Chapter 7

Paradise Gravity

> The Unqualified Absolute upholds the physical universe, while the Deity Absolute motivates the exquisite overcontrol of all material reality; and both Absolutes are functionally unified by the Universal Absolute. This cohesive correlation of the material universe is best understood by all personalities—material, morontia, absonite, or spiritual—by the observation of the gravity response of all bona fide material reality to the gravity centering on nether Paradise. **56:1.2**

The linear gravity first mathematically described by Newton is one of the four fundamental forces currently identified by physics. Up until the last few decades, there was never any question about the universality of linear gravity. Recent measurements of the velocity of rotation of galaxies contradict what is expected based upon the inverse-square force of linear gravity. As a result, physicists have been forced to consider new theories of gravity or a new and undetectable form of gravitationally responsive matter.

We are told there is another form of gravity which is absolute in nature. It is a manifestation of the Universal Absolute, which functionally unifies the Deity Absolute and the Unqualified Absolute. Absolute gravity causes all material things to be attracted to and revolve about the Isle of Paradise. From an analytical proof it is known that there are only two types of central force which can produce stable orbits. Newton identified a central force which varies inversely with the square of the distance, because this agrees exactly with the laws of planetary motion discovered by Kepler. If distance increases twofold, gravitational force decreases to one quarter of the original distance. This force relation limits linear gravity to cosmically short ranges, since it rapidly diminishes to insignificance at large distances.

Absolute gravity holds everything in the universe in revolution about Paradise. Apart from an inverse-square force, the only other type of central force capable of producing stable orbits is a force which varies directly with distance. If distance increases twofold, gravitational force is twice as strong. Absolute Paradise gravity is insignificant at cosmically short ranges, but it becomes

overwhelmingly powerful on large scales. Theoretically, it has an unlimited reach.

A directly proportional force is mathematically described by Hooke's law. This makes the dynamics of absolute gravity a form of simple harmonic motion. Various references to the motion of the space levels and their relationships to Paradise can only be reconciled if absolute gravity is a form of simple harmonic motion. The quantification of the relationship between absolute gravitational force and distance requires the empirical determination of a constant. A first estimate of this gravitational constant can be calculated from newly available data on the absolute orbital velocity of our superuniverse and its distance from Paradise.

1. Theories of Gravity

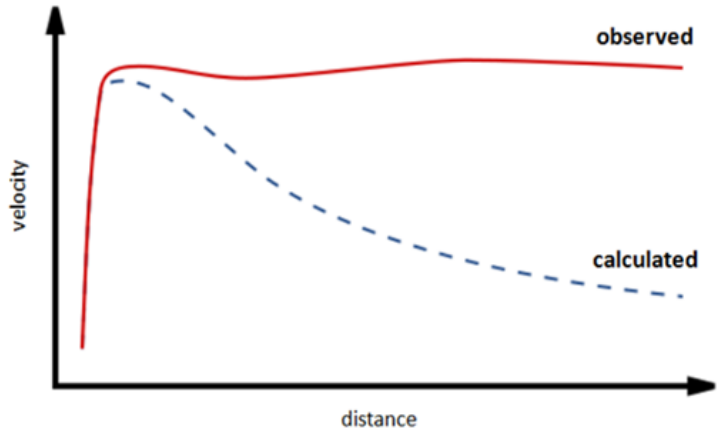
Up until well into the second half of the 20th century, there was never any doubt that (linear) gravity is universal and behaves as an inverse-square force on all scales of the universe. For three centuries, Newton's mathematical description of gravity successfully explained almost all celestial motions. Einstein's general theory of relativity accounted for the few minor discrepancies not explained by Newton's theory, but it did not alter the inverse-square nature of gravitational force. In 1959 Louise Volders discovered a puzzling phenomenon, which could not be explained by the inverse-square law.

Volders observed that the arms of the Triangulum galaxy (M33) and the Pinwheel galaxy (M101) rotate with about the same orbital velocity at all distances from their galactic centers. [26] Under the inverse-square law, the orbital velocities of sections of a spiral arm nearer the center of revolution should be significantly greater than the orbital velocity of sections further from the center. Instead, Volders discovered a "flat" rotation curve for these spiral galaxies; the orbital velocity is nearly the same regardless of the distance from the center of the galaxy. Since these secondary findings were not highlighted in her paper, which focused on neutral hydrogen, they attracted little attention. In 1978 Vera Rubin published high resolution measurements on the rotation curves for ten spiral galaxies. [27] Rubin found that all ten have flat rotation curves, like those

Volders found for M33 and M101. This apparent violation of gravity's inverse-square law finally caught the attention of the scientific community.

This discrepancy between theory and observation is referred to as the problem of galactic rotation curves. A graph with the orbital velocity of portions of a galactic arm along the y-axis and the radial distance of these portions from the galactic center along the x-axis should show a rapidly declining slope from left to right under the inverse-square law. Velocity should decrease with the square root of the increase in radial distance according to $v = \sqrt{GM/r}$. A doubling of the radius should result in the velocity decreasing to 70 percent of its original value. A tripling should cause it to fall to 57 percent of the original velocity. Velocity should fall rapidly as the radial distance increases, producing a "steep" rotation curve. Instead, graphs plotting measured orbital velocities consistently show flat rotation curves. The velocity tends to remain roughly unchanged all the way out to the edge of a galaxy.

Fig. 12: **Galactic Rotation Curves**



By the 1980s this glaring discrepancy between theory and observation compelled the emergence of two competing hypotheses. Currently, the most generally accepted idea is that a new type of energy-mass called dark matter accounts for the flat rotation curves of galaxies. This hypothesis "saves the phenomena" by assuming that the inverse-square law of gravity is valid on all scales, despite appearances. Dark matter is supposedly arranged about the center of revolution in a sort of halo, which is larger and far more massive than the galaxy. It is speculated that perhaps 5 percent of the total mass of the Milky Way

consists of observable baryonic (electronic) matter and 95 percent consists of undetectable dark matter.

