Conceptual FrameWorks
Research papers

On quantum gravity

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Experiments have showed that gravity can be manipulated by light. Light – electromagnetic waves – is a pure quantum phenomenon so we can conclude that quantum gravity isn't just a fantasy. Nearly half a century ago it was thought that gravity must be related to the conceptual framework of quantum electrodynamics. Gravity as a quantum field that interacts with the help of bosons, named gravitons. Unfortunately the problem about the origin of gravity still exists in spite of new proposed solutions like MOND, loop quantum gravity, etc. That is why the problem is more fundamental: "*What is the nature of the force we call gravity?*"

Introduction

If we are convinced of the reliability of our model – the Standard model of Particle physics – the search for quantum gravity is restricted to the creation of an extension of the current model. However, gravity – as a phenomenon – is only observable in relation to other phenomena, like objects and celestial bodies. Therefore it is really strange that we cannot understand gravity while our model of all the other phenomena is thought to be a very reliable model.

Besides that, what do we expect from a new hypothesis about quantum gravity? It is for granted that the hypothesis must show the direct relations between gravity and the other known quantum fields and quantum objects. Like the electromagnetic field, mass and rest mass. The hypothesis must also clarify free fall at the quantum level and explain the equivalence between gravitational mass and inertial mass. And last but not least, the new hypothesis must clarify the concept of General relativity, Newtonian gravity and maybe even the mechanism behind Dark matter.

Actually, this is not an extension of the current model. This is like a re-orientation of the Standard model.

The origin of matter

Without objects – rest mass – there is no Newtonian gravity in the universe. That's why we can conclude that Newtonian gravity isn't a basis quantum field.[1] Because basic quantum fields exist everywhere in the universe – without exception – during the evolution of the universe. If gravity just emerge at the moment rest mass is created, it is not reasonable to suppose that gravity itself is a basic quantum field too.

Matter is mass with an extension that is called rest mass. In quantum field theory the creation of rest mass is the result of the local supply of energy from one or more decreased scalars of the flat Higgs field to the electromagnetic field. An energy transfer that is called the Higgs mechanism. However, the hypothesis isn't without problems because of the quark model and the existence of the Higgs boson.

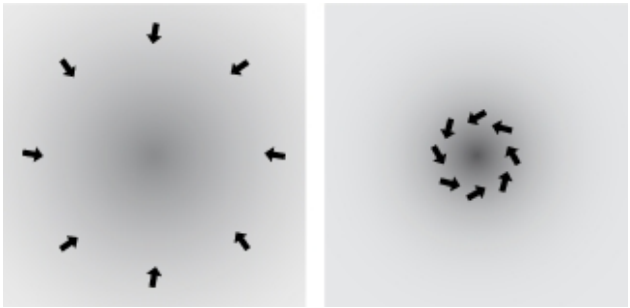

figure 1

Albert Einstein's theory about the equivalence of mass – inclusive rest mass – and energy shows that matter is a concentration of energy: $E = m c^2$.[2] The images in figure 1 show the progression of a local concentration of quanta and the result is the creation of a particle with a certain amount of mass and rest mass if the required amount of energy – the number of concentrated quanta – is available.

A quantum is a fixed amount of the energy of Planck's constant if there exist a minimal length scale in the universe. The concept of the existence of a minimal length scale means that the volume of space itself is quantized. Because a quantum is an amount of observable change and the existence of quantized change relates

the existence of a quantum to the spatial properties of the units of quantized space. Figure 2 shows a *schematic* representation of quantized space with the help of easy to draw cubes. The notation $\underline{\lambda}$ is the proposed standard length.[3]

