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Toward a Classical Unified Theory of Physics

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***Abstract**. We examine the foundations of physics and argue that the experimental results that led to the development of special and general relativity support a simpler, classical theory. We postulate a model of physics in which:*

1. *All particles are defined by two fundamental properties: mass and spin. Mass can be positive or negative, but not zero. Particles with negative mass, for example, are known as antimatter. Spin is quantized along zero, one, or two spatial axes.*
2. *We quantify the interactions of particles as spatiotemporal energy, which is collectively conserved by all particles. The sum spatiotemporal energy of the universe is zero. All energy is spatiotemporal energy, thus energy cannot be transmuted to different forms of energy.*
3. *A graviton is a particle containing a fundamental unit of mass and zero spin. Gravitons, which mediate the gravitational force, acting as virtual photons, travel with infinite speed and transfer momentum but not energy.*
4. *The speed of light is constant with respect to an absolute universal reference frame. For observers moving in other reference frames, the speed of light is quantized and has a time derivative given by* $\frac{dc}{dt}=\frac{1}{4c}$.

Given these assumptions, we propose a general field density law and use this to derive Newton's law of universal gravitation as well as Coulomb's law, and propose a theoretical formula for the value of the gravitational constant, $G=\frac{1}{16\pi c}$ *. We propose theoretical formulas for a variety of other constants including Coulomb's constant. We derive a theoretical value for the mass of a photon and hypothesize this to be the fundamental unit of mass. We derive a value for the minimum energy of a photon, and use this to calculate the number of cavity modes in a radiating black-body. We propose an energy equation for particles and show that de Broglie's relations may be derived from this equation. We propose a new interpretation of the fine structure constant. We use the zero energy principle to propose new resolutions to the cosmological mysteries of dark matter, dark energy, and cosmic background radiation. We propose a new model of the formation of our universe, which we call Genesis theory. Finally, we propose a new model for nuclear physics in which the four fundamental forces are unified.*

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Introduction

We take the position that Newtonian mechanics was mistakenly cast aside as an approximation of physical reality, and argue that it is still precisely consistent with all experimental evidence to date. Our overarching goal here in the construction of a classical unified theory is to reduce the number of "fundamental" constants required in modern theory down to one, so that all previously fundamental constants (which includes the masses of fundamental particles) may be expressed in terms of Planck's constant. Here we have fallen short of this goal, with much work remaining, yet have made substantial progress—expressing Newton's gravitational constant, Coulomb's constant, and the mass of a photon in terms of the speed of light, and removing the permittivity and permeability constants from electromagnetism, again replacing them with the speed of light.

It is our view that the true test of a physical model is not simply whether it can explain experimental results more accurately and precisely, although such capability is clearly desirable, but whether it can be used to create something practical and useful in the physical world that did not previously exist and could not have been conceived otherwise. We have had decades of the standard model, string theory, inflationary cosmology, and over seventy years of research attempting to harness fusion energy via electromagnetic confinement with no success. The prevailing ethos of quantum mechanics is to "shut up and calculate"—don't think about what the theory means or bother attempting to make sense of it, because there is no sense. Such thinking is antithetical to the spirit of scientific inquiry, which compels us to seek an understanding of natural laws. The current theories simply don't work, and fail to yield useful predictions manifested as practical technology. The field is in dire straits.

The current consensus model of physics is also grim and pessimistic. From a cosmological perspective, we cannot go anywhere, or talk to anyone, and the universe appears to be designed haphazardly with no purpose or reason. This is depressing and nihilistic, and the zeitgeist of our era reflects this. A variety of prominent individuals, particularly software engineers, who are intimately familiar with exceedingly complex, ill-conceived abstractions, frequently speak and write about the universe being a simulation, presumably since the closest thing to modern physics that they are familiar with is poorly written software. This is not the reality of our existence. We can do better.

It is imperative that we must.

Relativity

Einstein's theory of relativity is based on two postulates: First, that the laws of physics are identical in all inertial (non-accelerating) reference frames. Second, that the speed of light in a vacuum is constant for all observers (and not dependent on the velocity of the source or the velocity of the observer [1]).

The supposition that the observed velocity of light may be dependent on the velocity of its emitter or its observer goes back to Newton, who theorized "corpuscles" of light particles being emitted and received, following the usual laws of Newtonian mechanics. This concept was later expanded upon by the Swiss physicist Walther Ritz, who proposed a ballistic theory of light in 1908 based on similar premises. Ritz's theory also attempted to maintain consistency with the observed laws of electrodynamics.

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Ritz’s ballistic theory was eventually abandoned due to its inconsistencies with respect to a number of experimental observations. The Sagnac effect, for example, which demonstrates the formation of an interference pattern in a rotating interferometer, is inconsistent with Ritzian theory since the apparatus moves as a single unit without any portion existing in relative motion. Ritzian theory is also inconsistent with Bradley stellar aberration and observations of variable stars.

Here, we assume that light travels at a constant velocity in all directions with respect to an absolute frame of reference which we will refer to as the *Marinov frame*, after the Belgian physicist Stefan Marinov, who designed a variety of coupled-mirror experiments to measure the velocity of the Earth with respect to this absolute reference frame. In frames other than the Marinov frame, light may appear to propagate faster or slower. In addition, light will also appear slightly Doppler-shifted outside the Marinov frame [2].

The Michelson-Morley experiment

The Michelson-Morley experiment [3], conducted multiple times throughout 1887, was devised as an attempt to test the existence of a light-carrying-medium permeating space, which we will refer to as the *aether*. The failure of the Michelson-Morley interferometer (shown in figure 1) to detect any effect attributable to the aether played a major role in the motivations for the development and acceptance of Einstein’s theory of special relativity, proposed in 1905.

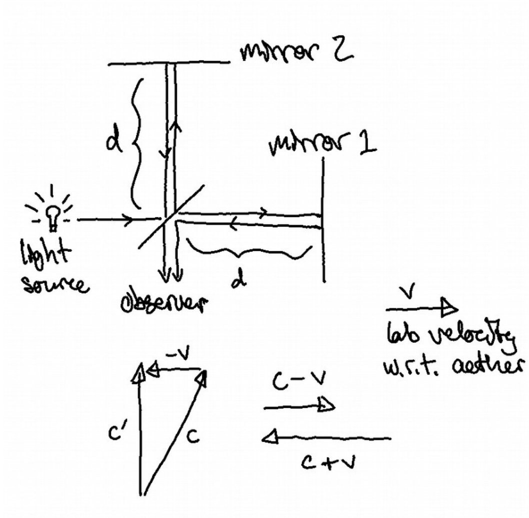

Figure 1: The Michelson-Morley experimental setup

In the Michelson-Morley interferometer, a collimated light source is directed toward a beam splitter, which directs the beam toward two mirrors along two separate perpendicular paths each with length *d*. The light is reflected from each mirror, travels back, recombines, and is sent toward a detector for observation. Michelson and Morley hypothesized that if their laboratory was moving at some velocity with respect to the aether (resting in the Marinov frame), they would observe a visual interference pattern in the form of fringes—a separation between areas of intensity. If the aether caused a phase difference between light along the two paths, each full wavelength of phase shift would result in an

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additional fringe observed. A fringe shift was therefore considered to be the number of wavelengths along which the phase was shifted.

Here we will review a derivation of Michelson-Morley's fringe shift calculation [4], and examine why their null result did not disprove the aether hypothesis. Michelson-Morley's experimental apparatus could be rotated in different orientations with respect to the hypothesized aether, however, to simplify our analysis we will consider the case in which the laboratory is moving in parallel along the path to mirror 1 with respect to the aether, as shown in figure 1.

The time for light to traverse the round trip path to mirror 1 is given by:
$t_1'=\frac{d}{c+v}+\frac{d}{c-v}=\frac{2dc}{c^2-u^2}=\frac{2d}{c}\frac{1}{1-\frac{v^2}{c^2}}=\frac{2d}{c}\gamma^2=t\gamma^2$, where γ is the Lorentz factor given by $\gamma=\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}>1$
and t is the expected roundtrip time in the Marinov frame.

Since $c^2=(c')^2+v^2$ by the Pythagorean theorem, the observed speed of light from the laboratory frame in the mirror 2 path is $c'=\sqrt{c^2-v^2}$, which holds for both directions (this is due to the fact that the actual path the speed of light is taking is $\vec{c}=\vec{c}'+\vec{v}$, which is longer than the observed path in the laboratory frame).

The time for light to traverse the round trip path to mirror 2 is given by:
$t_2'=\frac{2d}{c'}=\frac{2d}{\sqrt{c^2-v^2}}=\frac{2d}{c}\frac{1}{\sqrt{1-\frac{v^2}{c^2}}}=\frac{2d}{c}\gamma=t\gamma$.

It is important to note that in neither case is the speed of light *c* actually changing. Light is emitted at speed *c* with respect to the Marinov frame regardless of the laboratory's velocity *v*. However, because the laboratory is moving, the light appears to travel faster or slower from the laboratory perspective depending on its direction. The situation for light in this scenario is analogous to the way sound waves travel in Earth's atmosphere. Regardless of our velocity within the Earth's atmosphere, sound waves always travel at the same speed with respect to the frame of a stationary observer on the ground. However, in a fast-moving vehicle, a jet for example, the sound waves generated by the jet traveling in the same direction of the jet appear to be moving more slowly, from the jet's perspective, while sound waves moving away from the jet in the generation of the exhaust appear to be moving more quickly.

Because the speed of light is constant with respect to the Marinov frame in both scenarios, the optical path difference for the light is given by $ct_2'-ct_1'$, and the fringe shift according to Michelson and Morley is given by $\delta_n=\frac{ct_1'-ct_2'}{\lambda}=\frac{2d}{\lambda}(\gamma^2-\gamma)>0$, where λ is the wavelength of light in the laboratory frame.

Michelson and Morley did not observe any fringe shift during the course of their experiments, and this null result was taken as evidence against the aether hypothesis. However, there is a significant fault in their analysis: For there to be a difference in arrival time, there must also be a corresponding change in the observed speed of light down each path. By taking the speed of light to be the same along both

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optical paths, Michelson and Morley assumed their conclusion (technically speaking, Einstein's conclusion), which is that the speed of light is constant. This is a logical fallacy known as "begging the question".

