Conceptual FrameWorks
Research papers

Tessellation and concentration in quantized space

Sydney Ernest Grimm*

Quantized space creates phenomenological reality but quantized space isn't comparable with our phenomenological related concepts. To understand quantized space we must change our phenomenological point of view for the all-inclusive point of view. The latter shows that tessellation and concentration are geometrical based mechanism that are responsible for the creation of observable reality in our universe.

Introduction

In ancient Greece the Pythagorean had the conviction that our universe is ruled by numerical relations.[1] Recently Max Tegmark redefined this idea once again with the publication "*The Mathematical Universe*".[2] The idea our universe is "constructed by mathematics" isn't amazing because mathematics is a language to describe reality in an accurate way. It would be really awkward if we state that mathematics and reality are not related at all.

However, this has consequences because it is not realistic to assume that the foundations of mathematics shouldn't be identical to the foundations of physics. That's why the basic mathematical properties of our universe are the cause behind the creation of everything that exist.

Structure

Basic fields – as a structure that fills the whole universe – have the ability to change in a continuous way although macroscopic space shows to be homogeneous and isotropic. An apparent contradiction if we imagine the differences between vacuum space and a black hole, to name 2 quite different phenomenological examples.

However, in terms of field concepts different *basic properties* of the individual units of the field structure will lead to the conclusion that dynamical fields cannot exist. Comparable with the empirical based conclusion that we cannot build a working gearbox with gear wheels that have different sized tooth. In other words, the existence of observable phenomena everywhere in the universe shows that the underlying structure must be build up on identical basic properties. Basic properties that are invariant as well as variant.

I can visualize the structure of the basic fields in a schematic way because the structure is the only existing reality. Figure 1 shows a volume in space that's build up by units with identical basic properties.

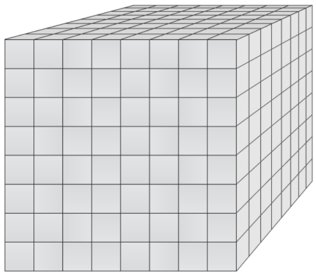

figure 1

Tessellation

The volume in figure 1 is composed of identical cubes and all the cubes tessellate the volume. If we examine the image a question arises about the mathematical properties that determine the shape of each unit. Because the volume of each unit inside the large volume cannot be a variable. Every unit must have an identical volume and every volume must be invariant.[A]

I cannot state that the shape of every unit in figure 1 is caused by an internal *cubical shape forming mechanism* because a cube isn't a dynamical shape. It is impossible to change the shape of a cube with an increase or decrease of only 1 property. Because if I have to change 2 or more properties at the same moment – synchronously – I have to face the conceptual problem that there must exist another underlying reality that facilitate all these synchronous changes of the cube.

Figure 2 shows the effect of a non synchronous alteration of the shape of one unit (rotation is the alteration of a shape in relation to everything around).

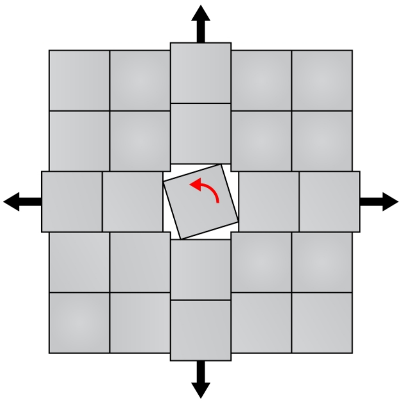

figure 2

The result is the creation of volume that isn't part of a unit. That is impossible so we have to conclude that all the units in the universe change their shape synchronously in a topological way (the invariant property is the identical volume of every unit).

The only reasonable solution for the problem of the missing dynamics is the assumption that every unit represent a scalar mechanism. Not only because of mathematical reasoning but also because the Higgs field – a scalar field – is a basic quantum field and it takes up about 74% of the volume of our universe.[B] Moreover, the sphere is the dominant geometrical shape in the universe, everywhere and at every observable scale.

If I propose that the volume and size of every unit is caused by the scalar mechanism, I have solved the conceptual problem about the existence of units that represent more than 1 basic quantum field. Because basic quantum fields have the ability to interchange properties. In physics we know that the Higgs field and the electric field – a topological field – can exchange energy. A local transformation that is called the Higgs mechanism, a transfer of energy that is caused by the decrease of 1 or more local scalars.

