Nuclear and Gravitational Interactions
Are Flip Sides of the Same Coin

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Abstract

These two forces that seem so disparate are in fact the same interaction. It is the pronounced difference occurring at the level of their quanta that makes them seem so completely unlike. Here we give the theoretical basic nature of each, quantifying both and fitting them to Dirac's *"Large Numbers Hypothesis".*

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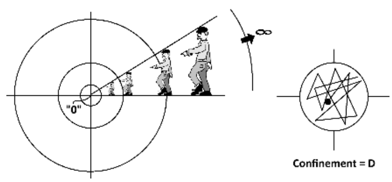
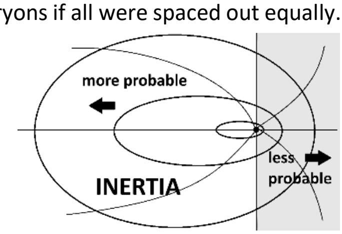
By my overall theory of existence, the universe is fundamentally logic counting … integers. The count is instantiated in three dimensions for reasons not explored here. We start with a standard 3D Euclidean gridwork and fill each 'unit box' with one 'unit point' (at unit determinacy *"It is in the box"* … and unit indeterminacy, *"It is anywhere within the box"*) … from which a spherical reference frame expands into the Euclidean grid … encompassing $4\pi R^2$ other such frame origins per unit time as it expands. It is itself also encompassed $4\pi R^2$ times per unit time by those other spherical frames because the whole universe starts instantly everywhere at the same time. Note: This is no stranger than the *Big Bang* of the Standard Model. We are just going to 'shrink' atoms instead of 'expand' space, i.e. we're taking the opposite perspective.

As a core rule of physics logic, for a thing to exist relative to another thing … it must *"do something"* in response to the presence of that other thing. To exist is a verb. What actions are possible in 3-space? There are only these: A thing may move toward-away from an observer or laterally relative to that observer (at right angles to the line connecting the two). On its own, an object could rotate on an axis or expand-contract like a balloon. That's all that is conceivable in 3-space (unless we count disappear-reappear elsewhere or impose an uncertainty principle).

In this article, we give lateral motion initially to the gravitational interaction and vertical motion to the nuclear force. When encompassed by another spherical field, our particles will move in some direction randomly. This acknowledges the existence of the new particle at the current Hubble radius of our central test particle. So, a particle will move $4\pi R^2$ times per *"unit time"* which we define as the time it takes light (unit velocity) to traverse the *"unit length"* defined by the unit box of the original Euclidean field. In meters, this would be about 2/3 meter give or take 10 centimeters. This measure is the average distance between two baryons if all were spaced out equally.

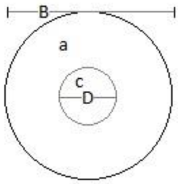


This produces a confinement (D) as shown above because the random jumps ('folded up' in response to the appearance of new particles from the Hubble radius) also creates *"inertia"* which is the interaction of a particle with its own field. In this manner… if a particle random walks away from its present position, its field lags behind because there is a finite transmission velocity in any space. The field lines are bent and spheres become ellipsoids. Anything that causes an acceleration will stretch the field backwards, creating a higher probability of returning to where it was.



What is needed next is to quantify the *"reaction velocity"* which gives the confinement a rate of shrinkage emulating the Hubble expansion. The following rule fills the bill exactly …
Note: **D** is equal to the reaction velocity (**a**) folded up $4\pi R^2$ times per unit time.

Let the time required to traverse the confinement at unit velocity,
be equal to the time required to traverse the β - field at reaction velocity.



B = the extent of the field (2 x Hubble radius)
D = the confinement (Compton wavelength)
a = the reaction velocity (to be determined)
c = unit velocity (light velocity)

$$\frac{\mathbf{B}}{\mathbf{a}} = \frac{\mathbf{D}}{\mathbf{c}} \qquad \mathbf{D} = \frac{\mathbf{Bc}}{\mathbf{a}} \qquad \mathbf{a} = \frac{\mathbf{Bc}}{\mathbf{D}}$$

$\mathbf{c} = 1$
$\mathbf{B} = 2r$
$\mathbf{D} = a/4\pi r^2$

in terms of "r" ⇨

$$\begin{cases} \mathbf{D} = \dfrac{1}{\sqrt{2\pi r}} & \text{ul (unit lengths)} \\ \mathbf{a} = \sqrt{8\pi r^3} & \text{ul/ut (per unit time)} \end{cases}$$

