The Thing That Is Space-Time

Numbers are fundamental to mathematics, sounds are fundamental to language, bits are fundamental to information processing, atoms are fundamental to ordinary mass, and cells are fundamental to living things. In general we know about our world by building with simple “fundamentals” to get our complex reality.

Historically we have thought of Space-Time as a void (nothing) within which the stars exist and which we live our lives. This changed about 100 years ago when Einstein argued successfully that Space-Time had the property of being curved. All of a sudden Space-Time became a thing that had properties.

This essay will focus on an aspect of light (electromagnetic radiation) and show that it has a fundamental aspect that can be interpreted as a quantum mechanical particle having mass. It will be argued that accumulations of this fundamental precursor of the photon on a large scale creates Space-Time with its curvature (aka gravity). This quantum mechanical particle will be called a *graviton*.

1. Two Previous Models of Gravity:

Newtonian Gravity: This theory postulates that masses attract each other. The equation describing this force is $F=GM_1M_2/d^2$. No quantum mechanics needed.

In spite of its simple formula, this Newtonian model of gravity is quite complex in that every mass in the universe connects to every other mass in the universe. And it gets much more complex when we consider that each mass can be divided into small masses about that of an eyelash (Planck masses) and each of these all connect together. This limit of the Planck mass will be derived shortly.

General Relativity: This theory also postulates that masses attract each other, but the masses do the attracting indirectly by curving spacetime. The key postulate is that mass curves space-time. Masses interacting in this mutually created space-time are then attracted to each by way of this space-time. No quantum mechanics needed.

2. Here is an outline of the presentation to follow:

A. An interesting asymmetry.

B. Gravitons fit the Planck-Einstein equation.

C. Fitting the graviton into Newton’s theory of gravity.

D. The mass of an individual graviton.

E. The Geometry of Dark Matter and Dark Energy.

F. Gravitons, the substance of space-time imitates an index of refraction.

G. Gravitons and Mach’s principle and why gyroscopes work.

H. Does this concept of “gravitons” as the building block of Space-Time make sense?

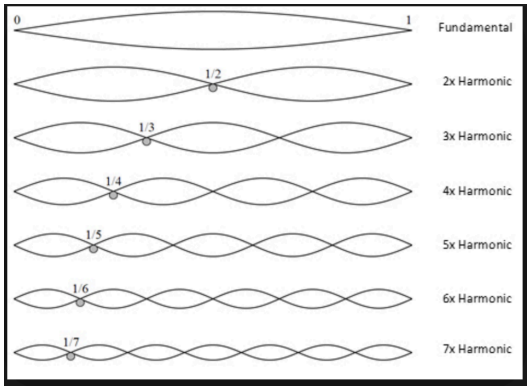
I. Does this graviton theory contradict Einstein’s general relativity theory.

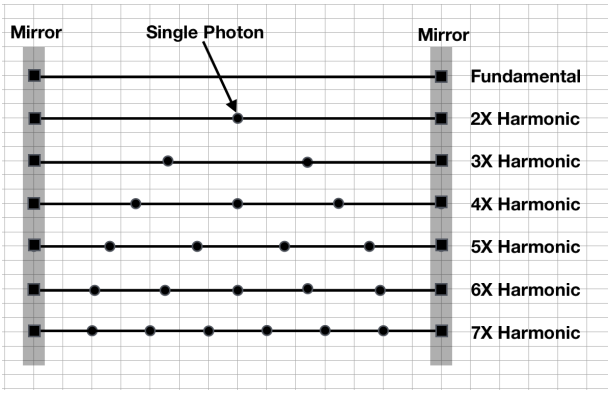
Why am I messing with Einstein’s general relativity?

I created this new concept of a graviton so that general relativity may be extended to the universe of dark matter and dark energy.

A. An interesting asymmetry.

Below is a diagram of what the harmonics of a guitar string look like. Also shown is a diagram of what the harmonics of photons looks like in a laser resonator. The two models of resonance, one classical, one quantum mechanical are very similar. However, there is a little asymmetry in that there is no photon present for the “fundamental” resonance of the photon.





