On the concept of (quantum) fields

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The main concept of quantum field theory is the conviction that all the phenomena in the universe are created by the underlying structure of the quantum fields. Fields represent dynamical spatial properties that can be described with the help of geometrical concepts. Therefore it is possible to describe the mathematical origin of the structure of the creating fields and show the mathematical origin of the law of conservation of energy, Planck's constant and the constant speed of light within a non-local universe.

Introduction

The discovery in 1900 by Max Planck that energy is quantized has changed our concept about the nature of reality. Before 1900 most physicists were convinced that space and time have properties that were described by Isaac Newton; the axioms about absolute space and absolute time.[1]

The universe shows structure at the macroscopic level and this simple observation excludes a structureless microcosm. At least if you agree that our universe represents some kind of an all-inclusive system, composed by units with identical basic properties. It is not a new concept because the ancient Greek philosophers – like Parmenides, Leucippus, Democritus and Aristotle – had about the same opinion although it is not easy to interpret the old papers some 2500 years later.[2]

The present concept in quantum field theory is that observable phenomena are created by an underlying structure of quantum fields. This concept raises questions about the interpretation of the term "quantum field". Because a local temporary quantum field – like an electron field – cannot be the same as a quantum field that exist in the whole universe. For example the universal scalar field (Higgs field).

Besides that, quantum field theory differs from the theoretical models that are based on the phenomenological point of view. Like the theory of relativity and quantum mechanics. The phenomena don't create observable reality, it is the underlying structure of the quantum fields that creates the observable phenomena.[3] The consequence of the concept is that the all-inclusive structure of the quantum fields is in rest in relation to all the observable phenomena.

Basic quantum fields

The term "basic quantum field" is used in this paper to differentiate between local temporary quantum fields and the creating "main" quantum fields. Basic quantum fields are fields that exist everywhere in the universe during the whole evolution of the universe. Moreover, all the basic quantum fields together "fill" the volume of the universe completely. Actually, the structure of the basic quantum fields *is* the universe.

There are fields that seem to exist everywhere in the universe, like the field of Newtonian gravity. Unfortunately in a universe without rest mass gravity doesn't exist because there is only vacuum space. And it is quite questionable that the magnetic field can exist within the boundary – the electromagnetic horizon – of a black hole.[4]

Nevertheless, it is really awkward to relate the field of Newtonian gravity and the magnetic field to the category of local temporary quantum fields because both fields exist nearly everywhere in the universe. So how must we interpret this type of fields?

The field of Newtonian gravity and the magnetic field cannot be basic quantum fields because both fields emerge (Newtonian gravity) or disappear locally (magnetic field) at the moment that the basic quantum fields create local phenomena. Phenomena like rest mass carrying particles and black holes. Conversely a basic quantum field cannot emerge of disappear because the volume of the universe is totally filled with these basic quantum fields.

However, both fields – the field of Newtonian gravity and the magnetic field – are true vector fields and don't transfer energy. Independent true vector fields don't exist because vectors need a mediating field, a field through which the vectors are guided and expressed. The only possibility is that one or more basic quantum fields are responsible for the pass on of the vectors.

The scalar mechanism

The cause behind the observable changes within the universe – the transformations of the observable phenomena – is energy. Energy that shows to be quantized (Planck's constant). Unfortunately, a scalar field that is also a basic quantum field doesn't show properties that are related to the geometrical transformations of the observable phenomena. Because there exist only one true scalar in the universe: the sphere. A sphere is the only spatial shape that can be changed with the help of only one property, its radius.

The term "scalar" isn't reserved for the sphere, in practise fields that show "static" magnitudes are called a scalar field. But at the lowest level of reality the basic concepts cannot be compositions of "more basic" concepts. That's why the sphere is the only true scalar in relation to the properties of the basic quantum fields. Besides that, the sphere is also the dominant geometrical shape in our universe and we cannot ignore this outstanding observation.

The Higgs field is the only known scalar field that is a basic quantum field. However, the individual scalars of the Higgs field have not the same magnitude everywhere in space. It is thought that local scalars can decrease their magnitude – decreasing the radius of the sphere – and the result is a local transfer of volume from the decreased scalar(s) to the electric field around (the so called Higgs mechanism).

