhibit zero charge to the external observer, e.g., as for a neutron.

If the inner and outer charged entities separate and form independent event horizons oppositely charged particles will result, one in observer spacetime the other inside a particle scale event horizon. Relativistic expansion of the outer circulation will reduce relativistic energy and thereby form a quantum circulation of increased wavelength and less apparent mass energy. If the circulation inside an event horizon decreases radius and thereby increases spacetime curvature its mass apparent to the observer will increase. The overall result is two particles of opposite but equal charges with significantly different mass values as observed for the electron and proton. If inner and outer energy circulations remain concentric, they will constitute a neutron-like particle, which could decay and separate to form individual particles with opposite charges.

4.2. A zero particle mass energy Universe: Electron stability is achieved with its positive mass energy in dynamic equilibrium with its negative charge potential energy. For the same reason, the energy within the proton's event horizon is necessarily in dynamic equilibrium between mass energy and charge energy. This condition implies the total particle mass energy *within* the universe is zero, even though the single quantum loop proton shows significant mass to the observer. But with the proton necessarily in equilibrium and its charge potential energy positive, how can the proton show positive mass? The short answer is the proton mass is not in the observer domain but inside an event horizon through which the proton's strained spacetime curvature must pass to reach observer spacetime.

On formation, the electron two loop circumferential strain energy moves outward into observer space and become relativistic, with a decreased rest mass and a corresponding wavelength and particle volume increase. As the proton energy moves inside its event horizon and similarly becomes relativistic the wavelength similarly increases, decreasing the circumferential curvature and increasing the particle volume by $1/\alpha$ to give the same but opposite charge potential value as the electron and a mass decrease by α . However, *the proton curved circumferential spacetime must pass through the event horizon to evidence mass in observer spacetime.*

Transit through the event horizon is posited to reverse the curvature and invert the relativistic factor apparent to the observer, evidencing a smaller particle and a corresponding greater mass. NOTE: The Author is not aware of any theoretical support for this premise.

The proton energy circulation propagates just inside an event horizon and is relativistic by α , as is the electron's, with energy distributed as a toroid about the x, y, z axes as $(\alpha^{-2/3}, \alpha^{2/3}, \alpha^{1/3}) = \alpha^{-1}$, the same as the electron. But to the observer the reversed proton circumferential energy appears as a mass energy increase to nominally $\alpha^{-2/3}35\text{MeV}$ ($= 930.6\text{MeV}$), close to the proton mass energy of 938.272MeV . The energy in the electron spin-1 photonic loop of 13.58MeV

shows a spin- $1/2$ value of about 6.791MeV with the "bare" mass energy circulation at $\alpha^{-1}6.791\text{MeV}$ at 930.6MeV . Including the cross axis coupling factor [4] yields a proton mass value within the CODATA 2018 empirical uncertainty.

In summary, the proton mass appears positive and large to the observer due only to his asymmetric location outside the proton event horizon within which the proton single loop 35MeV mass energy and charge energy are in equilibrium and sum to zero. This resolves the anomalous proton mass energy issue, with the total particle mass energy and charge energy in the Universe thereby zero.

As the Universe size is dictated by the number of electrons it contains and electrons and protons exist in equal numbers, the energy density of otherwise empty space is constant regardless of the Universe size.

4.3. Continuous matter formation via neutron creation: In a pre-Big Bang era of ongoing neutron creation, sudden conversion of cold neutrons, each of $0.84 \times 10^{-15}\text{m}$ radius, to hydrogen atoms each with a radius of $5.3 \times 10^{-11}\text{m}$, would have resulted in a very rapid increase in the volume of matter in the Universe by at least 2.5×10^{14} , and even greater expansion due to hot plasma creation. This does not preclude the possibility of eventual cooling and a later gravitational collapse followed by a hot rebound. The half-life of free neutrons is about 880 seconds, but with neutron stars lasting far longer there in no means to estimate when widespread decay occurred, or if matter later collapsed and a hot plasma rebound gave rise to the Cosmic Microwave Background Radiation, CMBR.

Neutron creation requires the formation of a related quantity of spacetime, but neither neutron decay nor matter collapse and rebound would impact spacetime size or the number of electrons and protons.

The Continuous Matter Formation (CMF) hypothesis eliminates problematic "big bang" issues, such as instant creation of vast amounts of matter and thermal and spatial singularities. The CMF hypothesis sets a lower limit on observer Universe time at t_0 and would allow various prior quantum fluctuations to produce myriad unstable virtual particles that quickly reset to zero until the circumstance required to form a first neutron occurred. Stability longer than one loop cycle time would enable the first neutron to function as a catalyst and a second neutron to form in proximity to the curved spacetime of the first, with neutron numbers rapidly increasing thereafter. The described creation process does not require the formation of antiparticles.

