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Forces that Form the Atomic Nucleus

Stephen L Metschan

BS in Mechanical Engineering, University of Portland, USA

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Abstract

More than a century ago, physicists discovered that mass is concentrated in a small, dense region at the center of atoms. However, the electrostatic repulsion between the positive particles of the atomic nucleus should break it apart. To solve this dichotomy, a stronger attractive force was proposed. Since then, decades of experimentation have gradually expanded our understanding of nuclear physics and revealed further mysteries. Despite this progress, a theory for the strong force using established physical laws consistent with these observations has yet to emerge. A mistaken consensus regarding nucleon composition during a crucial stage in the early development of particle physics could be the cause. This paper outlines how an alternate nucleon composition provides the geometric framework necessary for existing physical laws to accurately predict the strong force and other phenomena consistent with experimental results.

***Corresponding author:** Stephen L Metschan, BS in Mechanical Engineering, University of Portland, USA.

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Background

Dr. Werner Heisenberg's 1932 proposal of "Platzwechsel" (change of place, migration) suggested that neutron-to-proton transmutation occurs through the emission or capture of electrons by nucleons comprising the atomic nucleus [1]. At the 1933 Solvay Physics Conference, attendees debated his proposal and others of a similar nature but rejected them due to the theory of nuclear spin conservation. The rejection of these classically oriented theories left unresolved the question of how electron emissions from the nucleons could occur without violating special relativity, as they seemed to be creating matter from nothing. While the Standard Model has evolved to explain nucleons' electron emissions and other behaviors, a complex array of smaller fundamental particles and additional unknown forces has emerged. Nonetheless, the challenge of creating a theoretical foundation that explains the origins and behaviors of the strong force in terms of well-known physical laws endures.

Introduction

Nuclear spin will be addressed later in the paper, but let's return to the alternate theory that emitted particles exist independently within the nucleon. For a stable nucleon composed of individual negatively and positively charged particles to exist at its observed mass, a specific geometric arrangement and relative speed of the particles are required. Applying the physical laws of electrostatics, electromagnetism, centripetal force, and general relativity to create a stable nucleon at its observed mass also accurately predicts the properties and behaviors of nucleon-to-nucleon interactions. Working in concert, this nucleon composition and associated equations explain the origins of the strong force, nuclear fusion, fusion mass loss, the structure of atomic nuclei, radioactivity, nuclear fission, nuclear spin, proton mass, and the composition/existence of matter itself. Like the strong force, these other experimental observations lack a compelling theoretical foundation for explaining them individually, let alone through a single, straightforward model based on fundamental physics equations using experimentally determined properties and coefficients.

Nucleon Particle Family Architecture (Neutron to ^{4}He)

Aside from the proton, the nucleon family, illustrated in Figure 1, constitutes the building blocks of all elements above ^{4}He. The forces that cause proton clustering will be discussed later in the paper. All these nucleons have at least one and no more than four protons. All nucleons contain at most two additional positive particles (protons or positrons) compared to negatively charged electrons, with the difference determining the nucleon's charge. The decay modes align with experimental results when using Werner Heisenberg's migration theory for interpretation. For example, when tritium (^{3}H) decays into ^{3}He, the Standard Model describes this process as a change in quark composition that generates and ejects an electron. This process converts a heavier, electrically neutral neutron into a lighter, positively charged proton. According to this alternate theory, the tritium (^{3}H) nucleon (+1) loses an existing electron (-1) and increases its net charge by one, thus transforming into ^{3}He (+2). By utilizing a classical explanation for the same experimental observations, this theory enables the use of geometry and the foundational laws of physics to describe the force balance and mass of nucleons.

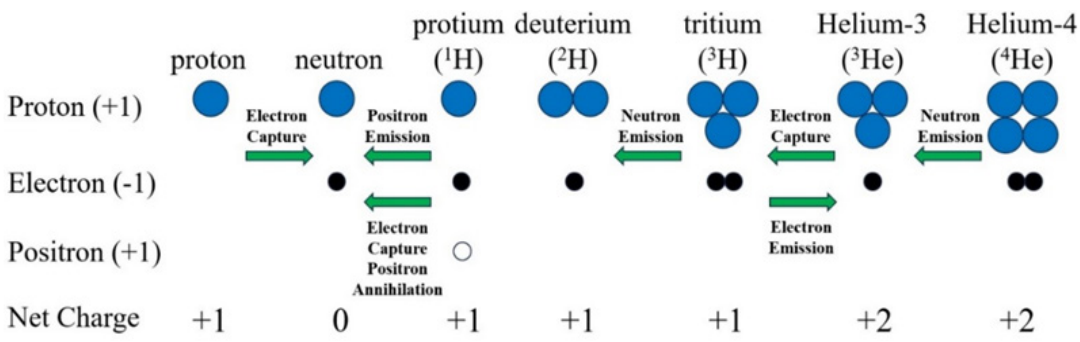


Figure 1: Nucleon Composition, Transmutation, and Beta/Gamma Decay

Nucleon Force Balancing Model

For a stable nucleon to emerge, the electrostatic attraction of positive particles (protons and positrons) to negatively charged electrons necessitates a corresponding repulsive force. The centripetal force from the electrons orbiting the positive center generates the balancing repulsive force [2]. The required orbital speed for nucleons with two electrons is less than one due to their mutual electrostatic repulsion. An additional constraint in the model is that the relativistic mass of the orbiting electron(s) must reflect the variations in the experimental mass of the nucleon [3]. These constraints lead to a specific orbital radius, speed, and mass for the electron(s), as shown in Table 1. Dividing the orbiting electron's de Broglie wavelength by the orbital circumference yields a ratio of the fine structure constant for all nucleons. The significance of this is unknown, but even slight changes in the mass, coefficients and experimentally determined inputs would not arrive at this ratio. Figure 2 depicts the geometric arrangement of the nucleon family at a relative scale.

Electron orbits are within the charge radius of their respective nucleons. The rapidly orbiting electron(s) around the positive center generates a strong electromagnetic field and angular momentum. Nuclear spin occurs when nucleons' randomly oriented angular momentum and electromagnetic poles align with an externally applied magnetic field.