Unfortunately, the concept of a true scalar – the sphere – doesn't match with the Higgs mechanism because a sphere has a surface area, the boundary of the sphere. If a part of the volume of a decreasing scalar of the Higgs field becomes part of the volume of the local electric field, it goes without saying that the Higgs field and the electric field cannot be considered to exist as 2 independent solitary fields. Therefore we have to conclude that the properties of each field represent different configurations of the same "underlying" field structure. A field structure that exists of spatial units and the size of these units must be related to the minimal length scale, the quantization of space.[5][6]

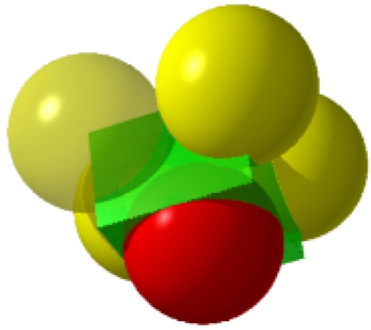

figure 1

The quantization of space cannot have a direct relation with the Planck length because our universe isn't totally filled with quanta. If this would be true, there exists no difference between the energy density of a rest mass carrying particle and the energy density in vacuum space.

Although the actual size of the minimal length scale isn't exactly known, it is logical that every unit of quantized space must envelope one scalar of the Higgs field. However, if every true scalar of the Higgs field has the same magnitude (figure 3) the flat Higgs field cannot fill the volume of the universe completely – only about 74% – so the remaining 26% of the volume of each unit represents other basic quantum fields, like the electric field. The proportion between the volume of the inscribed sphere and the deformed volume in vacuum space can be calculated with the help of figure 1 (the green block represents the volume of one unit).

If the scalar of the Higgs field can transfer a part of its volume to the electric field the volume of the units that represents the quantization of space must consist of an undistorted and a distorted part of an internal scalar mechanism. Because the main part of the volume of the unit is the true scalar of the Higgs field. That's why it is logically to conclude that every unit of quantized space represents the scalar mechanism, an internal spherical shape forming mechanism.

The reliability of a concept – in practise a model – resides on the mathematical consistency in relation to the empirical evidence of its basic assumptions. In respect to the scalar mechanism of every unit of quantized space the mathematical description must confirm the existence of the universal laws and constants in physics. Especially the law of conservation of energy. Because every change of the properties of the unit of quantized space – the scalar mechanism – must be conserved in relation to the changes of all the other units around. Not only conservations in relation to changes within the flat Higgs field but also to local changes of the basic quantum fields that represent a black hole at a certain moment.

Geometrical properties
The creation of observable reality by the interplay between the units of the underlying field structure has consequences, because our universe is a dynamical universe. That means that every unit of the field structure has an internal "power" to change its properties, although the macroscopic properties of space show to be homogeneous and isotropic. That implies that every unit of the field structure must have identical basic properties. Besides that, if the units of the structure of the basic quantum fields don't have identical properties it is impossible to imagine how the universe can transform continuously without any hitch or halt.

Every unit of the field structure is a deformed scalar because of the existence of the other units around. All the field units together fill the volume of space completely so I can draw schematically an imaginary symmetrical unit with the help of a mere cube (figure 2).

Every unit constantly "tries" to become a full sphere, thus in practise the *dynamical part* of every field unit is the deformed volume of the unit (grey). The inscribed sphere – the scalar of the Higgs field – isn't involved in the internal transformations if the scalar is part of a local flat Higgs field (vacuum space). Because in vacuum space all the scalars have the same magnitude and have obtained their maximal volume, see figure 3 (Kepler's conjecture).

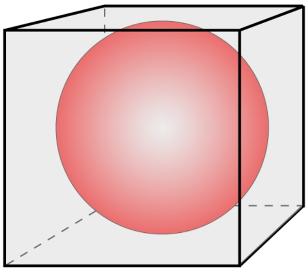

figure 2

The *active* "power" of the field unit to change its internal configuration is the deformed volume. But if the universe is transforming continuously this amount of internal "power" must be identical for all the units in our universe stops changing its internal configuration.

The consequence is that the amount of volume and surface area of the *deformed* part of every unit in the universe must be invariant.

