Extended Tangloids

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Abstract

Geometrical structures presented in the work naturally provide the standard model and quantum gravity, with explaining the important features of quantum physics and cosmology. Even though this endeavor has started with exploiting the intriguing spin of quantum mechanics, the geometry arising on that has directly lead to a comprehensive unified theory.

Together with that, a key distinction between two time notions, i.e. of the apparent time and of the manifold time is introduced. It shall be fundamental for understanding both the relativistic dynamics and quantum phenomena.

The geometry of extended tangloids is developed in a step-by-step manner, so that it is relatively easy to understand and apprehend it.

A notable point is that a way for creation of the exotic, i.e. anti-gravitating, matter was found along the way. Some applications of the exotic matter are discussed as well.

Contents

Introduction – Ruled by Geometry

Since the development in the field of fundamental physics has been stalled for quite some time, the author has decided to get inspiration in the ways of the exciting explorations that took place in the early 20$^{\text{th}}$ century. While successful theories originated during those celebrated times, the later advancements can be seen as precise adjusting without new reasonable rules.

The choice of targets for the explorations was identified as the main difference between then and now. The founding fundaments were revealed as clear consequences of simple thoughts and experiments. The later attrition of ascending thus descends from direct attempts to attack the universal unifications. Therefore, returning to essential phenomena was taken as the starting point.

Among the basic facts that have the most profound implications, there is the spin of elementary particles and its peculiar properties. The very existence of organized matter is determined by the everlasting spin. And yet the up to now theories of spin properties do not seem to explain its nature in an apprehensible way.

Geometrical models of spin had previously failed to describe systems of more than two particles. And putative proofs of the improvement impossibility lead to abandoning of such approaches. Fortunately, every proof has its preconditions, and it was possible to find a path to overcome the obstacles. The found way enlightens the spin, provides the standard model, and develops the quantum gravity.

Part I
Fundamentals

1 Tangloidal Geometry

1.1 Spin Requirements

The described geometry is initially found for 1/2-spin particles. The other particle types and other structures follow the resulted scheme as well.

Rotation of one 1/2-spin particle by 4π radians

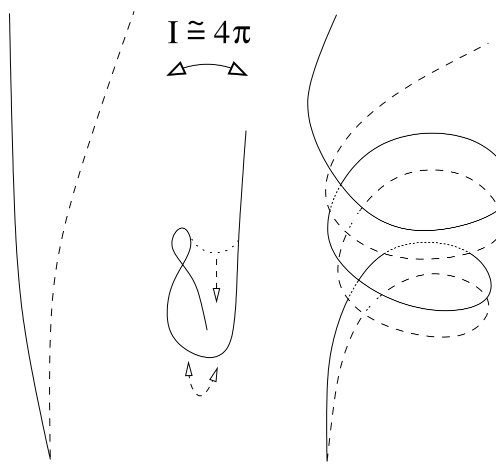

Figure 1: 4π rad rotation

Having 4π rad rotation as equivalent to 0 rad rotation, while non-equivalent to 2π rad rotation, can be achieved by any body connected (by at least three 1-dimensional connections) to the outer space. This can be set up for any amount of such bodies.

This is simple to create for any (reasonable) connection type, see Figure 1.

Exchange of two 1/2-spin particles followed by one 2π rad rotation

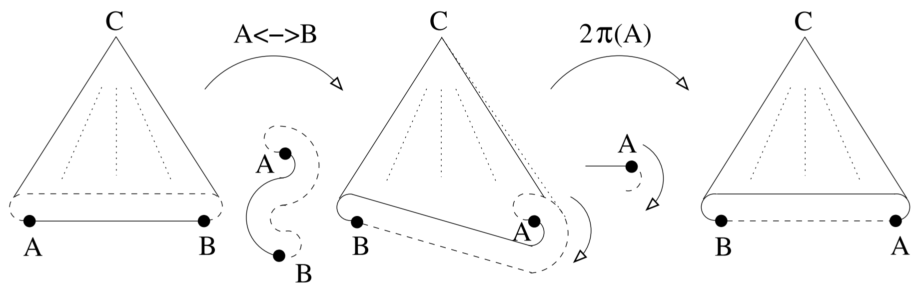

Figure 2: Exchange of two particles with single 2π rad rotation

To have the property that exchange of two such bodies is equivalent to 2π rad rotation of one of those bodies, can be seen as a simple consequence when dealing with just two bodies. For more particles, exchangeable pairs need to be connected to the third bodies, so that the subsequent 2π rad rotation does not produce additional tangles. Together with it, the notion of inner vs. outer is exchanged during this process. It requires to deal with double-laid sheets to preserve the geometry, see Figure 2.

For the other particles (connected to the exchanged pair), a process of putting one (double-laid) sheet over another (having a common base over the exchanged pair) is undergone during the pair exchange. It produces three 2π rad rotations, thus the ending 2π rotation untangles the structure. This is explored in general in the Sheet Reversion section below.

A common opinion has been that the equivalence of *"exchange of two bodies"* with *"2π rad rotation of one body"* can not be geometrically retained for connected bodies of count greater than two. The fact is that this equivalence is lost for such sets of bodies when the connections are pair-wise without having the other bodies engaging in them.

The solution is to add other bodies into the connections previously held as pair-wise.

Triples of bodies nearly solve the problem of retaining the pair exchange–2π rad rotation equivalence. It requires to have the triples with inner and outer surfaces where the surfaces themselves are taken as equivalent – unless differentiated by their features, like corner tips, as discussed later.

A natural view is that the basic geometrical structure is a double-laid sheet with three corners. They are (in the sequel) called $3T$-sheets, for three-corner tangloidal sheets.

As it shall be seen, the main building blocks are these $3T$-sheets (i.e. not their corners), even though the corners correspond to particles and thus they are (directly) detectable in simpler ways than the (overall) wholesome $3T$-sheet structures.

For the following, it is assumed that smooth layer parts that are not (multiply) wound, can – under ordinary conditions – pass through each other. The main constraint on such passage are alignments between the layers that would try to pass through each other.

1.2 Sheet Reversion

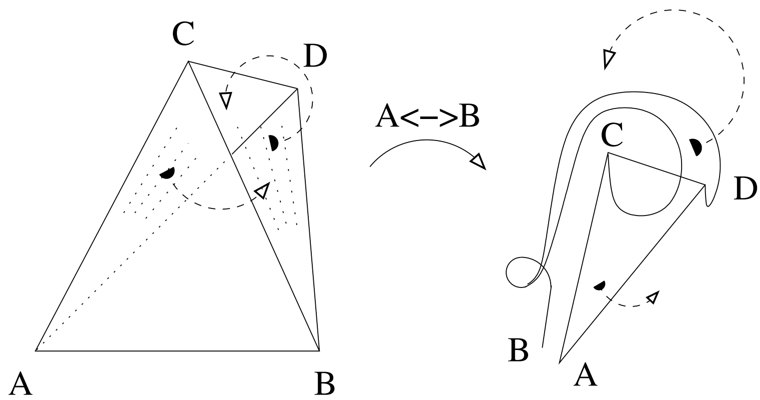

Figure 3: Exchange over the 3^{rd} particles

A notable geometrical process (during the pair exchange) is taking a corner and moving it over the opposite base. It employs three rotations by 2π rad – one rotation by each of the corners.

To have the geometry internally consistent, it has to be related to the two-corners exchange case. And it is that way. An exchange of two bodies where both of them are connected to a common pair of other bodies, is followed by simple moving of one of those $3T$-sheets, and by putting the second $3T$-sheet over the first one – i.e. over the common pair of bodies, see Figure 3.

The cases where the $3T$-sheets do not share a corner are taken as (mostly) independent, meaning that such $3T$-sheets can pass through each other. A global point of view on the resulting geometry is explored in the sequel.

Taking a pair of corner structures (A, B at Figure 3) of a $3T$-sheet (ABC there), two classes of $3T$-sheets are directly affected by the process of the $A \leftrightarrow B$ exchange (Ex) followed by 2π rad rotation of one of these corners (abbreviated as $2\pi \circ Ex$). They are ABC, ABD for $3T$-sheets based on the exchange side, and ACD, BCD for $3T$-sheets based on the other two sides of the acted $3T$-sheet.