If we assume that the energy of light given by $E=hf$ remains constant (after all, there is no reason for its energy to change), then in order for the apparent speed of light to change, its apparent *wavelength* must also change, since $c'=\lambda' f$, which will of course affect its phase. Thus, we cannot simply calculate fringe shift using the absolute speed of light—we must calculate the observed speed of light along each direction of travel, which affects the apparent wavelength of light along each direction of travel.

To do this, we derive a formula due to Klinaku [5] for calculating the Doppler shift in relation to an observer at an arbitrary angle. Consider figure 2, in which we have a stationary source at S_1 emitting waves traveling at speed c every T_s seconds. We see that after three emissions, the first wavefront reaches an observer at O located at a distance r_s from S_1. Now, consider the case when the source is moving at a velocity v along the x-axis. In both cases, the first wavefront reaches the observer at O in time t after three emissions. However, in the moving scenario, the distance r_o from the source to the observer is greater, so the three wavefronts must be divided by a larger distance when calculating their wavelength. By comparing the difference in wavelength between each scenario, we can determine the Doppler shift.

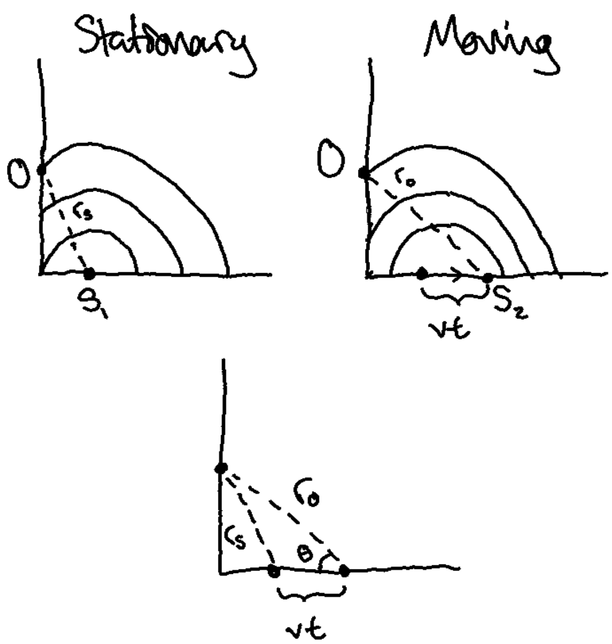

Figure 2: Doppler shift

From figure 2, using the Pythagorean theorem we can express the relation between distances as $r_S^2=(r_O\sin\theta)^2+(r_O\cos\theta-vt)^2=r_O^2-2r_O vt\cos\theta+(vt)^2$. We then apply the following substitutions: $r_S=n\lambda_S$, $r_O=n\lambda_O$ (where n is the number of wavelengths from source to observer), and $vt=v(nT_S)=vn\left(\frac{\lambda_S}{c}\right)$.

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Since a factor of n is applied to each substitution, these cancel and we are left with $\lambda_S^2=\lambda_O^2-2\lambda_O v\left(\frac{\lambda_S}{c}\right)\cos\theta+\left(\frac{v\lambda_S}{c}\right)^2$. We can treat this as a quadratic equation, and solving for λ_O we have $\lambda_O=\lambda_S\left(\frac{v}{c}\cos\theta+\sqrt{1-\left(\frac{v}{c}\right)^2\sin^2\theta}\right)$, a general formula for Doppler shift at an arbitrary angle.

Notice that for $\theta=0$, $\lambda_O=\lambda_S\left(1+\frac{v}{c}\right)$, and for $\theta=\frac{\pi}{2}$, $\lambda_O=\lambda_S\sqrt{1-\left(\frac{v}{c}\right)^2}=\frac{\lambda_S}{\gamma}$, which is the familiar Lorentz transformation, in agreement with the Ives-Stilwell experiment. Let us briefly mention here that this Lorentz transformation for motion transverse to an observer is responsible for the redshift of quasars. Although modern astrophysicists claim that quasars are not directly associated with their host galaxies, and interpret them as much more distant objects (sometimes traveling at superluminal velocities) being gravitationally lensed, it is clear from examples such as the Einstein cross that this interpretation is highly improbable, especially considering the clear observation of matter bridges connecting the quasars together (with said matter bridges also observed to be highly redshifted) [6].

Furthermore, let us note that if we apply our general Doppler transformation to a round trip, so that the second transformation is shifted by 180 degrees, using the identities $\cos(\theta+\pi)=-\cos\theta$ and $\sin(\theta+\pi)=-\sin\theta$ we obtain $\lambda_O=\lambda_S\left(\frac{v}{c}\cos\theta+\sqrt{1-\left(\frac{v}{c}\right)^2\sin^2\theta}\right)\left(-\frac{v}{c}\cos\theta+\sqrt{1-\left(\frac{v}{c}\right)^2\sin^2\theta}\right)=\lambda_S$. Thus, we can see that regardless of the position of our observer, a round trip journey will not result in any phase shift. This explains the Michelson-Morley null result.

The corrected fringe shift can be expressed as

$$\delta_n=\frac{c_1't_1'-c_2't_2'}{\lambda}=\frac{\lambda_1'f\,t_1'-\lambda_2'f\,t_2'}{\lambda}=\frac{\lambda_1't_1'-\lambda_2't_2'}{c}=\frac{t(\lambda_1'\gamma^2-\lambda_2'\gamma)}{c} .$$

Observed roundtrip time down either path can be expressed as

$$t'=\frac{d}{c_\uparrow'}+\frac{d}{c_\downarrow'}\Rightarrow\frac{1}{c'}=\frac{1}{2}\left(\frac{1}{c_\uparrow'}+\frac{1}{c_\downarrow'}\right)\Rightarrow\frac{1}{\lambda'}=\frac{1}{2}\left(\frac{1}{\lambda_\uparrow'}+\frac{1}{\lambda_\downarrow'}\right) .$$

For the mirror 1 path, $\frac{1}{\lambda'}=\frac{1}{2}\left(\frac{1}{\lambda_\uparrow'}+\frac{1}{\lambda_\downarrow'}\right)=\frac{1}{2\lambda}\left(\frac{1}{1-\frac{v}{c}}+\frac{1}{1+\frac{v}{c}}\right)=\frac{\gamma^2}{\lambda}$, thus $\lambda_1'=\frac{\lambda}{\gamma^2}$.

For the mirror 2 path, $\frac{1}{\lambda'}=\frac{1}{2}\left(\frac{1}{\lambda_\uparrow'}+\frac{1}{\lambda_\downarrow'}\right)=\frac{1}{2\lambda}\left(\frac{2}{\sqrt{1-\left(\frac{v}{c}\right)^2}}\right)=\frac{\gamma}{\lambda}$, thus $\lambda_2'=\frac{\lambda}{\gamma}$.

After substitution, we find that the corrected fringe shift is zero.

Let us note here that the formula supplied by Klinaku is presented for pedagogical clarity, not because Klinaku is the first to conclude that the Michelson-Morley experiment can be accounted for by classical Doppler shift. The possibility that the Michelson-Morley result might be explained by Doppler shift was originally proposed by the German physicist Woldemar Voigt [7] in 1887, although Voigt was not able to provide the correct analysis of the experiment at the time and later withdrew his objections after

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discussion with Lorentz. Furthermore, as early as 1983 J.P. Wesley published a paper [8] hypothesizing that the Michelson-Morley result could be explained by a Voigt-Doppler effect, which differed slightly from the classical Doppler effect. Later, in 2006 he amended his argument [2] and concluded that the Michelson-Morley result is satisfactorily explained by the classical Doppler effect.

In 2001, Norbert Feist [9] conducted an experiment duplicating the Michelson-Morley null result for sound, using a high-frequency sound generator along with a reflecting surface mounted on the roof of an automobile. He made a series of runs at speeds varying from 0 to 120 km/hr at a variety of angles between 0 and 90 degrees, and generated a series of curves validating Klinaku's formula, indicating that the roundtrip phase shift for sound is also zero degrees. In 2013, Randy Wayne at Cornell conducted a well-designed modern reproduction of the Fizeau experiment [10] in which he convincingly demonstrated that the interference pattern was more accurately predicted by classical Doppler theory than by Newtonian (Galilean) theory or special relativity.

The Sagnac effect and the Hafele-Keating experiment

We note here briefly that the Sagnac effect is also simply explained by the existence of a Marinov frame. Relativistic experiments such as the Hafele-Keating experiment can be interpreted as a type of Sagnac interferometer using planes and clocks. The clocks in this scenario perform a function similar to light clocks as envisioned by Max Born—since they rely on an electromagnetic mechanism, the difference in synchronization is an optomechanical effect rather than a dilation of time itself. In fact, the Hafele-Keating experiment is, if anything, evidence against the theory of relativity since—all reference frames being equal—each plane travels the same distance, therefore one should be able to argue that one plane's clock should run ahead as easily as the other. Or, one might expect both clocks to remain synchronized since each travels the same distance at the same speed, and should experience the same amount of time dilation. The fact that this is not observed is evidence that the planes are traveling in opposing directions within a frame (the Earth's) that is rotating with respect to a separate frame of reference.

Particles

Here we develop the ideas which we will use for deriving our general field density law, from which Newton's universal law of gravitation and Coulomb's electrostatic law follow.

Axioms

1. All particles are defined by two fundamental properties: mass and spin. Mass can be positive or negative, but not zero. Particles with negative mass, for example, are known as antimatter. Spin is quantized along zero, one, or two spatial axes.
2. Particles can be compelled to move along a particular vector, which we call a force vector *F*, as a result of interaction with other particles. Force vectors act colinearly between two interacting particles, so that $F_{12}=-F_{21}$. We define a particle's acceleration as $\frac{d^2r}{dt^2}=\frac{F}{m}$. We define energy as a force over a specified distance, so that $E=\int F\cdot dr$. We define momentum as a force over a specified time period, so that $P=\int F\,dt$.

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3. We quantify the interactions of particles as spatiotemporal energy, which is collectively conserved by all particles. The sum spatiotemporal energy of the universe is zero. All energy is spatiotemporal energy, thus energy cannot be transmuted to different forms of energy.
4. A graviton is a particle containing a fundamental unit of mass and zero spin. Gravitons, which mediate the gravitational force, acting as virtual photons, travel with infinite speed and transfer momentum but not energy.
5. The speed of light is constant with respect to an absolute universal reference frame. For observers moving in other reference frames, the speed of light is quantized and has a time derivative given by $\frac{dc}{dt}=\frac{1}{4c}$.