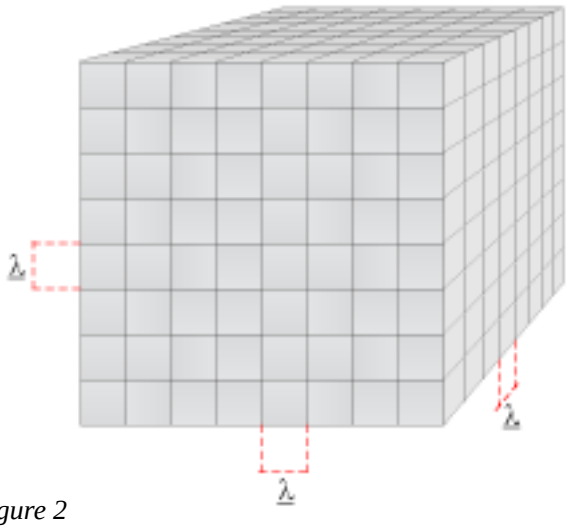

figure 2

The energy of Planck's constant (h) is an amount of change in one direction during 1 second and with the velocity of the speed of light. In other words, if I reduce the length of the change in one direction till the trajectory is equal to the minimal length scale I get the ratio of the amount of energy of every quantum. Because a quantum is the exchange of a fixed amount of energy between adjacent units of quantized space. So I can state that the energy of a quantum ($\underline{h}$) is a fixed small amount of the energy of Planck's constant.

If I substitute the energy in $E = m\ c^2$ by the amount of energy of the quantum ($\underline{h}$), the result is:

$$n\ \underline{h} = m\ c^2 \qquad [n = \text{integer}]$$

The addition c^2 at the right side of the equation represents the "action" that is required to transform the energy of the mass m into an amount of quanta in vacuum space. However, c^2 doesn't affect the amount of energy of the mass. So we can conclude that the energy of the mass and rest mass is equal to the amount of energy at the left side of the equation ($n\ \underline{h}$).

If we want to concentrate "change" within the composed cube in figure 2, we have to transfer an amount of a property of every cube to the centre of the big cube. The volume of every cube is invariant so we have to transfer an amount of surface area. Because invariant volumes can deform their shape if they deform synchronously. That means that every unit of quantized space is a topological object that represents a homeomorphism.

So what to think about c^2? The square of the speed of light represents about 300.000.000 m^2 but if I transform everything into quanta related to the minimal length scale c^2 becomes $\underline{\lambda}^2$. Therefore: $n\ \underline{h} = m\ \underline{\lambda}^2$.

However, the energy of the mass is a number of quanta in vacuum space ($n\ \underline{h}$). In other words, the mass represents the same number of quanta although the quanta are concentrated so the involved units – the schematic small cubes of figure 2 – represent together a topological deformation that is equal to the number of quanta.

The Higgs mechanism

Figure 3 shows a unit of quantized space in a *schematic* way. Inside the unit is the scalar – the inscribed sphere – and the deformed part of the unit encloses the scalar. If I make all the small cubes in figure 2 transparent, every cube shows a scalar and all the scalars together are like an atomic lattice: the flat Higgs field (see figure 4).

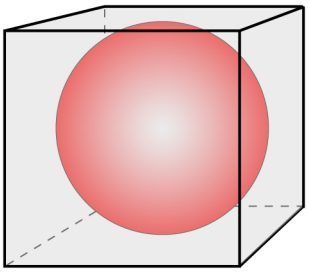

figure 3

The scalar inside the unit is a sphere because the sphere is the only true geometrical scalar. The volume around the scalar (light grey) must be the deformed part of the same spherical shape forming mechanism[3]. Because the decrease of a scalar – the inscribed sphere – means that the lost volume of the outer shell of the sphere has become part of the deformed volume (light grey). In other words, the scalar and the deformed part don't represent parts of 2 solitary fields, both are part of the same "internal" mechanism of every unit.

The Higgs mechanism – the transfer of volume from the outer shell of a decreased scalar to the deformed volume within the boundary of one unit – is related to the creation of rest mass: "ordinary matter".

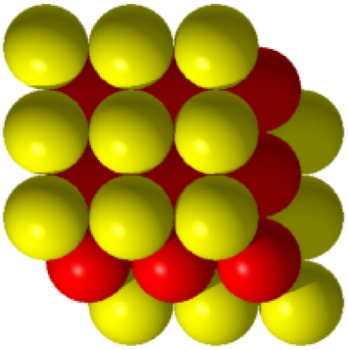

figure 4

The creation of matter by the structure of the basic quantum fields changes the mutual relations between the inscribed spheres – the scalars – of the flat Higgs field around the created matter. In other words, the creation of matter induces at the same moment a disturbance of the symmetry within the flat Higgs field. A phenomenon we call the force of gravity.