This halo of dark matter must be distributed in a specific way in order for the inverse-square law to result in the same orbital velocity at all distances from the center of a galaxy. Unlike baryonic matter, which is most concentrated near the center of rotation due to gravitational attraction, dark matter is most concentrated in a halo at some significant distance from the center. Despite this very different gravitational behavior of dark matter, it is imagined to consist of particles which only interact with the fundamental force of linear gravity. Dark matter is not responsive to the other three fundamental forces of physics: electromagnetism and the strong and weak nuclear interactions. Because dark matter does not respond to these other three fundamental forces, it neither emits nor absorbs electromagnetic energy. Dark matter is, therefore, a unique form of energy-mass which is theoretically beyond any possible direct detection. This is a radical proposal, since dark matter is exempt from those physical laws which are based upon the other three fundamental forces.

It is generally understood that this is an *ad hoc* theory developed to explain observations in terms of the inverse-square law of linear gravity. It proposes a new and undetectable form of energy-mass and makes numerous complex assumptions about its interactions with baryonic matter and why it is distributed in the specific way required to account for flat rotation curves. All of these speculative and unproven assumptions have led a significant minority of physicists to propose that the strict inverse-square relation of linear gravity is being violated on the galactic scale and above. The most prominent alternative theory to dark matter is Modified Newtonian Dynamics (MOND), which was proposed by Mordehai Milgrom of the Weizmann Institute in Israel in 1983. **[28]**

MOND proposes that the nature of the force of gravity is modified by distance. Gravity decreases with distance according to the inverse-square law as expected, but only up to a certain distance. Beyond this distance, the inverse-square relation gradually changes until the centripetal acceleration caused by gravitational force reaches an irreducible minimum. The centripetal acceleration remains constant and does not decrease with distance, as the inverse-square relation requires. Gravitational acceleration transitions from an inverse-square relation to an asymptotic relation, under which increasing distance does not result in decreasing centripetal acceleration; at some point, distance from the center becomes irrelevant. From observation Milgrom found that this minimum centripetal acceleration a_0 is approximately $1.2 \times 10^{-10}\ \mathrm{m/s^2}$. MOND gives the

correct orbital velocity for objects in orbits beyond a certain minimum distance from the galactic center, while linear gravity does not.

$$\text{linear gravity:} \quad v^2 = GM/r$$

$$\text{MOND:} \quad v^4 = GMa_0 \ \text{(beyond a minimum } r\text{)}$$

Data on orbital velocities in galaxies and galactic clusters have, so far, not detected centripetal accelerations which are less than MOND's minimum value. Our galaxy has a flat rotation curve of about 240 km/s and a radius of about 50,000 light-years. The centripetal acceleration at 50 kly equals 1.22×10^{-10} m/s^2, close to Milgrom's minimum. The mass $\boldsymbol{M}$ in the MOND equation is the total mass of the whole galaxy, not the mass concentrated at its center. Calculating the mass of the galaxy using a_0 and 240 km/s gives a total of 200 billion solar masses. This was a reasonable estimate of the mass using older estimates, but it is no longer satisfactory. Recent studies put the number of stars in the Milky Way at about five times this number.

The simple mathematics of MOND describes galactic rotation curves with as much accuracy as the hypothesis of dark matter. MOND makes a single assumption: The inverse-square relation of gravity changes with distance into an asymptotic relation. If MOND is correct, then the linear gravity of Newton and Einstein is limited in scope to the sub-galactic scale. A weakness of MOND is the absence of a theoretical explanation for why the centripetal acceleration of linear gravity does not drop below the minimum of 1.2×10^{-10} m/s^2. A more serious flaw is that the force of gravity is a fundamental law which should vary with distance in some consistent manner. If the nature of gravitational force, itself, changes with distance from an inverse-square to an asymptotic relation, then gravity does not appear to be a fundamental force in the commonly accepted sense; a fundamental force is one that is described by a constant relationship.

Linear gravity does not accurately describe motion on the scale of galaxies and above. This failure can be partially resolved under two radically different hypotheses, neither of which is really satisfactory. Either there is a new and exotic form of energy-mass dubbed dark matter and the inverse-square law holds, or gravity is not a fundamental force in the usual sense and there is no dark matter. The problems with gravitational theory are not limited to the galactic scale.

General relativity leads to the expectation that the spacetime of the universe will have a significant and measurable curvature due to linear gravity. This expectation is substantially contradicted by the evidence. The observable

universe is now known to have a virtually flat spacetime. More precisely, universe spacetime cannot be significantly distinguished from the flat Euclidean spacetime of an inertial frame. The only way in which the general theory can still be valid is if it is assumed that we can see just a very small, possibly infinitesimal, portion of the whole universe. This is wholly unsatisfactory from an empirical perspective, since it requires the unverifiable belief that virtually the entire universe is beyond any possible observation or detection. Like the hypothesis of dark matter, this "saves the phenomena," but it does so by making highly speculative and theoretically untestable assumptions.

Linear gravity is not strictly valid on the galactic scale. General relativity does not appear to be valid above the scale of galactic clusters. The universe must form a single whole, if the laws of physics are to be universal. But there does not appear to be any theory of gravity which is able to dynamically unify the universe. This compels the hypothesis that there must be a new and different form of gravity which operates on truly cosmic scales. Revelation refers to this new form of gravitation as Paradise or absolute gravity.