The volume of the *whole* field unit is invariant thus the volume of the *deformed part* of the unit is also invariant within the flat scalar field. However, the cause behind the continuous transformations of the shapes of all the field units in the universe is not the total amount of the scalar mechanism of every unit, it is restricted to the deformed part of the scalar mechanism. In other words, the "power" of the deformed part must be a fixed ratio between the volume and the surface area of the deformed part of every unit.

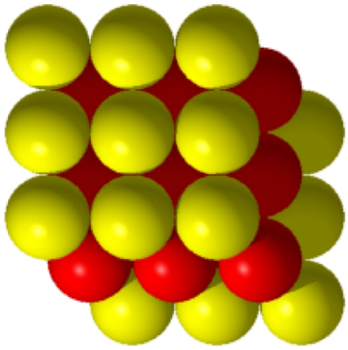

figure 3

Topological transformations
All the units of quantized space tessellate the universe. That means that every transformation of the shape of a unit is the result of the transformations of the whole configuration of the non-local universe at that moment. The consequence is that the transformation of the shape of every field unit is the result of the transfer of volume within the "boundary" of the unit, a topological transformation by the scalar mechanism.

The schematic figure 4 shows the influence of the transformations of some adjacent field units – green arrows – and the influence of the field unit itself on the other adjacent field units around; the red arrows. The topological deformation caused by the green arrows (input deformation) is identical to the topological deformation of the red arrows (output deformation), because the volume of every field unit is invariant.

I can reduce the involved tangent faces of the field unit in figure 4 to only 2 tangent faces, an input face and an output face. The schematic figure 5 – cross section – shows that the total amount of surface area of the whole field unit has increased. But the volume and the amount of surface area of *the deformed part* of the field unit are not changed. That's why I can conclude that the volume and the amount of surface area of the deformed part on the field unit must have a constant geometrical ratio within vacuum space.

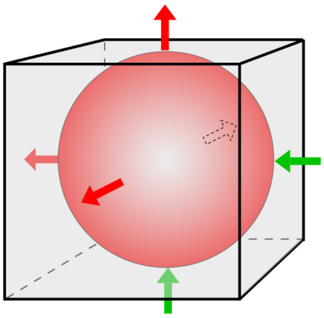

figure 4

The continuous topological deformations of the field units is quantized (directly related to Planck's constant). That's why I can state that every quantum represents a fixed amount of volume with the same constant ratio between volume and surface area as the deformed volume of a field unit. Because the quantum represents a small fixed amount of the volume of the whole deformed part of the field unit. That doesn't mean that the volume of the whole field unit is a multiple of the volume and surface area of the quantum. The quantum exists because of the tessellation of space by all the field units with identical basic properties; the identical scalar mechanism of every field unit.

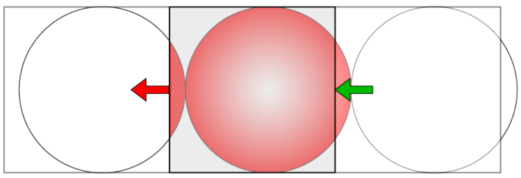

figure 5

The tessellation of space by the units of the structure of the basic quantum fields is only possible if all the units transform their shape synchronously because there exist no space that isn't "filled by a field unit".

The shape of the field unit

If I want to visualize a field unit within an imaginary static universe – where all the elements have an identical symmetrical shape – I only have to arrange identical scalars into a lattice and keep the joint faces between the units around identical. Figure 6 shows the result, a rhombic dodecahedron (I removed 2 rhombi for a better view inside).

However, the scalar mechanism of the unit is never in equilibrium. First because every unit is a deformed scalar – so it "tries" to become a full scalar again – and secondly because the mathematical ratio between the inscribed sphere and the deformed volume is determined by irrational numbers (π and √2).

Figure 3 represents the flat Higgs field. Although the inscribed spheres are in dynamical equilibrium every scalar is the centre of scalar vectors because of the points of contact between all the scalar mechanism that try to expand their inscribed spheres (figures 3 and 8).