The $2\pi \circ Ex$ on A, B corners of the ABC $3T$-sheet exchanges the two layers of the double-layer of this $3T$-sheet. Since the same holds for the ABD sheet, the inner layers – i.e. those in between ABC and ABD – go outside, and vice versa for the outer layers.

The ACD $3T$-sheet becomes (after the $2\pi \circ Ex$ on A, B) effectively the BCD $3T$-sheet with one exception: the layer facing the interior of the ACD, BCD $3T$-sheets becomes facing the exterior there. The outer layer of the double-laid ACD $3T$-sheet is the complementary layer, and thus it becomes the inner one then. Analogically, it holds for the BCD $3T$-sheet too.

The result is that the $2\pi \circ Ex$ process leads to the eversion (abbreviated as Ev in the sequel) of the $ABCD$ tetrahedron formed by the respective four $3T$-sheets.

Since the eversion is itself possible (i.e. putting the inner of the object outside without making crisps) in 3-dimensional space, the $2\pi \circ Ex$ process – previously described $3T$-sheet-wise without intersections at all – can happen at once as well (allowing the crisp-less intersections).

Having an AB edge (of a possible $ABCD$ tetrahedron) of the $3T$-sheets, each corner-based structure has to cooperate on either *a*) one of the A, B corners; or *b*) on one of the C, D corners of a tetrahedron with AB as its opposing edge.

Making eversions on these ($3T$-sheets based) tetrahedrons – while leaving the other tetrahedral structures – forms one part of the whole process.

The previous paragraphs dealt with ($3T$-sheets based) tetrahedrons that have (at least) one of the A, B corners as one of their corners. Any $3T$-sheet CDE that is off the A, B corners, is still a part of a tetrahedron where all the other $3T$-sheets have one of the A, B corners as their third corners, see Figure 4.

It forces the CDE sheet to exchange its two layers a well. As any tetrahedron $CDEF$ that is off the A, B corners is composed of such $3T$-sheets (like the CDE one), the eversion on all the remaining tetrahedrons complete the $2\pi \circ Ex$ process.

Since all the $3T$-sheets reverse (abbreviated as Rev) their two layers during the $2\pi \circ Ex$ process, the resulting wholesome structure (of all the $3T$-sheets) is globally isomorphic to the original one. I.e. no geometrical difference is produced. It can be written down equationally:

$$2\pi \circ Ex(loc) \overset{Ev}{\cong} Rev(glob)$$

meaning that a local corner pair exchange followed by a corner 2π rad rotation is congruent via the (middle-scope) tetrahedron eversions to the global reversion of the double-laid sheets of all the $3T$-sheets.

It makes – together with the local 4π rad rotations – an algebraic background for the whole geometrical construction of the spin-based geometry that is itself formed by the double-laid $3T$-sheets. It must be stated that while local (structure-wise) 4π rad rotations are equivalent to the identity, the local 2π rad rotation actions produce geometrically different structures.

$$Rot(4\pi) \cong Id \ncong Rot(2\pi)$$

Otherwise, the resulting universe would contain just bosons, it would be without any fermionic structures. I.e. no complex matter would originate there.

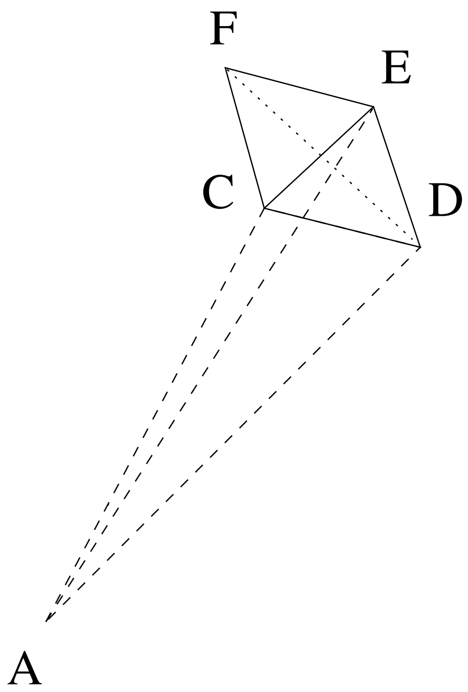

Figure 4: Sheet reversion

A few notable notices onto the tetrahedral structures should be stated.

Having a corner structure, multiple tetrahedrons originate there. To allow a sensible notion of orientation of the (rotation-based) spin, they should share a common start – with a multiplicity of all these $3T$-sheet-based tetrahedral structures serving as a background for linear combinations of particular orientations.

Actually, creation of new corners – as described in the sequel at the Standard Model part – follows this single-start design.

Contrary to the general auxiliarity of the tetrahedron-like structures, these tetrahedrons do not form new distinctive local objects themselves, i.e. on the top of objects already available via the two-dimensional $3T$-sheet structures.

The eversion of three-dimensional objects (topologically equivalent to a sphere) would equate clockwise and counter-clockwise rotations – and thus particle and anti-particle objects too; leaving just simple boson-like structures.

Herein, such a structure loss is avoided via extending the (rotating) tips of corners for just single layers of the (otherwise mostly) double-laid $3T$-sheets.

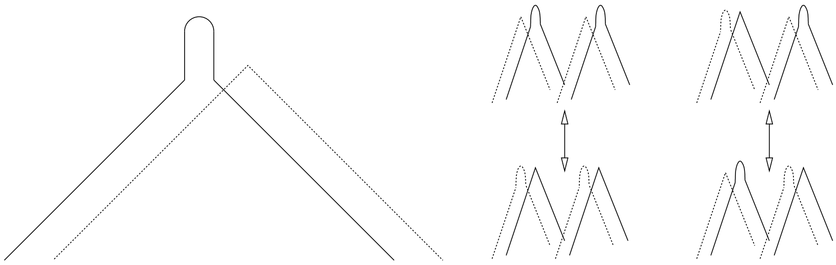

Figure 5: Single layer corner tips

Relations between the single layer parts remain intact during sheet reversion, see Figure 5. It is important for keeping the distinction between particles and antiparticles, as it is depicted in the sequel.

The corner tips are taken as (effectively) asymmetric single-laid sheet parts. Still, they can be based on pairs of single-laid fragments. It is discussed in the Universe Origin section. Regardless of the one-or-two single-laid tips question, the relative position of the (inner-vs.-outer) sheets is the property causing the distinction between particles and antiparticles.

2 Matter Structures

2.1 Building Blocks

Basic building blocks of matter and energy structures are the $3T$-sheets. Two other (auxiliary) types – closed balls and wound rods – are introduced in the sequel.

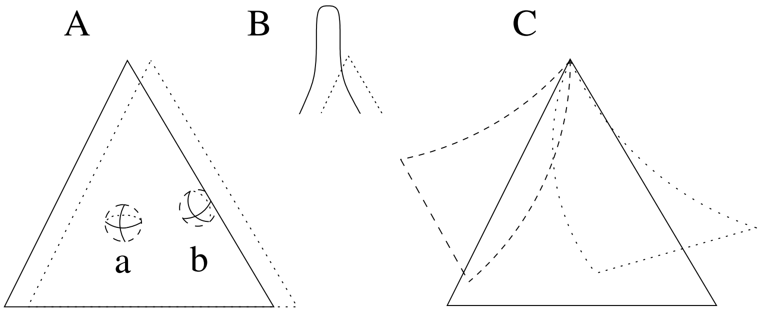

Figure 6: Building blocks

The $3T$-sheets are extended (i.e. nonlocal-wise) structures that give rise to two local-wise structures: sheet corners and sheet bubbles, see Figure 6, A, B. While the double-laid sheets themselves are materialization of the dark energy, the sheet corners and sheet bubbles are the matter structures.

A single measurable structure is comprised of a multitude of actual sheets, see Figure 6, C. This enables e.g. the quantum-mechanical superposition of states.

Here, just the main ideas are presented. Particular cases are explore at next sections.