2. Absolute Gravity

Linear gravity is described as a short-range interactive phenomenon occurring between particles of electronic matter (*gravita*: electrons, protons, neutrons, etc.). "Linear gravity is the short-range cohesive force of the macrocosmos somewhat as the forces of intra-atomic cohesion are the short-range forces of the microcosmos." **42:11.5** "Local or linear gravity pertains to the electrical stage of energy or matter; it operates within the central, super-, and outer universes, wherever suitable materialization has taken place." **11:8.3** Absolute gravity is a direct interaction between Paradise and ultimatons – subelectronic matter. "The center and focal point of absolute material gravity is the Isle of Paradise." **11:8.2** Since electronic energy-matter is evolved from ultimatons, it is responsive to both linear and absolute gravity. Absolute gravity is instantaneous; it is an "absolute *presence* circuit[s] … independent of time and space." **12:3.2** It is implied that linear gravity also acts instantaneously, as Newton hypothesized. "Space can actually neutralize such [linear] gravity action even though it cannot delay it." **11:8.3**

Absolute gravity is a long-range interaction between individual ultimatons and the Isle of Paradise, which has "a potential infinity of gravity extension." [11:8.9] Unlike other later forms of materialization evolved from cosmic force, ultimatons do not gravitationally interact with other ultimatons (*ultimata*) or with electronic masses (*gravita*). "The ultimatons are not subject to local gravity, the interplay of material attraction …. Ultimatonic energy does not obey the linear or direct gravity attraction of near-by or remote material masses." [41:9.2] They do have a force of mutual attraction, which causes one hundred ultimatons to cohere in a typical electron, but this is an extremely short-range force that is entirely distinct from absolute gravity. The absolute gravity of Paradise only attracts individual ultimatons and acts independently of local or linear gravity. Ultimatons are related to Paradise in a manner analogous to the way in which electrons are related to an atomic nucleus. "The ultimaton, the first measurable form of energy, has Paradise as its nucleus." [42:1.2] However, this analogy does not extend to include the nature of absolute gravity, which is not an inverse-square force like the electrostatic force binding negative electrons and positive protons.

Both linear and absolute gravity are central forces, by definition. It is known that linear gravity can produce stable orbits, but there could be other types of central forces which also produce stable orbits. Newton considers this issue in his *Principia* published in 1687. He first considers an elliptical orbit in which a central force is directed towards the geometric center of the ellipse. (Book I. Proposition X) He finds that the centripetal force necessary for a stable orbit about the geometric center must be directly proportional to the distance from the center. However, he also finds that under this type of central force all orbits would have exactly the same period of revolution, regardless of their distance from the center. This completely contradicts the laws of planetary motion discovered by Johannes Kepler more than half a century earlier. He then considers an elliptical orbit in which a central force is directed towards one of the two foci of the ellipse. In this case he finds that the centripetal force necessary for a stable orbit must vary inversely with the square of the distance to one of the two foci of the ellipse. The stable elliptical orbits of the planets described by Kepler's laws are fully accounted for under this inverse-square central force.

Newton only considers these two different types of central force, when other types of central force are theoretically possible. In 1873 J. Bertrand published a short paper in which he considers the question of what different possible types of central force are capable of producing stable orbits. [29] He develops a formal analytic proof, known as Bertrand's theorem, which identifies only two possibilities: A force varying inversely with the square of the distance to one of

two foci of an ellipse, and a force varying directly with the distance from the geometric center of an ellipse. Newton's law of universal gravitation is based upon an inverse-square force. The only other type of central force capable of producing stable orbits is one that varies in direct proportion with the distance to the geometric center of an elliptical orbit. Since we are told that absolute gravity is fundamentally different from linear gravity, Bertrand's theorem permits the simple deduction that absolute gravity must vary in direct proportion with the distance to Paradise.

A central force which varies directly with the distance to the geometric center results in simple harmonic motion. This is the same form of cyclical motion which measures duration, describes quantum oscillators, and potentially limits the extent of inertial frames. "Time comes by virtue of motion," and absolute gravity is the cause of the cycles of the simple harmonic motion which describe the revolution of the universe about the Isle of Paradise. Simple harmonic motion is described by Hooke's law of elasticity.

Fig. 13: **Linear Oscillation under Hooke's Law of Elasticity**
Simple harmonic motion traces out a sinusoidal wave over time

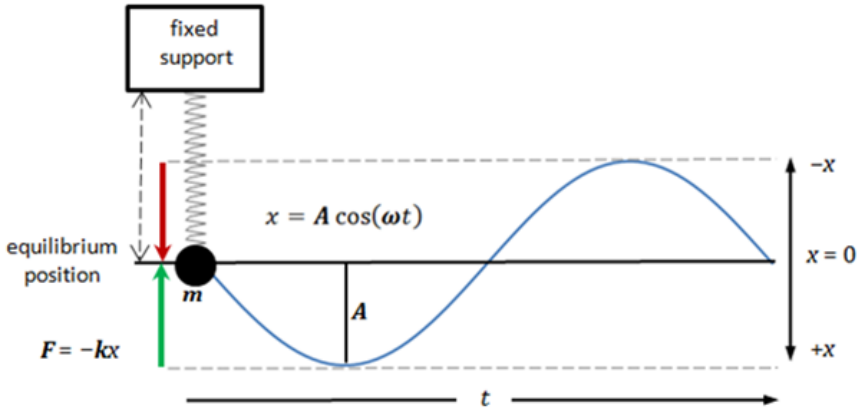


Fig. 13: **Linear Oscillation under Hooke's Law of Elasticity**
Simple harmonic motion traces out a sinusoidal wave over time

Hooke's law is classically modeled on the elastic property of springs. In 1660 Robert Hooke discovered that the restoring force F exerted by a spring stretched (or compressed) from its equilibrium position is directly proportional to the distance x of its displacement from equilibrium: $F \propto x$. The greater the displacement, the greater the restoring force. The amount of restoring force depends upon the stiffness of the particular spring, which is measured by the

spring constant k. The stiffer the spring, the larger the spring constant, and the more force is required to stretch (or compress) it.

$$F = -kx$$

The restoring force equals the spring constant times the displacement. If a spring is anchored to a fixed point at one end and a mass m is suspended from the other end, the spring will stretch until it reaches an equilibrium position. At equilibrium the restoring force is equal and opposite to the external gravitational force pulling the suspended mass downward. If the mass is then pulled down an additional displacement x, which is the amplitude $\boldsymbol{A}$, and released, the mass will oscillate up and down about the equilibrium position in simple harmonic motion. This linear oscillation has a predetermined angular frequency ω which is determined by the spring constant k and the mass m.