(1) $F = k\frac{q_1 q_2}{r^2}$ (2) $m_{\text{rel}} = \frac{m}{\sqrt{1-\frac{v^2}{c^2}}}$ (3) $F_c = m\frac{v^2}{r}$ (4) $F_m = 2k_A\frac{I_1 I_2 L_1}{r}$

		Neutron	Protium	Deuterium	Tritium	He3	He4	
	Charge Radius	**0.8000000**	**0.8407564**	**2.1277825**	**1.7591363**	**1.9661300**	**1.6782248**	fm
	Coulomb's Law							
	Proton Electrons's Orbital Radius	0.1255737	0.2981811	0.1480841	0.3504694	0.1909746	0.7675829	fm
	Electrons's Potential Energy	22.94	9.66	19.45	8.96	24.15	6.00	MeV
(1)	**Electrostatic Attraction (+)**	14,631	5,190	21,041	5,635	18,977	1,566	Ny
	Electrostatic Repulsion (-)	-	-	-	470	-	98	Ny
	Electron Orbit Speed as % of Light	99.9010535%	99.8607257%	99.9655235%	99.9143233%	99.9745065%	99.7699947%	
	Electron Orbit Speed	299,495,824	299,374,924	299,689,100	299,535,606	299,716,031	299,102,919	$m \cdot s^{-1}$
(2)	**Relativist Electron Mass**	2.04824459E-29	1.72659448E-29	3.46936814E-29	2.20108283E-29	4.03448262E-29	1.34386483E-29	kg
	Electron Rest Mass Multiple	22.5	19.0	38.1	24.2	44.3	14.8	
	Electrons Kenetic Energy	5.73	4.83	9.72	12.33	11.31	7.50	MeV
	Electrons Momentum, p	6.13441E-21	5.16899E-21	1.03973E-20	1.31861E-20	1.20920E-20	8.03908E-21	$kg \cdot m \cdot s^{-1}$
	Electrons Angular Momentum, L	7.70320E-37	1.54130E-36	1.53968E-36	4.62131E-36	2.30926E-36	6.17066E-36	$kg \cdot m^2 \cdot s^{-1}$
(3)	**Centripetal Force (-)**	14,631	5,190	21,042	5,635	18,977	1,566	Ny
	Electron Mass	0.0123348846	0.0103978518	0.0208931374	0.0265106060	0.0242963549	0.0161859747	daltons
	Positrons Mass	-	-	-	-	-	-	daltons
	Proton Mass	0.9963300313	0.9968786150	1.9926600626	2.9889900940	2.9906358451	3.9853201253	daltons
	Nucleon Mass	1.0086649159	1.0072764668	2.0135532000	3.0155007000	3.0149322000	4.0015061000	daltons
	Ampere's Law							
	Electron Orbital Circ	7.89003E-16	1.87353E-15	9.30440E-16	2.20206E-15	1.19993E-15	4.82287E-15	m
	Electron Orbits per second	3.7959E+23	1.5979E+23	3.2209E+23	1.3602E+23	2.4978E+23	6.2018E+22	
	Orbital Electrons	1	1	1	2	1	2	
	Amps (I)	60,817	25,602	51,605	43,587	40,019	19,873	$C \cdot s^{-1}$
(4)	**Electromagnetic Force vs Distance**	5.8365E-13	2.4560E-13	4.9557E-13	8.3672E-13	3.8434E-13	3.8093E-13	$kg \cdot m^2 \cdot s^{-2}$
	Electron Wave Length	1.07908E-13	1.28010E-13	6.37067E-14	1.00415E-13	5.47832E-14	1.64467E-13	m
	Electron Frequency	2.77822E+21	2.34194E+21	4.70582E+21	2.98553E+21	5.47234E+21	1.82281E+21	
	Angular Frequency	1.74561E+22	1.47148E+22	2.95676E+22	1.87587E+22	3.43837E+22	1.1453E+22	
	Electron Wave Length/Oribital Circ (A	136.76494863	68.32584289	68.46942994	45.60042800	45.65537921	34.10158601	
	Ratio of Fine Structure Constant/A	1.00198187	2.00562471	2.00141872	3.00514721	3.00153019	4.01846410	

Table 1: Balance of Nucleon Electrostatic and Centripetal Forces

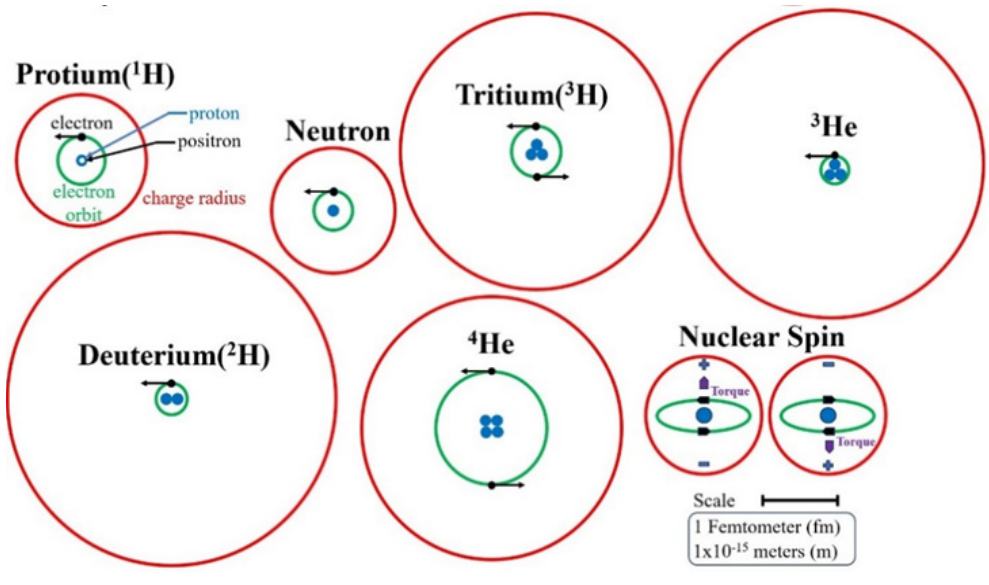


Figure 2: Nucleon Family Particle Geometry (Protium to 4He) and Nuclear Spin

Addressing the Standard Model's Critique of this Nucleon Theory

Quantum Incompatibility (Uncertainty Principle and Discrete Levels)

Classical orbits at nuclear scales violate uncertainty, as position-momentum precision would require enormous energy. However, if the charge radius boundary creates a "bubble" within spacetime where quantum mechanics don't apply, orbits could stabilize without quantum tunneling or collapse [4,5]. These charge bubbles in spacetime would enable Bohmian Mechanics to describe external wave-like behaviors (e.g., interference in scattering) via guiding waves in the spacetime-aether, while internals within the charge bubbles remain deterministic-classical [6,7].

Relativistic Inconsistencies

The relativistic high-speed electrons near the speed of light in tiny orbits imply extreme Lorentz factors, but if spacetime warping inside the bubble alters local metrics, like General Relativity does near singularities, effective masses and forces could balance without quantum electrodynamics (QED) breakdowns like pair production.

Nuclear Spin and Statistics

Early rejections (e.g., 1933 Solvay Conference) cited spin conservation issues in beta decay if electrons pre-exist. This lens allows internal compositions to evade fermionic statistics externally, with Bohmian mechanics' hidden variables ensuring observed spin-1/2 for nucleons.

Methodological Concerns

The theory's classical revival aligns with an aether-like spacetime as a wave medium, potentially unifying gravity (spacetime warping from charge bubbles) and electromagnetism, thus echoing Einstein's later "new aether" embodied in gravity waves and frame dragging.