Sheet corners

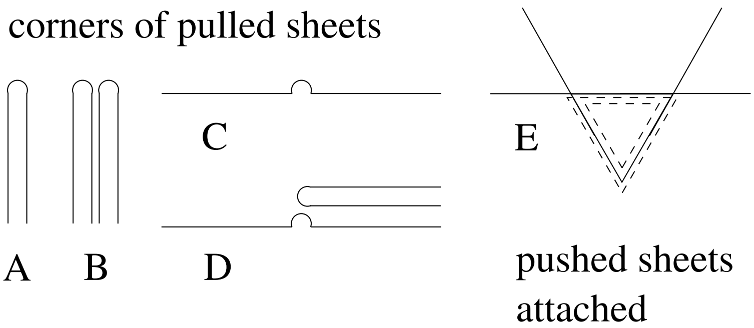

Figure 7: Corner structures

The geometry held by single corners is the that of fermions, see e.g. Figure 7, A (neutrino type), C (electron type), E (quarks). Genuine (i.e. elementary) bosons are paired corners, forming tight structures, see e.g. Figure 7, B (photons), D ($W^{\pm}$ bosons). The 2π rad rotation and exchange properties of bosons follow simply by taking that as twice done actions, since it is done on corner pairs.

Corner angles go from 0 rad to π rad. As it is described in the Pressure Interaction section, both 0 rad and π rad corners are of (locally) minimal pressure potential by their borders.

Along the real (corner-based) particles being corners of actual $3T$-sheets, virtual particles are disturbances within the $3T$-sheets (i.e. living on double-laid sheets of real particles), with structural properties alike those of distinct corner-based particles.

The $3T$-sheets are of two topology types: pulled and pushed ones. The pulled case belongs to electroweak interactions, the pushed case belongs to the strong interaction. For the cause of these two cases, see the Universe Origin section.

Corners of the pulled vs. pushed $3T$-sheets are held under different constraints:

- corners relatively free for the pulled type
- corners held together for the pushed type

Both corner-based and bubble-based particle structures employ single-layer parts for their mass acting. They are corner tips, bubble hemispheres for the corner-based, bubble-based particles, respectively.

Sheet layers

Apart from the corners (that are taken as non-scalar particles), the double-laid sheets themselves offer explanation for the dark energy and dark matter phenomena.

By the Casimir way of interaction of near surfaces, the double-laid sheets have to provide the property known as the dark energy. Then sheet bubbles flowing inside the double-laid sheets serve as constituents of the dark matter.

The double-laid sheets are a source of mass as well, as it is presented in the next parts. The Higgs-like properties are discussed at the Standard Model part by each matter structure type.

Being summarized, the double-laid sheets play a triple role:

- dark energy structure via their aligned sheets,
- dark matter and alike structures via sheet bubbles,
- Higgs-like mass generation via corner holding.

The double-laid $3T$-sheets (outside of their corners and bubbles) contain negative pressure by Casimir-like force on the aligned layers themselves (lesser content of virtual particles in-between). This way, the dark energy is a delocalized two-dimensional (not three-dimensional) structure, thus avoiding the cosmological constant discrepancy.

From the quantum dynamics point of view, the roles of $3T$-sheets can be seen as:

- laid over distant regions $\rightarrow$ enabling (non-local) entanglement
- a particle being a structure on a multitude of sheets $\rightarrow$ enabling state superposition

Sheet bubbles

The inner bubbles of $3T$-sheets are formed by positive inner pressure that is caused by the Casimir-like force on oppositely shaped layers. They can be seen as excitations of the double-laid sheet structures. Among others, sheet bubbles of a stable form are the materialization of the dark matter.

More on the sheet bubbles in the Sheet Bubbles section.

Antiparticles

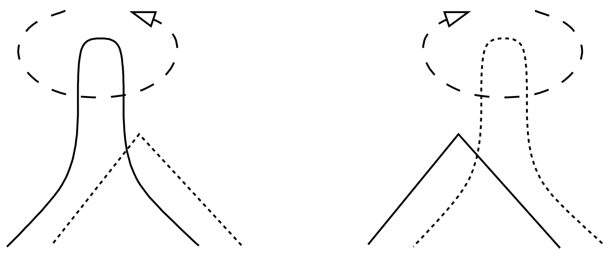

Figure 8: Corner rotations

The (single-laid) tip extensions of corners rotate. It is a reason for corner angles being between 0 rad and π rad, so that the corner tips can pass around.

Types of the rotations (along with corner angles) are (among others) a base for mass hierarchies, see more at the Standard Model part. Orientations of those corner rotations make the distinction between particles and antiparticles.

Structures of a corner-based particle vs. antiparticle pair rotate under mutually opposite orientations – using opposite layers for their rotating tips, see Figure 8. It does not change the mass of the particles, though it alters their dynamics under some conditions. See e.g. the meson case, Figure 30, later for an example.

In this way, (sheet) bubbles can be seen as their own antiparticles, alike it is e.g. for photons wherein it is based on corner pairing though.

The fact that layer relations of the double-laid $3T$-sheets remain intact under an $2\pi \circ Ex$ operation is necessary for not loosing the difference between (corner-based) particles vs. antiparticles, since they use different layers for their corner tips.

Closed bubbles

If the double-laid sheets would be restricted to form closed three-dimensional structures, the sphere eversion process would provide a single basic formation type. A system of such closed bubbles is taken as an alternative to the general, i.e. $3T$-sheets based, system.

The closed bubbles are exploited throughout the rest of the text, starting in the Classical Physics section.

Extended alignments

The sheet layers outside of matter structures should pass freely through each other. It can be altered though.

When the layers form (effectively) voluminous structures, i.e. of (effectively) non-zero cross-sections, they keep being split. One possibility to make such structures is to wind the sheets multiply, with e.g. wound rods as a result. This is another alternative structure (along with the closed bubbles) that is reused in the sequel, see the Classical Physics section, and the Quantum Gravity part.

Another alteration of the free sheet passing can be possibly done when the overall energy goes down. The wobbling of $3T$-sheets (being mostly outside of matter structures) vanishes and the $3T$-sheets can align to each other at vast areas – like an extended form of the weak interaction. Then, dynamics of these pressure-based interactions can overcome the – otherwise dominant –

matter formations, since the matter structures are localized comparing to the extended (and thus magnified) cold sheet aligning. This can be the cause of the bosenova phenomenon.

2.2 Statistics

Sheet flows

A common property for corners is that they execute rotations. These rotations are the (1/2-valued) spins themselves and they provide both the distinction between particles and antiparticles, and the spin orientations.

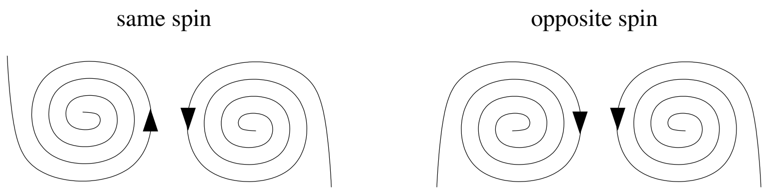

Figure 9: Pauli exclusion principle

As the spin is materialized as corner rotations, the corner rotations cause a (sheet) flow that can overlap with a flow of another corner structure.

Then there are two possible situations for a pair of 1/2-spin corners:

- same spin $\rightarrow$ contacts disagree
- opposite spin $\rightarrow$ contacts agree

The disagreeing (sheet) flows are the basis of the same-spin exclusion. Analogical (sheet) flow situations are reused at other situations, like e.g. at the Standard Model part for the electromagnetic interaction.

Corner equivalence

The A, B corner cases at Figure 10 are populated by corners of $3T$-sheets. Thus the corner counting has to be done according to the whole sheet structures.

The main (building) geometrical entities are the whole $3T$-sheets, not just their corners. This way, exchanging two corners of a $3T$-sheet dos not produce a new $3T$-sheet entity. And the exchange process is the same for having the corners laid either *a*) both on a single location; or *b*) on two locations.

It results in the quantum version of statistics where particles have to be treated as indistinguishable. Since the $3T$-sheets are the basic constituents, it is not necessary to put any requirements on particles herein – since those are just features of the $3T$-sheets.