Properties

All particles are defined by two properties: mass and spin. Furthermore, their spatial movements are specified by two variables: position and velocity. As spinning particles move through space, their spin gives them a measurable wavelength and frequency. The wavelength component of their spin can be expressed as a type of energy which we will call *spatial energy*, while the frequency component can be expressed as *temporal energy*. While we may refer to each type separately for convenience, both types of energy refer to a single interchangeable quantity which we call *spatiotemporal energy*. Mass can be positive or negative, and is collectively conserved by all particles in the universe, so that the total mass of the universe is zero. In addition, spatiotemporal energy is also conserved. The conservation of mass can be stated as a corollary of the conservation of spatiotemporal energy.

Because fundamental particles are defined only by mass and spin, they do not have a physical size in the classical sense (meaning that they do not have a radius that defines a boundary of where the particle ends and something else begins). If particles did have such a radius, this would require a third property to define them. Since particles do not have a physical size, angular frequency and wavelength cannot be understood in exactly the same sense as their classical interpretations. We suggest that spatial energy can be understood as an oscillation of a particle's movement through space, while temporal energy can be understood as an oscillation of a particle's movement through time.

Spatiotemporal energy

Classically, the energy of a propagating string is given by $E=\frac{1}{2}\mu\lambda\omega^2 A^2$, where μ is the string density, λ is the wavelength, ω is the angular frequency, and A is amplitude of the string wave. A classical string is not quite analogous to a propagating particle, however, because a particle exists as a dimensionless point and therefore does not physically rotate in the classical sense (it merely interacts as if it does), and neither does it have a physical amplitude.

Thus, in our modification of the classical energy equation we remove the amplitude term altogether and define the spatiotemporal energy of propagating particle as $E=\frac{1}{2}\mu^\Phi\lambda\omega^2$, where $\mu^\Phi=\frac{m^\Phi}{2\pi}\left[\frac{kg\cdot m}{rad}\right]$ is the string flux (with $m^\Phi[kg\cdot m]$ as the mass flux), λ is the wavelength, and ω is the angular frequency. Note that this energy expression is not postulated; it can be derived from $E=\int F\cdot dr=\int (m\ddot{r})\dot{r}\,dt$, using

$r=\frac{2}{k}\sin\left(\frac{\omega t}{2}\right)$ and $m=k\,m^{\Phi}=\left(\frac{\omega}{c}\right)m^{\Phi}$, integrating from 0 to T/2. Using mass flux, we can express spatiotemporal energy as $E=\frac{m^{\Phi}\lambda\,\omega^2}{4\pi}$.

For a string propagating with constant velocity, $c=\frac{\omega}{k}$, so $\omega=k\,c$, and $\lambda=\frac{2\pi}{k}$, so for spatial energy we can write $E_k=\frac{1}{2}\left(\frac{m^{\Phi}}{2\pi}\right)\left(\frac{2\pi}{k}\right)(k\,c)^2=\frac{1}{2}m^{\Phi}c^2k$.

Similarly, for temporal energy we can write $E_{\omega}=\frac{1}{2}\left(\frac{m^{\Phi}}{2\pi}\right)\left(\frac{2\pi c}{\omega}\right)\omega^2=\frac{1}{2}m^{\Phi}c\,\omega$. Using our mass flux relations $m=k\,m^{\Phi}=\left(\frac{\omega}{c}\right)m^{\Phi}$, E_k and E_{ω} can each be alternately expressed as $E_k=E_{\omega}=\frac{1}{2}m\,c^2$, the formula for *kinetic energy*. Thus, we can say they are simply two convenient names for the same quantity, which we refer to as spatiotemporal energy.

For comparison, the derivation of kinetic energy from classical mechanics is:
$E=\int F\cdot dr=\int\left(m\frac{dv}{dt}\right)dr=\int\left(m\frac{dv}{dt}\right)\frac{dr}{dt}dt=\int\left(m\frac{dr}{dt}\right)\frac{dv}{dt}dt=\int m\,v\,dv=\frac{1}{2}m\,v^2$. Let us note that in this derivation, by canceling *dt*'s we have (through an abuse of notation) stealthily assumed position and velocity to be changing with respect to the same variable, which we cannot assume in general. To make this more clear, we can distinguish these variables so that $E=\int F\cdot dr=\int\left(m\frac{dv}{dt}\right)dr=\int\left(m\frac{dv}{dt}\right)\frac{dr}{dt'}dt'=\int\left(m\frac{dr}{dt'}\right)\frac{dv}{dt}dt'$, which cannot be immediately integrated.

When velocity changes over time, we call this energy *potential energy*. For example, for gravity acceleration is $g=\frac{dv}{dt}=\frac{G\,M}{r^2}$, so energy is expressed as $E=\int F\cdot dr=\int\left(m\frac{dv}{dt}\right)dr=\int\frac{G\,M\,m}{r^2}dr=-\frac{G\,M\,m}{r}$. In both cases, the fundamental rule is $F=\frac{dE}{dr}$ (which is often expressed as $F=-\nabla U$, confusing students into believing that potential and kinetic energy are mysteriously different).

We can fundamentally define both energy and momentum in terms of force: $E=\int F\cdot dr$, and $P=\int F\,dt$. Unfortunately, we do not have an exact mathematical definition for force. We merely say that it is something that compels an object to move along a particular vector as a result of an interaction.

Deriving the de Broglie relations

From Newton's laws, $F=\frac{dE}{dr}=\frac{dP}{dt}$, thus any change in momentum is given by $dP=\frac{dE}{dv}$.
Recall that temporal energy is given by $E_{\omega}=\frac{1}{2}m^{\Phi}c\,\omega$. Therefore, let us guess that the mass flux of a photon is $m_{\gamma}^{\Phi}=\frac{2\hbar}{c}[kg\cdot m]$ (we justify this guess in our discussion of the quantization of frequency and wavelength). Substituting this into our equation for temporal energy, we have $E_{\omega}=\hbar\,\omega$, consistent

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with de Broglie. We can also use spatial energy and the mass flux of a photon to derive the de Broglie relation for energy: $E_k = \frac{1}{2} m_\gamma^\Phi c^2 k = \hbar c k$ (commonly expressed as $E = \frac{hc}{\lambda}$).

Let us note that these equations show it is possible for a particle to increase or decrease its velocity without changing its spatiotemporal energy. For example, suppose a particle increases its velocity by increasing its wavelength without altering its spin. In this case we can see that spatiotemporal energy remains constant, even though from a classical perspective, kinetic energy has increased. This apparent contradiction arises from the fact that in our derivation for kinetic energy, we assumed that position and velocity change with respect to the same variable *t*. If this is not the case, we cannot correctly express kinetic energy as $E = \frac{1}{2} m v^2$! Recall that our derivation of spatiotemporal energy requires evaluating $E = \int F \cdot dr = \int (m\ddot{r}) \dot{r}\, dt$, in which *dt* is not canceled, so the classical formula for kinetic energy is not applicable. Thus, photons (and other particles) can change velocity—around gravitational objects or when refracting through different mediums, for example—without their spatiotemporal energy changing, and this does not contradict classical mechanics.

Keeping $E_k = \frac{1}{2} m^\Phi c^2 k$ in mind for spatial energy, the change in momentum of a photon is thus given by $dP = \frac{dE}{dc} = m^\Phi c k$. Again substituting the mass flux of a photon, we have $dP = 2\hbar k$ and $P = 2\hbar k n$. For electrons, we have $m_e^\Phi = \frac{\hbar}{c} [kg \cdot m]$, so that $E_\omega = \frac{1}{2} \hbar \omega$, $dP = \hbar k$, and $P = \hbar k n$.

Gravitons

Gravitons consist of one fundamental unit of mass and do not have spin, and thus do not have spatiotemporal energy. Because they have no spatial energy, they have a wave number of zero (or alternatively, a wavelength of infinity), and because they have no temporal energy, they have an angular frequency of zero (or alternatively, an oscillation period of infinity). For these reasons, they are understood to travel with infinite speed. While gravitons cannot transfer energy, we will see that they can (and do) transfer momentum.

We may distinguish particles from gravitons by considering particles to be spinning clusters of gravitons. For example, photons, protons, and electrons are all examples of common particles. (Neutrons, on the other hand, are composed of a bonded proton, electron, and antimatter component of a neutrino, thus while they are particles, they are not fundamental particles.)

All particles continuously emit gravitons. Because the graviton travels with infinite speed, this means that every particle in the universe (which is fundamentally composed of gravitons) is potentially able to communicate instantaneously with any other particle in the universe, although in practice, graviton signals drop off quickly in intensity (due to the inverse square law for gravitational force) and gravitational objects tend to communicate locally.

Not only does this instant communication account for the fact that planetary orbits receive gravitational information instantly (there are a variety of observations that easily support this, such as the Poynting-Robertson effect, which could not exist unless there was an aberration between radiation pressure and gravitational force, as well as the fact that introducing an eight-minute time delay to numerical orbit calculations causes the Earth to roughly double its orbital distance around the sun in 1200 years [11]), this instant communication also resolves many of the current paradoxes and "spooky" (as described by Einstein) effects in quantum mechanics, such as the double-slit experiment and the EPR paradox, which seem to require faster-than-light communication.

These experiments will be discussed later in more detail in a discussion of quantum mechanics, but in essence, the simple resolution to these problems is that these effects are exactly what they seem to be: Information is communicated instantaneously throughout the universe via graviton interaction. Particles still travel along definite trajectories, as in classical mechanics, and cannot exist in two places simultaneously, but the instantaneous communication between them can cause their trajectories to change in ways that can be modeled using superpositions of waves.

Zero energy universe

The total spatiotemporal energy of all particles in the universe is always zero. We call this conservation rule the *zero energy universe*. While the sum total of energy is zero, particles may be created in pairs in a manner that preserves the zero energy universe. Thus, in a pair of two newly created particles, one will have positive mass while the other will have negative mass, and one will have positive spatiotemporal energy while the other will have negative spatiotemporal energy.