The photons in the laser resonator are shown as dots that are spaced uniformly between two mirrors. The little squares imbedded in the mirrors show the contact mass needed to support the photon reflection.

I am going to argue that another more subtle particle, the graviton, has taken the place of the photon at the fundamental wavelength. This graviton placeholder for the photon has photon like attributes in that it obeys the Planck-Einstein equation but it is not massless like the photon. This graviton takes the form of a Compton wavelength ($\lambda=h/mc$) with a mass m.(Ref 1)

The graviton (the fundamental oscillation shown above) attracts its two square anchor points together with a force of gravity. The other photon harmonics shown in the resonator, have momentum (with no rest mass) and push outward against their respective mirror anchor points, and the more photons the more the repulsion.

An individual graviton's mass will be shown to be exceedingly small and has a wavelength that is exceedingly long. Detecting them individually will be difficult. However, we have recently been detecting them en mass on the cosmological scale as dark matter and dark energy.

B. Gravitons fit the Planck-Einstein equation.

The Planck-Einstein equation is: **$E = Nhc/\lambda$**

E-Energy **N-**Number of Photons **h-**Planck's Constant **c-**Speed of Light **λ-**Wavelength

The fundamental wavelength λ (shown in diagram above right) is also the distance **d** that separates things like stars (and the mirrors of lasers). We now have the total gravitational quantum energy connecting two objects as **$E = Nhc/d$** instead of **$E = Nhc/\lambda$**. We can convert the energy $E = Nhc/d$ to force by dividing by d to get **$F = Nhc/d^2$**. This is the force of attraction between the two anchor points in the mirrors.

C. Fitting the graviton into Newton's theory of gravity.

Newton's law of gravity is ($F = Gm_1m_2/d^2$). Let's combine ($F = Gm_1m_2/d^2$) and ($F = Nhc/d^2$) and solve for N. N is the number of gravitons connecting the two masses m_1 and m_2.

We get $N = Gm_1m_2/(hc)$. Note that h is the not reduced Planck constant.

> **A little digression concerning the Planck mass.** The symbol for the Planck mass is **P_m**.
> By definition the **$P_m^2 = (\hbar c)/G$** (Ref 2).
> Note that by definition $\hbar = h/2\pi$, and **P_m^2** can now be written in two ways, as
> **$P_m^2 = (hc)/(2\pi G)$** and as **$P_m^2 = (\hbar c)/G$.**

N can now be written as **$N = (1/2\pi)(m_1m_2/P_m^2)$.** This is the number of gravitons connecting two masses m_1 and m_2 that are not rotating with respect to each other.

For masses that are rotating about each other (as stars do in galaxies) the equation for N Is: **$N = m_1m_2/P_m^2$.** The factor of 2π is needed to distinguish between the two different geometrical configurations. These two different geometries that gravitons can take into account for whether the gravitons have a mass seen as dark matter (rotating in galaxies) or a mass seen as dark energy (extended between galaxies).

D. The mass of an individual graviton.

As before the Planck-Einstein equation for a single graviton is: $E = hc/d$.

This energy is equal to mc^2. And $mc^2 = hc/\lambda$

Solving for the mass of a single graviton we get **$m = h/(cd)$**.