$$\omega = \sqrt{\frac{k}{m}}$$

The angular frequency ω of a simple harmonic system is constant over time, regardless of the initial amplitude of displacement x. A constant angular velocity is a defining characteristic of simple harmonic motion. The angular frequency multiplied by 2π equals the natural frequency f of the system, the number of complete cycles per unit of time, which is also a constant for the system. The reciprocal of the natural frequency is the period of time T required to complete one cycle.

$$f = \frac{1}{2\pi}\sqrt{\frac{k}{m}}$$

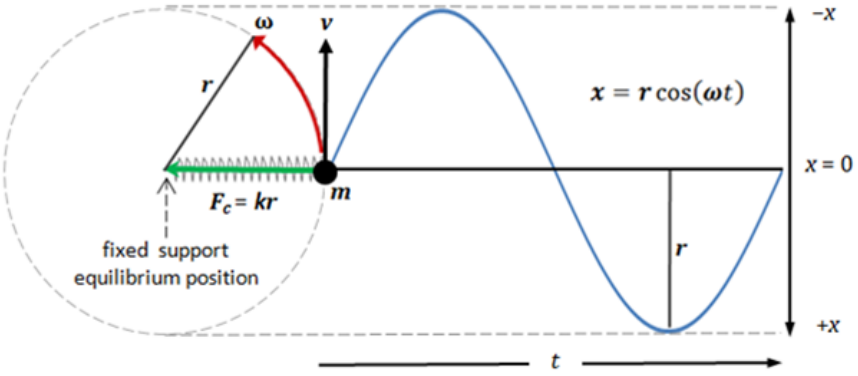
$$T = 2\pi\sqrt{\frac{m}{k}}$$

If the displacement x from the equilibrium position is plotted against the time t, it traces out a single sinusoidal wave over one period T. This sinusoidal wave form is also a characteristic of simple harmonic motion.

$$x = A\cos(\omega t)$$

All of these relationships hold for circular motion occurring in response to a central force which varies in direct proportion with the distance to the center of rotation. The radius r replaces the amplitude $\boldsymbol{A}$ of displacement x and cycles of circular motion replace cycles of linear oscillation.

Fig. 14: **Circular Motion under Hooke's Law of Elasticity**
Simple harmonic motion traces out a sinusoidal wave over time



The centripetal force equals the spring constant multiplied by the radius: $F_c = kr$. Since the spring constant equals the mass multiplied by angular velocity squared, $k = m\omega^2$, the centripetal force also equals $F_c = mr\omega^2 = mv\omega$. In linear oscillation a *temporary* external force is required to cause the initial amplitude of linear displacement from equilibrium. In circular motion there is a *continuous* external centrifugal force which causes a radial displacement of r, and this is equal and opposite to the centripetal force: $F_{cf} = -mr\omega^2 = -mv\omega$. Since the angular velocity is constant in a simple harmonic system, the period of revolution is the same at all radial distances. A constant period of revolution at all distances from the center is a defining characteristic of circular simple harmonic motion.

The displacement x from the center of the circle can be plotted against the time t to trace out a sinusoidal wave over the period T of one revolution. The formula is the same form as for linear oscillation. A circle is a special case of the more general form of an ellipse. Simple harmonic motion in a plane about the geometric center of an ellipse is described with two equations, instead of one. The radius of a circle is replaced with the semi-major x-axis length $\boldsymbol{a}$ and the semi-minor y-axis length $\boldsymbol{b}$ defining the ellipse.

$$x = \boldsymbol{a}\ \cos(\omega t)$$

$$y = \boldsymbol{b}\ \cos(\omega t)$$

We are told that, ultimately, all of the galaxies in the universe revolve about the Isle of Paradise in an elliptical orbit on the plane of creation. This is not possible under linear gravity. Linear gravity varies inversely with the square of the distance, which causes a significant proportion of the total mass to become highly concentrated in a dense spherical structure at the center of a revolving

system. There would have to be an unimaginably massive concentration of matter somewhere in the universe, if the entire universe was revolving about a single point under the force of linear gravity. This would be immediately obvious to observation, particularly in the significant curvature of spacetime this would cause. The observable spacetime of the universe is indistinguishable from flat Euclidean space. There is no detectable curvature to the spacetime of the universe, so there is no such concentration of mass in the universe.

Due to recent knowledge, detailed later, it is now possible to demonstrate that the energy-mass of the universe is concentrated about a single plane. The existence of this plane is most credibly explained by gravity. Since this planar structure cannot be caused by linear gravity, the only other possible form of gravity, under Bertrand's theorem, is the central force characteristic of circular simple harmonic motion – the absolute gravity referred to by revelation.

Absolute gravity holds the ultimatons making up the galaxies of the master universe in elliptical revolution about the Eternal Isle. "The master universe is existent in six concentric ellipses, the space levels encircling the central Isle." **12:1.3** "We have long since discovered that the seven superuniverses traverse a great ellipse." **15:1.2** These elliptical orbits are caused by a directly proportional central force, and revolution occurs about the geometric center of these concentric ellipses. A Universal Censor confirms that the center of revolution is at the geometric center, instead of at one of the two foci, when describing the positions of the superuniverses: "superuniverse number one … [is] approximately opposite, in an easterly direction, to the Paradise residence …. This position, with the corresponding one to the west, represents the nearest physical approach of the spheres of time to the eternal Isle." **15:1.4** In an elliptical orbit centered about one of the two foci, there is only one point in an orbit where a satellite is closest to the center of revolution. Since there are two points of periapsis in the elliptical orbit of the superuniverses, revolution must occur about Paradise at the geometric center of the ellipse. This is only possible under a directly proportional central force.