Figure 5 shows the scalar vectors of 4 identical scalars within the flat Higgs field (every scalar has the same magnitude). The scalar vectors exist because of the internal mechanism of every unit of quantized space: the spherical shape forming mechanism (scalar mechanism). Every scalar within the flat Higgs field has 12 points of contact with the 12 scalars of the adjacent units around. That means that the magnitude of the undistorted part of the scalar mechanism of every unit is determined by the repulsive force of the 12 adjacent scalars by means of the 12 points of contact.

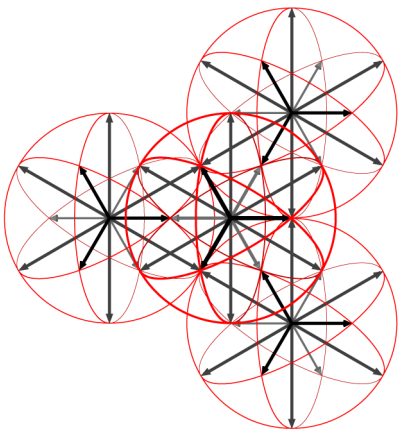

figure 5

Newtonian gravity

Figure 6 – cross section – shows the vectorized *flat* Higgs field with in the centre a decreased scalar. I have drawn the *resultant* vectors (blue) because it is to difficult to draw the pointers of the small scalar vectors – like figure 5 – in a clear way. The broken symmetry of all the vectors of the flat Higgs field around the decreased scalar will result in a “push force” in the direction of the decreased scalar. The push force from all the scalars around within the flat Higgs field – the force of Newtonian gravity – influences the direction of the changes of the deformed part of every unit. In other words, it influences also the direction of the movement of the involved rest mass in the centre of figure 6.

The mechanism behind the influence of the direction of movement of an object by the push force of Newtonian gravity can be illustrated with the help of the schematic representation of the unit, like figure 3.

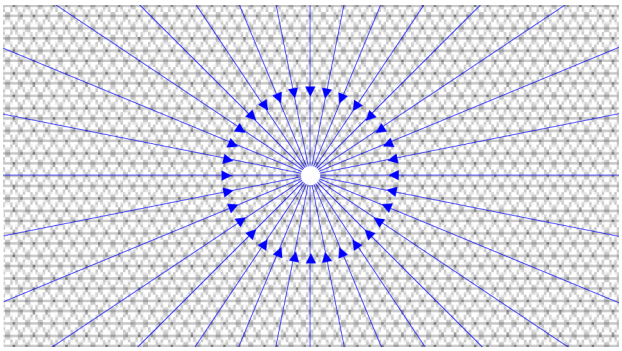

figure 6

The schematic representation – figure 7 – shows a unit and its scalar. The influence of the adjacent units – the topological deformation of the shape of the unit – is simulated with the help of the green arrows. The influence of the unit itself on the other units around are the red arrows. The net result is zero because of the invariance of the volume of every unit.

All the units together tessellate space thus the motion of an object – the propagation of an amount of topological deformation in space – is determined by vectorized vacuum space, the scalar vectors. Every unit has the same internal scalar mechanism – actually, the unit *is* the scalar mechanism – and the direction of the next deformation of its shape is determined by the distinct magnitudes of all the scalar vectors within the scalar of the unit in vacuum space (the flat Higgs field).

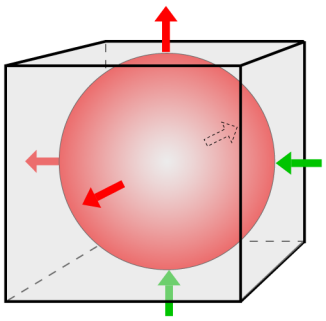

figure 7

The deformed part of every unit is the electric field and the synchronous change of the magnitude(s) of the scalar vectors of the scalar of the unit represent the magnetic field. That's why the increase of the topological deformation of the electric field generates a similar increase of the (scalar) vector of the magnetic field (and vice versa). Together both proportional coupled fields are the well known electromagnetic field.[1]

The scalar vectors of the Newtonian gravity – figure 6 – change the magnitudes of the scalar vectors of the electromagnetic field. The consequence is the resulting direction of the motion of objects in vacuum space, the force of Newtonian gravity.

Gravitational mass and inertial mass

Matter is gravitational mass because of the Higgs mechanism, the creation of rest mass that induces the existence of Newtonian gravity. Inertial mass is the amount of energy that is required to accelerate matter.