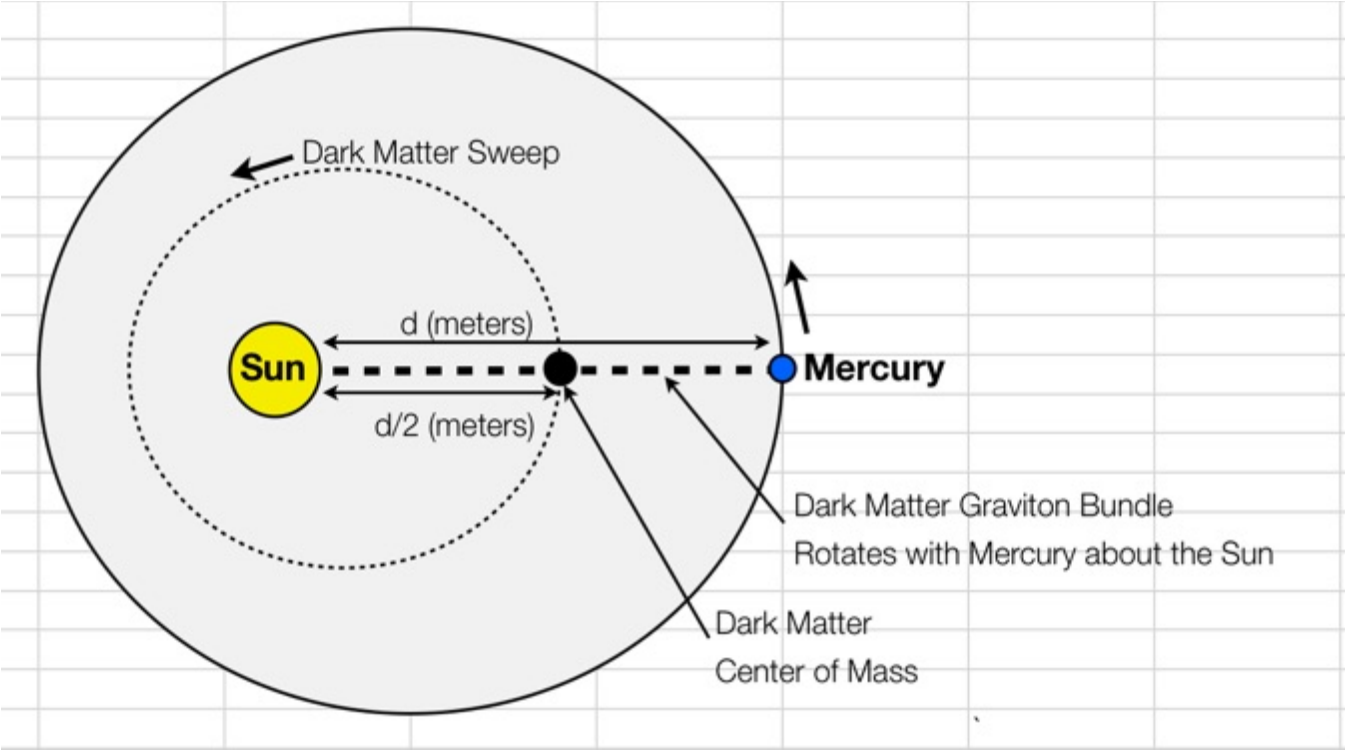
E. Dark Matter and Dark Energy.

Astronomer Tarun Souradeep authored a slideshow detailing how dark matter and dark energy are basically the same stuff. (Ref 3)

Why dark energy and dark matter are particular accumulations of graviton mass:

The mass of an individual graviton is obtained by combining the Planck-Einstein equation **E = hc/d** with $E = mc^2$ to get **m = h/dc**. This massive graviton can connect cosmological mass that are in two basic configurations: rotating assemblies of mass (galaxies and planetary systems) and linear intergalactic assemblies of far field mass (as seen via the Hubble telescope). (Ref 4)

Galaxy and Planetary Dark Matter Gravitons: In individual galaxies the stars are relativity close together and are usually rotating about a core. In this instance we speak of the dark matter contained in the galaxy because we can see the galaxy has an unexpected rotation due to the dark matter mass. This extra mass comes from the gravitons connecting the individual stars in the galaxy. These gravitons have more mass than intergalactic gravitons because they are separated by smaller distances d. The simplest cosmological rotating mass systems are planetary systems. Below is a diagram of Mercury rotating about the Sun showing its dark matter graviton bundle. See (Ref 5) for a detailed calculation of Mercury’s precession using gravitons.