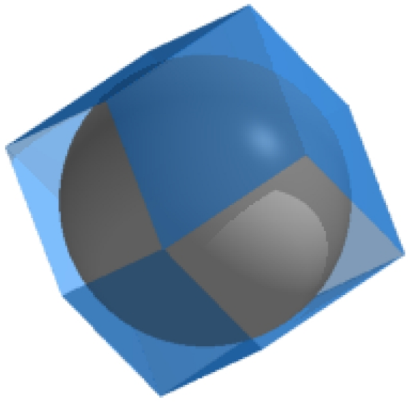

figure 6

Figure 6 showed an imaginary symmetrical element. It is clear that the deformed part of the element cannot change its shape because the rhombic dodecahedron is the shape with the smallest surface area. So how can the deformed part changes its shape if the volume is invariant? This is only possible if the size of the surface area of the unit exceeds the size of the surface area of the rhombic dodecahedron. In other words, all the units of the universe must have a surface area larger than the surface area of the dodecahedron.

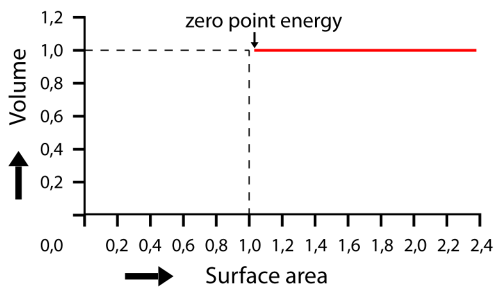

figure 7

The diagram above (figure 7) represents the volume and surface area of an element. The horizontal red line shows the range of the size of the surface area of the whole unit because the volume of a unit is invariant.

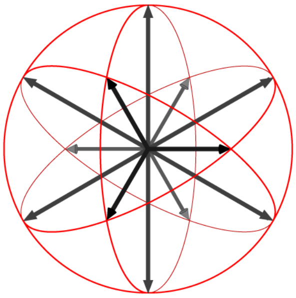

figure 8

V = 1,0 and A = 1,0 indicates the volume and surface area of the imaginary symmetrical rhombic dodecahedron (figure 6). The minimal deformed surface area of a field unit is the so called zero point radiation within vacuum space.

The actual size of the surface area of a unit is important because the amount of the surface area is related to the local amplitudes of the deformed part of the unit. Actually, the diagram not only shows the relation between volume and surface area of one element, the diagram represents also the volume and average surface area of all the units of the whole universe, even if the volume of our universe is infinite.

Tessellation

The invariant volumes of the field units tessellate space and an alteration of the shape of a field unit is only possible if all the units change their shape synchronously. The change of a spatial unit with an invariant volume is the alteration of its shape so every unit has to transfer some of its volume within its boundary. This is only possible if every unit transforms its shape in a continuous fluently way.

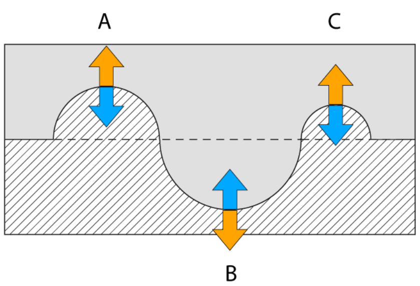

figure 9

If we have 2 bodies (figure 9) with invariant volumes we can only deform the joint surface area between both bodies if we move the arrows of the same colour simultaneous. We cannot move arrows with different colours simultaneous because the result will be the violation of both invariant volumes. Nevertheless, we can change arrows: A-B, A-B-C or B-C (see figure 4).

If all the elements deform synchronously – and the amount of transformation at any moment is identical – we have to conclude that the continuous deformation has a fixed amount of transferred volume. In other words, every element transfers synchronously a fixed amount of its volume within the boundary of its scalar mechanism and the result is the change of its shape.

This has consequences. Because a unit cannot change the "target unit(s)" during the transfer of the fixed amount of volume to the joint faces. That will ruin the synchronous alterations of the shapes of all the units. In other words, units change the direction of the transfer of volume in a synchronous way (in between the transferred amount of volume is a constant). Nevertheless, the transfer of the fixed amount of volume within the boundary of the unit is a flux of infinite small quantities of volume (indicated by the irrational numbers π and √2 mentioned at the top of page 4).

Now I can state that Planck's constant is directly related to the transfer of a fixed amount of volume during a fixed amount of time. Because the basic properties of the scalar mechanism of every unit are identical.

