Gravity in Physics of Numeric Relations

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Gravity does not depend on mass, and gravity is probably not a property of a celestial body at all. Most likely, gravity is caused by transcendental numeric attractors. These attractors cause mass accretion forming the shape of the celestial body and determine its motion in space and time.

One of the unsolved fundamental problems in physics is the stability of systems of a large number of coupled periodic processes, for instance, the stability of planetary systems. Newton himself had doubted the possibility of a mathematical solution, even concluding that periodic divine intervention was necessary to guarantee the stability of the solar system. Indeed, if numerous bodies are gravitationally bound to one another, even recent perturbation models predict long-term chaotic states that contradict the physical reality of the solar system and thousands of exoplanetary systems.

Another issue is that Kepler's laws cannot explain why the solar system has established the orbital periods 90560 days (Pluto), 60182 (Neptune), 30689 (Uranus), 10759 (Saturn), 4333 (Jupiter), 1682 (Ceres), 687 (Mars), 365 (Earth), 225 (Venus) and 88 days (Mercury), because in theory, there are infinitely many pairs of orbital periods and distances (semi-major axes) that fulfill Kepler's laws. Regrettably, Einstein's field equations do not reduce the theoretical variety of possible orbits, but increases it even more. As a consequence, the current orbital system of the Sun seems to be accidental, and its stability a miracle.

One of the greatest threats to the stability of systems of coupled periodic processes is parametric resonance, which can arise when the frequencies of the periodic processes happen to be in ratios of integers.

For instance, asteroids cannot maintain orbits that are unstable because of their resonance with Jupiter. These orbits form the Kirkwood Gaps, which are areas in the asteroid belt where asteroids are absent.

However, from the perspective of the physics of numeric relations, parametric resonance can be avoided, if the frequencies of the processes approximate irrational, in particular, transcendental ratios.

Among all transcendental numbers, Euler's number $e = 2.71828\ldots$ is unique, because its real power function coincides with its own derivatives. In the consequence, Euler's number allows inhibiting parametric resonance regarding any coupled periodic processes and their derivatives – rates of change. Because of this unique property of Euler's number, real systems of coupled periodic processes of various nature tend to establish frequency ratios that coincide with integer powers of Euler's number and its roots, as shown in my paper [1].

Actually, the orbital periods of planets and planetoids approximate ratios close to Euler's number and its integer powers. For instance, the ratio of Jupiter's orbital period 4332.59 days to Venus' orbital period 224.701 days approximates the 3^d power of Euler's number:

$$\ln\left(\frac{T_{jupiter}}{T_{venus}}\right) = \ln\left(\frac{4332.59\ \mathrm{d}}{224.701\ \mathrm{d}}\right) = 2.96$$

The same is valid for the ratio of the orbital period 90560 days of Pluto to that of Jupiter:

$$\ln\left(\frac{T_{pluto}}{T_{jupiter}}\right) = \ln\left(\frac{90560\ \mathrm{d}}{4332.59\ \mathrm{d}}\right) = 3.04$$

The equality of both deviations $(3 - 0.04) + (3 + 0.04) = 6.00$ results in a perfect approximation of the 6^{th} power of Euler's number in the Pluto-to-Venus orbital period ratio:

$$\ln\left(\frac{T_{pluto}}{T_{venus}}\right) = \ln\left(\frac{90560\ \mathrm{d}}{224.701\ \mathrm{d}}\right) = 6.00$$

The ratios of the orbital periods of other planets and planetoids approximate the square root or other rational powers of Euler's number. This trend can be observed not only in the solar system, but in hundreds of exoplanetary systems, as shown in my paper [2].

Obviously, Pluto's orbit is essential for the stability of the solar system. However, this knowledge is far beyond conventional models, as evidenced by the official definition of the International Astronomical Union (IAU), which only partially recognizes Pluto as a planet [3]. Regrettably, the estimated mass of a celestial body is notoriously considered as a quantitative criterion [4] for defining it as a planet, despite the fact that the mass of a planet cannot be measured, but only calculated based on highly speculative model assumptions.