French astronomer Urbain Le Verrier predicted that a planet (Vulcan) was causing Mercury's precession (Ref 6). According to Tom Levenson, "Vulcan is remarkable because the idea of this little body inside the orbit of Mercury makes perfect sense," (Ref 7). The work presented here shows that Le Verrier was on the correct track. There is a mass between Mercury and the Sun. This mass consists of a bundle of long-wavelength gravitons with a mass value of 05.3 x 10^{16} kg.

Dark Matter as developed here, is a line of mass (a bundle of gravitons) that connects Mercury and the Sun which has a mass of about a million kg per meter for 5.76 x 10^{10} meters. And the question is, why can't we see this huge mass directly and can only detect it via the subtle phenomena of precession? I believe the answer is that this graviton mass is a wave phenomenon and manifests quite differently than observable mass such as a golf ball or planet; and to detect it we need to couple to it. This is similar to radio reception. Even if we had a radio transmitter that could produce 1 megawatt of power at a wavelength of 1000 kilometers, we cannot sense this energy with an antenna that is only 1 meter long; it is not capable of coupling to the energy. However, if we had an antenna that was 1000 kilometers long, we could easily couple to this energy.

The graviton waves we are considering for Dark Matter and Dark Energy behave in a fashion similar to electro-magnetic waves (photons), even though they are not exactly electro-magnetic phenomena. We cannot directly sense the graviton mass connecting Mercury and the Sun because it has a wavelength of 5.76 x 10^{10} meters and a period of 3.23 minutes. This low frequency is below the ELF band (Extremely Low Frequency) and would be in a humorously postulated Ludicrously Low Frequency (LLF) band. We haven't given much thought on how to couple to this type of electromagnetic like energy. However, the Mercury-Sun combination has the correct distance for coupling to this immense graviton mass.

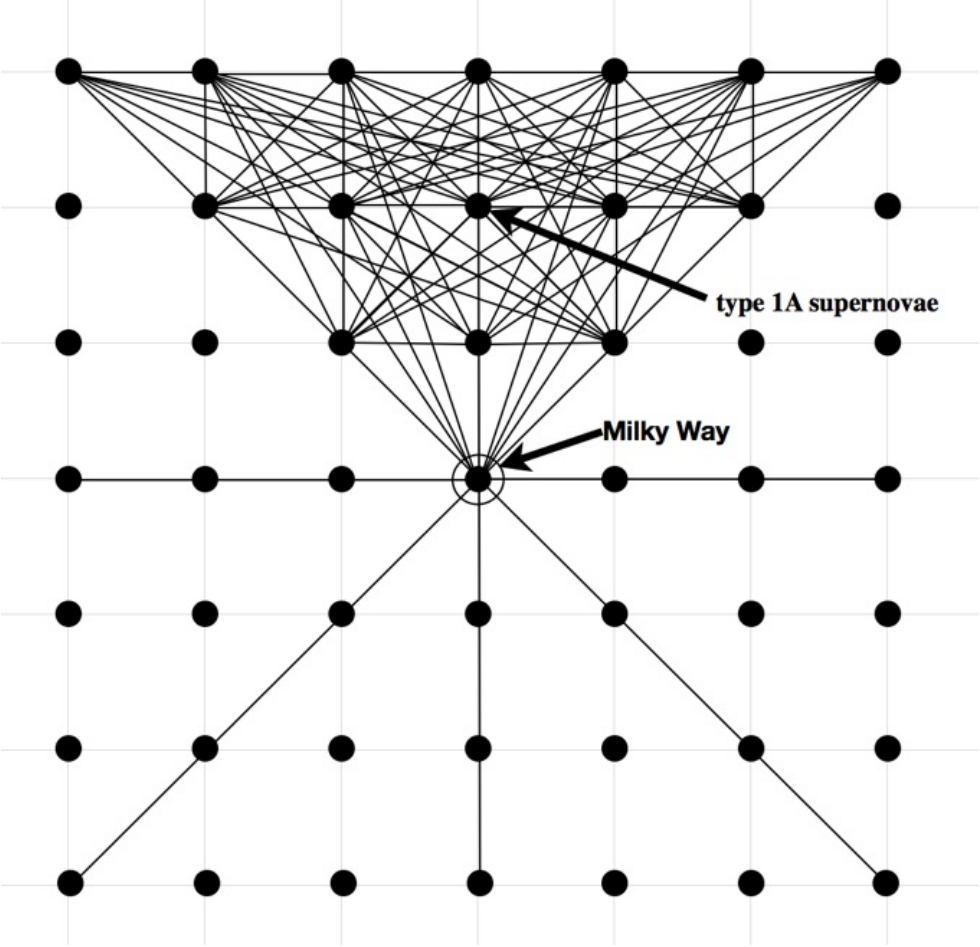
Comparison of Precessions of Mercury, Venus, and Earth