Continuation of the Theory

The Strong Force and Nuclear Fusion

The 'strong force' is not a new, distinct force of nature but originates from the degree of polar alignment of nucleon-to-nucleon electromagnetism. The balance of electrostatic repulsion and the alignment of electromagnetic attraction between nucleons determines their net force with distance. For nucleons to fuse, they must be on a collision course with enough initial velocity to overcome their electrostatic repulsion and reach a critical separation distance before reversing direction, as illustrated in Figure 3. At a critical distance, the nucleons' electromagnetic poles will self-align, overcoming their electrostatic repulsion. This polar alignment causes the nucleons to change from now to accelerate towards each other. This model of the strong force, along with variations in nucleon types, initial velocities, and collision angles, will validate this crucial fusion distance and independently confirm the electromagnetic field strength of specific nucleons.

As nucleons accelerate toward one another, the electrostatic repulsive force increases more rapidly than the linearly driven aligned electromagnetic attractive force, as illustrated in Figure 4. At maximum velocity, the attractive electromagnetic forces and the repulsive electrostatic forces will be equal. The deceleration rate then steadily increases, diminishing their kinetic energy until the nucleons are less than 0.3 femtometers (fm) apart and at zero velocity.

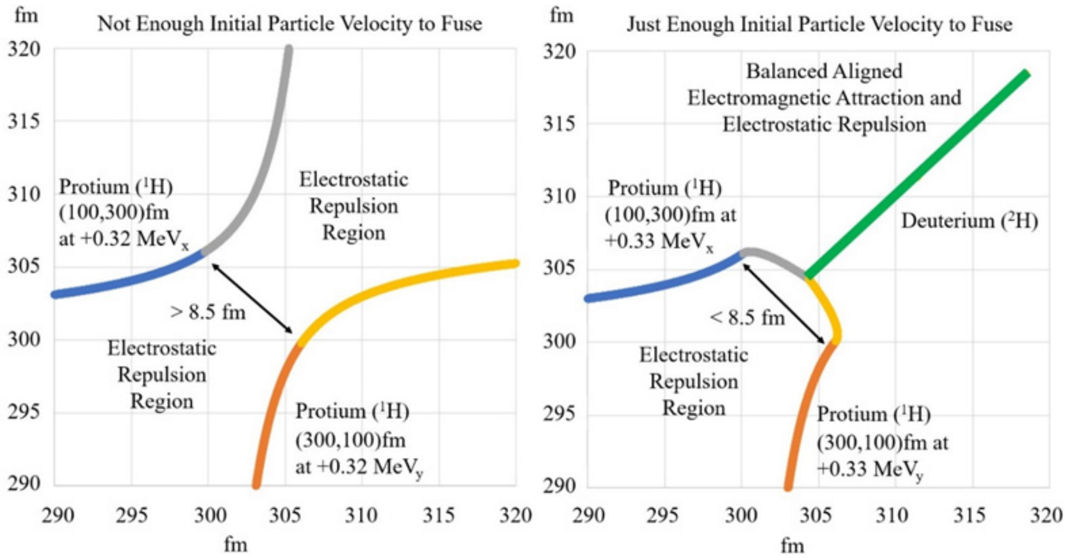


Figure 3: 2D Simulation of the Fusion of Two Protiums(^{1}H) into Deuterium(^{2}H)

Protium (^{1}H) to protium (^{1}H) fusion is characterized by the emission of a positron, converting one of the protium nuclei (^{1}H) into a neutron, reducing the electrostatic repulsion between nucleons, bringing them even closer together. At a critical point in this fusion process, the final ^{1}H releases a positron that annihilates one of the nucleon electrons, causing the fusion of the two depleted protons at the center of the deuterium (^{2}H) nucleon with one orbiting electron.

Annihilating one positron from the original primordial protium (^{1}H) nucleon is a key prediction in this fusion theory. The Standard Model predicts that ^{3}He-^{3}He nuclei fusion will produce one ^{4}He nucleus and two protiums (^{1}H). According to this nucleon theory, the fusion of ^{3}He-^{3}He nucleons produces one ^{4}He nucleon and two depleted protons with a +1 charge, but missing the mass of one positron and no orbiting nucleon electron. Thus, no nucleon-level electromagnetic field exists, and the ejected protons have a measurably lower mass than protium (^{1}H). The mass of the ejected depleted protons is a key calibration value for this theory. Fusing these depleted protons at the 'nucleon' level will not be possible until they are transformed into a neutron through electron capture. Neutron-Neutron fusion will eject an electron and will produce ^{2}H.

The notable discrepancies in the predicted proton mass from (^{3}He-^{3}He) fusion provide a clear and definitive experimental test to evaluate whether this nucleon composition theory or the Standard Model is correct. The depleted protons (928.0761 MeV) produced from this fusion event are predicted to be the same as those from neutron beta decay. The Standard Model assumes that the protons that result from neutron beta decay are identical in all ways to those measured precisely from ionized hydrogen (938.2727 MeV). I can find no evidence that the direct mass measurement of a proton produced from the beta decay of a neutron being done. The predicted lower mass of 10.19653 MeV, or 1.08%, represents a comparatively easy yet unambiguous difference between the Standard Model and this classical nucleon composition theory's predictions. This one test would set the record straight as to whether the classical approaches were rejected prematurely.

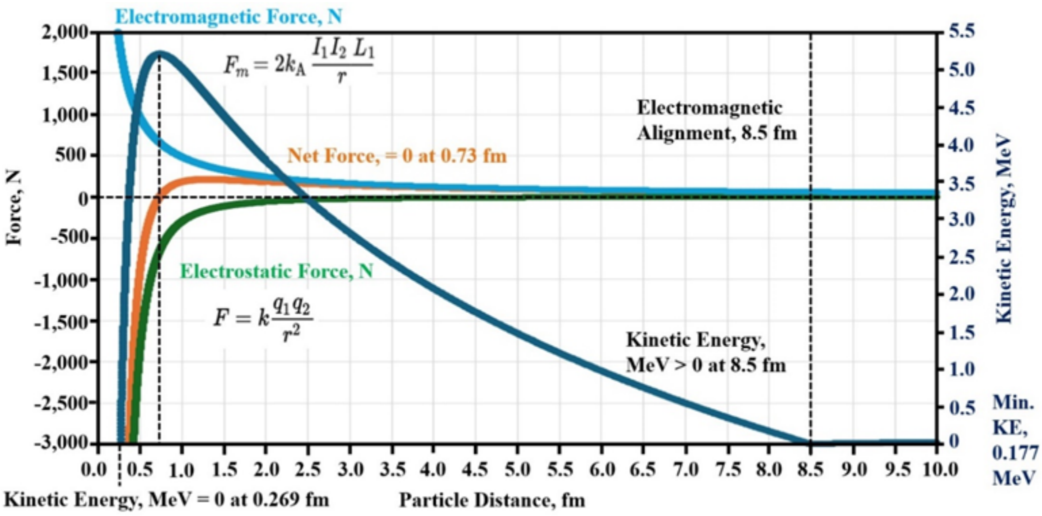
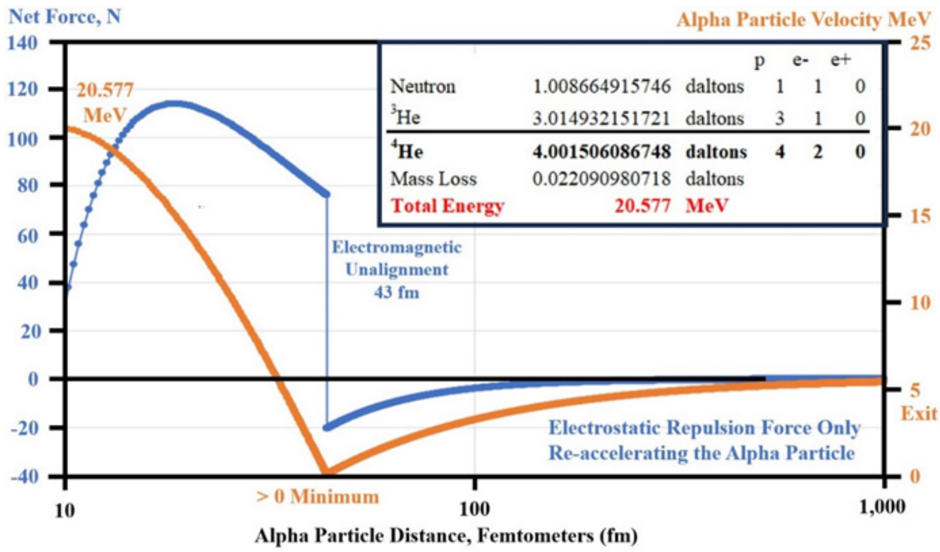