As shown in my post Newton's Invalid Law, a theory that postulates gravitation of mass as forming factor of the solar system is not falsifiable, because there is no method to *measure* the mass of a planet.

Furthermore, it is not difficult to demonstrate that gravity acceleration does not depend on masses and therefore, gravity cannot be caused by mass. Galileo Galilei, Friedrich Bessel and Loránd Eötvös proved this already. Obviously, Newton's "law" must be taken as an unproven hypothesis. Regrettably, the outdated idea about mass as source of gravity is not anymore counted as a hypothesis, but as a dogma, regardless of its theoretical absurdity and the lack of empirical evidence.

In order to get an idea about the true cause of gravity, now let us continue the development of our numeric physical approach.

Normal matter is formed by nucleons and electrons because they are exceptionally stable quantum oscillators. However, a free neutron decays into a proton and an electron within 15 minutes while the life-spans of the proton and electron top everything that is measurable, exceeding 10^{29} years. In our numeric physical approach [2], proton and electron are exceptionally stable, because the ratio of their eigenfrequencies approximates the seventh power of Euler's number and its square root that makes impossible proton-electron parametric resonance:

$$\ln\left(\frac{\omega_p}{\omega_e}\right) = \ln\left(\frac{1.42549 \cdot 10^{24}\,\mathrm{Hz}}{7.76344 \cdot 10^{20}\,\mathrm{Hz}}\right) \simeq 7 + \frac{1}{2}$$

The eigenfrequencies and harmonics of the proton and the electron are natural frequencies of any material, also of the accreted matter of a planet. Conventional models of the solar system do not take into account this aspect, which lies at the heart of our interscalar view. Given the enormous number of protons and electrons that form a planet, eigenresonance must be avoided in the long term. This affects any periodical process including orbital and rotational motion.

This is why the planets in the solar system and in hundreds of exoplanetary systems have orbital periods that approximate integer and rational powers of Euler's number relative to the natural oscillation periods of the proton and the electron [2].

Jupiter's orbital period 4332.59 days approximates the 66^{th} power of Euler's number multiplied by the oscillation period τ_e of the electron:

$$\ln\left(\frac{T_{jupiter}}{2\pi \cdot \tau_e}\right) = \ln\left(\frac{4332.59 \cdot 86400\,\mathrm{s}}{2\pi \cdot 1.28809 \cdot 10^{-21}\,\mathrm{s}}\right) = 66.00$$

Jupiter's orbital radius approximates the 56^{th} power of Euler's number multiplied by the Compton wavelength λ_e of the electron. The aphelion $A = 5.45492$ AU $= 8.160444 \cdot 10^{11}$ m delivers the upper approximation:

$$\ln\left(\frac{A_{jupiter}}{\lambda_e}\right) = \ln\left(\frac{8.160444 \cdot 10^{11}\,\mathrm{m}}{3.86159 \cdot 10^{-13}\,\mathrm{m}}\right) = 56.01$$

Jupiter's perihelion $P = 4.95029$ AU $= 7.405528 \cdot 10^{11}$ m delivers the lower approximation:

$$\ln\left(\frac{P_{jupiter}}{\lambda_e}\right) = \ln\left(\frac{7.405528 \cdot 10^{11}\ \mathrm{m}}{3.86159 \cdot 10^{-13}\ \mathrm{m}}\right) = 55.91$$

Consequently, we can express Jupiter's orbital period and its mean orbit radius in electron units and integer powers of Euler's number:

$$T_{jupiter} = 2\pi \cdot \tau_e \cdot e^{66} \qquad R_{jupiter} = \lambda_e \cdot e^{56}$$