(Note 1: all precessions are in arc-seconds per century)

(Note 2: for planets beyond Earth, precession is to small to observe)

	Observed Precession	General Relativity Calculated	QM Graviton Theory Calculated
Mercury	43.1 ± 0.5	43	**43.2**
Venus	8.4 ± 4.8	8.6	**9.0**
Earth	5 ± 1.2	3.8	**4.0**

The Galaxy to Galaxy Dark Energy Gravitons (Ref 8): The number of galaxies in the universe are much more numerous than the stars in an individual galaxy. These inter-galactic gravitons have a mass that comprise the dark energy contained in the universe. This graviton mass is distributed in such a way as to make the universe expand at an accelerated rate. These galaxy to galaxy gravitons have less mass than inter-galaxy gravitons, but they out-number the inter-galaxy gravitons and are dominant in the universe. Here is a simple 2D out-line of how dark energy gravitons accumulate in the universe.



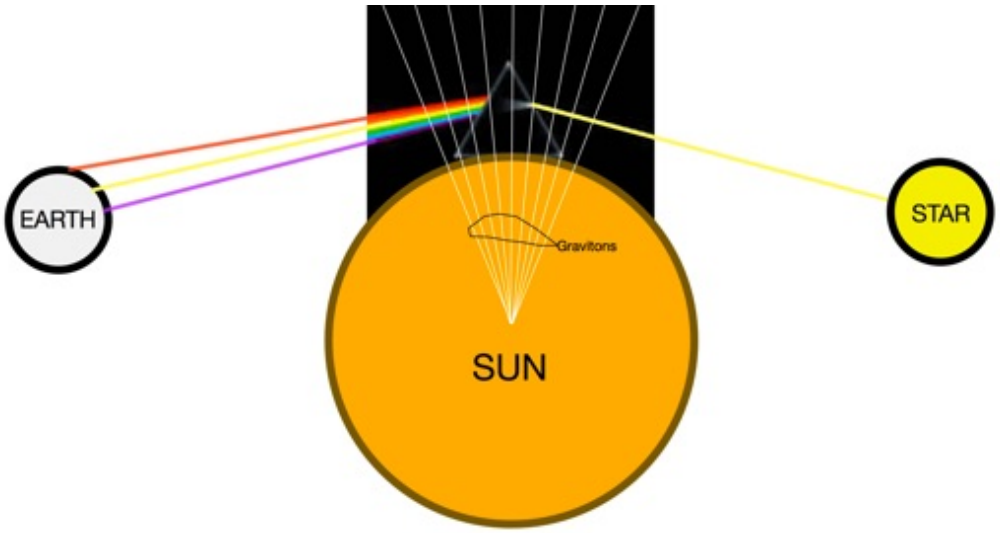
The dots on the diagram represent the observable mass of each galaxy. The dark lines connecting the dots represent graviton bundles (dark energy). From this diagram we can see how dark energy accumulates on the scale of the universe.

Note 1: The number of dark energy bundles (dark lines) increases with the distance from the observer in the Milky way.