Elliptical orbits caused by linear gravity exhibit apsidal precession. The point of closest approach in an orbit, the periapsis, moves slightly about a focus of the ellipse after each revolution, and the orientation of the major axis of the ellipse changes slightly in the sidereal frame. Because of apsidal precession, a satellite will not pass through exactly the same space on each subsequent revolution. The elliptical orbits of the six space levels do not undergo apsidal precession. Their galaxies follow exactly the same path on each revolution. "You are following the orderly and predetermined path of the superuniverse space level. You are now

passing through the very same space that your planetary system, or its predecessors, traversed ages ago; and some day in the remote future your system, or its successors, will again traverse the identical space through which you are now so swiftly plunging." **15:1.3** The absence of apsidal precession in an elliptical orbit is only possible under a directly proportional central force acting from the geometric center of the orbit.

A directly proportional central force results in the same period of revolution for every stable orbit. The Universal Censor compares the superuniverse level to a wheel. "The Seven Master Spirits radiate their influence out from the central Isle, thus constituting the vast creation one gigantic wheel, the hub being the eternal Isle of Paradise, the seven spokes the radiations of the Seven Master Spirits, the rim the outer regions of the grand universe." **15:0.1** This is more than an analogy. "The radial boundary lines of any one of the superuniverses do actually converge at the Paradise headquarters of the supervising Master Spirit." **16:0.12** If galaxies in the superuniverses at different distances did not all have the same period of revolution about Paradise, the galaxies from one superuniverse would gradually move into the region of another, and this whole organization would not be possible.

These and other revealed descriptions of the structure and dynamics of the universe under absolute gravity are only consistent with a central force varying in direct proportion with the distance from Paradise.

3. The Paradise Gravitational Constant

Newton formulated his universal law of gravitation as an inverse-square force which is proportional to the two masses involved divided by the square of the distance between them.

$$F \propto k\frac{Mm}{r^2} \rightarrow F = \frac{\boldsymbol{G}Mm}{r^2}$$

The masses of the two bodies are constant, so the force varies inversely with the square of the distance. The ratio of quantities needs to be multiplied by a proportionality constant k in order to give the actual quantity of force. This factor is the gravitational constant $\boldsymbol{G}$. The ratio of Mm/r^2 has units of $\mathrm{kg}^2/\mathrm{m}^2$. The

gravitational constant has units of $\mathrm{m}^3/(\mathrm{kg}\cdot\mathrm{s}^2)$. The gravitational constant times the gravitational proportion has units of force: $F = \mathrm{kg}\cdot\mathrm{m}/\mathrm{s}^2 = ma$. It was not until 1798, more than a century after *Principia* was published, that Henry Cavendish was finally able to directly measure the gravitational constant using the newly invented torsion balance. Cavendish's value differs by less than one percent from $6.674 \times 10^{-11}\ \mathrm{m}^3/\mathrm{kg}\cdot\mathrm{s}^2$, which is the currently accepted value.

Absolute gravity acts between individual ultimatons and the Isle of Paradise. This force is described by Hooke's law. The restoring force is proportional to the distance *r* between an ultimaton and Paradise.

$$F \propto r \ \rightarrow\ F = \boldsymbol{k_P} r$$

The proportionality constant k is the elastic constant. Absolute gravity can be modeled with a spring attaching an individual ultimaton to Paradise, where the spring constant is designated by $\boldsymbol{k_P}$. The elastic constant k for a specific spring can be determined by the external force required to displace it from its equilibrium position: $k = F/r$. In the case of circular simple harmonic motion, the centripetal force can be found from the mass of the orbiting body, the radius, and the angular velocity: $F = mr\omega^2 = mv\omega = ma$. The ultimatonic elastic constant is specific to ultimatons, which can be treated as a masses attached to Paradise by theoretical springs with an elastic constant equal to $\boldsymbol{k_P}$. There are exactly 100 ultimatons in a typical electron, which has a mass of 9.11×10^{-31} kg. Each ultimaton has 1/100th of this mass or $m_u = 9.11 \times 10^{-33}$ kg.

The orbital velocity of an ultimaton increases with the distance from Paradise, since the angular velocity is constant in simple harmonic motion. The orbital velocity cannot exceed that of light, which occurs at the theoretical limit of the master universe. The angular velocity at a radius R of 13.8 Bly (1.31×10^{26} m) and an orbital velocity of light c equals $\omega = c/R = 2.3 \times 10^{-18}\ \theta/\mathrm{s}$ ($\omega = v/r$). In a simple harmonic system, this is the constant angular velocity at every radial distance. The centripetal force acting on an ultimaton at the limit of the universe equals the ultimatonic mass multiplied by the velocity of light multiplied by the angular velocity.

$$F_c = \ m_u c\omega = 6.28 \times 10^{-42}\ \frac{\mathrm{kg}\cdot\mathrm{m}}{\mathrm{s}^2}$$

The centripetal force acting on an ultimaton at a radial distance of 13.8 Bly is known, and the elastic constant for a single ultimaton can be calculated.

$$\boldsymbol{k_P} = \frac{F_c}{R} = \frac{6.28 \times 10^{-42}\ \frac{\text{kg} \cdot \text{m}}{\text{s}^2}}{1.31 \times 10^{26}\ \text{m}} = 4.8 \times 10^{-68}\ \frac{kg}{\text{s}^2}$$

There is an isolated elastic tension between each ultimaton and Paradise. The elastic tension between an electron and Paradise is, therefore, the sum of the tension between 100 ultimatons which are all at the same distance from Paradise. One kilogram of mass contains 1.098×10^{32} ultimatons ($1/m_u$). Since $\boldsymbol{k_P}$ is the spring constant for one ultimaton, the mass of a body M orbiting Paradise divided by the ultimatonic mass equals the number of "ultimatonic springs" exerting a restoring force on the body toward Paradise.

$$F_c = \frac{M}{m_u}\boldsymbol{k_P} r$$

Both the ultimatonic elastic constant (kg/s^2) and the mass of an ultimaton (kg) are constant quantities. Dividing the first by the second gives the Paradise gravitational constant $\boldsymbol{\mathcal{G}}$, which has units of radians per second squared (θ/s^2). This changes the equation for absolute gravity into one with a form similar to that for linear gravity.