Even though the corner properties are described in a versatile way in the next chapters, it should be remembered that they are just parts of the $3T$-sheets and that it does not make sense to treat sheet corners as wholesome entities.

The only way to distinguish among the corners is to have different geometries on those corners. It can be done either by different corner types, i.e. different particle types, or by localizing the corners, i.e. by restricting the connections among the corners. It leads into having (factor) sets of sheet corners where the corners are factored by the (possible) connections.

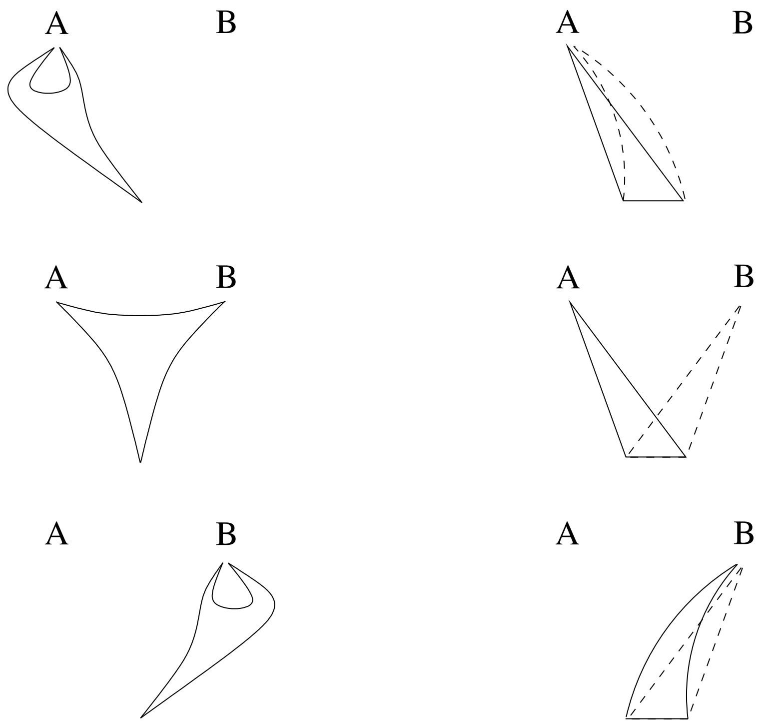

Figure 10: Quantum statistics

Sheet multiplicity

A natural way to put a distribution over the $3T$-sheet geometries is to have multitudes of actual $3T$-sheets for (measurable) structures, see Figure 6, C.

The $3T$-sheets are spread over the available $3T$-sheet geometries, with their distinguishability being equivalent to a possibility to distinguish among the particular geometries of and along the sheet matter structures.

A multitude of actual $3T$-sheets is a natural explanation for the path-integral approach to quantum physics where particular $3T$-sheets provide layers and corners for all the executed paths.

A greater relative speed between sheets causes lesser pressure between them. Thus a sheet part moving under a (greater) relative speed along other sheet parts attracts those sheets during the course of such passing by.

This enables the relativistic mass increase when moving relative to an observer, as well as creation of particles during high-speed collisions.

3 Pressure Interaction

Structure of the double layer of both $3T$-sheets and their inner bubbles is based on Casimir-like force, i.e. on differences of virtual particle compositions inside and outside the double layer.

The differences in energy content result in pressures that keep and curve the double-layer formations.

Since the non-rotating parts of the double-layer can not feel the interactions of the Standard Model, neither the $3T$-sheets themselves nor their inner bubbles can be accelerated by the processes described in the Standard Model part in the sequel.

Thus pressure gradients end-up being the main sources of accelerations of $3T$-sheet formations outside of their corners. Here, we neglect gravitation that is considered in the Quantum Gravity part.

3.1 Structure Borders

Borders of the double-laid sheets can be taken as the outer (Figure 11) ones – forming the actual double-laid sheets themselves, and the inner (Figure 13) ones – delineating the bubbles inside the sheet double-layers.

Sheet corners

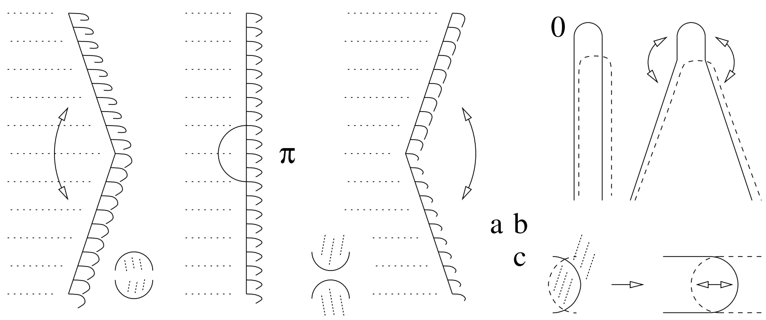

Figure 11: Outer borders

Putting a corner angle from π rad into a slightly greater or lesser value causes an approaching of two oppositely shaped surfaces, see Figure 11, a.

For 0 rad angles, the borders are (π rad) aligned with their corner tips, see Figure 11, b.

Two close borders (e.g. borders of 0 rad angled corners) are held apart (i.e. not passing through each other) via repelling of those (oppositely shaped) borders, see Figure 11, c. Analogically, a similar lock can hold the structure of weak-interaction bosons temporarily. There the lock is just transient, since it is opposed by sheets of non-zero widths.

For a lower energy, borders of corners do not wobble – curving would cause (partially) oppositely shaped formations. Thus they can be aligned to fulfil the weak interaction. A greater (amount of) energy can cause waves along the sheet structures, disabling the – otherwise common for fermions – weak interaction. A narrow sheet strip should be more prone to that wobbling than the other corner side structures, see Figure 12, b. Hence the 0 rad angled particles (i.e. of

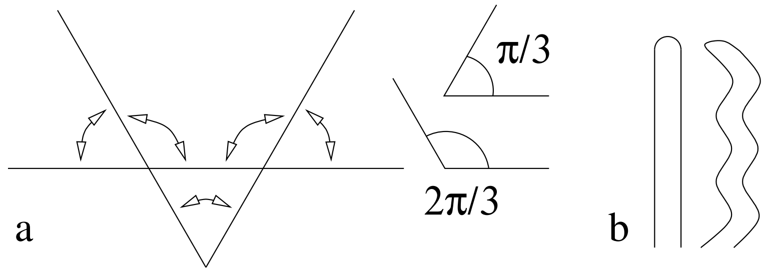

Figure 12: Altered borders

the neutrino type) should be able to form that as the first particles – thus becoming the so called sterile (anti)neutrinos and loosing the weak interaction ability. This should be visible as a lack of particles on greater energies, firstly for the neutrino type.

Single $3T$-sheet corners – i.e. those formed as leptonic particles – are for pulled $3T$-sheets of either π rad or 0 rad angles. They correspond to electron-type fermions for the π rad case, and to neutrino-type fermions for the 0 rad case.

Pulled $3T$-sheets of hadrons are under constraints of having attached the geometry of the pushed $3T$-sheets onto them in a way where they form a single outer structure altogether. See Figures 7, E, and 12, a. Particular alignments of the combined structure are described in the Pushed Sheets section in the sequel. They share the next properties:

- The borders located inside the (double-laid) sheet half-plane are displaced from each other and from the overall half-plane borders as much as possible – thus forming either $\pi/3$ rad or $2\pi/3$ rad angles.
- Those internally located borders – even though still considered as outer borders of respective sub-sheets – are aligned with those borders going from the pushed $3T$-sheet structure that itself sticks out from the overall double-layer half plane. It stabilizes the overall structure.

The pressure preferences of aligned sheet structures (of various $3T$-sheet geometries) over their displacements should be the cause of allowing just distinctive quantum states.

Sheet bubbles

Generally, two sheet bubbles repel each other, and the same repelling holds for a sheet bubble vs. sheet borders.