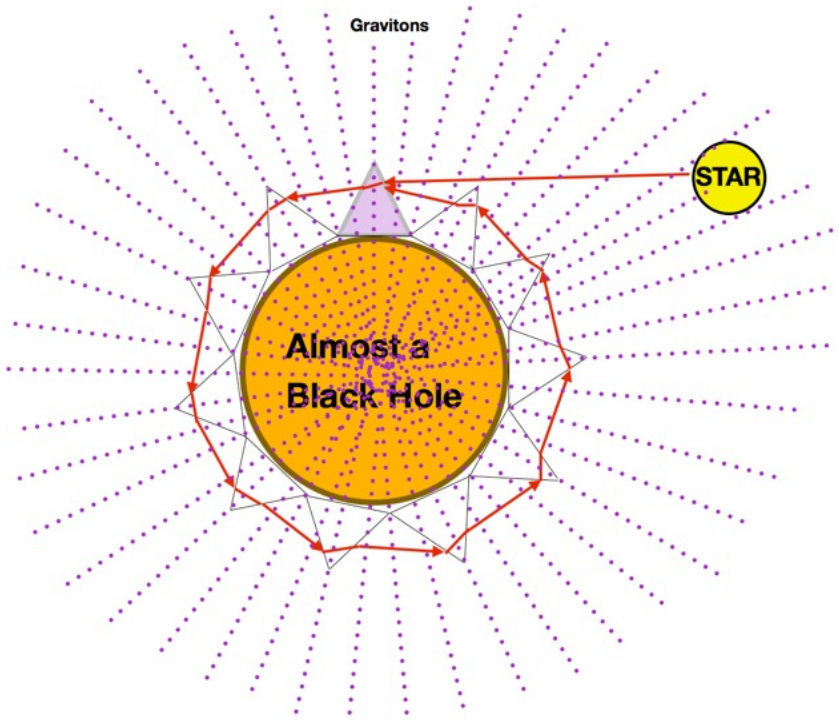
Note 2: In the diagram we can see how the dark energy in the universe creates an outward pull on the type 1A supernovae.

Note 3: This may fit with Roger Penrose’s theory of aeons, an alternative to the theory of the big bang, only now the big bang is matched by a “big end” no inflation needed. (Ref9)

F. Gravitons, the substance of space-time cause it to imitate an index of refraction.



Light passing through the dark energy prism surrounding the sun curves light. from the star. This gives us an apparent position and a true position for the star. But the most amazing thing about the graviton prism is that it curves the path of light and also curves the path of ordinary masses (according to general relativity). Thus we do not call the effect the curving of light but the curving of Space-Time. By increasing the density of gravitons we can create a black hole.



G. Gravitons and Mach’s principle. The reason gyroscopes work.

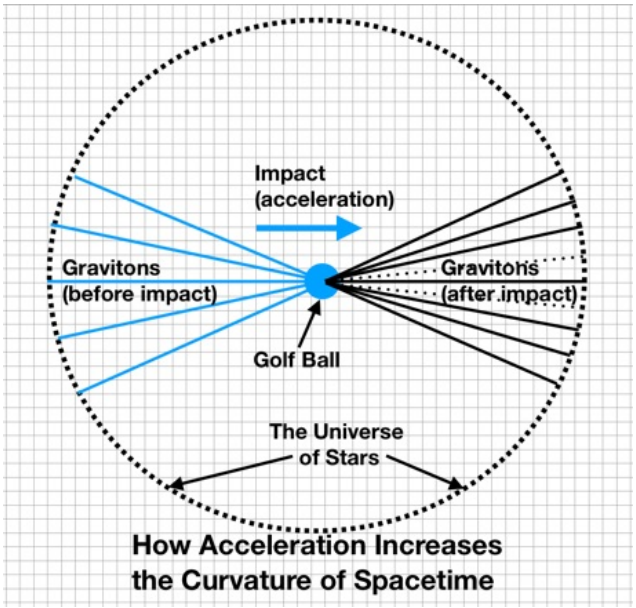
Foucault’s pendulum moves with respect to the background of stars. (Ref 10)

.

