New Concept of Gravity

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Abstract

For more than a hundred years, discussion has been going on in physics: is gravity a force or a curvature of space? This article shows that gravity is both a force and a curvature of space simultaneously. The forcefield of gravity and space are synonyms. Gravity, like other potential forcefields, has allowed different energy levels.

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01.55.+b General physics; 04. General relativity and gravitation; 03.50.-z Classical field theories; 12.10.-g Unified field theories and models

Introduction

Throughout our lifetime, we feel a force that pulls us down. It is everywhere we go: high in the mountains, underground in the caves, on the street, on the bus and on the plane. It cannot be shielded like electric and magnetic fields. It cannot be switched OFF or ON like electricity. This force is gravity. According to Isaac Newton [1] the cause of gravity is mass. Any body with mass attracts all other bodies with mass. The force of attraction is proportional to the product of masses and inverse proportional to

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the distance between bodies in square. The Newton gravitation law works well for a planet orbit calculation and for everyday use.

Albert Einstein [2] thought otherwise. Gravity as a force did not fit into his theory of relativity. He therefore assumed that gravity is not a force but a curvature of space. Mass is the cause of curvature. Detailed researches on how light bends near the Sun showed that space is really curved. Nevertheless, on a daily basis, we feel the force of gravity which we should overcome when we try to lift heavy things. We do not feel the curvature of space.

Einstein theory versus Newton's

Both theories of gravity are based on the presumption that space is an endless container where everything is located and all events occur. Newton wrote: "Absolute space, in its own nature, without regard to anything external, remains always similar and immovable."

It is Euclidean 3D space that is linear and independent without any curvature (Fig. 1.).

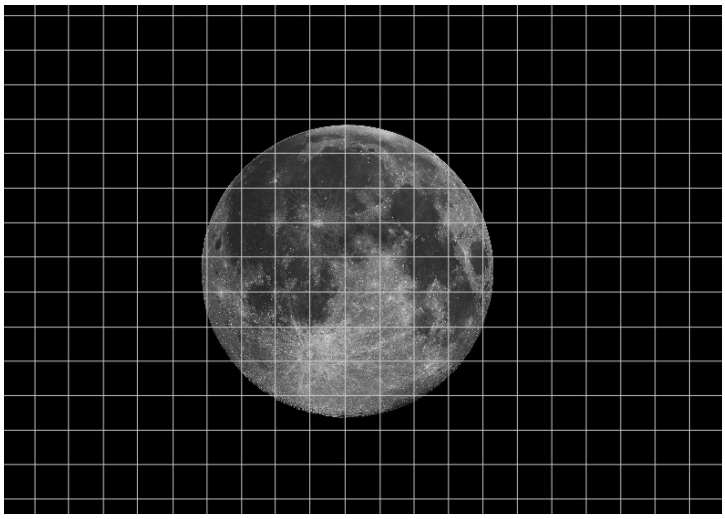

Fig. 1. Cross section of Space coordinates according to Newton.

Einstein wrote [3] that the Newton conception of space is “free imagination of human mind”. Einstein improved it by adding time as a fourth coordinate. It is De Sitter 4D spacetime, i.e., 3 dimensions of space and 1 dimension of time. The bodies on which force does not act are moving in geodesics (Fig. 2.).

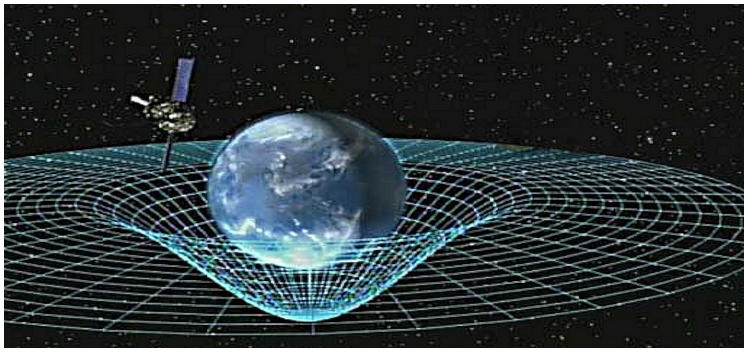

Fig. 2. Curvature of Space according to Einstein.
By NASA – http://www.nasa.gov/mission_pages/gpb/gpb_012.html.

The observations confirm with high accuracy that space is curved near celestial bodies. The gravitational lensing of distant galaxies shows that in their vicinity space is curved. Far from massive bodies no curvature of space is found. There is Euclidean space.

The above theories show some sort of contradiction: Newton's theory is consistent with our daily experience, but astronomical observations confirm Einstein's assumption. Newton and Einstein both accept that space itself is an empty container.