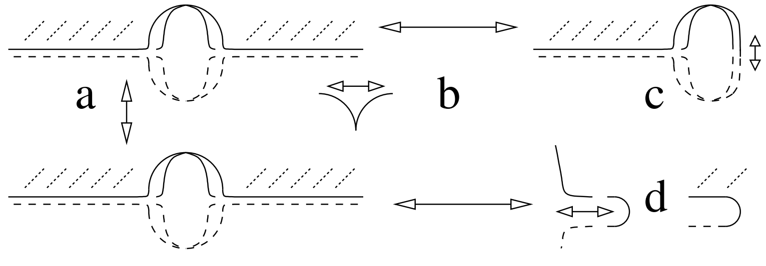

Figure 13: Inner borders

Putting two sheet bubbles together aligns their oppositely curved surfaces. Thus sheet bubbles are mutually strongly repelled from each other, see Figure 13, a, b.

Putting a bordered bubble slightly off the border would disalign two already alike aligned surface, see Figure 13, c. Putting a sheet bubble closer to an outer border puts closer two differently curved surfaces. The border would need to change its shape according to the bordered bubble case, see Figure 13, d. Thus this switch between free and bordered bubble cases is analogous to switching between electron-type and neutrino-type corners.

For more on sheet bubbles, see the Sheet Bubbles section.

3.2 Structure Flows

Sheet layers

The free type of the $3T$-sheet inner bubbles are repelled from each other and from the other border structures, and thus they can overcome their forming pressure gradients (and decay) only if the actual surrounding effects exceed the barriers of partial overlays of sheet bubbles and outer sheet borders. It shall be on the order of their inner energy contents.

The $3T$-sheets themselves contain negative relative energy with added positive energies under curving of itself, though such positive energy additions shall be lesser, since the curving is spread over larger distances than the inter-layer distance. It means that lesser energy contents are necessary to locally overcome this sheet stretching.

Thus the $3T$-sheets are accelerated toward regions of lower pressures at basic situations, but an energy addition allows other processes as well. And the default situation is that the double-laid sheets themselves are repelled from their matter structures.

Velocity dynamics

The basic ideas presented here are heavily used for relativistic effects.

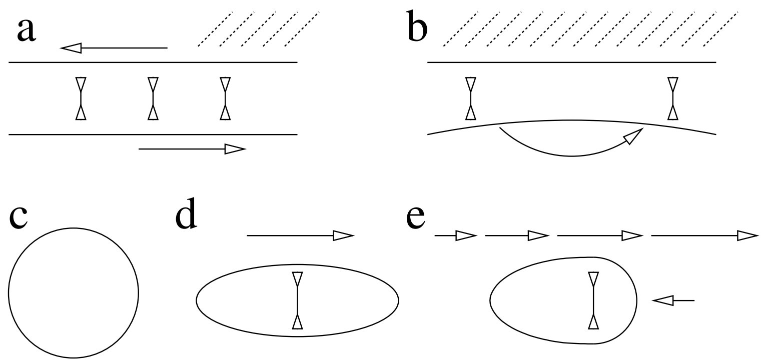

Figure 14: Flow effecting

Sheet structures moving relatively along each other perceive lesser pressure in between of them, thus they are attracted, see Figure 14, a. The same holds for a case of a rotational motion, see Figure 14, b.

Analogically, a sheet bubble flowing inside a double-laid sheet perceive a lesser inner pressure thus changing its structure from spherical into elliptical, see Figure 14, c, d. When the sheet bubble accelerates, it has to overcome the friction in front of it, thus changing its shape from a symmetrical one into a drop-like structure, see Figure 14, e.

Sheet bubbles

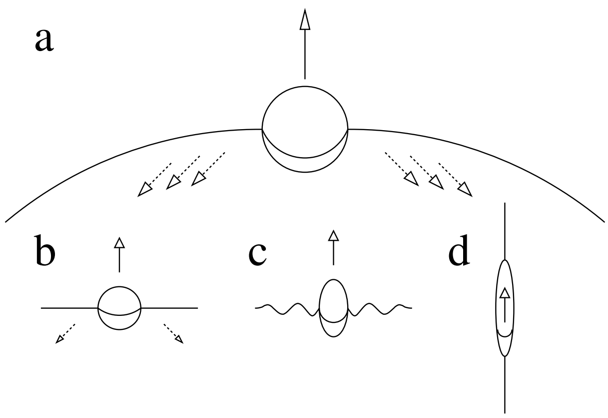

Figure 15: Bubble releasing

Taken the previous together, when a (sheet) bubble flows inside a double-laid sheet, it repels the surrounding parts of the double-laid sheet and it thus stabilizes the layout of the sheet, see Figure 15, top.

As a result, sheet bubbles flowing even through curved double-laid sheets do not cause accelerations of the overall structure – unless the energy content of its surrounding allows sheet restructuring.

Such sheet restructuring can go as follows, see Figure 15, bottom:

- A temporal energy increase enables the free sheet bubbles to flow away.
- Sheet bubbles change their shapes according to velocity.
- Sheets restructure to oppose the shape, releasing the bubbles.

When ambient energies (slightly) raise to the energies of the double-layer repelling, double-laid sheets stop to oppose the actions of their sheet bubbles. I.e. the whole formation can follow the sheet bubble flow that is not hindered by the sheets themselves. Sheet layers relocate according to sheet bubble vs. sheet layer repelling when energy goes back to low values.

It is reused in the Cosmology section in the sequel.

4 Classical Physics

In this section, a brief development of the geometry that is suitable for classical physics is done. The main purpose is to use it for comparing to the real world physics.

4.1 Restricted Geometry

Closed bubbles

The closed bubbles are closed double-laid three-dimensional structures, see Figure 16.

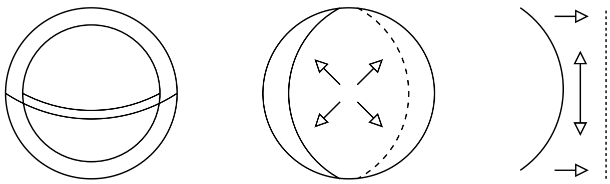

Figure 16: Closed bubbles

Closed bubbles are a simple structure that serves as particles of classical physics. They are based on a closed double-layer sheet that was found in the Tangloidal Geometry section. It does not distinguish between fermion and boson particles, being just a classical boson-like structure.

It forms symmetric bubbles that can be pressed to other sheets when under relative motions toward them.

Wound rods

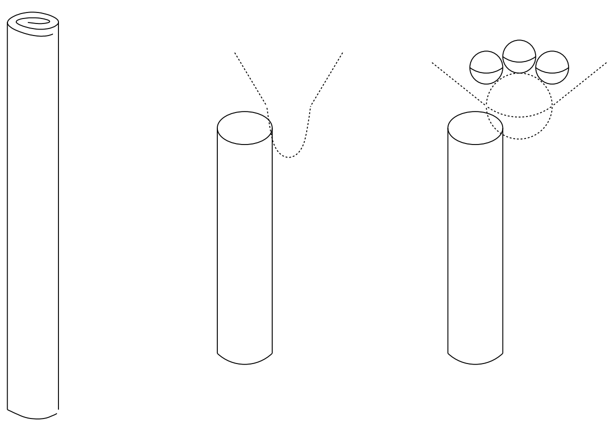

Figure 17: Wound rods

The rods a different structure – made of a single layer, here by multiple winding around itself. It is a variation on the sheet alignment scheme, since it uses repeated alignments. The result of the rod winding is that even though it is based on a single sheet, the layer is multiple, providing an effectively voluminous structure, see Figure 17.

The rods can serve as a scaffold for interactions with other structures, especially with those of single-layer parts. Having a matter structure, one single-laid part of it is aligned to the rods.

Thus, sheet bubbles can align just single hemispheres to the rods. The second (single-laid) hemispheres of sheet bubbles are open for interactions with other structures. As for corners, see the Universe Origin section for discussing the one-vs.-two single-laid tips question.