Why are the stars special?

You are standing in a field looking at the stars. Your arms are resting freely at your side, and you see that the distant stars are not moving. Now start spinning. The stars are whirling around you and your arms are pulled away from your body. Why should your arms be pulled away when the stars are whirling? Why should they be dangling freely when the stars don't move?

Both the force of gravity and the force of inertia are due to gradients of gravitons. However, the network of gravitons needs to be in place before the force produced by acceleration can be developed.



Extending this line of thought to gyroscopes: Gyroscopes function using angular acceleration instead of the linear acceleration of the golf ball. Thus the rotating gyroscope has a continuing acceleration very useful for making navigational instruments. And as with the golf ball, the gyroscope moves (rotates) with respect to the stars.

H. Does this concept of “gravitons” as the building block of Space-Time make sense?

First: This theory is able to calculate the precession of Mercury about the Sun to the same accuracy as the theory of general relativity.
Second: I believe this graviton theory offers the first rational explanation of Mach’s Principle.
Third: This theory offers explanations of both dark matter and dark energy that are plausible and testable.
Fourth: This theory offers an explanation for the accelerating expansion of the universe.

This theory has the Planck mass as fundamental to gravity. This is not generally agreed upon. However, Sir Roger Penrose does postulate a boundary to quantum mechanics at the Planck mass. It is possible that quantum mechanics has a type of phase change at the Planck mass. Ordinary mass looses its usual quantum properties above the Planck mass (a threshold sometimes called “dust”) becoming ordinary non quantum mechanical matter and at the same time gaining new quantum mechanical Space-Time “graviton” connections to the universe. (Ref 11)

I. Does this graviton theory contradict Einstein’s general relativity theory.

General relativity says that mass curves Space-Time directly. Graviton theory gives a reason why mass curves Space-Time. Ordinary masses are never separate from other ordinary masses. All ordinary masses above the Planck mass are connected to all other ordinary masses above the Planck mass. The connector between these Planck masses is the graviton a very low mass quantum mechanical particle. It is the gradient packing densities of these gravitons that is the curvature of Space-Time. I believe this graviton theory extends general relativity without changing it significantly.

Parting thought: Physics is amazing, but I believe that completeness is not one of its properties. And it keeps on getting better.

All the web references within this essay have been verified as of 1/13/2018 by Don Limuti

References:

1: Derivation of the Compton wavelength:
http://www.digitalwavetheory.com/16_Derivation_of_the_Compton_Wavelength.html

2: Planck units:
https://en.wikipedia.org/wiki/Planck_units#Cosmology

3: Cosmology: Cosmic Structure & content Tarun Souradeep I.U.C.A.A, Pune, India 1 st Asian Winter School Pheonix Park, Korea (Jan 15, 2007)
http://meghnad.iucaa.ernet.in/~tarun/lecs/QUEST06_cosm.pdf

4: Hubble far field pictures the universe:
http://hubblesite.org/images/news/14-deep-fields

5: Dark matter graviton accumulations:
http://www.digitalwavetheory.com/20_Dark_Matter_and_Mercurys_Orbit.html

6: The prediction of the planet Vulcan:
https://www.britannica.com/biography/Urbain-Jean-Joseph-Le-Verrier

7: Tom Levenson: http://news.nationalgeographic.com/2015/11/151104-newton-einstein-gravity-vulcan-planets-mercury-astronomy-theory-of-relativity-ngbooktalk/

8: Dark energy graviton accumulations:
http://www.digitalwavetheory.com/17_The_Case_for_Gravitons.html

9: Roger Penrose and the cosmological concept of Aeons
https://www.youtube.com/watch?v=xAcvNnSrkcM

10. Mach’s Principle:
https://en.wikipedia.org/wiki/Mach%27s_principle

11: Roger Penrose on the Planck mass (dust) and the limits of quantum phenomena
https://en.wikipedia.org/wiki/Penrose_interpretation