Figure 4: 1D Force and Energy vs Distance for the Fusion (^1H) -(^1H) into (^2H)

Alpha Decay and the Strong Force

The Alpha Particle Paradox was another issue the Standard Model needed to address. Under this theory, Alpha particles (^4He) forcefully ejected from the atomic nucleus are governed by the same electrostatic and electromagnetic forces as fusion. Nuclear fusion within the atomic nucleus supplies the energy needed to overcome this force balance. When ^3He fuses with a neutron to produce a ^4He (alpha particle), over 20.5 MeV of energy is generated, which is sufficient to eject the newly created ^4He nucleon to a distance where the electromagnetism becomes unaligned, as shown in Figure 5. This also explain why its an Alpha particle and not some other particle.



			p	e-	e+
Neutron	1.008664915746	daltons	1	1	0
^{3}He	3.014932151721	daltons	3	1	0
^{4}He	**4.001506086748**	**daltons**	**4**	**2**	**0**
Mass Loss	0.022090980718	daltons			
Total Energy	20.577	MeV			

Figure 5: Alpha Decay Force and Energy Curves for ^{210}Po

Only the electrostatic force remains to accelerate the alpha particle from the nucleus. The same model of electrostatic and electromagnetic forces used for fusion also accurately predicts the observed exit velocity of the ^4He alpha particle from the nucleus. The Standard Model's quantum tunneling hypothesis is no longer necessary to explain this common form of radioactive decay, detailed for the ^{238}U to ^{208}Pb in Table 2.

Isotope Description				Nucleons in the Nucleus					Particles			
Isotope	Mass #	Atomic #	Half-Life	^{4}He	^{2}H	^{3}H	^{3}He	Neutron	Protons	Electrons	Charge	Decay Mode
^{238}U	238	92	4.4 billion yrs.	46	0	0	0	54	238	146	92	elec. capture/ejection
^{238m}U	238	92	280 nano sec.	45	0	0	1	55	238	146	92	alpha emission
^{234}Th	234	90	24.1 Days	45	0	0	0	54	234	144	90	electron emission
^{234m}Pa	234	91	1.17 minutes	44	0	1	1	52	234	143	91	electron emission
^{234}U	234	92	245,000 years	45	0	0	1	51	234	142	92	alpha emission
^{230}Th	230	90	75,400 years	45	0	0	0	50	230	140	90	elec. capture/ejection
	230	90		44	0	0	1	51	230	140	90	alpha emission
^{226}Ra	226	88	1,600 years	44	0	0	0	50	226	138	88	elec. capture/ejection
	226	88		43	0	0	1	51	226	138	88	alpha emission
^{222}Rn	222	86	3.82 days	43	0	0	0	50	222	136	86	elec. capture/ejection
	222	86		42	0	0	1	51	222	136	86	alpha emission
^{218}Po	218	84	3.1 min	42	0	0	0	50	218	134	84	elec. capture/ejection
	218	84		41	0	0	1	51	218	134	84	alpha emission
^{214}Pb	214	82	27 min	41	0	0	0	50	214	132	82	electron ejection
^{214}Bi	214	83	19.9 min	40	0	1	1	48	214	131	83	electron ejection
^{214}Po	214	84	164 micro sec.	41	0	0	1	47	214	130	84	alpha emission
^{210}Pb	210	82	22.2 years	41	0	0	0	46	210	128	82	electron ejection
^{210}Bi	210	83	5.0 Days	40	0	1	1	44	210	127	83	electron ejection
^{210}Po	210	84	138.4 Days	41	0	0	1	43	210	126	84	alpha emission
^{206}Pb	206	82	Stable	41	0	0	0	42	206	124	82	

Table 2: ^{238}U to ^{206}Pb Alpha Decay Chain

The Strong Force and Nuclear Fission

This theory of nucleon construction explains how isotopes transition from fertile to fissile forms and ultimately undergo fission. Neutron activation is a well-understood process for producing radioactive and sometimes fissionable isotopes. For example, to convert fertile ^{238}U or ^{232}Th into fissile isotopes, a neutron with sufficient kinetic energy strikes a ^{4}He nucleon, destabilizing it into two deuterium (^{2}H) nucleons and one neutron, creating a new isotope. Deuterium (^{2}H) absorbs a neutron and ejects an electron to become ^{3}He. The isotope produced is now fissile, as shown in Table 3. If another neutron strikes the ^{3}He nucleon, the fusion energy generated destabilizes the entire nucleus, causing it to split into two daughter nuclei that rapidly accelerate away from each other. Most of the energy released during fission is in the final kinetic energy of the two daughter nuclides. Much like a compressed spring, the fusion energy released destabilizes the entire nucleus by misaligning the electromagnetic fields of its nucleons. Suddenly, the once delicate balance of aligned attractive electromagnetic forces that hold the nucleus together diminishes to the point where the stored energy of electrostatic repulsion is released. Energy stored billions of years ago in the stable remnants of nuclei formed during the most energetic processes of neutron star collisions and supernova explosions that still occur in the universe.