Energy transfer

Energy transfer occurs when two particles enter the same space in a manner that allows them to combine into one particle, or alternatively, the reverse process in which a single combined particle emits a new particle. For example, a cluster of spinning gravitons can be modeled as a single spinning graviton. This single large particle may emit smaller particles, losing mass and energy in the process.

From a quantum mechanical perspective, two particles occupying the same space are indistinguishable from a single particle (in quantum mechanical terms, they share the same wave function). Bose-Einstein condensates are an example of this. Because the photons in the condensate all occupy the same space and share the same wavelength and the same angular frequency, they can be treated as a single particle.

Transmutation

We define *transmutation* as the conversion of one type of energy (e.g., temporal energy) to another type of energy (e.g., mass energy, which is nonexistent in our model). While particles can transfer their energy from themselves to other particles, no transmutation of energy is allowed. Although energy cannot be transmuted, it may be created ex nihilo as long as the zero energy state of the universe is maintained. During particle pair creation, positive and negative energy is spontaneously created in equal quantities.

The equivalence principle

Broadly speaking, Einstein's *equivalence principle* is the postulate that experiments performed in a frame accelerated by a gravitational field should be indistinguishable from those performed in a non-accelerating frame. For example, an observer in a windowless spaceship that is falling freely toward a planet or a spaceship in orbit around a planet (since an orbit can be viewed as a type of free-fall with a constant tangential velocity), cannot determine whether the spaceship is in a gravitational field or is floating freely in space.

While the equivalence principle may appear unintuitive, anyone who has ridden a roller-coaster has experienced some measure of weightlessness during extended free-fall for themselves. NASA's KC-135A aircraft also relies on the equivalence principle to allow its occupants to experience temporary weightlessness during parabolic flight maneuvers. And of course, video from the International Space Station demonstrates that objects in orbit around the Earth also experience zero-gravity, despite the fact that they are still well within the Earth's gravitational well.

Meanwhile, anyone who has accelerated forward or stopped suddenly in a vehicle knows that we do experience inertia when accelerating or decelerating under the influence of non-gravitational forces. The inertial effects of acceleration also hold true in the vacuum of space—the science fiction TV series *The Expanse* (and its corresponding novel series), for example, accurately depicts the uncomfortable effects of high-g maneuvers during battles in space. While science fiction is certainly not a proof of the equivalence principle, the effects of equivalence have also been well-documented by experiment, for example in NASA's Zero Gravity Research Facility, where objects are studied during free-fall in a large vacuum chamber.

Thus, it is clear that there is something truly different about gravity in relation to other forces. Even though the form of Newton's law of universal gravitation, $F = G\frac{m_1 m_2}{r^2}$, is strikingly similar to Coulomb's law for electrically charged particles, $F = k_e\frac{q_1 q_2}{r^2}$, the mechanism of the force itself must be different. In fact, this difference can be attributed to the fact that the two forces are mediated in different ways—gravity by gravitons, and electromagnetism by photons.

We note that the equivalence principle is incompatible with the modern theory of electrodynamics, which asserts that accelerating charges produce radiation. It is also incompatible with the concept of negative mass, since negative mass would certainly be observed to accelerate in a gravitational field (away from the gravitational field), but would remain stationary in a non-accelerating frame. There are weaker versions of the equivalence principle that might accommodate such effects, but our intention here is not to salvage general relativity, but to explain the non-inertial properties of graviton interaction within a classical framework.

During gravitational acceleration, all particles are equally accelerated by graviton momentum transfer, and an observer in a spaceship isolated from any external forces would not be able to perform any experiment that might detect an increase in the spatiotemporal energy of all particles in the observer's ship (including the particles comprising the observer). This is because only the particles' wavelengths have increased, while their spin remained constant. Thus, if a large gravitational body is suddenly placed at a distance away from the ship (hopefully a long distance away), the ship will accelerate toward the source of gravity although its occupants will not experience (or be able to detect) any force of acceleration.

Electromagnetic force, on the other hand, *is* inertial, so if the spaceship suddenly fired its engines, its occupants would experience a force of acceleration. Suppose the rocket engines operated by the combustion of fuel, for example. The combustion of fuel is a chemical reaction that ultimately amounts

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to a form of electromagnetic interaction between different molecules, which rearranges the electron structures of atoms and causes them to combine in different ways while releasing electromagnetic radiation (perceived as heat and light) in the form of photons.

Because electromagnetic interaction is mediated by the exchange of photons, electromagnetic interaction changes the spin of particles aboard the ship, which can be measured as an increase in temperature, and is experienced as an inertial force. With electromagnetic interaction, it is important to note that during the ship's acceleration, this interaction travels primarily through surfaces on the ship. Thus, a rubber ball floating in the middle of the ship will appear to move backwards until it reaches the back wall of the ship, whereupon it experiences a measurable force from the back wall of the ship. Compare this to an acceleration caused by a gravitational field—the rubber ball would remain floating in the middle of the ship, appearing unaffected by external forces since all particles aboard the ship are being accelerated by gravitational interaction simultaneously.

Antimatter

Antimatter, which is composed of particles with negative mass, can be conceptualized as matter that moves backward in time. There is no experiment that an observer composed of matter could perform that would be distinguishable from an experiment performed by an observer composed of antimatter; the laws of physics are the same for both observers.

For two masses, the forces are attractive, so $F_{21}=\frac{Gm_1m_2}{r^2}$ and $F_{12}=-\frac{Gm_1m_2}{r^2}$. If $m_1 < 0$ or $m_2 < 0$, then the forces become repulsive, so that $F_{21}=-\frac{Gm_1m_2}{r^2}$ and $F_{12}=\frac{Gm_1m_2}{r^2}$. If both masses are negative, then the forces become attractive once more. From this argument, we can see that while matter-matter and antimatter-antimatter interactions are gravitationally attractive, matter-antimatter interactions are gravitationally repulsive. We note that the situation is reversed for electromagnetic interactions.

While particles and antiparticles may neutralize each other's masses to produce neutral composite particles, they do not "annihilate" each other on contact. We refer to "annihilation" as the phenomena in modern physics in which matter and antimatter appear to annihilate on contact, resulting in their conversion to energetic photons. We view this energy release instead as a fusion process.

Time

Time can be conceptualized as a parameterization of the universe's 3D spatial coordinate system. This is a convenient construction for understanding the evolution of the universe, but unlike spatial coordinates, time is not a physical property of the universe; only the present moment exists and the universe has no memory of its existence before the present moment—it only evolves according to its state in the present moment.

While we have a tendency to view our orientation in time as moving forward, this is only due to the fact that the entropy of matter increases in the direction we view as forward. However, the entropy of antimatter (composed of antigravitons) decreases with respect to our forward orientation, so antimatter

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appears to move backwards in time according to our perspective. Entropy itself, however, is merely a consequence of the evolution of the universe according to graviton and antigraviton interaction. From the perspective of antimatter, our motion (the motion of matter) through time is backward. All laws of physics appear the same regardless of whether an observer is made of matter or antimatter.

Because we only experience the present, we are biased to understand our motion through time as forward merely due to the increase of entropy in the direction we view as forward—our memories, our perceptions of the present, and our decisions all evolve according to our biased perception of our orientation in time. We believe that events in the past have already happened, while in fact the universe may be evolving toward the past or away from it. An observer made of antimatter also only exists in the present moment, and believes that events have occurred in an order opposite to an observer composed of matter. Yet the perceptions of both matter and antimatter observers are simultaneously correct.

While we believe that the past has already occurred and the future is undetermined, it may be instead that the future has already occurred and the past is undetermined. There is no experiment an observer could perform to know which is true, and in a sense there is no "true" direction, as the evolution of the universe in one direction is indistinguishable from the other. Our orientation in time is simply a construct that our minds have imposed on the present. In fact, perhaps our perspective on time itself is too provincial. The universe may exist in both the past and the future simultaneously. If its state changed in the past, our state in the present would also change in such a way that we would never know.

Because the universe is equally composed of gravitons moving "forward" in time as it is of antigravitons moving "backward", and these particles interact with one another, we can see that the present is a convergence of both past and future, and our present is influenced by our future as much as by our past. From our own plane of existence, we use a perception of cause and effect to navigate our world, but this is merely a crutch we have adopted due to the limitations of our large-scale, predominantly matter existence. On a higher plane of existence, it is possible that past, present, and future exist simultaneously, interacting continuously, and the concepts of cause and effect have little meaning.

Photons

Let us assume that between two massive bodies emitting gravitons, each graviton transfers the momentum of a photon (a virtual photon, since there is no time delay in transit) in the form of spatial energy. The classical momentum of an exchanged photon is given by $P=m_\gamma c$, where m_γ is the mass of a photon. Since $F=\dot{P}$, the force exerted by an individual photon is given by $F_\gamma=\frac{d}{dt}(m_\gamma c)=m_\gamma \dot{c}$.

General field density law

Let us define the unitary surface density as $\sigma_u=\frac{\Sigma F_\gamma}{\Phi}=1\left[\frac{u}{m^2}\right]$, where F_γ is the force of a photon, and is summed over all photons that would be emitted if the radiating body were converted to photons, $\Phi=\oint_s \boldsymbol{F}\cdot d\boldsymbol{A}\left[\frac{J\cdot m}{u}\right]$ is the flux of a field $\boldsymbol{F}\left[\frac{N}{u}\right]$, and [u] is a unit of the field type, e.g., [kg] for the gravitational field or [*C*] for the electric field. Thus, we can understand general flux as the emission of energy divided by the field line density of a field, which has units $\left[\frac{u}{m}\right]$. This is our general field density law, which we can use to derive the acceleration of a point mass due to gravity and the acceleration of a point charge due to electrostatic attraction/repulsion.

Gravitational field acceleration

From Gauss's law, gravitational flux is $\Phi_g=\oint_s \boldsymbol{g}\cdot d\boldsymbol{A}=\boldsymbol{g}\cdot 4\pi r^2\left[\frac{J\cdot m}{kg}\right]$, since the surface area of a sphere is $4\pi r^2$.

From our definition of unitary surface density: $\sigma_u\Phi_g=\Sigma F_\gamma=N_\gamma F_\gamma=\frac{M}{m_\gamma}F_\gamma=M\dot{c}[N]$, where N_γ is the number of photons, and we have used the relations $N_\gamma=\frac{M}{m_\gamma}$ and $\frac{F_\gamma}{m_\gamma}=\dot{c}$.