Every unit of the electric field – the deformed part of every unit – transfers 1 quantum at the same moment that all the other units in the universe transfer one quantum ($\underline{h}$) too. That means that quanta transfer in space is conserved and synchronized (the conservation of change is the synchronisation of change).[3]

So there is only one question: "How many quanta are involved by the transfer of matter in a certain direction?" The direction of the transfer of a number of local quanta that represent a concentration of quanta within a non-local universe is set by the scalar vectors of the whole universe. But the method to create a certain direction doesn't change the amount of topological deformation that represents the mass.

Free fall

Figure 8 shows a celestial body without atmosphere (e.g. the moon) and I have drawn in a schematic way the units of the structure of the basic quantum fields (cubes). A hammer (H) and a feather (F) are dropped high above the surface of the celestial body.

Both objects represent rest mass – matter – and the nuclei of the atoms contain decreased scalars: holes within the flat Higgs field that interrupt scalar vectors (figure 6). In other words, both objects cut off the entire scalar vectors of Newtonian gravity, created by the rest mass of the moon. All the units of the underlying structure of the basic quantum fields transfer synchronously 1 quantum at the same moment because all the units tessellate space and their volume is invariant.

In other words, the feather and the hammer move with the same velocity in the direction of the surface of the moon by the interrupted scalar vectors: free fall.

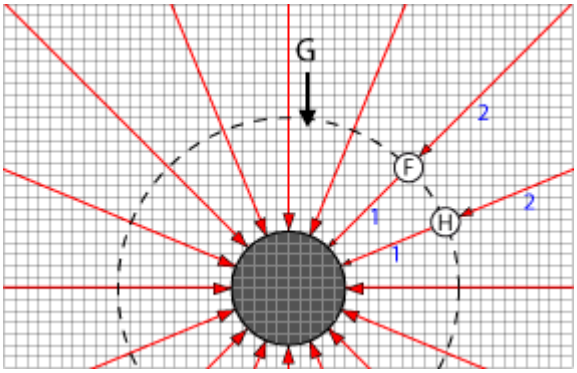

figure 8

Effect of light on gravitation

Experiments have proved that light – electromagnetic waves – can influence the force of Newtonian gravity. The publication of the experiments by Louis Rancourt and Philip Tattersall describes the influence of a shield of light on the force of gravitation. Moreover, the experiments prove that the force of gravitation must be a push force.[4][5]

If the description of quantum gravity is correct, the model must clarify how light can influence the induced scalar vectors by the creation of matter.

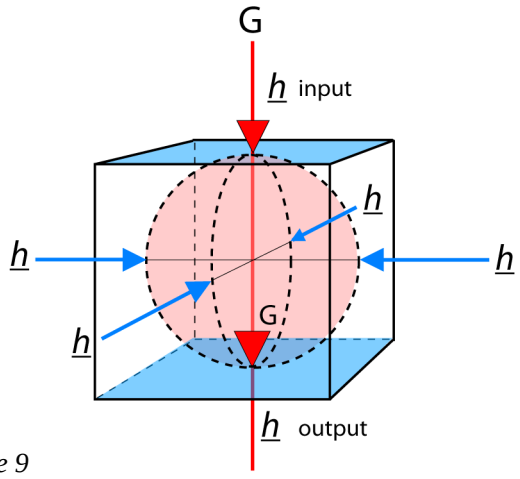

figure 9

The image above shows a schematic unit. Every adjacent unit can transfer 1 quantum to the unit but the gravitational scalar vector G is dominant. In other words, only the 2 blue faces are involved in the transfer of a quantum ($\underline{h}$ input = $\underline{h}$ output).

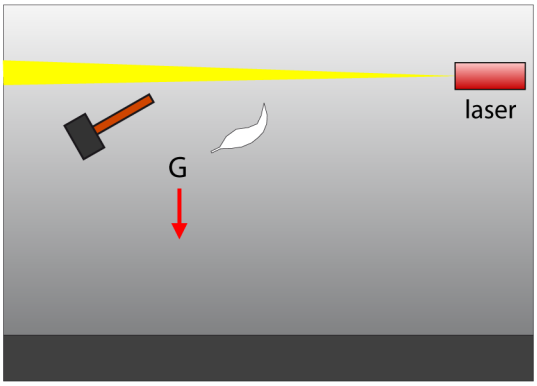

figure 10

But if I manipulate the free fall of the hammer and the feather with a shield of light – see figure 10 – I disrupt the scalar vectors of Newtonian gravity too. Not with the help of an interruption by reducing the magnitude of scalars but with the help of a stream of quanta within the electromagnetic field. Figure 11 shows the principle.