4.2 Restricted System

Classical dynamics

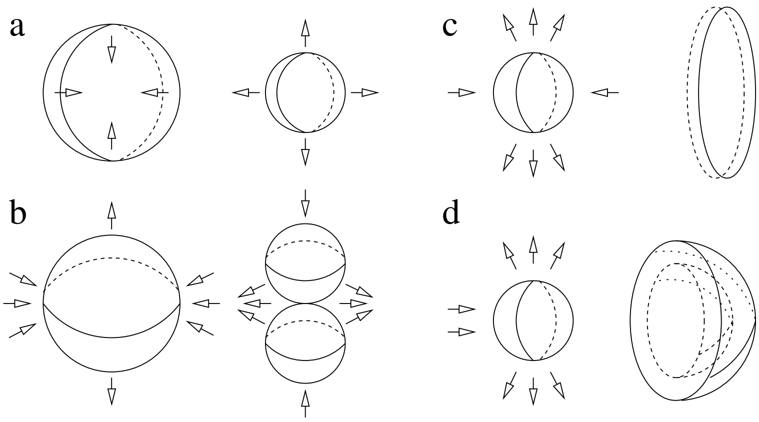

Figure 18: Bubble pulsing

A natural dynamics for the closed bubbles is pulsating. It can be symmetric or it can lead to shape changes and or (closed) bubble splitting, see Figure 18. Actions of surrounding closed bubbles or pressures between closed bubbles and nearby $3T$-sheets can cause the asymmetric way of pulsation.

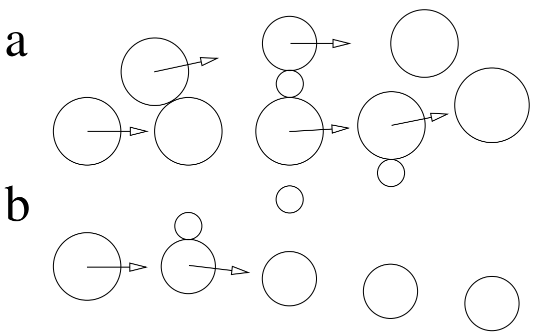

Figure 19: Classical interactions

Attractive and repulsive forces can be seen as exchanges of closed bubbles. An exchange of (small) closed bubbles can go in two possible ways:

- When the exchanged closed bubbles are free in-between, the interaction is repulsive.
- When the exchanged closed bubbles are shared (temporarily), the interaction is attractive.

Newtonian gravitation

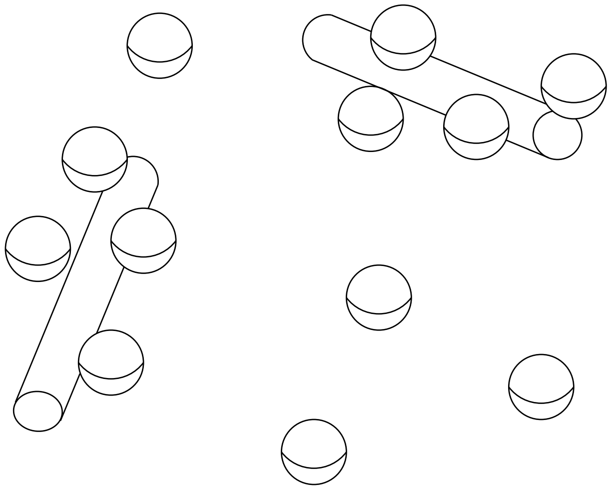

Figure 20: Classical gravitation

The classical (i.e. Newtonian) gravitation is materialized as aggregation around the (wound) rods. This form of gravitation can be used as an addition to the Standard Model to complete the flat-space (i.e. without general relativity) interactions of physics.

If the space were exactly three-dimensional, objects there would be restricted to these three dimensions as well. And thus the closed bubbles and the wound rods are a natural fit for such a system.

Some wound rods could be dispersed throughout this restricted system. Aligning between and those wound rods the closed bubbles would concentrate the rods at places with greater concentrations of the closed bubbles. Complementarily, the closed bubbles would be attracted to such places. It would end-up with the Newtonian gravitation where the concentration of the wound rods would serve as the scalar gravitational potential.

The Quantum Gravity uses a more complete system. Still, it reuses these (wound) rods and (closed) bubbles too.

Part II
Standard Model

5 Pulled Sheets

5.1 Corners

For the pulled $3T$-sheets, the geometry of each corner is formed by itself.

Corner life

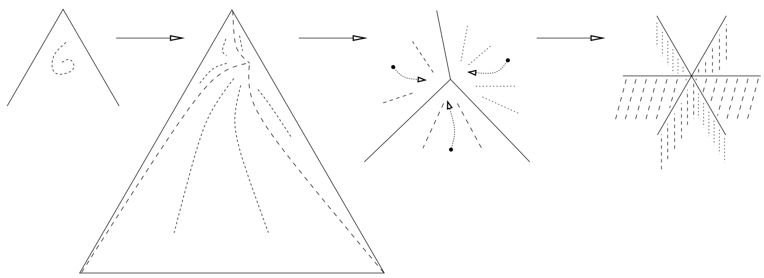

Figure 21: Corner origin

Two types of corners – according to structures of borders (see e.g. Figure 32 for a concrete depiction of the border types) – are assumed:

- corners of real particles: with real borders, i.e. sheet endings,
- corners of virtual particles: with borders as crisp (i.e. non-smooth) folds inside the sheets.

$3T$-sheets themselves – apart from matter formations – evolve via smooth changes. When a crisp folding occurs, it starts its life as (a part of) a virtual particle. If enough energy is put onto such structures (i.e. enough sheets aligned), the original $3T$-sheets tear up (by the stiffness of those sheets) into triples, forming thus a new real – corner based – particle.

Structures at new corner formations (of virtual particles) depend on the angles that are held by the new corners. They range from prism-like ones for 0 rad angles, to monkey saddle-like ones for π rad angles. The newly created triple structure separates, forming a freed star-like structure then, see Figure 21.

The tetrahedron-like structure of the original-plus-new geometries assures that the triple connectivity among all (corner-based) particle bodies is retained. The new corner is connected to the same corner pairs as the original corner, plus the pair of original-new corners is connected to all the other corners.

When a corner cease to exist via becoming (a part of) a virtual particle, the process goes the opposite way – i.e. through healing the borders among triples of sheets. The absorbing $3T$-sheet geometry ends up with a greater amount of actual $3T$-sheets. It is in accordance with the increased energy of the absorber, see the Mass Action section for more information.

During a fermion-antifermion pair annihilation, two initial corners (one per fermion) transform into four final corners (two per boson), see Figure 22, top.

Steps of the process:

- Corners of the two initial fermions are aligned, thus sides of their borders become free from each other.
- The sidewise borders rotate according to the original rotation flows.

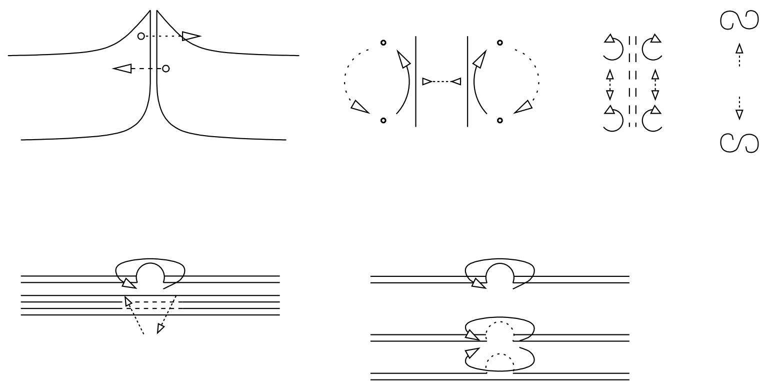

Figure 22: Annihilation and creation

- The (new) alike rotations on a fermion repel each other, while they are attracted to the opposite ones.
- The (former) rotation pairs split and connect with the opposite rotations that become available in alike way.
- The new rotation pairs join, forming final pairs of rotations, i.e. photons herein.

The corner creation process can be a part of particle-antiparticle pair creation. When enough energy present, rotation pairs – of mutually opposite orientations – originate by the action of a respective corner tip, see Figure 22, bottom. The (mutually opposite) rotations are based on complementary sheet layers, as it shall be for particle-antiparticle pairs.