No empty space (void) has been observed in nature. There is at least a gravity field. Possibly space does not exist at all – it is just a gravitational field. When we overcome gravity, we feel it as space. In this case gravity is a force as defined by Newton's law of gravity and space is curved according to Einstein's assumption. The curvature of space is just the curvature of a gravity field (Fig. 3.).

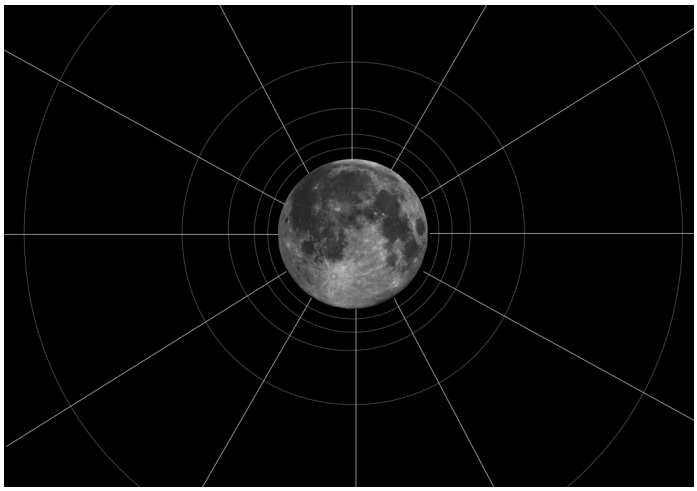

Fig. 3. Natural Curvature of Space (gravity field).

In the vicinity of massive bodies, the space corresponds to the geometry of Riemann. The bodies on which force does not act are moving in geodesics.

The magnitude of curvature is the same as in the Einstein General Relativity. Therefore one can presume that the new theory has the same accuracy as the General Relativity. The only difference is that there is no need for artificial construct, i.e., spacetime.

Riemannian curved space (Fig. 4.) is around each atom in crystals. The gravity of individual atoms is additive. As the distance from the atoms increases, the curvature of the space decreases. Far away from the sources of gravity (atoms) the space is flat. It is Euclidean space.

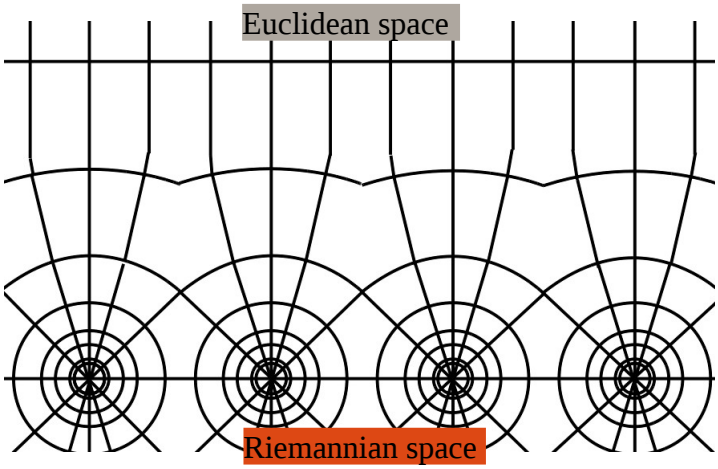

Fig. 4. Curvature of Space near the surface of crystal.

The same characteristics of space are also observed in the Universe. Space is curved near celestial bodies. Space is flat far away from stars and planets.

Energy levels in gravity field

A gravity field as well as an electric field is a potential field. The electric field has allowed energy levels around each nucleus (charge). The excited electrons in the electric field of nucleus can return to the ground state by emitting a particle (photon or phonon). The emitted particle carries away the energy difference between the excited state and the ground state of an electron (Fig. 5).

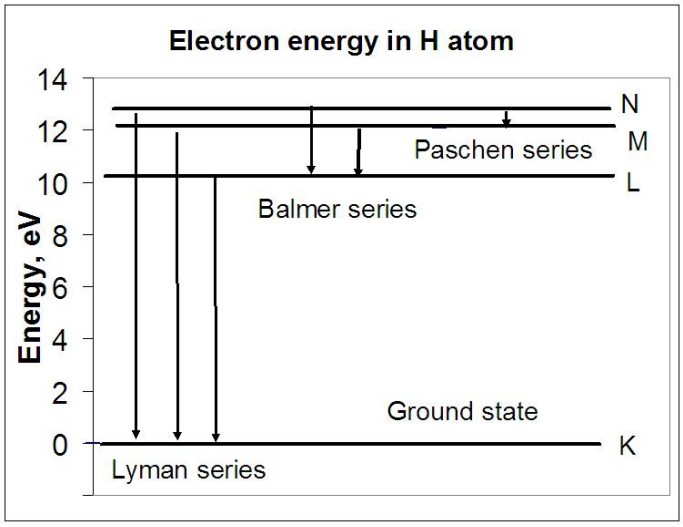

Fig. 5. Electron energy levels **K, L, M, N** in hydrogen atom.
Emitted photons are classified by energy in series: Lyman, Balmer, Pashen.