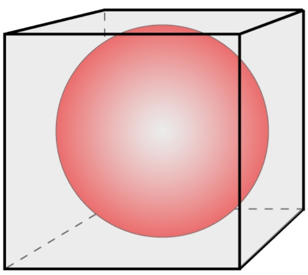

figure 3

Figure 1 shows in a schematic way the tessellation of the universe by the units of the structure of the basic quantum fields: quantized space. Scalars cannot tessellate space but deformed scalars can. The result is the division of the volume of every unit in 2 parts. An inscribed sphere that represents the undistorted scalar mechanism and a deformed part of the scalar mechanism. Figure 3 shows the concept – applied on a cube – in an easy imaginable way.

Thinking about the tessellation of space by spatial units with identical basic properties isn't easy because in daily live reality is phenomenological reality. It only shows the mutual relations between the observable phenomena. Actually, phenomenological reality shows only local mutual differences.

Therefore, the observable phenomena are specific local configurations of the properties of the units of the underlying field structure. The consequence is that the velocity of the observable phenomena is the propagation of mathematical properties – local differences – within the structure of quantized space, while the structure of quantized space is in rest.

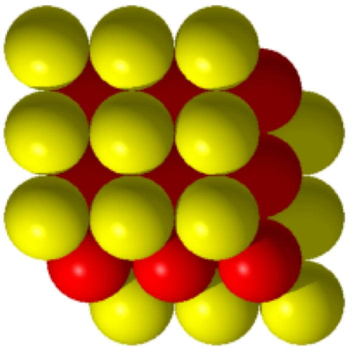

figure 4

The origin of quanta

Figure 4 shows the flat scalar field (Higgs field).[3] Actually these scalars represent the inscribed spheres of the units of quantized space (see figure 3). It is easy to calculate the relations between the 2 distinct parts of every unit if our universe is static and 100% symmetrical (every unit has the same shape). But the volume and the surface area of a sphere is determined by the number pi (π) and the volume and surface area of the deformed part of the unit by the square root of 2 ($\sqrt{2}$).

Both are irrational numbers so it is impossible that both volumes and surface areas share the same geometrical “fixed units”. In other words, it is impossible that the volume/surface area of the inscribed sphere is – for example – exactly 2 or 3 times the volume/surface area of the deformed part of every unit of quantized space.

Unfortunately, modern physics has showed that the energy in our universe is quantized (directly related to Planck's constant). That means that every observable change is caused by the transfer of one – or a multiple – of a fixed amount of energy. In other words, observable phenomena are "build up" by numbers of fixed amounts of energy. So how is it possible that the quantum of energy is a fixed amount of change while the "creators" of the quantum – the not-deformed and deformed part of the units of quantised space – are not "build up" by fixed amounts of volume and surface area?

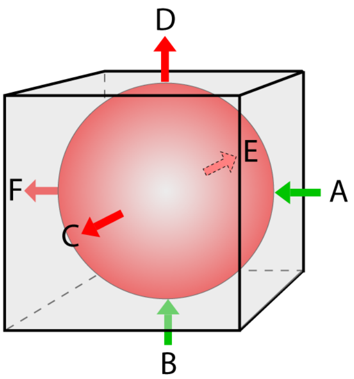

figure 5

The volume of every unit of quantized space is invariant. That means that every deformation of the shape of the unit – see figure 6 – is the result of a synchronous transfer of a flux of infinite small amounts of volume within the boundary of the unit. All the units of quantized space tessellate space thus every change of the shape of a unit shows an "input" deformation and an "output" deformation in relation to the adjacent units. The green arrows A and B in figure 5 are 2 "input" deformation planes and the red arrows C, D, E and F are "output" planes of the unit *at this moment*.

Therefore: $V_{input} = V_{output}$ or $V_{input} - V_{output} = 0$.

If the quantum of energy is equal to the flux of infinite small amounts of volume that are transferred within the boundary of the unit of quantized space, energy cannot be quantized. However, the quantisation of energy is directly related to phenomenological reality. In other words: the observation of the quantum is the observation of a local change.