The following may then be deduced …

Because confinement is shrinking $\approx R^{-1/2}$, an observer, taking himself as the standard, will see the universe as expanding. The rate of expansion can be determined by calculating the rate at which new *apparent* length is added to the Hubble radius by holding confinement as stable and adding the corresponding increment to R. Thus …

We can now calculate the increment added to R in lieu of the amount decremented from the confinement D. Note: **R = r** below.

$$\frac{D-\Delta D}{R} = \frac{D}{R+\Delta R}$$

Differentiating,

$$\left.\frac{1/\sqrt{2\pi r}}{R}\right| = \frac{1}{\sqrt{8\pi r^3}}\ \frac{\text{ul}}{\text{ut}} = \Delta D$$

$$\boxed{\frac{D-\frac{1}{\sqrt{8\pi r^3}}}{R} = \frac{D}{R+\Delta R}} ⇨ \boxed{\frac{R+\Delta R}{R} = \frac{D}{D-\frac{1}{\sqrt{8\pi r^3}}}} ⇨ \boxed{\frac{R+\Delta R}{R} = \frac{\frac{1}{\sqrt{2\pi r}}}{\frac{1}{\sqrt{2\pi r}}-\frac{1}{\sqrt{8\pi r^3}}}}$$

$$⇨ \frac{R+\Delta R}{R} = \frac{\frac{1}{\sqrt{2\pi r}}}{\frac{1}{\sqrt{2\pi r}}-\frac{1}{2r\sqrt{2\pi r}}} = \frac{\frac{1}{\sqrt{2\pi r}}}{\frac{2r}{2r\sqrt{2\pi r}}-\frac{1}{2r\sqrt{2\pi r}}} = \frac{\frac{1}{\sqrt{2\pi r}}}{\frac{2r-1}{2r\sqrt{2\pi r}}}$$

$$\frac{R+\Delta R}{R} = \frac{\frac{1}{\sqrt{2\pi r}}}{\frac{2r-1}{2r\sqrt{2\pi r}}} = \frac{\frac{2r\sqrt{2\pi r}}{\sqrt{2\pi r}}}{2r-1} = \frac{2r}{2r-1}$$

$$\frac{R+\Delta R}{R} = \frac{2r}{2r-1} \;\Big|⇨\; R+\Delta R = \frac{2r^2}{2r-1} \;\Big|⇨\; \Delta R = \frac{2r^2}{2r-1} - \frac{R(2r-1)}{2r-1}$$

$$\frac{2r^2 - R(2r-1)}{2r-1} = \frac{2r^2 - 2r^2 + R}{2r-1} = \boxed{\Delta R = \frac{R}{2R-1}\ \frac{\text{ul}}{\text{ut}}}$$

This means that the apparent velocity of an object at the Hubble radius (moving away) will always appear to be … ½ of light speed. And this is the apparent velocity of any object receding from the observer at near light speed, due to light travel time back to the observer. Thus, a traveler leaving an observer at near light speed, will be seen to pass a marker 1 light-year distant, in 2 years from the frame of that observer – apparent recession velocity is $1/(v/c +1)$. And … a traveler approaching may appear to have unlimited velocity (greater than c).

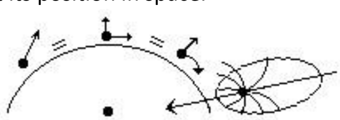
The reaction velocity is presently about $10^{39}c$ … a stupendous velocity equivalent to a virtual instantaneous connection with the entire known universe. The logical reason for this is what I call *"Extension Denial"* by which is meant that to us, the universe plays out in three dimensions. But to an electron, which is incapable of detecting parallax, the universe logically plays out on the surface of a sphere of diminishing radius … down to the limits of the electrons physical dimensions whatever these may be. It simply responds to forces immediately upon it … nothing else. Logic must therefore construct the universe to comply with both aspects as if equally true.

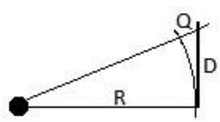
The baryon number represents the total number of particles presently counted ($4/3\ \pi R^3$), the radius (and age) of the universe is R, the speed of light is set at "1" and the base Compton wavelength is $1/(2\pi R)^{1/2}$ … we are therefore consistent with Dirac's large numbers hypothesis.

"The age of the universe divided by the time required to traverse the confinement at unit velocity, always approximates the square root of the baryon number."

Gravitational Interaction

Recall that inertia tends to keep the particle in one place. This is only true when the space surrounding it is fully isotropic (equal in all directions away for the particle so that no direction can be preferred). If we skew the space by placing a clump of matter near our test particle, the reaction velocity will tend to follow the skewed (curved) space toward the clump adding itself to it. It does so by the lateral component of its reaction velocity which follows the definition of a straight line at its position in space.