	Isotope Description				Nucleons in the Nucleus					Particles			
	Isotope	Mass #	Atomic #	Half-Life	^{4}He	^{2}H	^{3}H	^{3}He	Neutron	Protons	Electrons	Charge	Decay Mode
Fertile	^{238}U	238	92	4.4 billion yrs	46	0	0	0	**54**	238	146	92	neutron activation
	^{239}U	239	92	23.5 minutes	45	2	0	0	**55**	239	**147**	92	electron ejection
Fissile	^{239}Np	239	93	2.4 days	45	1	0	1	54	239	**146**	93	electron ejection
Fissile	^{239}Pu	239	94	24,100 years	45	0	0	2	53	239	**145**	94	

	Isotope Description				Nucleons in the Nucleus					Particles			
	Isotope	Mass #	Atomic #	Half-Life	^{4}He	^{2}H	^{3}H	^{3}He	Neutrons	Protons	Electrons	Charge	Decay Mode
Fertile	^{232}Th	232	90	14.0 billion yrs	45	0	0	0	**52**	232	142	90	neutron activation
	^{233}Th	233	90	21.8 minutes	44	2	0	0	**53**	233	**143**	90	electron ejection
Fissile	^{233}Pa	233	91	27.0 days	44	1	0	1	52	233	**142**	91	electron ejection
Fissile	^{233}U	233	92	159,200 years	44	0	0	2	51	233	**141**	92	

Table 3: Fertile to Fissile Decay Chain for ^{238}U and ^{232}Th

The Atomic Nucleus

The atomic nuclei of all elements and their isotopes above ^4He consist of various combinations of neutrons, protium (^1H), deuterium (^2H), tritium (^3H), ^3He, and ^4He nucleons. The precise balance of aligned electromagnetic and electrostatic forces that govern nuclear fission, and radioactive decay also predict the arrangement of atomic nuclei in elements and their isotopes heavier than Helium. A good example of this force-balancing nucleon arrangement is ^{12}C. The expected structure of the ^{12}C nucleus is a tri-alpha particle composed of ^4He, as shown in Figure 6. A prediction that the ab initio framework of Nuclear Lattice Effective Field Theory (NLEFT) also yields [8].

The observation that $^8Be(^4He,^4He)$ is unstable while $^{12}C(^4He,^4He,^4He)$ is stable suggests that only tri-nucleon particle geometries or higher will be stable. Thus, by extension, the stable isotopes of $^6Li(^2H,^2H,^2H)$, $^7Li(^2H,^2H,^3H)$, $^9Be(^4He,^4He,n)$, $^{10}B(^4He,^3H,^3He)$, and $^{11}B(^4He,^4He,^3H)$ are predictably tri-nucleon compositions and confirmed by this model as well. The Standard Model's 'generic' consolidated sphere of protons and neutrons, held together by a 'generic' strong force, cannot explain the discrete nucleon structures that this theory predicts. The differences in the fusion behaviors of ^7Li vs ^6Li and other isotopes are also explained by this nucleus theory.

For stars that are much more massive than the sun, ^4He is not the final product of stellar fusion. Beginning with ^{12}C, they progressively create the elemental isotopes of ^{16}O, ^{20}Ne, ^{24}Mg, ^{28}Si, ^{32}S, ^{36}Ar, ^{40}Ca, ^{44}Ti, ^{48}Cr, ^{52}Fe, and ^{56}Ni through successive fusion with ^4He, as illustrated in Figure 7. The successive reduction in fusion mass is the result of the lowest energy balance of the electron orbital speeds among the nucleons that make up a stable nucleus. The last stable element and isotope made entirely of ^4He nucleons is ^{40}Ca. Beyond this point, the heavier isotopes decay by progressively absorbing two electrons, transforming two ^4He nucleons into two tritium (^3H) nucleons and two neutrons. This double Beta+/Electron Capture decay process reduces the electrostatic repulsion, increasing the electromagnetic attraction among the constituent nucleons and arriving at a stable isotope. A physical model simulating the atomic nucleus can be created using spherical magnets to represent the nucleons of ^4He. The metal surfaces of the magnets represent the balance of electrostatic and electromagnetic forces.

^{12}C Charge Radius	2.4702220	fm
^4He Charge Radius	1.6782483	fm
Coulomb's Law (^4He to ^4He)		
^4He to ^4He Diagonal Distance	1.5686736	fm
Repulsion Force Diagonal, N	375.03	N
Diagonal Force Vector	30	Degrees
^4He to ^4He Diagonal Force	324.79	Nx
^4He to ^4He Diagonal Force	187.51	Ny
Total Repulsive Force Nx	**649.57**	**Nx**
Ampere's Law (^4He to ^4He)		
Electromagnetic F per Distance	3.3965E-13	$kg*m^2*s^{-2}$
^4He to ^4He Diagonal Distance	1.5686736	fm
Attractive Force Normal, N	433.05	N
Diagonal Force Vector	30	Degrees
^4He to ^4He Diagonal Force	375.03	N
^4He to ^4He Diagonal Force	324.79	Nx
^4He to ^4He Diagonal Force	187.51	Ny
Total Attractive Force Nx	**649.57**	**Nx**
Net Force	**(0.00)**	**Nx**

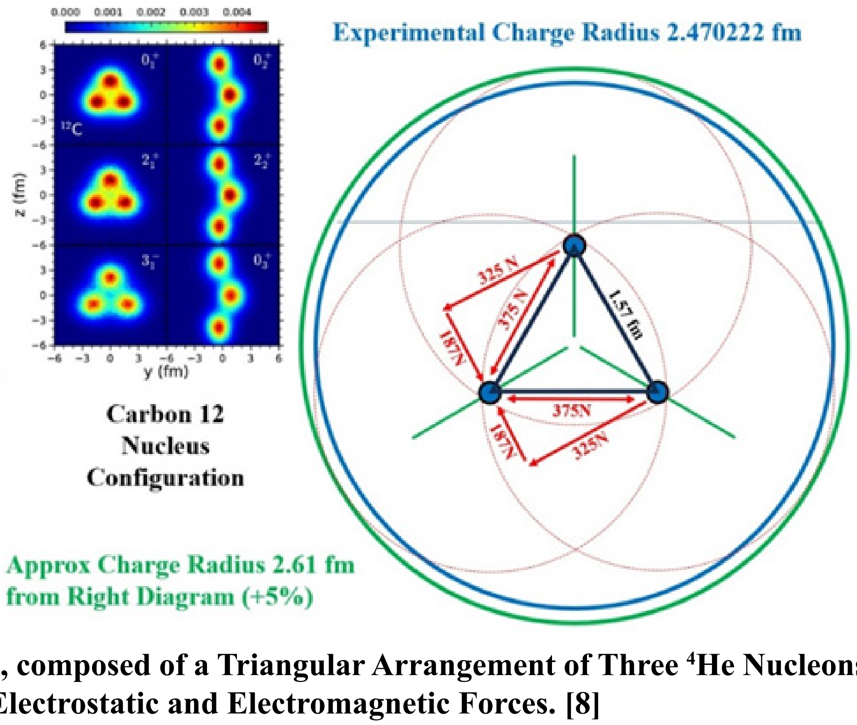


Figure 6: The Atomic Nucleus of ^{12}C, composed of a Triangular Arrangement of Three ^4He Nucleons, is a Balance of Electrostatic and Electromagnetic Forces. [8]