Substituting $\Phi_g=\boldsymbol{g}\cdot 4\pi r^2$, we have $\boldsymbol{g}=\frac{M\dot{c}}{\sigma_u 4\pi r^2}=\frac{1}{4\pi\vartheta_0}\frac{M}{r^2}\left[\frac{N}{kg}\right]$, where we define $\vartheta_0=\frac{\sigma_u}{\dot{c}}\left[\frac{kg^2}{J\cdot m}\right]$ as the gravitational permittivity constant. We can use the gravitational permittivity constant to express Newton's gravitational constant as $G=\frac{1}{4\pi\vartheta_0}\left[\frac{J\cdot m}{kg^2}\right]$. Alternatively, $\boldsymbol{g}=\frac{GM}{r^2}$ with $G=\frac{\dot{c}}{4\pi\sigma_u}\left[\frac{J\cdot m}{kg^2}\right]$. We can also use the gravitational permittivity constant to express gravitational flux as $\Phi_g=\frac{M\dot{c}}{\sigma_u}=\frac{M}{\vartheta_0}\left[\frac{J\cdot m}{kg}\right]$. We can interpret this result in more familiar terms as well. The number of photons *N* per kilogram exchanged from a mass *M* at a distance *r* is given by $N=\frac{N_\gamma}{\sigma_u 4\pi r^2}=\frac{\frac{M}{m_\gamma}}{\sigma_u 4\pi r^2}\left[\frac{1}{kg}\right]$, where N_γ is the total number of photons emitted from *M*, m_γ is the mass of a photon, and $4\pi r^2$ is the surface area of a sphere with radius *r*.

Substituting our formula for N_γ into our formula for force, we have:
$g=NF_\gamma=Nm_\gamma\dot{c}=\left(\frac{M}{m_\gamma\sigma_u 4\pi r^2}\right)m_\gamma\dot{c}=\left(\frac{\dot{c}}{4\pi\sigma_u}\right)\frac{M}{r^2}=\frac{GM}{r^2}$, where $G=\frac{\dot{c}}{4\pi\sigma_u}$. Note that the actual mass of the particle exchanged is irrelevant, since the number of particles exchanged is inversely proportional to their mass and the force is proportional to the particle mass. The important consideration is merely that a particle of some mass is exchanged. However, because we know that the particle exchanged imparts a force as if it is traveling at the speed of light, we infer that it must be a photon.
Gravitational acceleration can therefore be rewritten simply as $g=\frac{F}{m_g}=\frac{M\dot{c}}{\sigma_u 4\pi r^2}$, where m_g is a point mass. Notice the stark similarity between this formulation (involving the expression $M\dot{c}$) and Newton's second law $F=ma$. We can now understand the force of gravity from a mass *M* on a point mass m_g as the total force of all photons emitted from the gravitational body divided by the area over which that force is exerted times the field density of the area—this gives us the acceleration of a point mass at a distance. Thus, the force of gravity is a simple consequence of Newton's second law.

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Electrostatic field acceleration

From Gauss's law, electric flux is given by $\Phi_E = \oint_s \boldsymbol{E} \cdot d\boldsymbol{A} = \boldsymbol{E} \cdot 4\pi r^2 = \frac{Q}{\varepsilon_0}\left[\frac{J \cdot m}{C}\right]$, and similarly, the electric flux for a single charge is given by $\Phi_e = \oint_s \boldsymbol{E} \cdot d\boldsymbol{A} = \frac{e}{\varepsilon_0}\left[\frac{J \cdot m}{C}\right]$.

From our general field density law, $\sigma_u \Phi_E = \Sigma F_\gamma = N_\gamma F_\gamma$. Furthermore, $\sigma_u \Phi_e = N_{\gamma/C} F_\gamma = \frac{N_\gamma}{N_C} F_\gamma$, where $N_{\gamma/C} = \frac{N_\gamma}{N_C}$ is the number of photons per Coulomb.

Thus $\sigma_u \Phi_e N_C = N_\gamma F_\gamma = \sigma_u \Phi_E$, so we have $\Phi_E = \Phi_e N_C$.

Substituting our results from Gauss's law and using the relation $N_C = \frac{Q}{e}$,

$\boldsymbol{E} = \frac{\Phi_E}{4\pi r^2} = \frac{N_C \Phi_e}{4\pi r^2} = \frac{\frac{Q}{e}\left(\frac{e}{\varepsilon_0}\right)}{4\pi r^2} = \frac{1}{4\pi\varepsilon_0}\left(\frac{Q}{r^2}\right)\left[\frac{N}{C}\right]$, which is the electric field in Coulomb's law.

Note that the gravitational permittivity constant and the electric permittivity constant are both expressed with the units $\left[\frac{J \cdot m}{u^2}\right]$, and gravitational flux $\Phi_g = \frac{M}{\vartheta_0}$ is expressed analogously to electric flux $\Phi_E = \frac{Q}{\varepsilon_0}$.

We define the impedance of free space to be $Z_0 = 120\pi[\Omega]$. Thus, $k_e = \frac{1}{4\pi\varepsilon_0} = \frac{30}{120\pi\varepsilon_0} = \frac{30}{Z_0 \varepsilon_0} = 30c\left[\frac{J \cdot m}{C^2}\right]$.

The quantization of light

Let us notice that if $\frac{dc}{dt} = \frac{1}{4c}$, then $G = \frac{1}{16\pi c} \approx 6.636 \cdot 10^{-11}\left[\frac{m^3}{kg \cdot s^2}\right]$, which is less than the current measured value for the gravitational constant $G \approx 6.674 \cdot 10^{-11}\left[\frac{m^3}{kg \cdot s^2}\right]$ by about 0.5%. This is a significant difference. However, a team of Chinese researchers recently hypothesized the theoretical value for *G* presented here [12] and examined the experimental methods used to measure the gravitational constant. The researchers found that the weights in these experiments were treated as point masses rather than objects with surface areas. After applying a correction to account for the surface areas of these weights, they found that the error was reduced to less than 25 parts per million. Furthermore, the adjusted value of *G* also accounted for the anomalous precession of Mercury, one of the pillars of general relativity. Thus, let us assume $\dot{c} = \frac{1}{4c}$.

Differentiating our expression for group velocity, we have $\dot{c} = \frac{d}{dt}\left(\frac{\omega}{k}\right) = \frac{1}{k}\frac{d\omega}{dt} - \frac{c}{k}\frac{dk}{dt}$. For a photon with minimum spatial energy, $k=1$ and we have $\dot{c} = \dot{\omega} - c\dot{k}$. We can increase a particle's velocity by either increasing its spatial energy or its temporal energy independently. If we increase spatial energy, then $\dot{k}=0$ and $\dot{c} = \dot{\omega}$. If we increase temporal energy, then $\dot{\omega}=0$ and $\dot{c} = c\dot{k}$.

Thus, $\omega_n = n\dot{\omega} = n\dot{c} = \frac{n}{4c}$ and $k_n = \frac{\omega_n}{c} = n\frac{dk}{dt}$, so $\frac{dk}{dt} = \frac{1}{c}\frac{d\omega}{dt} = \frac{1}{4c^2}$.

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Minimum mass and energy of a photon

From de Broglie's relations, $E_n = \hbar\omega_n = \frac{\hbar n}{4c}$, so the minimum energy of a photon is $E_\gamma = \hbar\dot{c} = \frac{\hbar}{4c}$.
Furthermore, $E_n = \hbar\omega_n = \hbar n\dot{c} = \hbar n(4\pi G) = 2Ghn$, thus the minimum energy of a photon can also be expressed as $E_\gamma = 2Gh$.
To calculate photon mass, we substitute $G = \frac{1}{16\pi c}$ into
$E_\gamma = 2Gh = \frac{h}{8\pi c} = \frac{1}{2}m_\gamma c^2$, and obtain $m_\gamma = \frac{h}{4\pi c^3} = \frac{\hbar}{2c^3} \approx 1.96\cdot 10^{-60}[kg]$. Note that the currently accepted experimental upper bound on the mass of a photon is approximately $4\cdot 10^{-51}[kg]$ [13], which is roughly 1 billion times greater than its predicted mass here.

Quantization of frequency and wavelength

Since $f_n = \frac{\omega_n}{2\pi} = \frac{n\dot{c}}{2\pi} = \frac{n}{8\pi c} = \frac{c}{\lambda_n}$, we infer that frequency is quantized by $f_n = \frac{n}{8\pi c}$ and the quantized wavelengths of light are given by $\lambda_n = \frac{8\pi c^2}{n}$, with the largest possible wavelength of light given by $\lambda_1 = 8\pi c^2$.
Since $k = \frac{2\pi}{\lambda}$, we have $k_n = \frac{n}{4c^2}$ from our expression for quantized wavelength, and similarly $\frac{dk}{dt} = \frac{1}{4c^2}$. We can also see this by examining the first two terms of k_n: $k_0 = \frac{2\pi}{\infty} = 0$ and $k_1 = \frac{2\pi}{\lambda_1} = \frac{2\pi}{8\pi c^2} = \frac{1}{4c^2}$, thus $\frac{dk}{dt} = \frac{1}{4c^2}$. From our expression for spatial energy, $E_k = \frac{1}{2}m_\gamma^\Phi c^2 k = \hbar ck$, and the minimum energy of a photon is again $E_\gamma = \hbar c k_1 = \frac{\hbar}{4c}$.
While we posit that the speed of light is variable, note that when the speed of light is constant, the phase velocity is given by $c = \frac{\omega}{k}$. Differentiating both sides with respect to time, we then have $\dot{c} = \frac{\dot{\omega} - \dot{k}c}{k} = 0$, which gives us the group velocity $c_g = \frac{d\omega}{dk}$. Notice that for $\frac{d\omega}{dt} = \frac{1}{4c}$ and $\frac{dk}{dt} = \frac{1}{4c^2}$, $c_g = c$. This gives us some confidence that at the very least, we expect $\dot{\omega} \propto c^{-n}$ and $\dot{k} \propto c^{-n-1}$, and this is obeyed by our expressions for $\dot{\omega}$ and $\dot{k}$.