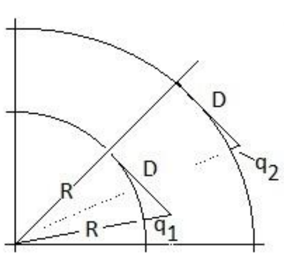




As the accelerated object falls, a reverse probabilistic curvature distortion results, that exactly cancels the curvature that is causing the attraction. The acceleration then reaches a constant value by that cancelation … producing "*freefall*" (9.8 m/sec^2 for the Earth).

Note: Two different test masses fall at the same rate in a given gravitational field, because it is the *rate of acceleration* that causes the distortion and not the attracting mass itself.

The individual β-field is composited with the α-field, and … all the other β-fields that encompass it. The α-field has no net gravitational effect because it is, of itself, completely isotropic (flat). However, the β-fields, being randomly placed within each unit cube at the outset, have initial asymmetries by which they may diverge from uniform distribution. Note: "q" is equal to $[R^2+D^2]^{1/2}-R$ and approaches 1/R as a limit of decrease. That is, when R is doubled, q is ½ of its value at 1R. D is held as a constant and is the confinement or Compton diameter of a particle.



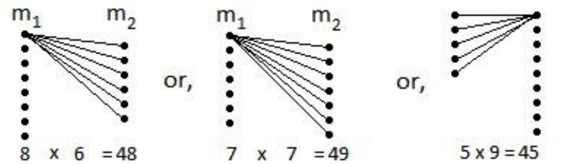
R	q
1,000,000	.000000499
10,000	.000049999
100	.004999875
4	.132105625
2	.236067977
1	.414213562
.5	.618033988
.1	.904987562
.01	.990049998
.001	.9990004999
.0001	.9999000049

Then "q" is a contributor to the probability being skewed toward the center of mass of the attracting particle aggregate according to the equation $m_{earth} / M_{universe} \times q$ = total skewing factor.

$$\frac{m_1}{R} \times \frac{m_2}{R} = \frac{m_1 m_2}{R^2}$$

From this also comes the familiar Newtonian formula. Thus, the field curvature goes as 1/R but the force between two objects falls as $1/R^2$ as required by observation.

Note here that in the Newtonian equation; by multiplying one mass with the other, we are merely adding couplings.



So that, if we have 14 mass units to distribute to 2 bodies (m_1 and m_2), no matter how they are distributed, the force between them is the sum of their couplings. The maximum force is always the most even distribution. And … the field must decrease as 1/r, or the force cannot algebraically generate Newton's equation. That is, m_1m_2/r^2 cannot be derived from …

$m_1/r^2 \times m_2/r^2 = m_1m_2/r^4$ ……. [does not equal… m_1m_2/r^2]
$m_1/r^2 + m_2/r^2 = m1+m2/r^2$ … [does not equal… m_1m_2/r^2]

The gravitational constant is initially just "1" thereafter changing … as the 'ratio' between the increasing reaction velocity, which strengthens the force … and the total number of particles, which diminishes the priority of each particle to impose its spherical reference frame on all others.

Therefore, when R is 10^{26}, we are still in compliance with Dirac's Large Numbers Hypothesis.

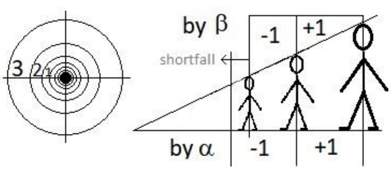
$$G = \frac{\sqrt{8\pi R^3}}{4/3\,\pi R^3} = \frac{5 \times 10^{39}}{4.2 \times 10^{78}} = \sim 10^{-39}$$

For example, the earth has about 10^{51} baryons. So, its priority in establishing a spherical reference frame is … $10^{51}_{\text{earth } \beta\text{-fields}}$ / (***?***$10^{78}_{\text{straight } \alpha\text{-cubes}} + 10^{78}_{\text{non-earth } \beta\text{-fields}}$). We can compute a gross estimate of the earth's gravitational acceleration from the above …

~10^{60} 'jumps' per second … x … each jump drops the particle $10^{51}/10^{78}$ x $([R^2+D^2]^{1/2}$-R (at the earth's surface) = ~1.569 meters/sec^2 … here we considered the earth's radius as 6,371,000 meters and 'D' as ~10^{-13} meters. This is a very gross *"order of magnitude"* estimate.