For bosons, natural processes of corner changes are corner joining and splitting.

Bosons are created by joining two corners that are either some of the original ones, or newly created ones during the boson-creation process.

One of the ways to decay a boson is to split the two-corner joining. It can be done when corners of its corner pairs compete for the common double-layers, while having enough of sheet momentum to tear the joining, i.e. when (at least) one of them has non-zero angle (and thus rest mass). It holds for bosons of the weak interaction. It can happen alike for a tightly connected fermion pair of opposite rotation types, i.e. for mesons, see the Hadron Dynamics section.

Rest mass

While the genuine bosons have stabilised tips (thus forming a single generation), fermions have flipped tips with possible bending (and oscillating). The result is that there is a single generation of bosons, while there are three (as depicted below) generations of fermions.

Rest mass can be viewed as basically generated by connections between the corner tips and the rest parts of the $3T$-sheets. It is considerable for for non-0 angled corners. Then fermion tip rotating (based on its flipping) and bending provide additional – minuscule, considerable, respectively – mass sources (the only ones for neutrino-type corners), leaving photons as the only massless particles of the pulled $3T$-sheets.

Apart from photons, angles between rotation axes (of corner-based particles) are $\pi/2$ rad, thus a rotation can be seen along any direction. Further exploring of mass is in the sequel, notably in the Mass Action and Space Structure sections.

Corner dynamics

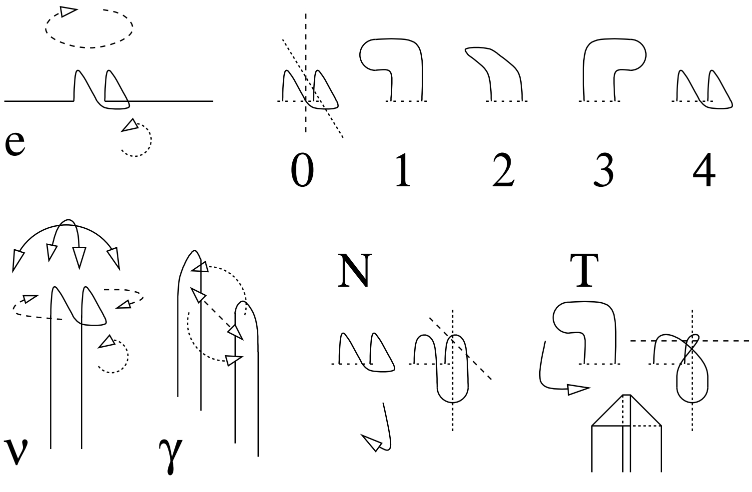

Figure 23: Corner rotations

Fermions of pulled $3T$-sheets are leptons, with corner angles at limit values: 0 rad (neutrino and alike, Figure 23, ν), π rad (electron and alike, Figure 23, e).

The feasible way to rotate a corner tip around the corner itself is by flipping the corner tip, see Figure 23, top right. Then rotating the flipped tip by twofold 2π rotation around the rest of the corner brings it back into the original state. If the corner itself is rotated (i.e. not only its tip), it is necessary to make a 4π rotation to bring it back to its original state, as it was described in the Spin Requirements section.

The tip itself is a structure that can be bent, with possibly doing oscillations. There are two principal directions for the bending: normal and tangential to the flipped tip – both being perpendicular to the depth of the corner, see Figure 23, bottom right.

Naturally, the tangential case (with π twisted corner tip) requires a greater energy. Since a 2π twisting is reverted by just moving the corner tip cross the corner body plane, such 2π twisting does not create new entities. And since any 4π twisting (or generally rotating) results in structures equivalent to the initial ones, the original (i.e. non-bent) and the two bent (with corner tip untwisted or π rad twisted) cases are the only real structure versions.

All these rotations employ two rotation axes (where one of those axes rotates itself) that are mutually orthogonal. This is an important and notable property.

Bosons of pulled $3T$-sheets are the bosons of electroweak interactions. Here we mean genuine bosons (of the pulled $3T$-sheets), i.e. the $W^{\pm}$, Z, γ ones. For the photon structure, see Figure 23, γ. Bosons of the weak interaction are presented at Figure 25. These bosons are of the form of double-corner tips – a structure with an inter-corner bordering, but without a flip of the aligned (and thus straighten) corner tips.

The moieties either oscillate perpetually (for photons), or until the inner $3T$-sheet is depleted (for $W^{\pm}$ bosons), or until the inter-corner border rips the structure by its momentum (for the Z boson).

Here again, the massive bosons employ two mutually orthogonal rotation axes. The photon case is the only one for pulled $3T$-sheets where the two axes are parallel – and hence the photon is a special case, with zero rest mass and the maximal velocity (in vacuum, i.e. when not mixed with other structures).

5.2 Interactions

Interactions among corners of pulled $3T$-sheets are based on rotations of the interacting corners.

Mediated interaction

Electric charge of a (rotating) corner is equal to the angle size (in rad/π) of that corner – when the corner sheets undergo a rotation flow. By this way, the Z-boson has zero charge (even though it has overall π rad angle), since its corners obliterate their charge feeling (into effectively just border transitions).

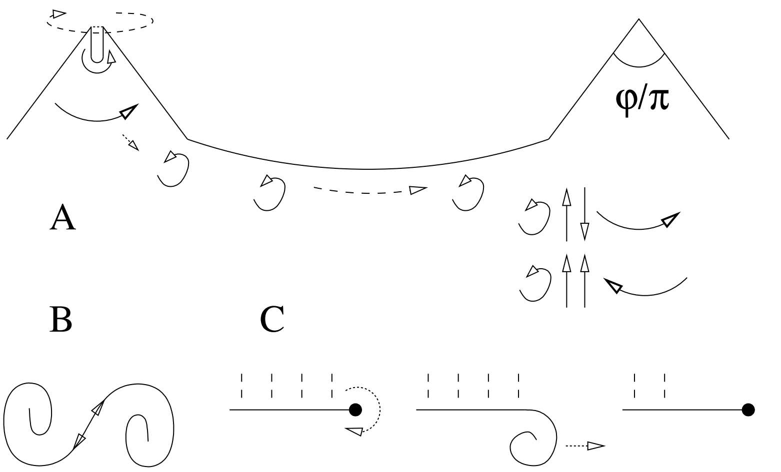

Figure 24: Electromagnetic interaction

Schematic view of a twofold action of virtual photons is at Figure 24. A rotating corner of open particles (electron and alike, $W^{\pm}$ bosons, quarks) or a sheet transition between corners of a boson (photon or Z boson) triggers photon-like disturbances over the $3T$-sheets. Those virtual photons spread and interact with particles having a rotating open corner.

Alike rotating disturbances are repelled from the source, alike by the Pauli exclusion principle. When approaching another open (to be able to enter) rotating corner, two cases can happen:

- For an oppositely rotating corner (e.g. of a charge opposite to the source charge), it shares its sheet flows with the approaching virtual photons. Thus the connecting borders tend to be shortened, starting from the corner being approached. The result is an attraction of the approached corner toward the source of those virtual photons.
- For an alike rotating corner, the corner vicinity is repelled (by the opposing sheet flows) out of the virtual photon source.

This shows up both the dual usage of photons – as real (Figure 24, B) and virtual (Figure 24, C) particles – and a reuse of the geometrical origin of the Pauli exclusion principle for attracting and repelling over distant regions (via the virtual photons as mediators of the attraction or repulsion), here manifesting as the electromagnetic interaction.

An argument for the fine structure constant at zero energy is $1/\alpha \simeq ((((2\pi+2\pi)\cdot\pi)+\pi)\cdot\pi+\pi)$ where the apparent zero outer energy actually means a positive effective energy, since the $3T$-sheet double-layers contain negative relative (Casimir-like) energy by themselves.

The first term part of $2\pi + 2\pi$ would correspond to the total angles of the paired corner rotations – one of those rotations being effectless for the interaction.

Then, π multiplications would be for angles at next sections (at rotating corner vs. virtual photon meeting), with π additions for alternative possibilities of the two-fold action of virtual photons as discussed in the preceding. Greater energy would force the sections to be closer to corner tips.