A local change is the start of a difference between a local state of energy in relation to "everything" around. For example if the red output arrow C changes into a green arrow. Of course $V_{input} = V_{output}$ is conserved.

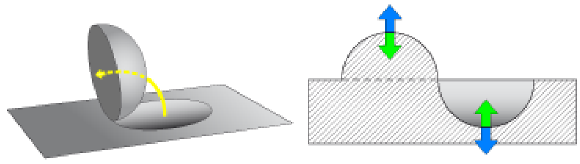

figure 6

But this is impossible if the change of the shape of the unit isn't synchronized with the transformation of the shapes of all the other units in the universe.

The consequence is that the topological transformation of the shapes of all the units by the internal transfer of a continuous flux of infinite small amounts of volume is "interrupted" by a change of one or more input and output planes.

Conclusions:

- The existence of the quantum of energy is the result of the tessellation of the universe by the units of quantized space.
- All the units of quantized space transfer 1 quantum of topological deformation at the same moment.[C]

Topological deformation

The origin of the change of the shape of every unit of quantized space is the continuous deformation of the internal spherical forming mechanism of all the units of quantized space. Because all the units tessellate space.

Figure 4 shows the scalars of the flat Higgs field, the inscribed spheres of the scalar mechanism. From the geometrically point of view the scalar is the inscribed sphere of the unit of quantized space. But the inscribed sphere is not static; the scalar mechanism of every unit tries to "force" the shape of a full scalar. That means that the whole volume of the unit tries to obtain the shape of a sphere.

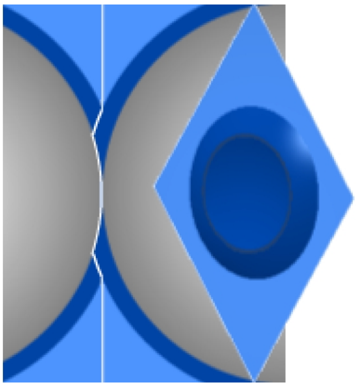

figure 7

Figure 7 shows the joint face of 2 units in cross section. At the right side I have drawn the “true” appearance of the joint face of the unit at the right side (rhombic dodecahedron). The dark blue colour indicates the volumes of both units that were in all probability involved in the displayed deformation.

The topological deformation in figure 7 – the transfer of volume within the boundary of the unit – represents a number of transferred quanta. The velocity of a linear transfer of a quantum is the speed of light. The already stored quanta – that means the fixed amounts of volume that are already transferred to a joint face within the boundary of the unit – are not involved in the present transformation of $V_{input} = V_{output.}$

Figure 7 clarifies the influence of the deformation of the deformable part of the unit on the magnitudes of the scalar vectors – see figure 8 – of both units. The vectors are generated by the transfer of volume to the joint face by the unit at the right side. That means that the mediated vectors are vectors of the magnetic field. The light and blue coloured volume is the electric field.

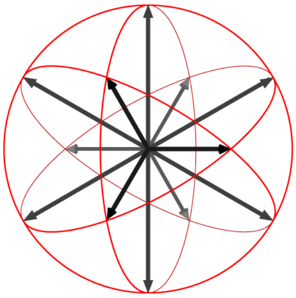

figure 8

If all the units of quantized space have identical scalars – the flat Higgs field – the inscribed spheres are in a state of equilibrium. So I have to conclude that all the changes of the shapes of the units within vacuum space – volume where the Higgs field is flat – are created by the deformed part of every unit. The cause behind the lack of a static equilibrium of the deformed parts of the scalar mechanisms are the irrational relational numbers π and $\sqrt{2}$, mentioned at page 2.

The deformation of the shape of a unit is the result of the transfer of quanta within the deformed part of the scalar mechanism of every unit. Actually it is about the changing of the red and green arrows in the schematic figure 5. This changing of the direction of the topological deformation within the boundary of the unit will effect the symmetrical vectors within the scalar of the units within vacuum space (figure 9). In other words: the linear transfer of 1 quantum generates a positive or negative vector – super positioned on the symmetrical vectors – with the magnitude of 1 quantum. Because $V_{input} = V_{output}$ represents the conservation of energy and the smallest amount of energy – related to observable reality – is 1 quantum (= V_{output}) .