$$\boldsymbol{\mathcal{G}} = \frac{\boldsymbol{k_P}}{m_u} = 5.27 \times 10^{-36}\ \frac{1}{\text{s}^2}$$

$$F = \boldsymbol{\mathcal{G}} M r$$

The constant $\boldsymbol{\mathcal{G}}$ is calculated based upon the assumption that ultimatons cannot have an orbital velocity exceeding that of light when they are 13.8 Bly distant, which is the estimated radius of the observable universe. In a simple harmonic system the angular velocity is constant and $\boldsymbol{\mathcal{G}}$ is simply the square of the angular velocity for the system ($\boldsymbol{\mathcal{G}} = {\omega_0}^2 = \boldsymbol{k_P}/m_u$). The angular velocity of universal revolution is the square root of the Paradise gravitational constant, which is found from the centripetal force acting on the ultimaton.

However, this centripetal force is estimated using the theoretical Hubble radius of 13.8 Bly. It depends upon the Hubble constant, which has about a ten percent margin of error. It also depends upon certain as yet unproven assumptions about the nature of space expansion. These assumptions and uncertainties carry forward into the calculation of the Paradise gravitational constant. Even at a minimum margin of error of ten percent, this first estimate of the Paradise gravitational constant $\boldsymbol{\mathcal{G}}$ establishes the scale of this central force.

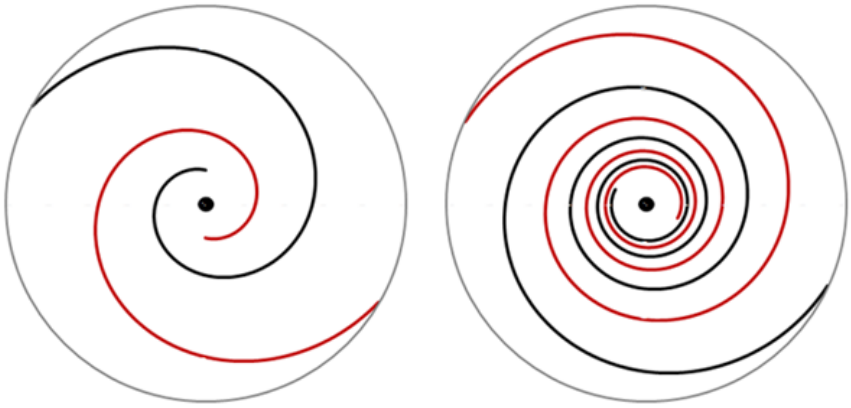
Since absolute gravity results in simple harmonic motion, the period for an ultimaton to complete one revolution about the universe, regardless of its radial distance from Paradise, equals about 87 billion years.

$$T = 2\pi\sqrt{\frac{m_u}{\boldsymbol{k_P}}} = 2\pi\sqrt{\frac{9.11\times10^{-33}\ \text{kg}}{4.8\times10^{-68}\ \frac{\text{kg}}{\text{s}^2}}} = 2.73\times10^{18}\ \text{s} = 86.6\ \text{billion years}$$

4. Absolute Tidal Forces and Spiral Galaxies

Over half of all galaxies (56 percent) are spiral galaxies similar in structure to the Milky Way and Andromeda, according to a comprehensive 1996 analysis of galaxy morphology. [81] Spiral galaxies are flat disks with a central bulge, and the spiral arms formed by stars and clusters are their distinguishing feature. It was recognized in the 1930s that the spiral arms must move differently from the stars making up a galaxy. Under linear gravity, if the radius of the outermost orbit of a spiral arm is 8 times greater than the radius of the arm's innermost orbit, the inner orbit would complete 23 revolutions for each outer orbit revolution. This would cause the spiral arms to wind up about the center, become smeared out, and disappear.

Fig. 15: **Winding Problem for Galactic Spiral Arms**
Milky Way's spiral arms now and after ½ revolution of outermost orbit
if every part of each arm has the same orbital velocity about the center



By the 1970 it was realized that most stars orbit galaxies with essentially the same orbital velocity, regardless of their distance from the center. The problem of flat galactic rotation curves led to the alternate hypotheses of dark matter and MOND. The discovery of flat rotation curves did not solve the winding problem of the arms in spiral galaxies. If the arms of the Milky Way are made up of the same stars over a long period of time, and these stars all have the same orbital velocity, then the spiral arms would become smeared out and disappear after just one revolution. In the case of the Milky Way, the innermost portion of the arm completes 7 revolutions for each revolution of the outermost portion of the arm. The Lin-Shu density wave hypothesis, discussed later, offers a potential description for the persistence of spiral arm structures over time, but it does not address the cause of their motion. This hypothesis was developed in 1964 before flat rotation curves were discovered, but it still gives a mathematical description of the persistence of galactic spiral arms.

The orbital velocity of each part of a spiral arm is directly proportional to the distance of the part from the galactic center, as though the spiral arms are painted on a solid disk. When this imaginary disk rotates, the arms painted on its surface retain their shape under rotation. There is no winding up of the arms about the galactic centers over time, because all portions of a spiral arm have the same period of revolution regardless of their distance from the center. This is a defining characteristic of simple harmonic motion, which has a constant angular velocity at every radial distance. Because every part of a spiral arm moves with the same angular velocity, its motion can be described as simple harmonic motion.

The orbital velocity of the spiral arms in the Milky Way has been measured as increasing by 55 km/s for every 3,262 ly (one kiloparsec) of radial distance from the center. [80] This relationship gives a constant angular velocity for the arms of 1.78×10^{-15} θ/s ($\omega = v/r$). This suggests a relationship to the force of absolute gravity. The stars in the Milky Way have roughly the same orbital velocity at all distances from the center. This motion of the stars cannot be explained by the simple relationship of linear gravity between each star and a central mass. This has compelled the search for more complex gravitational relationships within galactic structures. This more complex gravitational relationship would include the interaction between linear and absolute gravitational fields.