Thus far we have not used the mass of a photon m_γ, although we have defined the mass flux of a photon as $m_\gamma^\Phi = \frac{2\hbar}{c}[kg\cdot m]$. Let us posit that, similar to Gauss's law for an electron, there is a fundamental wave number k such that $m_\gamma^\Phi = \frac{m_\gamma}{k}$. Recalling that $k_1 = \frac{2\pi}{\lambda_1} = \frac{2\pi}{8\pi c^2} = \frac{1}{4c^2}$, for a photon with minimum possible energy we have $k = k_1 = \frac{1}{4c^2}$. We then have $m_\gamma = k_1 m_\gamma^\Phi = \frac{1}{4c^2}\left(\frac{2\hbar}{c}\right) = \frac{\hbar}{2c^3} \approx 1.96\cdot 10^{-60}[kg]$, in agreement with our previous calculation.

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Photons per Coulomb

We can use our formula for m_γ to calculate $N_{\gamma/C}$: $N_{\gamma/C}=\frac{\Phi_e}{F_\gamma}=\frac{1}{F_\gamma}\left(\frac{k_e e}{r^2}\right)$. Since $F_\gamma=m_\gamma\dot{c}=\frac{\hbar}{2c^3}\left(\frac{1}{4c}\right)=\frac{\hbar}{8c^4}[N]$ (and interestingly, $m_\gamma=m_\gamma^\Phi\left(\frac{\dot{c}}{c}\right)$), the number of photons per Coulomb exchanged at a distance r is: $N_{\gamma/C}=\frac{8c^4}{\hbar}\left(\frac{k_e e}{r^2}\right)=\frac{240c^5}{\hbar}\left(\frac{e}{r^2}\right)\approx\frac{8.55\cdot10^{59}}{r^2}\left[\frac{1}{C}\right]$.

Planck length and the energy of a photon

We can express the minimum energy of a single photon as $E_\gamma=\frac{1}{2}m_\gamma c^2=\frac{1}{2}\left(\frac{\hbar}{2c^3}\right)c^2=\frac{\hbar}{4c}=\hbar\dot{c}=\hbar c\dot{k}=2Gh$ (and for a photon in general, $E_n=nE_\gamma$).

We can use $E_\gamma=2Gh$ to calculate the Planck length, if we interpret this to be the distance at which two photons with minimum energy can escape their gravitational attraction. From $\frac{Gm_\gamma^2}{r_P}=2Gh$, we have $r_P=\frac{m_\gamma^2}{2h}=\frac{2Gm_\gamma}{c^2}=\frac{\hbar}{16\pi c^6}\approx2.98\cdot10^{-87}[m]$.

The fine structure constant

If we consider the number of photons per Coulomb to be a function of distance, so that $N_{\gamma/C}(r)=\frac{8c^4}{\hbar}\left(\frac{k_e e}{r^2}\right)$, then we can express the fine structure constant as $\alpha=eN_{\gamma/C}\left(\sqrt{8c^5}\right)=\frac{k_e e^2}{\hbar c}=\frac{30e^2}{\hbar}\approx\frac{1}{137.027}$. $r=\sqrt{8c^5}$ is a convenient choice for distance since the units of $F_\gamma r^2=\frac{\hbar}{8c^4}r^2[N\cdot m^2]$ and $\hbar c[N\cdot m^2]$ both match, creating the appearance of a dimensionless constant that relies on the speed of light. In reality, the square root of any speed to the 5th power could have been substituted for r and $eN_{\gamma/C}(r)$ would still be a dimensionless quantity.

Derivation of cavity modes in black-body radiation

Black-body radiation is defined as the energy density $\rho_B=S_f E(f,T)$, where energy as a function of frequency and temperature is defined as $E(f,T)=\frac{hf}{e^{\frac{hf}{k_B T}}-1}$, S_f is the number of cavity modes, and the Planck volume V_P is $V_P=\frac{1}{S_f}$. For quantized frequencies, $f_n=nf_1$ and the number of cavity modes becomes $S_{f_n}=\frac{8\pi f_n^2}{c^3}=n^2 S_f$, with the cavity mode coefficient $S_f=\frac{8\pi f_1^2}{c^3}$. From our new definition of S_f, we define a Planck volume $V_P=\frac{1}{S_f}$ and redefine black-body radiation as $\rho_B=n^2 S_f E(f,T)=n^2\frac{E(f,T)}{V_P}$. Here we will derive the cavity mode coefficient S_f.

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Define a unitary specific weight as $\gamma_u=\rho_u g_u=1\left[\frac{N}{m^3}\right]$, with the unitary density $\rho_u=1\left[\frac{kg}{m^3}\right]$ and unitary acceleration $g_u=1\left[\frac{m}{s^2}\right]$. Let us define a Planck mass and volume $m_P=\rho_u V_P$, a Planck force $F_P=m_P g_u$, so that $\gamma_u=\rho_u g_u=\frac{m_P}{V_P}\frac{F_P}{m_P}=\frac{F_P}{V_P}$, and a Planck energy $E_P=F_P r_P$.
Furthermore, let us define the Planck energy as the energy of a system of two photons that have escaped each other's gravitational attraction, so that $E_P=2E_\gamma$. Thus, $V_P=\frac{F_P}{\gamma_u}=\frac{E_P}{\gamma_u r_P}=\frac{2E_\gamma}{\gamma_u r_P}$.

Substituting $E_\gamma=\frac{\hbar}{4c}$ and $r_P=\frac{\hbar}{16\pi c^6}$ as calculated previously, we have $V_P=\frac{2\left(\frac{\hbar}{4c}\right)}{\gamma_u\left(\frac{\hbar}{16\pi c^6}\right)}=8\pi c^5$ (dropping our unitary specific weight factor) . Using $f_1=\frac{1}{8\pi c}$, $V_P=8\pi c^5=\frac{(8\pi c)^2 c^3}{8\pi}=\frac{c^3}{8\pi f_1^2}=\frac{1}{S_f}$, and we have $S_f=\frac{8\pi f_1^2}{c^3}$ as expected.
Thus, we can express Planck mass and Planck force (ignoring different units) as $m_P=F_P=8\pi c^5$, and Planck energy as $E_P=\frac{\hbar}{2c}$.

Cosmology

Cosmic background radiation

Spontaneous graviton emission may occur (in the void of space, for example) in which graviton-antigraviton pairs arise as particles with spin. Usually, this spin is just one quanta of spin energy above the ground state—higher levels become increasingly improbable.

There are two main ways particles may develop spin. In the first method, all of the particle's spin is along a single axis. In the second method, the particle's spin is split between two of its three axis, so along two axes the particle has a spin of 1/2 a quanta, and along the third axis it has zero spin. In both methods, rotational energy is the same. Particles that form via the first method are called spin-1 particles, also known as bosons, whereas particles that form via the second method are called spin-1/2 particles, also known as fermions.

Modern physics has a serious unresolved problem known as the "spin crisis", because it posits new subatomic particles, such as quarks and gluons, to make up protons. However, since the proton always has a charge of +1, these quarks have fractional charges, come in triplets, obey "new" conservation laws called "color" and "flavor" (properties that obviously have no classical analogue), and there is no clear way of combining them to create a spin-1/2 particle. Of course, there is no clear way of combining these quarks and gluons because these particles do not exist.

Fermions and bosons have several important differences. First, fermion particles cannot combine, so they always remain separate particles. The reason fermion particles cannot combine is because in order for a system of two particles to combine, the system must be indistinguishable after a 180 degree

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rotation. However, due to quantum mechanics, spin-1/2 particles only "rotate" halfway around their axes after a full rotation, which makes it impossible to swap the particles in a way in which the swapped particles would be indistinguishable. Thus, the probability of finding both particles in the same rotational state in the same position is zero.

Bosons, on the other hand, rotate the way classical intuition would expect, and have no difficulty combining. Most bosons in the universe have just one quanta of gravitons, and are known as photons. Photons (and antiphotons) are the particles that mediate electromagnetic radiation.

The second important difference between bosons and fermions is that newly created fermions in the energy level just above their ground state, which we will call E_1, cannot reduce their rotational energy by emitting a boson, since this would require the fermion to lose a full quanta of spin from one of its axes, while it can only afford to lose 1/2. This means that while these fermions can absorb bosons or deflect bosons, they cannot emit radiation from E_1, making them difficult to detect. (Bosons in their first energy level cannot reduce their rotational energy by emitting a boson either, but this has little significance since they are already bosons.)

When spontaneously emitted particle-antiparticle pairs are bosons, they are gravitationally repelled, and gain energy as they move apart. This spontaneous production of particles in the vacuum of space accounts for the uniform nature of the cosmic background radiation throughout the universe, which is observed to peak in the microwave region of the electromagnetic spectrum.

It is worth noting that the conventional Big Bang theory does not adequately explain all aspects of cosmic background radiation: If it originated from an early plasma stage of the universe, one would expect to observe the Lyman spectral series present in the absorption spectra; however, it is not. Furthermore, the sheer uniformity of the cosmic background radiation itself is problematic; if the radiation was truly generated during an early, embryonic stage of the universe, one would expect to observe structural anomalies present in the distribution of the radiation due to small asymmetries present in the early universe that would have been magnified with its expansion. However, this is not observed. The cosmic background radiation is close to perfectly uniform in all directions, suggestive of a significantly more recent origin.

Cosmic background radiation is absorbed by electrons over time, replenishing the loss of electron mass from graviton emission (but not the loss of proton mass—more on this later), and ultimately supplying electrons with the energy necessary to orbit their protons rather than being drawn inward from electromagnetic attraction. Contrary to the Big Bang theory, the energy we see and experience in our universe today was not imparted during its moment of conception. Certainly some energy was, but that energy has long since radiated away. The cosmic background radiation, which existed before our universe began and will remain after it ends, is the one true source of energy in our universe. Even the stars themselves are merely squeezing out from atoms the energy that was initially imparted by cosmic background radiation.

When the spontaneous emission of a particle-antiparticle pair consists of fermions, the fermions are drawn together electromagnetically until they reach close equilibrium distance between their electromagnetic attraction and gravitational repulsion, and form a neutrino. One of the fermions within the neutrino is gravitationally attractive while the other is gravitationally repulsive, so the neutrino will have a gravitational dipole moment. Because both fermions comprising the neutrino are in their E_1 energy level, they cannot (initially) emit any photons. Neutrinos created by this process are known as *dark matter*.