If every unit transfers a fixed part of Planck's constant – a quantum (notation <u>h</u>)[6] – in one direction to the joint faces of the adjacent units there must exist a constant velocity of the propagation of <u>h</u> between the involved units: the constant speed of light (*c*). However, if all the units in the universe transfer synchronously one quantum (<u>h</u>) at the time, the total amount of change in our universe – energy – must be conserved. Although it is difficult to imagine how all these topological transformations will effect the continuous altering shapes of the field units.

Transformations

Figure 10 shows in a schematic way 2 adjacent field units and to illustrate the scalar mechanism I have drawn concentric circles on the cross sections. I want to know how unit M2 deforms if unit M1 transfers some volume to the joint face with unit M2. Will the amount of volume appear at point A or perhaps point B, or maybe in A and B together?

The scalar mechanism "tries" to restore a full scalar. Figure 03 shows why this isn't possible so we have to conclude that the unbalance of the scalar mechanism of every unit will try to restore its spherical shape at the

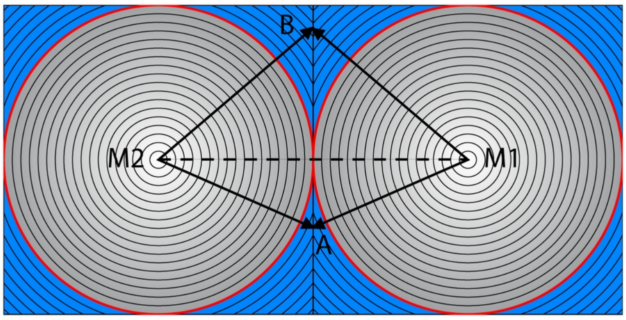

figure 10

points of contact with the adjacent elements. These points of contacts with the other inscribed spheres of the units around are the obstacles that prevent the scalar mechanism to retrieve the shape of a perfect sphere. Moreover, the units don't transfer quanta to other positions on the surface of the joint faces because at these points (e.g. A, B) the scalar mechanism – the drawn small concentric shells – is undistorted.

Conclusion: field units transfer volume to the surface area around the points of contact with the 12 adjacent elements around. However the situation will change immediately if the inscribed sphere – the scalar of the Higgs field – decreases its radius.

The decrease of a scalar within the flat Higgs field is the transfer of volume from the scalar to the deformed volume of the element. The cause behind the decrease of the radius of the scalar is the transformation of all the elements around at that moment. In other words, the unit is forced to transform its shape to a configuration of the scalar mechanism with a reduced undistorted part of its volume, a reduced inscribed sphere.

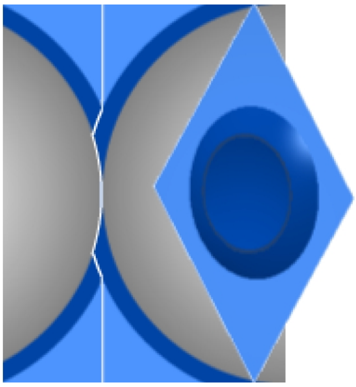

figure 11

Figure 11 shows the cross section of 2 field units and the deformation is maximal within the flat Higgs field.The rhombic shows the surface area of the joint face of between both units. The dark blue part of the deformed volume is in all probability involved in the transfer of the quanta.

The size of the surface area of the right field unit is identical to the size of the surface area of the left unit. The total amount of surface area of the *deformed part* of every unit within the flat Higgs field is a constant, described at page 4 and displayed with the help of the schematic image of figure 5.

Figure 11 shows that the increase of deformation – increasing the surface area of the whole element – is determined by the increase of the surface area of the inscribed sphere at the joint face. In other words, if the deformed volume in the joint face of the right unit increases, the "naked" surface area of the unit at the left increases with the same ratio. But that's a known "phenomenon" in physics…

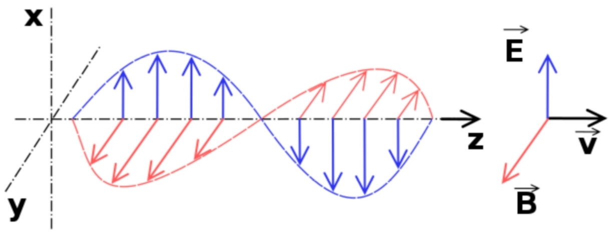

figure 12

The propagation of an electromagnetic wave in vacuum space shows synchronous alterations of the electric field and the magnetic field (figure 12). The deformed part of every unit transforms in a topological way and is a basic quantum field too. In other words, the increase or decrease of the volume of the electric field in a joint face creates an increase or decrease of *vectors* within the scalars of the involved units: the magnetic field.