5. Conclusion

The electron count match shows the expanding Universe a quantum structure with a size and mass driven by the increasing number of electrons it contains, i.e., **Dark Energy**. The discovered relationship between the number of electrons in the Universe and the Universe diameter has evidently existed throughout time, with electrons and protons formed simultaneously as Neutrons, which on decay force Universe expansion. This shows the "Big Bang" was not a transient event in the past but remains an ongoing process. The

Universe is still being created even though the total energy remains zero!

Resolution of the proton mass anomaly is proposed with each particle of zero net energy in its own separate domain giving the Universe zero net energy, not readily apparent to an observer in the electron Universe. The Continuous Matter Formation (CMF), theory is consistent with a Universe created by a multi-phase process resulting in the lowest possible energy state. The initial distribution of neutronic matter was probably very symmetrical due to originating from a single source, with symmetry mostly retained during rapid conversion of neutrons to hydrogen.

This analysis, as posited by others, [1], [2], [5]-[7], recognizes the Big Bang as **not** the first creation event. It stands apart from a plethora of prior articles on creation by others, typified by [8]-[16], none of which specifically address the quantum coupling of spacetime and mass or the Universe net zero particle energy.

References

1. Siegel Ethan. Surprise: The Big Bang isn't the beginning of the universe anymore. 2021. Facebook.
2. Decadal Survey on Astronomy and Astrophysics. National Academies of Sciences, Engineering, and Medicine 2021. Pathways to Discovery in Astronomy and Astrophysics for the 2020s. Washington, DC: The National Academies Press. 2021; Section 2-2-1: 2-24. doi: 10.17226/26141.
3. Oakley WS. Analyzing the large number problem and Newton's G via a relativistic quantum loop model of the electron. *Int J Sci Rep*. 2015; 1(4): 201-205. doi: 10.18203/issn.2454-2156.IntJSciRep20150671
4. Oakley W. A Review of Inconsistencies and Unfounded Assumptions in Physics Enables a Path Forward. *Int J Cosmol Astro Astrophys*. 2020; 2(1): 115-120. doi: 10.18689/ijcaa-1000124
5. Paul Steinhardt. Simons Foundation, Time to take the "Big Bang" out of the Big Bang Theory. 2021; YouTube.
6. D Lincoln. The problem with the Big Bang theory, Fermi National Accelerator Lab. 2021.
7. Nova. PBS. Universe revealed: Big Bang. 2021.
8. Choi SK, Hasselfield M, Ho SPP, Koopman B, Lungu M, Abitbol MH, et al. The Atacama Cosmology Telescope: a measurement of the Cosmic Microwave Background power spectra at 98 and 150 GHz. *Journal of Cosmology and Astroparticle Physics*. 2021; doi: 10.1088/1475-7516/2020/12/045
9. Bousso Raphael. The Holographic Principle. *Reviews of Modern Physics*. 2002; 74 (3): 825-874. doi: 10.1103/RevModPhys.74.825
10. Strominger A, Giddings SB. Baby universe, third quantization and the cosmological constant. *Nuclear Physics B*. 1989; 321(2): 481-508. doi: 10.1016/0550-3213(89)90353-2
11. WF Blyth, CJ Isham. Quantization of a Friedmann universe filled with a scalar field. *Physical Review D*. 1975; 11(4): 768. doi: 10.1103/PhysRevD.11.768
12. A Hosoya, M Morikawa. Quantum field theory of the Universe. *Physical Review D*. 1989; 39(4): 1123-1129. doi: 10.1103/physrevd.39.1123
13. M McGuigan. Universe creation from the third-quantized vacuum. *Physical Review D*. 1989; 39(8): 2229. doi: 10.1103/PhysRevD.39.2229
14. JA Geiger. Measurement Quantization Describes History of Universe—Quantum Inflation, Transition to Expansion, CMB Power Spectrum. *Journal of High Energy Physics, Gravitation and Cosmology*. 2020; 6: 186-224. doi: 10.4236/jhepgc.2020.62015
15. F Finelli, A Gruppuso, G Venturi. Quantum fields in an expanding universe. *Classical and Quantum Gravity*. 1999; 16: 3923. doi: 10.1088/0264-9381/16/12/310
16. L Smolin. Space and time in the quantum universe. *Conceptual problems of quantum gravity*. 1991; 228-291.