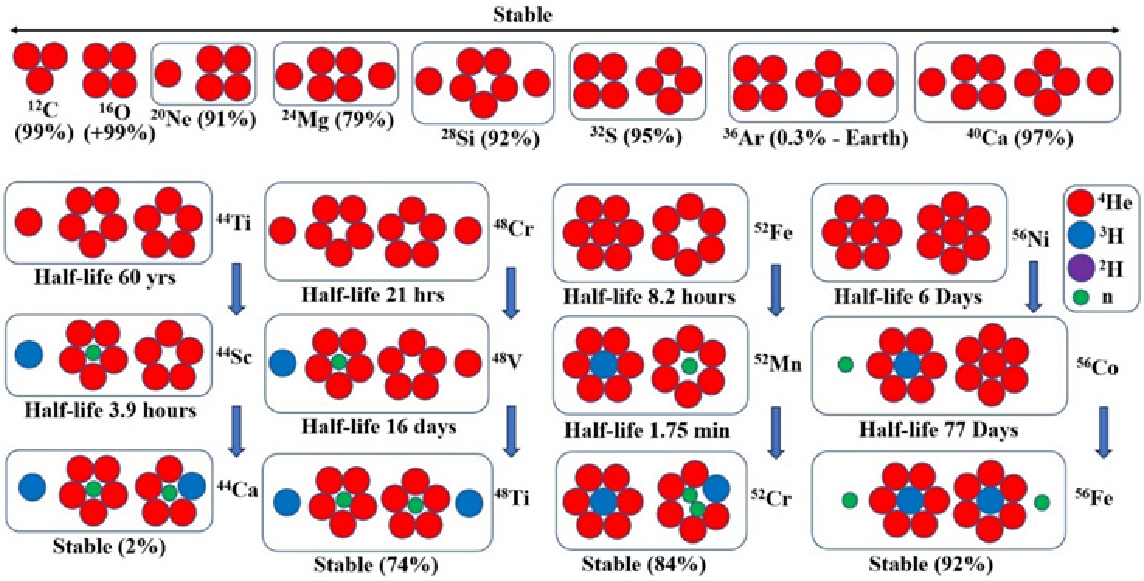


Figure 7: The Progressive Conversion of ^{4}He into ^{12}C to ^{56}Fe

Proton Clustering, Proton Mass, and the Existence of Matter

Extending the same geometry, force, and mass equations down to the proton level explains the origins of depleted proton clustering within the nucleons of deuterium (^{2}H), tritium (^{3}H), ^{3}He, and ^{4}He. The ejected positron in the nuclear fusion of protium (^{1}H) and proton mass is shown in Figure 8. This proton construction theory predicts that all matter in the universe consists of electrons (e^{-}) and their antimatter equivalent, positrons (e^{+}). Following the simultaneous creation of matter and anti-matter in the Big Bang, the only matter that survived annihilation had to arrive at this 'specific' balanced configuration of three positrons (e^{+}) collected at the center and one orbiting electron (e^{-}) to produce the primordial proton, resolving the anti-matter enigma. As the universe cooled, the primordial proton could capture an electron, becoming a protium (^{1}H) nucleon. At this point, the density and temperature of the universe were still sufficient in some areas to fuse protium (^{1}H) into other nucleons and even produce elements beyond Helium. As spacetime rapidly expanded and cooled further, the protium (^{1}H) nucleon could now capture an atomic electron and become the element hydrogen, the building block of stars that ultimately produces all other elements.

	Depleted Proton	Primordial Proton	
Charge Radius	**0.8000000**	**0.8407564**	fm
Coulomb's Law			
Proton Electrons's Orbital Radius	0.0031066	0.0046599	fm
Electrons's Potential Energy	927.05	927.05	MeV
Electrostatic Attraction (+)	47,810,678	31,873,785	Ny
Electrostatic Repulsion (-)	-	-	Ny
Electron Orbit Speed as % of Light	99.9999848%	99.9999848%	
Electron Orbit Speed	299,792,412	299,792,412	$m{\cdot}s^{-1}$
Relativist Electron Mass	1.65261E-27	1.65261E-27	kg
Electron Rest Mass Increase	1,813.2	1,813.2	
Electrons Kenetic Energy	463.52	463.52	MeV
Electrons Momentum, p	4.95441E-19	4.95441E-19	$kg{\cdot}m{\cdot}s^{-1}$
Electrons Angular Momentum, L	1.53915E-21	2.30872E-21	$kg{\cdot}m^{2}s^{-1}$
Centripetal Force (-)	47,810,678	31,873,785	Ny
Electron Mass	0.99523286	0.99523286	daltons
Positrons Mass	0.00109717	0.00164575	daltons
Proton Mass	-	-	daltons
Nucleon Mass	0.99633003	0.99687862	daltons
Ampere's Law			
Electron Orbital Circ	1.95195E-17	2.92792E-17	m
Electron Orbits per second	1.53586E+25	1.02391E+25	
Orbital Electrons	1	1	
Amps (I)	2,460,750	1,640,500	$C{\cdot}s^{-1}$
Electromagnetic Force vs Distance	2.3639E-11	1.5759E-11	$kg{\cdot}m^{2}{\cdot}s^{-2}$
Electron Wave Length	1.33741E-15	1.33741E-15	
Electron Frequency	2.24159E+23	2.24159E+23	
Angular Frequency	1.40843E+24	1.40843E+24	
Electron Wave Length/Orbital Circ (A)	68.51666451	45.67777634	
Ratio of Fine Structure Constant/A	2.00003897	3.00005846	

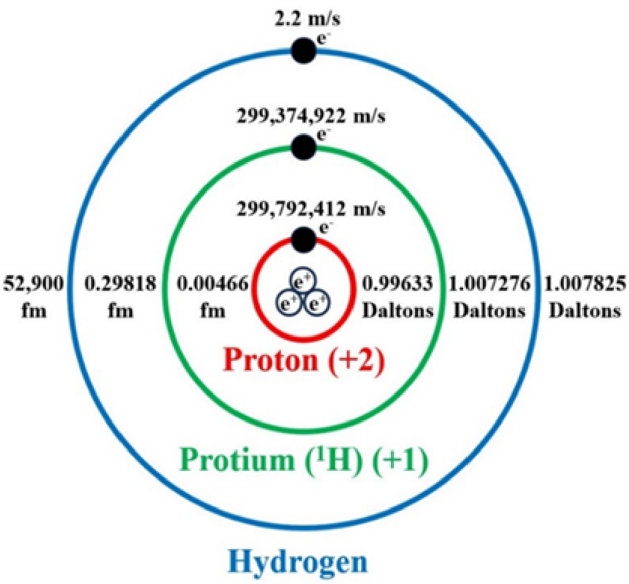


Figure 8: Proton Mass, Proton Clustering, and the Existence of Matter

Nucleon Composition Theory Summation

Nuclear Fusion of Two Protium Nucleons

Several aspects of this theory can be explained by the fusion of two protium nucleons into deuterium using this classical nucleon composition lens, as shown in Figure 9. As described in Figure 8, protium consists of a primordial proton ($3e^+$,$1e^-$) orbited by one nucleon electron at 0.2918 fm radius. Should two protiums have sufficient speed to overcome their initial electrostatic repulsion and approach within 8.5 fm, as shown in Figure 3, their respective electromagnetic poles will self-align, resulting in fusion at 0.269 fm, as shown in Figure 4. At some point along this fusion trajectory, one positron will be ejected from the primordial proton. The other primordial proton will also eject one positron, but it will annihilate one of the orbiting nucleon electrons. The remaining nucleon electron will absorb this energy. This produces two depleted protons ($2e^+$,$1e^-$) that are still electromagnetically active from the respective orbiting electron. Their respective electrostatic repulsion and electromagnetic attractions are zero at 0.0083 fm for these depleted protons. The result of this ^1H-^1H fusion is deuterium with two depleted protons at its center and one nucleon orbiting electron at a 0.140841 fm radius. The nucleons of ^3H, ^3He (tri particle, similar to ^{12}C), and ^4He (quad particle, similar to 16O) have a similar balance of forces for their respective cluster of depleted protons, as shown in Figures 2,6