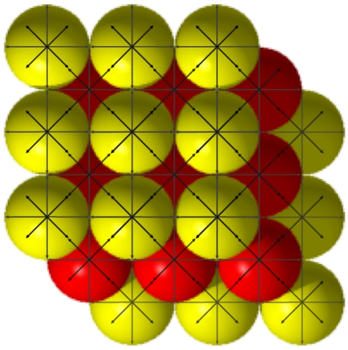

figure 9

In other words, if a unit has a high amount of topological deformation it has generated strong scalar vectors too. These scalar vectors are known as the magnetic field and the deformed volume of every unit is known as the electric field. Both fields change their correlated magnitudes synchronously (that’s why we call it “the electromagnetic field”.

Figure 4 and 8 show that every scalar within the flat Higgs field has 12 scalar vectors. The dominant scalar vector at a certain moment is the cause behind the next increase of deformation in one of the joint faces of the unit that corresponds with the dominant scalar vector. However, reality is a bit more complicated.

The magnitude of a distinct scalar vector is created by all the units in the universe. Because vectors are not bound to the speed of light. Moreover, every topological deformation is caused by a flux of infinite small amounts of transferred volume. In other words, most of the time the deformation of 1 quantum will influence more than one “V_{output}” face (see figure 5).

Calculations

The description of the topological deformation of the units of quantized space raises a question about the computability of the spatial changes within a certain amount of space. For example a volume of 1 cm^3. Because if we can calculate a sequence of spatial changes the result must be the appearance of some of the observable phenomena, like elementary particles.

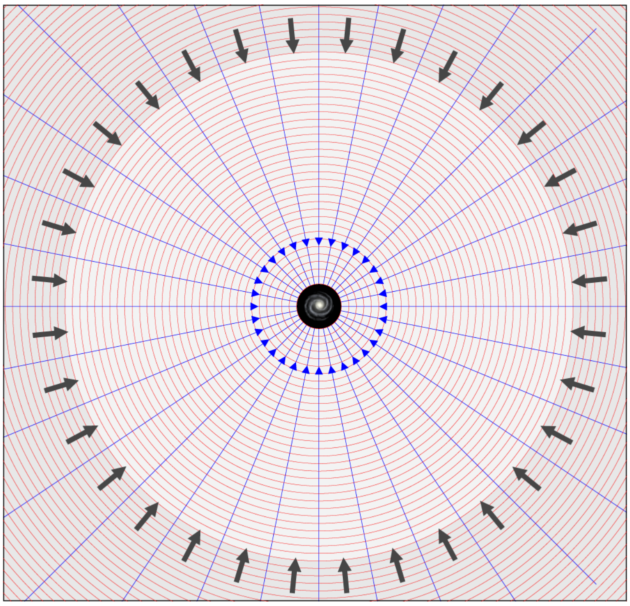

figure 10

The size of 1 unit of quantized space must be a little bit smaller than 1/6 of the radius of the proton, because a proton has rest mass – a reduced scalar – and has spin – a rotational transfer of topological deformation – within its boundary. Moreover, the size of every unit is directly related the amount of linear quanta that are transferred by one unit in quantized space.

If the size of one unit is about 0,5 • 10^{-15} m one 1 cm^3 will enclose about 9 • 10^{40} units and every unit transfers 6 • 10^{23} quanta/sec. Unfortunately, reality isn't "digital". Every topological transformation is the result of a flux of infinite small amounts of transferred volume. And last but not least, our universe is non-local too. That's why we have to implement "the universe" at the outside of the volume of 1 cm^3 to get 100% reliable results. That's why the simulation of all the changes within quantized space with the help of calculations to create phenomena within a large amount of units – e.g. a Hydrogen atom – isn't a realistic option. Moreover, there is another problem too.

Figure 10 shows in the centre a galaxy (hardly visible). The galaxy – an enormous amount of concentrated quanta – is created by the units of a huge volume of space. Much and much larger than the volume of the galaxy and its direct surrounding. Actually, if we distribute all the concentrated quanta of the mass in our universe in such a way that every volume in space has a nearly equal amount of average topological deformation, we are arrived at the state of our universe at the start of the present cycle of evolution.