This fusion process to produce neutrinos releases energy, which comprises the cosmic background radiation. We can calculate the temperature of the newly created neutrinos by $T=\frac{m_\nu c^2}{6k_B}$ from the equipartition theorem. From Wien's law, the peak wavelength of this radiation is given by $\lambda_m=\frac{k_\omega}{T}=\frac{6k_B k_\omega}{m_\nu c^2}$, which corresponds to a neutrino mass of approximately $1.4\cdot10^{-39}[kg]$, which is roughly 100 times smaller than the currently accepted upper bound of $1.5\cdot10^{-37}[kg]$ for the neutrino mass.

Although these neutrinos are mass neutral, it is still possible for them to experience a net force in a gravitational field, since they will rotate themselves to align with nearby gravitational fields, and the subparticle closest to the gravitational source will experience slightly more attraction than the antisubparticle's repulsion. Since these neutrinos generally do not emit photons in the vacuum of space and are electrically neutral, their main form of interaction with the universe is gravitational, although it *is* possible for them to absorb or deflect photons, which in fact they do when they wander near sources of radiation.

Over large interstellar distances within galaxies, the gravitational dipoles of many neutrinos creates a gravitational dielectric, which strengthens the force of gravity over long distances and increases the rotational speed of galaxies, accounting for the anomalous observation that the amount of visible matter in galaxies cannot explain their rotational speeds.

Dark matter and electromagnetism

In particle physics, certain particles, such as the electron and the neutrino, have different versions of themselves that appear with the same integer charges, yet with higher masses. If electromagnetism is to be unified with gravity, this raises an interesting question: How can electromagnetism arise from gravity when it is not only much stronger, but also seems to be an innate property independent of a particle's gravitational field?

Recall from our discussion of dark matter that neutrinos pervade the universe. Each neutrino is composed of a gravitationally attractive particle and a gravitationally repulsive antiparticle, creating a gravitational dipole moment. When a neutrino wanders near a particle with a gravitational field, it quickly aligns itself with the field. This rapid alignment is allowable since gravitons travel with infinite speed, and they communicate their gravitational field to any passing neutrinos.

Furthermore, recall from our discussion of dark matter that cosmic background radiation and dark matter both stem from the same basic phenomena, the spontaneous emission of new particles in the vacuum. Thus, from our observations of cosmic background radiation and visible matter in the universe, we can estimate the ratio of photons to protons in our universe, and by extension, neutrinos to protons. We can also detect neutrinos directly and compare the results to our estimations. Using this

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method, we estimate that there are well over 1 billion photons and well over 1 billion neutrinos for every proton in the universe.

Since dark matter neutrinos in particular are very light and electromagnetically neutral, they generally pass through matter without difficulty. At the same time, since they are prone to clustering around gravitational fields, they should maintain their high ratios in proportion to protons and electrons, creating a dense field around ordinary matter. The density of this field will be consistent regardless of a particle’s mass, since the neutrinos will cluster together as tightly as possible.

Let us consider the case of a single proton surrounded by neutrinos. The gravitationally attractive ends of nearby neutrinos will face toward the proton, while the antigravitational ends of the neutrinos will face away. Similarly, additional layers of neutrinos encasing the proton will orient themselves in the same manner. As these neutrinos are compressed together, they will seek to release energy in the form of photons in order to nestle more closely together within the proton’s gravitational field. Since it is the antigravitational end of the neutrino dipole that is causing the resistance, the photon emitted will be an antiphoton.

Thus, we expect the neutrino field surrounding protons to emit antiphotons, and similarly we expect the neutrino field surrounding electrons (which are made of antimatter) to emit photons. It is easier conceptually to simply imagine the protons and electrons themselves to be emitting photons, so we will not emphasize this distinction in the following discussion.

Let’s now consider the case of two protons, as in figure 4. Each proton will emit antiphotons, which will create a repulsive effect between the two protons as the antiphotons transfer repulsive momentum to the two protons. Note that the antiphotons are not being absorbed by the protons, since positive and negative masses do not “annihilate” each other (though they may certainly release energy as they combine)—they merely transfer energy. In the case of a proton and electron, the proton will emit an antiphoton that will interact with the electron’s antigravitons to create an attractive force, while the electron will emit a photon that will interact with the proton, also creating an attractive force.

In both cases it is important to note that while the photons are mediating the electromagnetic force, they are not simply transferring information, but energy, and it is this transfer of energy (energy which ultimately originated from cosmic background radiation) that explains the staggering 10^{42} ratio between the strength of electromagnetism and the strength of gravity.

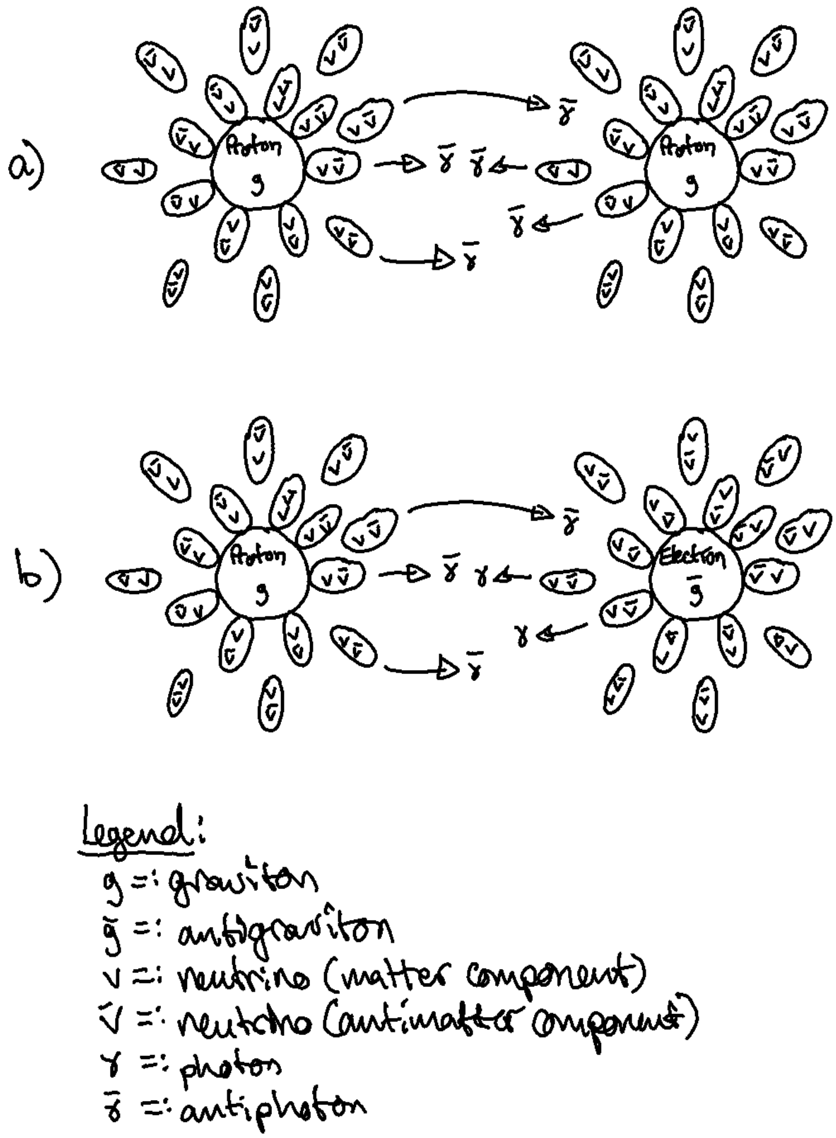

Figure 3: (a) Proton-proton repulsion and (b) proton-electron attraction

One might wonder, how it can be possible for electrons to be antigravitational? First, let us note that both positive and negative mass solutions are produced by Dirac's equation (although it is a relativistic equation), meaning that both are possible. Furthermore, one must note that the gravitational effect upon a single electron is extremely minute, and is usually dominated by electromagnetic effects in nature (protons are currently measured to have 1836 times the mass of electrons).

In semiconductor physics, electrons are routinely treated as having "negative effective mass" in order to make successful calculations. One might surmise that if electrons were to have negative mass, then it

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would be possible to make objects levitate simply by charging them with very high voltages—and indeed, this is the the case, as evidenced by the Biefeld-Brown effect. We note that conventional explanations for the Biefeld-Brown effect, such as ion wind, utterly lack the capability to produce the levitation observed, even in theory, and are disproved by experiments demonstrating the Biefeld-Brown effect works under full vacuum, as well as a lack of any observable corona discharge.

Note that because the energy of the neutrino field is constant, and the physical size of a particle is constant regardless of the number of gravitons within (recall that gravitons are spin-zero and may occupy the same state), the electromagnetic fields generated by particles always have the same strength regardless of the particle's mass. This is consistent with the observation that particles in nature always have a single unit of charge (whether positive or negative) regardless of their mass.

Weber electrodynamics

In 1846, the German physicist Wilhelm Weber discovered that the forces exerted between electric charges could be described by the following formula: $\vec{F}_{ji}=\frac{q_i q_j}{4\pi\epsilon_0}\frac{\hat{r}_{ij}}{r_{ij}^2}\left(1-\frac{\dot{r}_{ij}^2}{2c^2}+\frac{r_{ij}\ddot{r}_{ij}}{c^2}\right)$.

In 1848, he further noted that this force could be simply derived from the potential energy formula $U=\frac{q_i q_j}{4\pi\epsilon_0}\frac{1}{r_{ij}}\left(1-\frac{\dot{r}_{ij}^2}{2c^2}\right)$. The advantages of this formula for describing electromagnetic forces, aside from reducing Maxwell's formulation from at least five separate equations down to one, are that Weber's formulation can be shown to obey Newton's third law, such that $F_{ji}=-F_{ij}$, as well as the fact that charges acting under Weber's force can be proven to obey the conservation of energy, linear momentum, and angular momentum. Furthermore, Weber's formulation handles discrete and continuous charge sources equally well, and predicts certain observed phenomena (such as longitudinal forces acting between colinear segments of current-carrying wires) that Maxwell's formulation does not [14].