According to Bertrand's theorem only an inverse-square central force (linear gravity) or a directly proportional central force (absolute gravity) can generate a stable orbit. The flat rotation curve of the stars of the Milky Way means that they cannot follow stable orbits about its central core, since there is no single central

force that supports this type of orbit. Our sun has a general orbital velocity about the center of the Milky Way of 240 km/s, but it also has a local motion of 16.5 km/s toward galactic coordinates $\boldsymbol{l} = 56.24°$, $\boldsymbol{b} = 22.54°$. [83] The orbital path of the sun is perturbed by all of the near and far gravitational forces acting upon it. Stars in the Milky Way do not have stable orbits about the center of the Milky Way. One of the gravitational forces perturbing the orbits of all stars within the Milky Way is the tidal force caused by absolute gravity.

Newton was the first to describe how gravitational tidal forces cause the oceans to bulge outward on the side of the earth facing the moon (or the sun) and also on the earth's opposite side. About 55 percent of tidal motion is due to the moon and 45 percent to the sun. The rise and fall of the oceans is the result of the interaction of the three gravitational fields of the earth, moon, and sun. At the surface the centripetal acceleration caused by earth's gravity is 9.81 $\mathrm{m/s^2}$, which equals one **g** or earth-gravity. The earth's gravitational field is moving through a second field generated by the sun. Newton's Shell theorem proves that all of the mass of a sphere can be treated as though it is concentrated at its center, even though the mass is distributed throughout a volume. This theorem enables the calculation of gravitational force between the earth and the sun using their total masses and the distance between the centers of each.

However, the sun still directly attracts each water molecule in the oceans. This attraction between the center of the sun and a water molecule varies, since the distance to each molecule varies. A water molecule on the daylight side of the earth is attracted more strongly by the sun's linear gravity, because it is nearer. The difference between sun's gravity at the center of the earth and at a water molecule on its surface is the tidal force. The acceleration caused by the sun at the location of the earth's center equals $5.9317 \times 10^{-3}\ \mathrm{m/s^2}$. The radius of the earth is 6,371 km, so the acceleration on a water molecule on the daylight side is greater and equals $5.9322 \times 10^{-3}\ \mathrm{m/s^2}$. The difference is the tidal force which equals $5.053 \times 10^{-7}\ \mathrm{m/s^2}$. If this is expressed in terms of earth gravity, it equals $5.15 \times 10^{-8}\ \mathbf{g}$. The tidal force is 20 million times weaker than one earth gravity, but it is strong enough to cause the oceans to rhythmically vary in height twice a day by several feet.

The absolute tidal force along the line between Paradise and the Milky Way is the difference between absolute acceleration at the center and circumference of the Milky Way. The ultimatonic spring constant which determines absolute gravity equals $\boldsymbol{k_P} = 4.8 \times 10^{-68}\ \mathrm{kg \cdot m/s^2}$. At a distance of 9 Mly the absolute gravitational force on an ultimaton is:

$$F = \boldsymbol{k_P} r = 4.8 \times 10^{-68} \ \frac{\text{kg}}{\text{s}^2} \cdot \ 8.52 \times 10^{22} \ \text{m} = 4.087 \times 10^{-45} \ \frac{\text{kg} \cdot \text{m}}{\text{s}^2}$$

The force on the ultimaton divided by its mass gives a gravitational acceleration at 9 Mly of 4.486×10^{-13} m/s^2. At a distance 50,000 ly beyond this point at the boundary of the Milky Way the acceleration increases to 4.511×10^{-13} m/s^2. The difference in the accelerations is 2.492×10^{-15} m/s^2. This is the absolute tidal acceleration acting at this point 9.05 Mly from Paradise. The force of linear gravity acting between the center of the Milky Way and a star on its circumference 50,000 ly away cannot be calculated using Newton's equation for linear gravity. However, the apparent centripetal acceleration between this star and the center of the Milky Way can be calculated from the kinematics. The constant orbital velocity of 240 km/s divided by a distance of 50,000 ly gives an angular velocity of 5.07×10^{-16} θ/s. The centripetal acceleration equals the orbital velocity times the angular velocity ($a_c = v\omega$) or 1.22×10^{-10} m/s^2. If this acceleration at 50,000 ly from the center is considered to be one Milky Way gravity, then the absolute tidal force equals 2.05×10^{-5} $\mathbf{g}_{\text{mw}}$.

Proportionately, the absolute tidal force at the circumference of the Milky Way is almost 400 times stronger than the tidal force of the sun acting upon the earth's oceans. The Sun's tidal force results in two oppositely directed bulges in the oceans. An absolute tidal force should also result in two oppositely directed phenomena, such as the Milky Way's two major spiral arms. This suggests the hypothesis that the persisting pattern of spiral arms seen in the majority of galaxies is related to the tidal forces induced by absolute gravity. There is additional circumstantial evidence which suggests such a causal connection.

Absolute tidal acceleration varies in direct proportion to the distance from the center of the Milky Way. Angular velocity is a constant in simple harmonic motion, so the angular velocity squared equals the centripetal acceleration divided by the radial distance ($\omega^2 = a_c/r$). A constant angular velocity is also found in the form of the spiral arms of the Milky Way. The spiral arms are mathematically described by logarithmic spirals, which are used in the above graphic (Fig. 15).

$$r(\theta) = ae^{b\theta}$$

The radial distance *r* to a point on a logarithmic spiral uses a constant distance *a* multiplied by the natural logarithm *e* raised to a constant pitch factor *b* that is multiplied by a number of radians θ. The single variable in this equation is the radians θ of rotation; the radial distance increases from a minimum of *a* as the radians of rotation increase. If radians is set to zero, the radius is simply equal to

a. This radius a defines a circle around the center into which the logarithmic spiral does not extend.

$$x(t) = ae^{bt}\cos(t) \;\rightarrow\; x(\theta) = ae^{b\theta}\cos(\theta)$$

$$y(t) = ae^{bt}\sin(t) \;\rightarrow\; y(\theta) = ae^{b\theta}\sin(\theta)$$

The parametric form of the equation gives separate x and y values for the radial distance as a function of time. In order to form a logarithmic spiral, the time parameter must be determined by a constant angular velocity. The time multiplied by a constant angular velocity gives radians, $\theta = t\omega$, which are then used in the parametric equations. The major arms of the Milky Way are described by logarithmic spirals which are generated from a constant angular velocity, which is a defining characteristic of simple harmonic motion and the directly proportional force of absolute gravity.