There is no reason to think that a gravity field is an exception. Let us analyze the particles decay end product, for example, an electron. All modes of decay [4] can be displayed in a single chart (Fig. 6.).

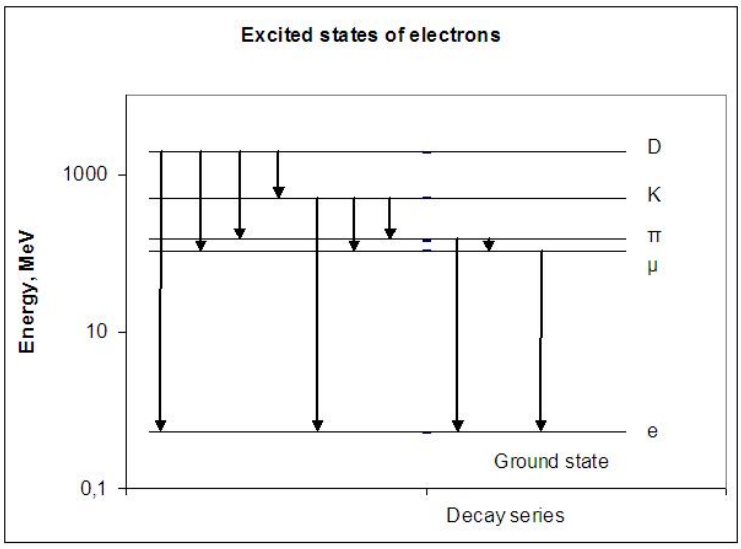

Fig. 6. Electron energy levels in gravitation field and decay modes. Excited electron **D** can return to the ground state **e** directly or via lower levels **K, π, μ**.

If Fig. 5 is compared with Fig. 6, they seem to be practically the same. The only difference is that an excited electron in an atom gains additional momentum, but in the gravity field it also gains mass. Taking into account the equivalence of mass and energy, this is not a significant difference.

Similar decay diagrams containing all decay modes can be created for protons, neutrons and photons. There are many variants of carrying away excess energy: by neutrinos, by photons or by neutral mesons, the latter finally converting to photons. The new concept disposes a particle classification by stable end products of decay: electrons, protons, photons, neutrons and neutrinos. The question about the stability of the last two items should be discussed for the below-mentioned reasons. The neutrons are stable in the nucleus of an atom, but they decay outside the nucleus in the gravitation field of the Earth. Information about the nature of neutrinos is inconsistent and insufficient.

As a result, there are three classes of intrinsic elementary particles and antiparticles: electrons (leptons), protons (baryons) and photons (bosons). All other particles are excited states of intrinsic elementary particles. These are as follows:

1. Excited states of electrons are muons, charged pions, charged kaons, τ, D, other leptons and charged mesons.

2. Excited states of protons are Λ, Σ, Δ, Ξ and other baryons.

3. Excited states of photons are uncharged pions, neutral kaons and other neutral mesons.

When the excited particle decays, the excess energy is carried away by the massless particles (photons, neutrino) or by the particle – antiparticle pairs.

If gravity, like an electric field, has allowed different energy levels and restricted zones, the question is why we do not see it in the Solar system. Let us look at an excited particle decay process. The strength of the forcefield and the time of particle decay (lifetime) are closely associated. The product of lifetime and interaction force is constant for strong, electromagnetic and weak interactions. It is a decay momentum [5] and is equal to $2*10^{-16}$ Ns at a distance $2*10^{-16}$ m. Presuming that the decay momentum is the same for all four forces, the lifetime of bodies in a gravity field is equal to 10^{16} s. For this reason, comets, meteorites, asteroids and other celestial bodies can wander around the Sun System for 300 million years before they find their stationary orbits.

Nutshell about the origin and nature of mass [6]:

Let us look at the Dirac equation in the Gauss unit system: $E^2 = m^2 + p^2$. Therefore the mass is: $m = \pm(E^2 - p^2)^{1/2}$. It means that each event of energy conversion creates 2 masses with an opposite sign. This is confirmed by experiments. The particles are generated in particle-antiparticle pairs and *vice versa*: the mass disappears when a particle collides with an antiparticle. The antiparticles have negative mass, i.e., anti-gravity. It follows that matter repels antimatter. There must be an Antiverse containing only antimatter. The ordinary Universe and Antiverse [7] repel each other. It explains baryon asymmetry in the Universe.

Conclusions

Mass is the charge of gravity. Gravity is a force. The forcefield of gravity is space. Space is curved as a forcefield. A gravity forcefield has Allowed Levels of Energy (ALE). All experiments with elementary particles are performed in the gravity field of the Earth. It is expected that ALE has different values in the different gravity field on the Moon or on the Mars.

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