Let us examine two charges acting under an electrostatic potential [15], so that $U=\frac{q_i q_j}{4\pi\epsilon_0}\frac{1}{r_{ij}}$. Suppose now that energy is transferred by photon emissions between the two charges, so that *U* is a function of time and energy arriving at q_i left q_j at an earlier time $t_j=t-\frac{r_{ij}}{c}$, so by differentiation we have $\frac{d}{dt}U(t_j)=U(t)\left(1-\frac{\dot{r}_{ij}}{c}\right)$, and similarly energy leaving q_i arrives at a later time $t_i=t+\frac{r_{ij}}{c}$ so that $\frac{d}{dt}U(t_i)=U(t)\left(1+\frac{\dot{r}_{ij}}{c}\right)$. For slowly varying effects we can express the mean interaction of the potential as $\left\langle\frac{dU}{dt}\right\rangle=U\sqrt{1-\frac{\dot{r}_{ij}^{\,2}}{c^2}}\approx\frac{q_i q_j}{4\pi\epsilon_0}\frac{1}{r_{ij}}\left(1-\frac{\dot{r}_{ij}^2}{2c^2}\right)$, using the binomial approximation. Let us note in passing that the former expression contains our familiar transverse Doppler shift: $\sqrt{1-\frac{\dot{r}_{ij}^{\,2}}{c^2}}=\frac{1}{\gamma}$.

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Thus, using a simple model of photon transfer, we are able to derive all of electrodynamics. We note that although gravitational and electrostatic forces both take the same mathematical form, their mechanism of energy transfer is different, which accounts for their disparity in strength. Objects in gravitational fields exchange gravitons as “virtual photons” instantaneously, and the source of these gravitons originates from the objects themselves. Electric fields, on the other hand, are generated by neutrinos residing in large halos external to the charges themselves, and actual photons are being exchanged between charges to transfer energy. Because these photons travel with a finite velocity c, there is a time delay in energy transfer, which leads to the force of electromagnetism as formulated by Weber. While the laws of electromagnetism are complex, the source of the complexity is very straightforward.

We note here briefly that we reject the standard explanation of photon propagation as an alternate induction of electric and magnetic fields. From a quantum mechanical perspective, photon polarization is mathematically equivalent to quantum spin, because the two are equivalent physically. We must also reject the standard explanation of electromagnetic radiation being generated by the acceleration of charges. Instead, it is clear that it is the *compression* of charges which generates radiation, analogous to the generation of sound waves in any medium. This model clearly explains the mechanism of radiation emission for everything from linear dipole transmitters to pulsars (in which charged particles spiraling along magnetic field lines are compressed together at the poles), which standard electromagnetic theory struggles to interpret. It also helps us understand how the neutrino field in figure 4 emits radiation.

The strong nuclear force, fission, and fusion

At very short distances from particles, neutrinos are too energetic to move in any closer, and the force of gravity once again dominates, acting as the strong force. In the case of two protons, for example, at long ranges the protons will repel each other electromagnetically, however, if this initial repulsion can be overcome so that the protons can be brought within a close range, the force of gravity will take over and the particles will enter a stable relationship. However, because the particles involved are both fermions, they can never fully merge together to occupy the same state, so they will remain separate particles despite their gravitational attraction. As the protons are compressed together, they will reduce their energy by releasing mass and temporal energy in the form of photons to enter a lower energy state at a closer distance. This “mass defect” that is carried away is the principle behind fusion.

Note that if energy is added to the system and the protons are brought back to a more distant position, electromagnetic repulsion will force the two particles far apart again at high speeds, releasing energy. This is the principle behind the fission of large atoms.

Protons and electrons may also enter stable relationships at close ranges to form neutrons, although in this case the electromagnetic force will be attracting the particles together until they reach a close distance where graviton-antigraviton repulsion pushes them back apart. In order for electrons to leave their orbits to move closer to protons, they must lose a significant amount of energy (again, as mass and temporal energy in the form of photons).

In modern physics, Coulomb's law predicts that the electromagnetic field approaches infinity as the distance from a charged particle (whether proton or electron) approaches zero. However, this creates a conundrum, since Einstein's mass-energy equivalence $E=mc^2$ predicts that since the energy of the

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field is infinite, the mass of the particle must also be infinite. This problem is unresolved in modern physics.

Note that there is no equivalent mass-energy equivalence here, since total mass remains constant in all interactions, thus it is no paradox for the gravitational field to approach infinity as distance approaches zero. While $E=mc^2$ may be a useful equation for approximating the energy released during fission/fusion, conceptually, it is not correct because mass and energy are not interchangeable. The mass and energy of our universe was originally produced during its genesis (more on this event later), and afterward continually replenished by spontaneous graviton emission.

Fusion is commonly believed to take place at high temperatures and require the same sorts of high energy collisions that release energy during fission. After all, the sun is hot and fusion takes place in the sun. But one can see from the above discussion that the ideal conditions for fusion are at high pressures and *low* temperatures. Fusion takes place within the sun due to the high pressure in its core *despite* its high temperature.

This explains why planets such as Jupiter (but not only Jupiter) emit far more radiation than they receive from the sun [16]. Conventional explanations offered for this effect involve heat being generated by leftover energy from Jupiter's formation, or the contraction of the planets in size [17], but these explanations are unconvincing and far from satisfactory. The simple, satisfactory explanation is that this excess heat is generated by fusion, caused by high pressure in the planet's core due to its gravity. Yet modern tokamak reactors attempt to achieve fusion under exactly the opposite of ideal conditions, at extremely high temperatures and low pressures. One can see exactly why such designs fail.

To summarize, the strong nuclear force is actually not a separate fundamental force, but arises from a combination of gravity and electromagnetism in two different ways, depending on the charges of the particles involved.

Hubble’s law

In 1928, the astronomer Edwin Hubble published a paper [18] in which he plotted the radial velocity (as calculated by Doppler redshift) of a number of galaxies and compared them to their distances from the Earth (estimated by luminosity), finding a linear relationship. Modern relativistic physics argues that this relationship indicates that the fabric of space in the universe must be expanding. Since space is not observed to expand in any Earth-bound laboratory, the theory is amended to limit the expansion only to distant areas of space which are not gravitationally bound [19], and conveniently, cannot be observed.

Here we can understand Hubble’s observations much more simply. Let us suppose that the universe at some time t_1 was contained within a radius of r_1, and all objects within the universe were given velocities by some mechanism (e.g., gravitational interactions) following a uniform random distribution (although the exact distribution is unimportant). Allow these objects time to move, assuming that all objects continue along with their initial velocities, then observe the universe again at time t_2.

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If we measure the new position of every object in our universe at t_2, we will notice a linear relationship (particularly strong at distances closer to the edge of the universe) between the positions and velocities of the objects in our universe at t_2: Namely, that the objects with the largest velocities at t_1 are now the most distant objects at t_2. By comparing the change in distance and the change in time for each object, we will find $v=\frac{r_2-r_2}{t_2-t_1}$, which we can rewrite as Hubble's law: $v=Hr$, where H is Hubble's constant [20].

While Hubble's law expresses a straightforward relationship, his observations are nevertheless vital evidence contrary to the steady state hypothesis, since the correlation between distance and velocity would likely not be observed unless the universe was in a phase of expansion.

Genesis, antigenesis, and dark energy

We are now in a position to understand the genesis of the universe. We hypothesize that spinning particles with mass in excess of a certain spin decay threshold will decay into lighter particles with less rotational energy. The amount of mass required to exceed the spin decay threshold increases inversely to the rotational energy of the particle (i.e., particles with less spin require more mass to exceed the threshold). For a fermion with just a single quanta of energy, the mass required to exceed the spin decay threshold is extremely large—large enough to account for all matter in the universe. Thus, the universe began as the spontaneous emission of an unstable universe-sized particle—the Original Particle—and a corresponding Original Antiparticle.

Under normal circumstances, a single fermion-antifermion pair with a significant amount of rotational energy would be drawn together by the electromagnetic force to form a stable nuclear bond. However, recall from the previous section on dark matter that fermions just above their ground state cannot emit photons, and thus cannot communicate electromagnetically. Thus, the universe could not immediately shed its mass via photon emission, and instead was forced to shed mass via a series of highly energetic spin decays, culminating in a universe primarily consisting of lighter, stable, fast-spinning particles, particularly protons and electrons, as well as many photons. The protons and electrons were quickly drawn together electromagnetically, creating hydrogen atoms, which then coalesced via gravitational attraction to form the first generation of stars.

Meanwhile, the antimatter universe particle was also expanding, although at a slower rate due to the fact that the entropy of the antimatter universe runs in reverse. The reversed entropy of the antimatter universe explains why we do not see large amounts of antimatter--the antimatter universe is still near the end stage of its existence, with most of its mass clustered together in antimatter black holes. The reversed entropy also explains how the universe can recombine with the antimatter universe during its antigenesis despite its gravitational repulsion.

Another reason why we do not observe large amounts of antimatter in the cosmos is because antiphotons are gravitationally repulsive, thus even the radiation that is emitted from the antimatter universe will be difficult (but not necessarily impossible) to detect. Antiphotons should refract negatively through matter since they will be sped up, thus the conventional telescopic lenses designed to detect radiation from matter may not work effectively to detect radiation from antimatter.

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The antimatter universe within our own also explains the "dark energy" that is accelerating the expansion of our universe (hopefully, by now it should be obvious why this is the case), as well as the unusually large "empty" voids in space that have been detected, such as the Bootes void, an enormous region of space 330 million light-years across that should statistically contain about 2000 visible galaxies. These voids are almost certainly occupied by antimatter.

We conclude that genesis of the Original Particle was therefore simultaneously the antigenesis of the Original Antiparticle, and the antigenesis of the Original Particle will be the genesis of the Original Antiparticle. This process is perfectly symmetric; therefore, if no matter is removed from the universe, it should continue indefinitely.

The antigenesis of the OA also reveals the fate of our own universe, although we could have also deduced this from the infinite speed and range of the graviton. Regardless of how far the universe expands, it is inevitably and inexorably drawn back to return to its ultimate fate, the antigenesis.

Philosophy

We do not discuss the religious implications of this theory here, except to note that we have posited a universe composed of a single fundamental substance, which communicates information instantaneously throughout the universe, is generated continuously throughout space, and may travel either forward or backwards in time.

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