Conclusion: every local topological deformation of the electric field creates a corresponding vector(s) within the involved scalar(s) of the flat Higgs field *and visa* verse (the electromagnetic field).

Scalar vectors

Figure 08 and 13 show the scalar vectors within the inscribed spheres of the flat Higgs field. The electric field – the deformed part of every unit – changes continuous the shape of every unit and creates at the same moment an inequality between the 12 vectors of every unit in vacuum space. Because the increase or decrease of volume in every rhombi of a unit will add or subtract “vector force”. Figure 14 shows how the increase of volume of the joint face by unit M1. The result is a push force ($\underline{h}$) against the “naked area” (diameter A - B) of the undistorted part of the scalar mechanism, the inscribed sphere of unit M2.

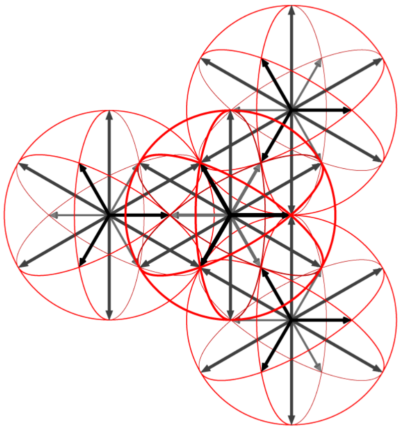

figure 13

The consequence is that the inequality of the individual scalar vectors of every unit reflects the topological deformations of the deformed part of the unit within the flat Higgs field. Actually, the scalar vectors change continuously their magnitude in a fluent way by the local topological deformations of every field unit.

Scalar vectors act instantaneous within the flat Higgs field because there is no transfer of quanta with the propagation of the speed of light. So there is no limitation of the distance of the active vectors too if there are no opposite vectors. That means that vacuum space is totally pervaded with the instantaneous changing forces of the scalar vectors. Actually, without the existence of the scalar vectors there are no observations of entanglement in our universe.

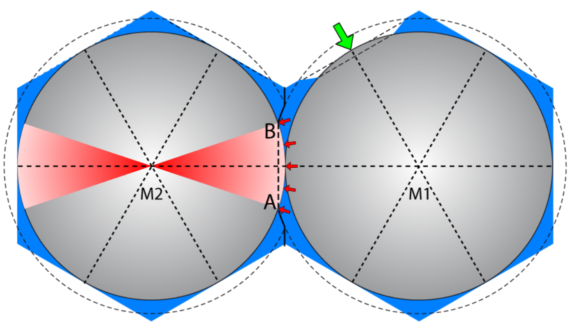

figure 14

The magnitude of the 12 scalar vectors of an imaginary symmetrical unit – see figure 6 – has a certain value. The transformation of a unit with a topological deformation of 1 quantum ($\underline{h}$) will affect the individual amounts of volume at the 12 faces.

So I can write:

$$\sum \Delta V_{1,2,\dots 12} = 0$$

[$V_{1,2,\dots 12}$ = distributed deformation of the 12 faces]

The total deformation is the sum of the “input” and the “output” deformation. But the input deformation of a unit is the output by 1 or more adjacent units so the totally amount of energy of the input deformation is also 1 quantum ($\underline{h}$). That is why the equation needs a differentiation between negative volume (e.g. input volume) and positive volume (output volume).

The magnitude of the scalar mechanism of an imaginary *solitary* unit can be calculated with the help of the ratio between the radius and the surface area of the sphere. Figure 15 shows the result. Sm is the scalar mechanism and r_{is} is the (inscribed) radius.