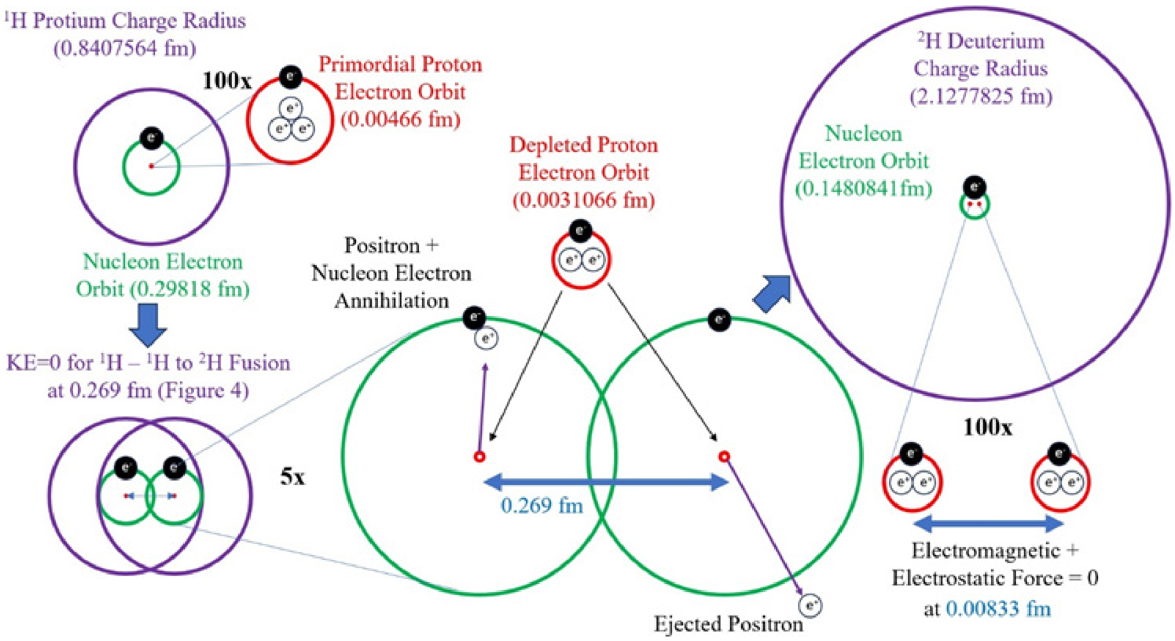


Figure 9: Protium – Protium Fusion into Deuterium

Resolution of the Standard Model Issues from this Theory

Incompatibility with Gravity and General Relativity

The Standard Model ignores gravity; quantum gravity (e.g., loop quantum gravity or string theory) fails to unify without infinities or extra dimensions. Under this theory, charge bubbles warp spacetime directly, making gravity an emergent property of aggregated electrostatic charges/geometries [9,10,11,12,13,14,15,16]. This classically unifies electromagnetism and gravity (echoing Einstein's unified field theory attempts), where bubble distortions explain General Relativity effects like light bending or black holes without quantum conflicts. There is no need for gravitons or Quantum Field Theory extensions.

Absence of Dark Matter Candidates

The Standard Model lacks particles explaining ~27% of the universe's mass (e.g., galactic rotations, gravitational lensing); WIMPs/axions are hypothetical and undetected. This theory eliminates the need for dark matter. Spacetime warpage is from charge bubbles (at nuclear scales) that accumulate macroscopically, mimicking dark matter's gravitational effects via modified geometry (e.g., flatter rotation curves from bubble-induced curvature). Classical simulations of bubble clustering could reproduce observations without new particles.

No Explanation for Dark Energy
The Standard Model's vacuum energy prediction mismatches observations by 120 orders with no mechanism for the universe's acceleration (68% of energy density). This theory replaces dark energy with inherent spacetime properties. These charge bubbles create a "repulsive" warp at large scales (e.g., via geometric expansion from charge distributions), driving acceleration classically. Vacuum is not "empty" but a bubble-fabric medium, resolving the cosmological constant problem without fine-tuning.

Matter-Antimatter (Baryon) Asymmetry
The Standard Model's CP violation is too weak to explain why matter dominates and shouldn't have been annihilated post-Big Bang. This theory provides a basis for the inherent asymmetry from positron "destruction" in fusion/decay. Pre-existing positrons/electrons in nucleons favor matter retention (e.g., positron annihilation in p-p fusion creates photons, not reforming antimatter). Geometric imbalances in bubble formations could bias the early universe toward matter-dominated structures.

Neutrino Masses and Oscillations
The Standard Model (SM) assumes massless neutrinos; oscillations require masses, implying beyond-SM physics (e.g., seesaw mechanism). This theory potentially reinterprets neutrinos classically as relativistic byproducts of beta decays (energy-sharing waves in spacetime-aether), not as fundamental particles. Bubble interiors might allow flavor "oscillations" via geometric vibrations, deriving tiny masses from orbital adjustments without new fields. However, the paper focuses on nucleons, so lepton specifics are underdeveloped at this point, but could provide a new lens to reexamine existing results.

Hierarchy Problem
Unnatural fine-tuning needed for mass scales (e.g., Higgs at 125 GeV vs. Planck at 10^{19} GeV); why no cancellations causing instability? This theory's classical derivations eliminate hierarchies. Masses arise from relativistic orbital equilibria (e.g., electron speeds balancing forces at femtometer scales produce ~938 MeV proton mass). Geometry sets scales naturally (e.g., +3 vs. +2 charge adjustments yield 1% variations), avoiding quantum loops or tuning.

Strong CP Problem
Quantum Chromodynamics allows CP violation in the strong force, but none has been observed; thus, it requires an arbitrary theta angle ~0. This theory suggests that the strong force is a classical interaction of electrostatic/centripetal balances inside bubbles, inherently CP-symmetric due to geometric determinism. Thus, no color charge or axions are needed.

Arbitrary Parameters and Lack of Elegance
The Standard Model has between~19-26 unexplained inputs (masses, couplings, generations); seen as ad hoc and inelegant [17]. Historic advancements in physics made the complex simpler. This theory reduces to classical constants (e.g., c, e, h, alpha) using parameters derived from classical geometry (orbital radii, charges) and relativity, while using the well-explored particles of electrons/positrons as building blocks, unifying the very large and the very small via charge bubbles existing within the spacetime aether without Quantum Field Theory.