Now we substitute $\lambda_e = c \cdot \tau_e$ and apply Kepler's 3^{rd} law of planetary motion to express the gravitational parameter μ_{sun} of the Sun through Jupiter's orbital period and its mean orbit radius:

$$\mu_{sun} = 4\pi^2 \frac{R^3_{jupiter}}{T^2_{jupiter}} = 4\pi^2 \ \frac{c^3 \cdot \tau_e^3 \cdot e^{56 \cdot 3}}{4\pi^2 \cdot \tau_e^2 \cdot e^{66 \cdot 2}}$$

After reasonable reduction, we can express the gravitational parameter μ_{sun} of the Sun through the oscillation period of the electron, the speed of light in a vacuum and Euler's number:

$$\mu_{sun} = \tau_e \cdot c^3 \cdot e^{36}$$

In logarithms, the cube of the mean orbit radius divided by the square of the orbital period $56 \cdot 3 - 66 \cdot 2 = 36$ results in the 36^{th} power of Euler's number. Integer powers of Euler's number are attractors of transcendental numbers, as shown in my paper [5].

In this way, within our numeric physical approach, the gravitational parameter of the Sun does not appear to be accidental, but is stabilized by Euler's number and origins from the quantum physical properties of the electron respectively the proton.

Naturally, also the large moons must avoid eigenresonance and prefer orbital periods and radii that approximate integer and rational powers of Euler's number relative to the natural oscillation periods of the proton and the electron. Hence, it is not difficult to derive [6] the gravitational parameters of the planets, for instance:

$$\mu_{jupiter} = \tau_e \cdot c^3 \cdot e^{29} \quad \mu_{saturn} = \tau_e \cdot c^3 \cdot e^{27}\sqrt{e} \qquad \mu_{uranus} = \tau_e \cdot c^3 \cdot e^{26}$$

$$\mu_{earth} = \tau_e \cdot c^3 \cdot e^{23} \qquad \mu_{mars} = \tau_e \cdot c^3 \cdot e^{21}$$

Saturn's gravitational parameter approximates the center of scale symmetry $(26 + 29)/2 = 27 + 1/2$ between the parameters of Uranus and

Jupiter. The gravitational parameter of Uranus approximates the center of scale symmetry $(23 + 29)/2 = 26$ between the gravitational parameters of the Earth and Jupiter.

If we use the oscillation period of the proton $\tau_p = 7.01515 \cdot 10^{-25}$s to express the gravitational parameter of Jupiter, we can discover an elegant connection with the gravitational parameter of the Sun:

$$\mu_{jupiter} = \tau_p \cdot c^3 \cdot e^{36}\sqrt{e} = \mu_{sun}\,\frac{\tau_p}{\tau_e}\,\sqrt{e}$$

If we use the oscillation period of the proton to express the gravitational parameter of Saturn, we can discover another connection with the gravitational parameter of the Sun:

$$\mu_{saturn} = \tau_p \cdot c^3 \cdot e^{35} = \mu_{sun}\,\frac{\tau_p}{\tau_e} \cdot \frac{1}{e}$$

As we can see, the gravitational parameters μ have always the form $\tau_e \cdot c^3$ respectively $\tau_p \cdot c^3$ and differ only by integer powers of Euler's number. Actually, the natural oscillation period of the electron respectively the proton multiplied by the cube of the speed of light is a spatial acceleration:

$$\tau_e \cdot c^3 = \frac{\lambda_e^3}{\tau_e^2} \qquad\qquad \tau_p \cdot c^3 = \frac{\lambda_p^3}{\tau_p^2}$$

$\lambda_e = 3.86159 \cdot 10^{-13}$m and $\lambda_p = 2.103089 \cdot 10^{-16}$m are the Compton wavelengths of the electron and the proton. This acceleration suggests a subatomic origin of gravity.

As we shall see below, this acceleration guides us to the true cause of gravity. In fact, all what we need to know for deriving Earth's surface gravity acceleration g is the geocentric gravitational constant μ and the radius r of the Earth:

$$g = \frac{\mu}{r^2}$$

No data about the mass or chemical composition of the Earth is needed for calculating Earth's gravity, in full agreement with Galileo Galilei's discovery that the acceleration of a free falling body does not depend on its mass, physical state or chemical composition.