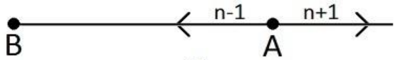
Nuclear Interaction

The spherical β-field is non-uniform, having a non-linear metric. Distance in the β-field decreases with proximity to the center. It is a "*proportional metric*". Its unit length decreases relative to the α-field unit length as the center is approached.



The α-field is logically equal to the β-field. By definition, as many α-field cubes exist as there are β-field spheres. The two types composite to establish the true standard of length for a given space. Thus, length (like the curvature of space around a mass) is determined by the number of particles present, composited with the α-field as well. In general, considering only the vertical component of the reaction velocity … a particle can be at (n+1) or (n-1) after one jump of that velocity (which is folded up $4\pi R^2$ times per unit time) … where *"n"* is the number of Compton diameters distant from the gravitational field center. In the α-field, this distance (+1 or -1) is equal. However, in β-field lengths, -1 is > +1 (as measured by the β field as in the above illustration) … therefore there is a net probability for a particle to go toward the center of mass, as was the case with the reaction velocity responding to the curvature of the field in the gravitational interaction. Like curvature, these length probabilities vary as 1/R.

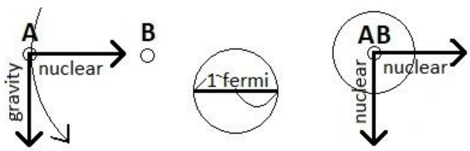
The α-field (10^{78}cubes) overpowers the single β field or the reasoning could go oppositely as well. Also, at about 1 fermi, the strength must approach infinity. However, as no particle can sit on a single designated point an "*average*" about that point is defined as unit strength.



n	$\frac{n-1}{n+1}$
10	.81818...
100	.9801980...
1000	.998001998...
10,000	.99980001999...
100,000	.99998000019...
1,000,000	.9999980000019..

1/R

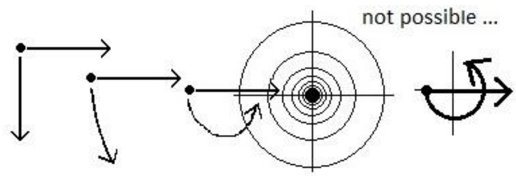
<u>Note</u>: The closer n-1/n+1 approaches '1', the weaker the force becomes, i.e. no preference is shown for movement toward or away. This inverse 'r' fall-off is indistinguishable from curvature (at long distances compared to the Compton wavelength) and is identified as the gravitational force as well. However, at lengths on the scale of particle confinement, curvature and radius converge to reveal the nuclear force.



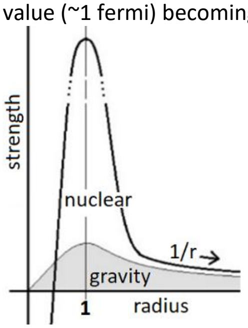
When A converges on B, the gravity (lateral) component gradually transforms into only another nuclear (vertical) component.

Thus, as A approaches B, the nuclear interaction becomes repulsive within ½ Fermi because at the level of its quanta, the next step must take B farther from A no matter the direction. The lateral component disappears. So that the 'attractive' force is maximized at about 1 fermi.

Note that the β-field cannot *overpower* the α-field and thereby cause an infinitely increasing capacity to curve the lateral component of the reaction velocity into a "*wrap-around*" circle, because the totality of α and β-fields here generally composite to a flat Euclidean reference frame, against a single curved β-field.



We may then look upon the nuclear force as a manifestation of the gravitational force at the level of its quanta (at short distances). Its strength is defined as "1" at distance of maximum value (~1 fermi) becoming repulsive at about ½ Fermi.



By this mechanism, a gravitational singularity must be limited to ~1 fermi regardless of the amount of mass present, because the cause of gravity is the behavior of the reaction velocity, and not a mathematical abstraction that diminishes to zero upon coincidence.

We can also see the cause of the nuclear liquid drop model here, as the balance of electrical repulsion and nuclear attraction, combined with nuclear repulsion at the base level of the relevant quanta. The distinction between the gravitational and nuclear force at 1 fermi is ambiguous, as both here composite. The nuclear and gravitational forces become indistinguishable at the Fermi level.

Conclusions

The fundamental forces of the universe are exceptionally simple at base. That which is common to all things is not *"trivial"*. Commonality rather, implies great importance else it would not be everywhere displayed. Any theory that begins with complex mathematical equations and abstruse logical principles is a false theory of existence.

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