Experimental Anomalies
Discrepancies like muon g-2 or B-meson decays hint at new physics were as the Standard Model predictions sometimes fail at precision edges. This theory could explain these anomalies as stemming from charge bubble effects on lepton interactions (e.g., muons probing nuclear bubbles differently). Classical re-interpretations might fit data via geometric adjustments, but specific predictions (e.g., mass shifts) would need testing.

Overall Incompleteness and Philosophical Flaws

The Standard Model, by any fair assessment, is exceedingly complicated and doesn't explain the "why" of many observations in physics. (e.g., universe's existence, vacuum nature, etc.) This theory provides a deterministic, classical foundation that unifies the very small with the very large. It does this by postulating that charge bubbles warp the aether of spacetime while incorporating Bohmian Mechanics to explain the wave behavior of particles at the small scale.

This theory represents a rare, unambiguous, and low-barrier opportunity to challenge the Standard Model (SM) at its foundations, particularly the quark model of nucleons, while potentially validating a classical alternative that addresses multiple longstanding SM deficiencies. The analogy to the 1919 solar eclipse experiment, which measured starlight bending to confirm General Relativity (GR) over Newtonian gravity, is apt. Both involve a precise, observable prediction where these theories diverge sharply, with minimal ambiguity in interpretation and low-cost repeatability. In that case, the result shifted physics paradigms. A confirmation that the proton generated by neutron beta decay is 1% lighter than predicted by the Standard Model would expose the flaws in Quantum Chromodynamics (QCD) and open doors to classical unification of the physics of the small and large.

Summary

This paper revives a classical model of nucleon composition that was dismissed during the formative years of nuclear physics. By embracing a purely classical framework, it leverages electrostatics, electromagnetism, centripetal forces, and special relativity to accurately describe nucleon properties and behaviors, aligning seamlessly with empirical observations. This cohesive model elucidates a wide array of longstanding mysteries, including the emergence of the strong nuclear force, the mechanics of nuclear fusion and its associated mass deficit, the architecture of atomic nuclei, radioactivity, nuclear fission, nuclear spin, proton mass, and even the fundamental composition and existence of matter. Furthermore, it tackles several unresolved challenges in the Standard Model while offering a pathway to reconcile General Relativity with Quantum Mechanics through a unified classical lens that was potentially rejected prematurely.

The theory stands out for its precise, testable predictions concerning the protons generated in ^3He-^3He fusion and neutron beta decay. It presents a unique, comparatively low-cost experiment to rigorously probe the Standard Model's core assumptions, particularly the quark-based structure of nucleons, while potentially affirming a classical alternative that resolves enduring Standard Model problems.

Echoing the 1919 solar eclipse expedition, which definitively validated General Relativity by measuring the deflection of starlight around the Sun and upending Newtonian gravity, the

predicted 10.19653 MeV lower proton mass from neutron beta decay vs the Standard Model proton, represents an inexpensive, independently replicable, theory-based difference. With straightforward interpretation and minimal experimental hurdles, confirmation could catalyze a paradigm shift, revealing cracks in Quantum Chromodynamics and paving the way for a classical unification of fundamental forces that governs at all scales.

"Space-time is not necessarily something to which one can ascribe a separate existence, independently of the actual objects of physical reality. Physical objects are not in space, but these objects are spatially extended. In this way, the concept "empty space" loses its meaning."
-Albert Einstein

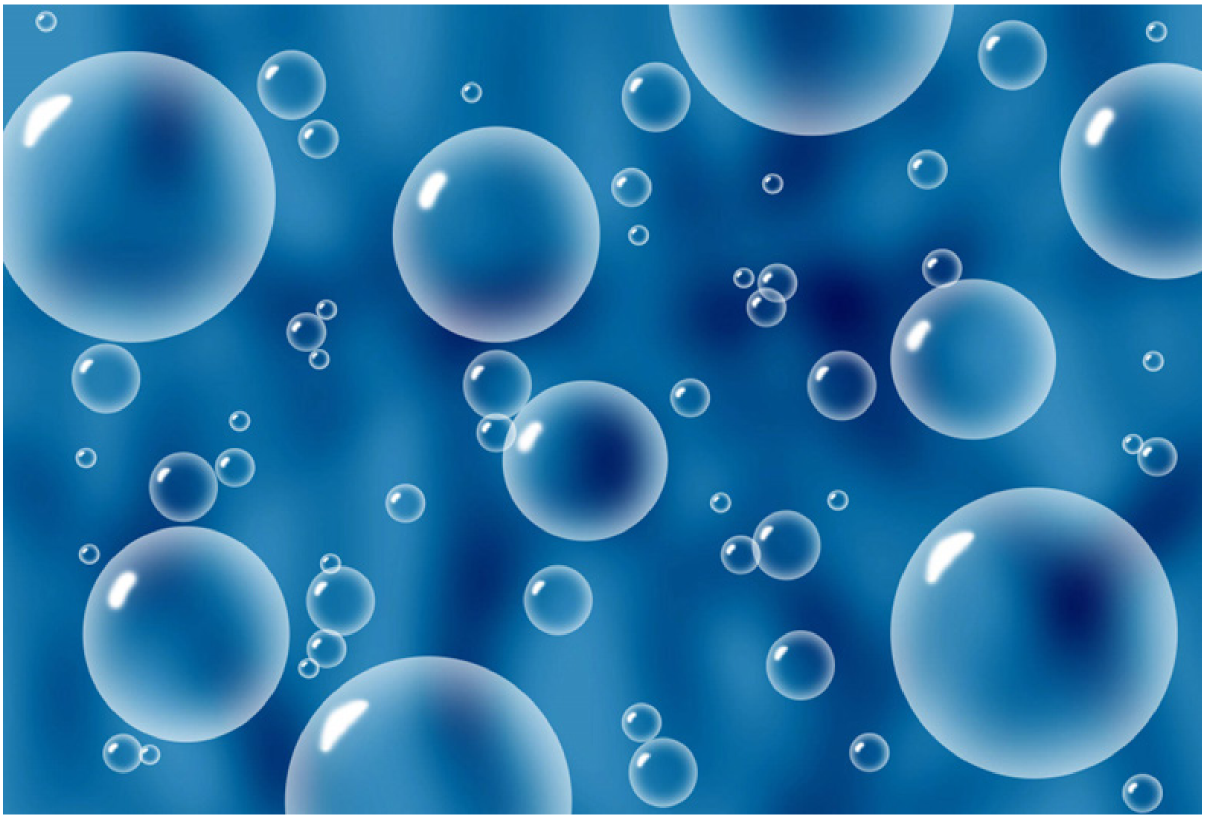


Figure 10: Charge Particles Suspended within the Aether Fabric of Spacetime

"One good test is worth a thousand expert opinions."
-Wernher Von Braun
"Somewhere, something incredible is waiting to be known."
-Carl Sagan

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