Orbital motion is perpetual free fall. Orbital motion is periodic. So is free fall. Only the aggregate state of the planet prevents the free fall from becoming a damped oscillation. If we express gravity in units of time, we see that Earth's surface gravity corresponds with an oscillation period of 354 days that is quite close to Earth's orbital period:

$$T = \frac{c}{g} = \frac{299792458 \text{ m/s}}{9.8 \text{ m/s}^2} = 354\,\text{d}$$

By the way, at an altitude of 100 km above sea level, at the Karman line, Earth's gravity reduces down to 9.5 m/s^2 that corresponds with the orbital period of 365.25 days.

The subatomic origin of gravity suggests to express the acceleration of free fall through the speed of light and comprehend gravity in terms of a frequency gradient:

$$g = \frac{1}{\nu}\frac{\Delta\nu}{\Delta h}c^2$$

Already in 1959, Robert Pound and Glen Rebka [7] verified this equation in their famous gravitational experiment. Sending gamma rays over a vertical distance of $\Delta h = 22.56$ m, they measured a blueshift of $\Delta\nu/\nu = 2.46 \cdot 10^{-15}$ that corresponds with Earth's surface gravity 9.8 m/s^2.

The circle is complete. Now we can conclude: A body experiences free fall due to just the gradient of the frequency shift of its own quantum oscillators – protons and electrons. The local direction and amount of this frequency gradient derives from the spatial gradient of the fractal scalar field of the local numeric attractor, as shown in my paper [8].

Gravity is all about frequency shifts of quantum oscillators caused by numeric attractors. To get more kinetic energy, protons, electrons, and atoms move (fall) towards the spatial gradient of the numeric attractor. Like gnats flying to the lamp. The larger the attractor, the more energy they *can* get. The closer to the attractor the more energy they *get*. This is why the core of a planet is hot.

The closer the distance to the attractor, the greater the acceleration of the free fall. However, the numeric field of the attractor is fractal, as shown in my paper [2]. Hence, on the way down to the attractor, the acceleration of free fall increases and decreases in a fractal sequence.

The fractality of the attractor field causes a logarithmically fractal change of matter density with the depth that corresponds well with the seismic profile of the Earth, as shown in my paper [9]. The atmospheric stratification of Earth, Venus, Mars and Titan continues the fractal pattern of the attractor field that has formed the planet [10].

In contrast, Newton's shell theorem that considers mass as source of gravity, predicts that the gravity acceleration of a particle decreases as the particle goes deeper into the Earth and becomes zero at the Earth's center. This is why the official Preliminary Reference Earth Model [11] affirms the decrease of the gravity acceleration with the depth. However, this hypothesis is still under discussion. In 1981, Stacey, Tuck, Holding, Maher and Morris [12] reported anomalous measures (larger values than expected) of the gravity acceleration in deep mines and boreholes.

Gravity does not depend on mass, and it is not a property of a celestial body at all. Gravity is caused by transcendental numeric attractors. These attractors cause mass accretion forming the body's shape and determine its orbital and rotational motions. In this way, galaxies, stars and planets form in Euler numeric attractors of stability. These attractors and their distribution differ only in scale. Euler-attractors determine the spatial distribution of stars [13] as well as astrophysical and geophysical cycles, as shown in my paper [14].

Euler numeric attractors of stability are omnipresent in space and time. This information has not to propagate. Therefore, gravity acts instantaneously. Please, watch my video Faster Than Light on this topic.

The number of Euler attractors in a given scale range is finite. Consequently, the probability of finding similar orbital systems in the galaxy is very high. For this reason, hundreds of exoplanetary systems [2] have orbital periods familiar to our solar system, which are integer and rational powers of Euler's number multiplied by the oscillation period of the electron or proton. This is a strong confirmation of our numeric concept of gravity. Please, watch also my video Gravitation on this topic.

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