The consequence is that if we want to calculate all the changes within a small volume of space – e.g. 1 cm^3 – it is not for sure that we will discover simulated phenomena that show a high degree of similarity with known phenomena in physics.

The dark grey pointers in figure 10 show in a schematic way the enormous volume that was involved into the concentration of the quanta that created the mass of the galaxy. The blue pointers indicate the resulting scalar vectors within vacuum space that emerge at the moment rest mass is created by the Higgs mechanism (Newtonian gravity).

Conclusion: if I want to understand the creation of observable phenomena by the structure of quantized space I have to use mathematical reasoning instead of calculations that simulate the evolution of the changes within the structure of the universe.

Concentration

The basic properties[A] and the tessellation of all the units of quantized space elucidate why the creation of the observable phenomena is the result of the concentration of topological deformation in space.

Every "output" deformation of a unit is only possible if there is a synchronous correlated "input" deformation (see figure 5). The result is a local increase of topological deformation because of the decrease of the length of the "loop" – e.g. spin – within the involved units of quantized space. Figure 11 shows the principle.

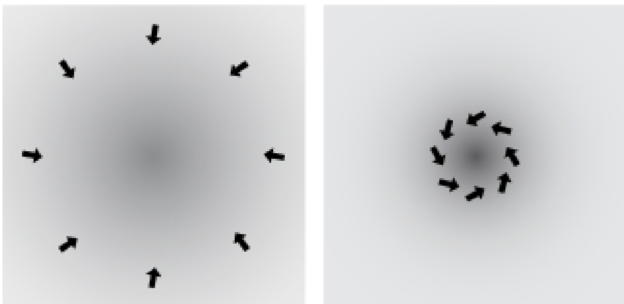

figure 11

The evolving concentration of quanta at the atomic scale results in the creation of mass and rest mass. However, the concentration of quanta by the units of quantized space within a large volume in space – see figure 12 – will result in the creation of 3 distinct "types of space". A small volume with a huge amount of concentrated energy (A), a large volume showing a small deficit of deformation for every unit in relation to the average deformation of space (B) and the average deformation of space "itself", the apparent not involved units of quantized space (C).

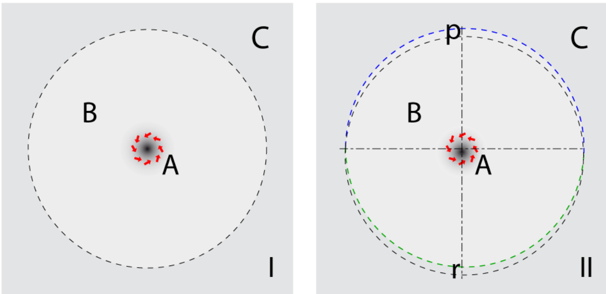

figure 12

The concentration of energy in the centre (left image I) represents an amount of energy we call "a particle" which energy is equal to the distributed deficit of energy of volume B. Nevertheless, even if the concentration has caused one or more scalars of the Higgs field to decrease – the creation of rest mass – all the other involved units have scalars with the same magnitude, the flat Higgs field. In other words, all the quanta transfer within volume B represent changes within the electric and the magnetic field. Therefore particle A and volume B are coupled together because of the existence of the average deformation of the units in volume C (positive and negative electric charge; +e and –e).

The basic properties of the units of quantized space[A] show that symmetry isn't a normal situation at the lowest level of reality. The scalar mechanisms of all the deformed units "try" to capture the shape of a full scalar. In other words, the symmetrical particle A – inclusive volume B – has to rearrange its configuration and the result is an asymmetrical concentration of quanta (figure 12, right image II).

Every linear transferred quantum has a velocity that's known as the constant speed of light. However, figure 12 (I and II) shows a static situation. In other words, the asymmetrical particle A has a spin (red arrows) and has a velocity that is related to the amount of concentrated quanta because every unit in quantized space transfers 1 quantum synchronous with all the other units in the universe. In other words, the amount of deformation of a unit – in relation to the average deformation of the other units around – is responsible for the velocity of the transfer within quantized space.