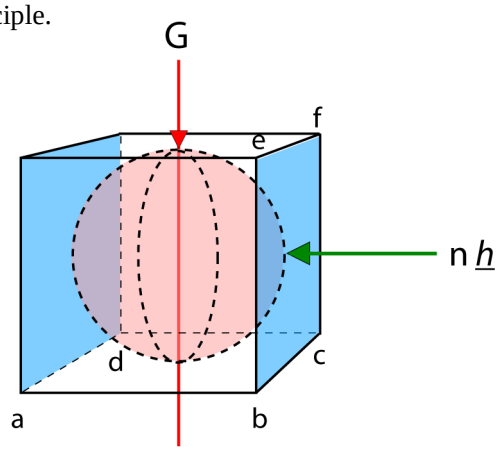

figure 11

The stream of quanta from the right side – created by the laser – influences the magnitudes of the scalar vectors within the involved scalars. In other words, from time to time the gravitational scalar vector G is not the dominant vector thus the topological transformation of the unit is caused by a quantum of the electromagnetic wave (n $\underline{h}$). The result is an interruption of the gravitational acceleration if the unit is – at that moment – involved in the propagation of an amount of deformation we call matter. Actually the hammer or the feather.

Dark matter

Newtonian gravity isn't the only mechanism that acts like a push force. The electric field itself is responsible for the concentration of quanta. The mechanism is a bit awkward because it is caused by the distribution of deformation in space by the scalar mechanism of every unit. Every unit "tries" to change its shape in such a way that the unit becomes a true scalar, a sphere. But obviously, this is impossible.

The distribution of deformation between units in vacuum space is related to the concept of probability. However, our universe is non-local. First because all the units tessellate space and second because of the existence of scalar vectors within vacuum space. Scalar vectors that influence the direction of the next transformation of the units. The scalar vectors act instantaneous thus nearly all the units in the universe are instantaneous "coupled" to the changes of the other units that are part of vacuum space at exactly the same moment.

Figure 1 shows the concentration of deformation by the transfer of quanta. But every unit transfers 1 quantum ($\underline{h}$) to 1 or more units around. A unit that has a higher amount of deformation needs more "cycles" of quanta transfer to get the average amount of local deformation. But if a region in vacuum space cannot concentrate its deformation into rest mass carrying particles – for example because there is too much disturbance by particles and radiation – the result is a local accumulation of deformation that is mass. The centre of an accumulation of matter by Newtonian gravity is a centre of deformation. Local concentrated deformation – Dark matter – is pushed in the same direction because all the units in the universe try to minimize their surface area.

We cannot detect local topological deformations of the electric field because these local deformations don't emit radiation. Moreover, our sun de-concentrates the clouds of Dark matter because of the continuous emission of high-energy particles and radiation. In other words, if our sun is less active the Dark matter at the edge of our solar system will become more concentrated and it will influence the balance between the internal and external conditions in our solar system.

References

1. S.E. Grimm (2019), "*On the concept of (quantum) fields*"
   DOI: 10.5281/zenodo.3585790
   https://zenodo.org/record/3585790
2. A. Einstein: "*Does the Inertia of a Body Depend upon its Energy Content?*" *Annalen der Physik (ser. 4)*, **18**, 639–641,
   http://myweb.rz.uni-augsburg.de/~eckern/adp/history/einstein-papers/1905_18_639-641.pdf

3. S.E. Grimm (2019): “*Quanta transfer in space is conserved*”.
DOI: 10.5281/zenodo.3572846
https://zenodo.org/record/3572846
4. *Louis Rancourt and Philip J. Tattersall (2015), "Further Experiments Demonstrating the Effect of Light on Gravitation".*Applied Physics Research; Vol. 7, No. 4; 2015
http://dx.doi.org/10.5539/apr.v7n4p4
5. Chungpin Hovering Liao (2019), “*Microwave-caused influence on gravitational constant G in Newton’s gravitational law*”.
DOI: 10.13140/RG.2.2.15509.37600
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