The stars within a galaxy do not follow stable orbits about its center, and they do not move with velocities solely determined by linear gravity acting between individual stars and its center. Stars have essentially the same orbital velocity at all radial distances, and galaxies typically have flat rotation curves. The complexity of stellar motion clearly demonstrates the presence of complex gravitational relationships. These relationships must have a common cause, which implies the action of an unrecognized force that influences stellar motion on a cosmic scale. It is now possible to demonstrate that absolute gravity is a real force, from which it follows that this force must affect stellar dynamics within galaxies. Absolute gravity can be causally related to the spiral arms of galaxies and must also be causally related to flat rotation curves in some way, but the extent and manner in which absolute gravity is responsible for flat rotation curves remains to be determined.

The majority of galaxies are classified as spiral galaxies. The spiral arms move in a completely different manner from the stars within a galaxy. The pattern of spiral arms revolves as a single whole. This requires the orbital velocity at different locations in the spiral arms to increase in direct proportion to the radial distance. The spiral arms rotate with a constant angular velocity. The nature of this dynamic is identical to the simple harmonic nature of absolute gravity. Since absolute gravity is the only force which acts in this way, there is clearly some causal relationship between it and the dynamics of spiral arms. Circumstantial evidence of this causal connection is apparent in the fact that absolute tidal force and the form of spiral arms are both directly governed by constant angular velocities.

5. Beyond the Copernican Principle

The revolution of the universe is an ancient idea that was incorporated in Ptolemaic cosmology. This cosmology dominated the western and near eastern world view for two millennia. The mathematics of this geocentric model, with its deferents, epicycles, and equants, described and predicted the motions of the planets with acceptable accuracy, given the technology available at the time. The planets each orbited in one of the seven heavens. Beyond the seventh heaven of Saturn are the immovable sphere of fixed stars and the location of Aristotle's Prime Mover. The mathematics of Copernicus's heliocentric model, published in 1543, was not more accurate than the Ptolemaic geocentric model in its predictions. However, the heliocentric model was philosophically superior. It could explain the mysterious retrograde motions of Venus and Uranus as apparent and not real, while the geocentric model considered them real but had to employ complex *ad hoc* mechanisms to explain their motions.

This paradigm shift in cosmology has become enshrined as the Copernican principle. Initially, this was simply the idea that there is nothing special about the earth or its location in the cosmos. This principle has since become more general in its assumption that there is nothing special about any location in the universe. This is an axiomatic assumption of relativity theory. On the basis of the Copernican principle, relativity theorists make the unverifiable assertion that it is impossible for a preferred reference frame to exist in the universe; that is, relativity is absolute. The Copernican principle has also found formal expression in the cosmological principle, of which Einstein was a strong proponent. This principle holds that the universe looks the same from every location, because energy-mass is distributed randomly and uniformly throughout its extent. The discovery of the homogeneous and isotropic CMB radiation in 1964 fit perfectly with both the Copernican and cosmological principles, as well as the idea of a Big Bang.

Current theory assumes the universe is finite simply because the total energy in the universe must be finite. At least this was the case until just recently; some physicists are now proposing that the universe is virtually infinite. The space of the universe is expanding. This logically leads to the idea that the universe begins as a gravitational singularity which explodes, causing space to expand. Revealed cosmology also describes a finite universe, in which the unsearchable plans of the Architects of the Master Universe are limited to pervaded space. "Their plans appear to be ultimately space limited in extent by the concept

periphery of the master universe, but as plans they are not otherwise conditioned by time or space." **118:4.6** "There is a concept periphery to the master universe…" **105:3.7** This concept periphery appears to be imposed by the limiting velocity of light.

The whole of creation is revolving about Paradise. This revolution occurs in an inertial frame, and velocity cannot exceed that of light in an inertial frame. The spatial extent of the master universe is constrained by an orbital velocity of light, instead of by some fixed quantity of energy which is eternal, uncreated, and self-existent. There are two types of absolute motion. There is the radial motion of acceleration away from Paradise caused by space expansion, and the orbital velocity about Paradise caused by absolute gravity. At the Hubble expansion rate, the velocity of light is reached after 13.8 billion years. At an angular velocity of $\sim 2.30 \times 10^{-18}$ θ/s, the orbital velocity equals that of light at a distance of 13.8 Bly. The universal revolution of the plane of creation is difficult to detect, because it requires roughly 87 billion years for one revolution. The angular velocity of 2.30×10^{-18} θ/s equals 4.18 billionths of a degree per year. By way of comparison the "fixed" guide star (HR 8703) used in the Gravity Probe-B experiment has an angular velocity that is ten times faster at 41.7 billionths of a degree per year. **[30]**

The idea of universal revolution about a center of the universe strikes the modern sensibility as an ancient and erroneous religious doctrine. The most potent legacy of Copernicus' discovery was the effective emancipation of the inquisitive intellect from the spiritual tyranny which ecclesiastical authority exerted over the cosmological investigations of natural philosophy. But natural philosophy is now reaching out to the limits of the universe. There is nothing particularly unique about the location of the earth, but this does not mean that the earth is not relatively near a preferred location which is absolutely unique in the universe – the Isle of Paradise. The Copernican heliocentric model displaced the geocentric model, because it was superior. The Paradise-centric model will eventually displace the model of a random universe proscribed by the cosmological principle, because it is philosophically superior in its explanatory power.