Therefore it is not by chance that a free neutron decays into a proton, an electron and an anti-neutrino "by the weak force".[4] The mass of the proton is smaller than the mass of the free neutron so I have to conclude that the energy of the electron is a "push off" of quanta during the transformation of the neutron into the asymmetrical proton. The amount of quanta of the electron is part of the concentration of quanta within volume B that resulted in the creation of the free neutron.

Therefore it is reasonable to expect that the size of volume B will decrease because of the restore of the surplus of quanta (the electron). But electrons are observed phenomena that represent a distinct amount of energy. So I have to conclude that the size of volume B doesn't decrease in "normal situations". The involved units of quantized space that represent volume B will push the electron to the boundary of volume B to maintain their state of less deformation (in relation to C).

Figure 12, image II shows the consequences of a moving asymmetrical particle. Volume B "is forced" to adapt constantly to the "frequency-like" movement of the asymmetrical particle because particle A contains the whole deficit of deforming of volume B (in relation to the average deformation of volume C).

That's why the surplus of quanta of the electron shows like a wave-like electromagnetic phenomenon within the configuration of the Hydrogen atom. Figure 12, image II, shows the reason why the proton forces the quanta of the electron at the boundary of volume B to act as a wave-like pattern (indicated by r and p). Because p is part of volume B and it is forced to the state of energy of volume C. At the opposite side r is forced to become part of the energy state of volume B. Therefore it is impossible that more than 2 electrons can share the same quantum state in one "orbit" (Pauli exclusion principle[5]).

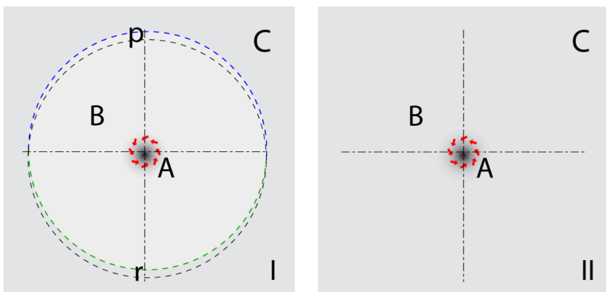

figure 13

If the local electromagnetic field C around particle A and volume B has too much turbulence (high amplitudes), volume B will "dissipate" within volume C (figure 13, image II). The result is the creation of a free electron that is no longer part of the configuration of the Hydrogen atom.

An electron has no rest mass thus its boundary is variable. That means that an electron has a size that is determined by the local properties around. So if I try to smash 2 electrons against each other with the help of a high-energy particle collider the electron shows a point-like structure. All the topological deformation – the amount of quanta of the electron – can be "absorbed" by 1 unit of quantized space at the moment of collision.

"Enclosures" (blue)
To reduce the length of the paper there are links to papers that describe details not mentioned above.

A. *"The objective reality of space and time"*
DOI: 10.5281/zenodo.3593872
https://zenodo.org/record/3593872

B. "*On the concept of (quantum) fields*"
DOI:10.5281/zenodo.3585790
https://zenodo.org/record/3585790

C. "*Quanta transfer in space is conserved*".
DOI: 10.5281/zenodo.3572846
https://zenodo.org/record/3572846

References (red)
1. Encyclopedia of Philosophy:
https://plato.stanford.edu/entries/pythagoreanism
2. Max Tegmark (2007), "*The mathematical universe*".
DOI: 10.1007/s10701-007-9186-9
https://arxiv.org/abs/0704.0646
3. Hales, Thomas C.; Ferguson, Samuel P. (2006), *"A formulation of the Kepler conjecture", Discrete & Computational Geometry,* ***36*** *(1): 21–69,*
https://arxiv.org/abs/math/9811078
4. Heyde, K. (2004), "Basic Ideas and Concepts in Nuclear Physics", chapter 5. Beta decay.
An Introductory Approach, Third Edition.
Taylor & Francis (2004)
DOI: 10.1201/9781420054941.ch5
5. Pauli, W. (1925), "*Über den Zusammenhang des Abschlusses der Elektronengruppen im Atom mit der Komplexstruktur der Spektren*".
Zeitschrift zur Physik **31,** 765–783 (1925).
https://doi.org/10.1007/BF02980631

* Amersfoort, the Netherlands
(segrimm@conceptualframeworks.org)
Orcid: 0000-0002-2882-420X