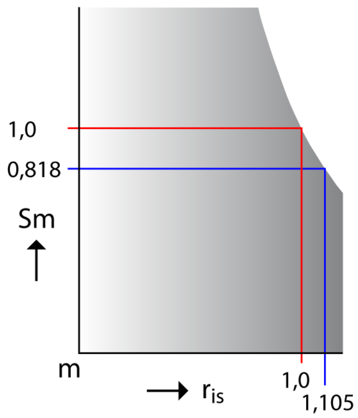

figure 15

The radius of the inscribed sphere of a unit within the flat Higgs field is 1,0 (red lines). The blue lines show the relation with the imaginary solitary unit (the whole volume is a sphere). The resistance against deforming of every unit is infinite. Without an infinite resistance against deforming of every unit our universe cannot exist because of the collapse of units.

However, quanta transfer by the deformed parts of the units represent the active part of the scalar mechanism, an active mechanism that is conserved everywhere in the universe. If we subtract the scalar vectors from all the units in vacuum space the remaining vectors – created by the active scalar mechanism – represent the electromagnetic field. Figure 15 shows a schematic display of the electromagnetic field “on top” of the flat Higgs field. The drawn vectors are resulting vectors so they don’t display real scalar vectors.

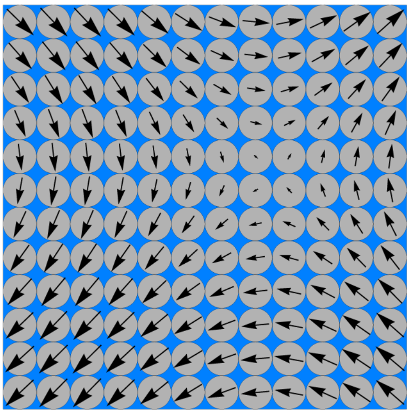

figure 16

Reduced scalars

The propagation of quanta in vacuum space create inequalities within the scalar vectors of every involved unit. But if a scalar within the flat Higgs field decreases its magnitude the overall balance of the scalar vectors between all the inscribed spheres with the same magnitude is broken.

Figure 17 shows the "network" of scalar vectors by the points of contact between all the scalars with the same magnitude. In the centre of the image 1 scalar is decreased (the "white hole"). Decreased scalars disrupt the propagation of the scalar vectors of all the other units around because decreased scalars have no points of contact with other scalars. As a result the symmetry of the 12 scalar vectors within every scalar is broken and the result is a "push force" of all the involved scalar vectors towards the "white hole". The drawn blue arrows are not the real scalar vectors, these blue arrows represent the direction of the "push force" to simplify the drawing.

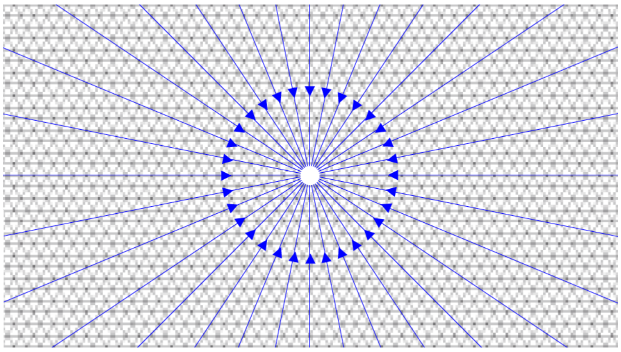

figure 17

The creation of rest mass is the consequence of the local concentration of quanta by the electric field. If the amount of the concentration of quanta exceeds a certain value at least one scalar in the centre of the concentration will decrease its radius. In other words, the creation of rest mass will result in a "push force" from all the scalar vectors in vacuum space around.[7]

The properties of the "push force" by the scalar vectors around 1 or more decreased scalars are comparable to Isaac Newton's concept of gravitation. Scalar vectors are not limited by the speed of light – true vectors act instantaneous – and the "force" is inversely proportional to the square of the radius between the reduced scalar and every point in space.

Conclusion

The examination of the properties of the known (quantum) fields in phenomenological physics makes it possible to translate the unknown origin of laws, constants and principles into pure mathematical concepts. The description of the mathematical origin of the law of conservation of energy, Planck's constant and the constant speed of light shows that the theoretical models in physics are too much influenced by the limitations of the phenomenological point of view. Field properties are conceivable with the help of non-local mathematical concepts.

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