Analogical reasoning for the weak vs. strong interactions would result in greater vs. lesser inverse values of respective coupling constants – since the contact lengths are extended for the alignments of the weak interaction, while the strong interaction works on tight areas.

While the basic structural definition is the same for both real and virtual photons (apart from sheets involved), the exact geometries differ.

Real photons are symmetric beings where the two corners of a photon play the same role. As for the electromagnetic interaction-mediating virtual photons, (momentary) roles of their two corners differ. One corner exerts the rotation (that fulfils the electromagnetic interaction), the second corner just releases the structure tension, so that it can proceed into the next (rotation) step. This twofold stepping of virtual photons should be the reason for the dichotomous nature inside the advised derivation of α (the fine structure constant).

Direct interaction

Two (of pulled $3T$-sheets) fermions – being put together – can form structures with outer angles of either 0 rad (for the boson of electromagnetic interaction), or π rad (for weak interaction bosons). For bosons of the weak interaction, see Figure 25.

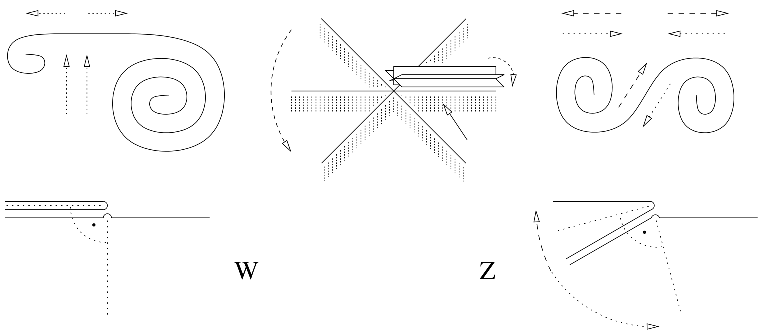

Figure 25: Weak interaction

A schematic view on transfers of the sheet layers at virtual particles of the weak interaction:

- $W^{\pm}$ bosons – living while having some sheet to wind,
- Z-boson (functional as a massive photon) – big sheet momentum disallows (contrary to photons) a perpetual sheet (un)winding.

Anti-rotating particles (like e^+ and ν) can touch together when aligned, forming the $W^{\pm}$ bosons.

$W^{\pm}$ decay is based on depletion of the $3T$-sheets in between its forming corners. It is alike for mesons (another unstable structure based on two anti-rotating corners, as described below).

Virtual Z-bosons can change the alignment of 0-charged and 1-charged leptons, resulting in scattering of neutrinos.

As for photons, the real vs. virtual particles of the weak interaction share common structural properties, but their differ in their exact geometries. Contrary to the electromagnetic interaction, virtual bosons of the weak interaction are formed by direct contacts of the interacting fermions. While real $W^{\pm}$, Z particles are genuine bosons based on tight corner pairs, their virtual counterparts are just loose pairs of co-aligned corners that can exchange their (corner angle forming) sheet layers.

The direct output is that weak interactions are chiral, since the contacts has to be formed by aligned boundaries of the respective $3T$-sheets.

Electroweak algebraic structure

The $SU(2) \otimes U(1)$ structure of the electroweak interaction describes (inter-corner) structures of pulled $3T$-sheets of the paired corners:

- The $U(1)$ algebra describes possible orientations of a shared (i.e. coupled) rotation of the corners around a common axis (i.e. around each other).
- The $SU(2)$ describes possible alignments of the respective corners from the point of view of transfers of the sheet layers between the paired corners.

The mixing of the (original) $U(1)$ and $SU(2)$ algebras – that produces photon and Z-boson – is based on the fact that these two (neutral) bosons employ both the sheet transfer (between their corners) and the (paired) rotation of their corners.

Both the above structures are based on rotating $3T$-sheet corners, i.e. they combine directions of rotation axes and orientations of those rotations, in the result forming complex spaces.

If a hypothetical boson (made of two 0 rad angled corners) would contain (effectively) zero amount of the (inter-corner) sheet material – with its two corners just rotating around their common axis – it would be a boson of the original $U(1)$ algebra.

The chirality of the week interaction is already explained above.

Since neither a direction nor an orientation has a geometrical preference, the structures of the electroweak interactions naturally obey the gauge invariance.

6 Pushed Sheets

For a pushed $3T$-sheet, geometries of all its three corners combine together to form a single geometry. Hadronic structures with pushed $3T$-sheets can be seen as a densely packed dual of leptonic particles with just the pulled $3T$-sheets.

6.1 Nucleon Structure

Nucleon structure is made of three pulled $3T$-sheets with an attached (size-limited) pushed $3T$-sheet of a tight spherical surface. Then, quarks are combinations of regular corners of the packed pulled $3T$-sheets and of angular points (i.e. corners, called *partons* henceforth) of the attached pushed $3T$-sheet.

Gluons are (flow-causing) pairs of rotations on the sides (i.e. on corner connections), thus they are coupled to pairs of corners. Embedded squeezed surfaces (created by inner gluons) on the attached pushed $3T$-sheet form virtual quarks, known (together with their gluons) as the quark-gluon sea. Colliding nucleons form these disturbances where even the embedded squeezed surfaces can host other embedded quarks. The result being the fractal-like structure of measured energies on non-elastic hadronic interactions.

Each corner tip is aligned along a different axis, forming – together with orientations of the flows through the corners – a three-dimensional complex space. Limited size of the spherical surface puts stringent constraints on parton separation lengths, while leaving them virtually free on distances lesser then the lengths of the spherical triangle sides.

Since no axis or orientation is privileged, the gauge invariance holds automatically. It is alike for the electroweak case where the gauge invariance is geometrically satisfied as well.

Weak interactions acting on hadrons

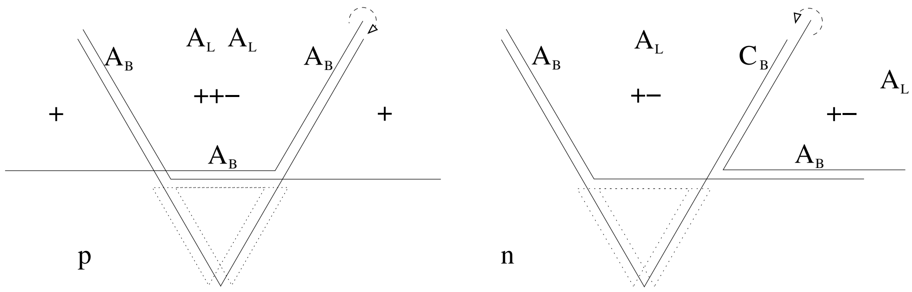

Figure 26: Nucleon stability

Comparing proton and neutron schemes from the point of view of their structural properties, see Figure 26, with A, C for aligned, counter-aligned; L, B for layers, borders:

- The proton scheme (Figure 26, left) is more knotted than the neutron scheme (Figure 26, right). This fixes the proton.
- The neutron scheme contains a counter-aligned border part (C_B). This provides the switching axis.
- The neutron scheme contains one more $\pi/3$ rad angle (compared to the corresponding $2\pi/3$ rad angle of proton). This forces the neutron $\Rightarrow$ proton switch, since it is more favourable to have angle values closer to π rad.

The structure of the $2\pi/3$ overall angle with mutually cancelled charges (i.e. of neutron) is a (higher energy) alternative to the basic proton structure. Since the particular $3T$-sheets of neutron form non-π spread outer geometries, they are unstable structures. They can be stabilized by aligned (muon) structures, as it is at nuclei, though.

Hierarchy of quark energies

The sterically constrained structure forces the particular quark angles to be integral parts of $\pi/3$ rad, i.e. their electric charges have to be integral multiple of $1/3$ (of the basic e charge).

For quarks of the 2^{nd} and 3^{rd} generations, the (corner tip) bending energy is greater for greater angles. It makes the c, t (of $2\pi/3$ rad angles) to be heavier than the ($\pi/3$ rad angled) s, b, respectively – contrary to u being lighter than d (because of lesser border repelling of the greater angle of u).

Nucleosynthesis

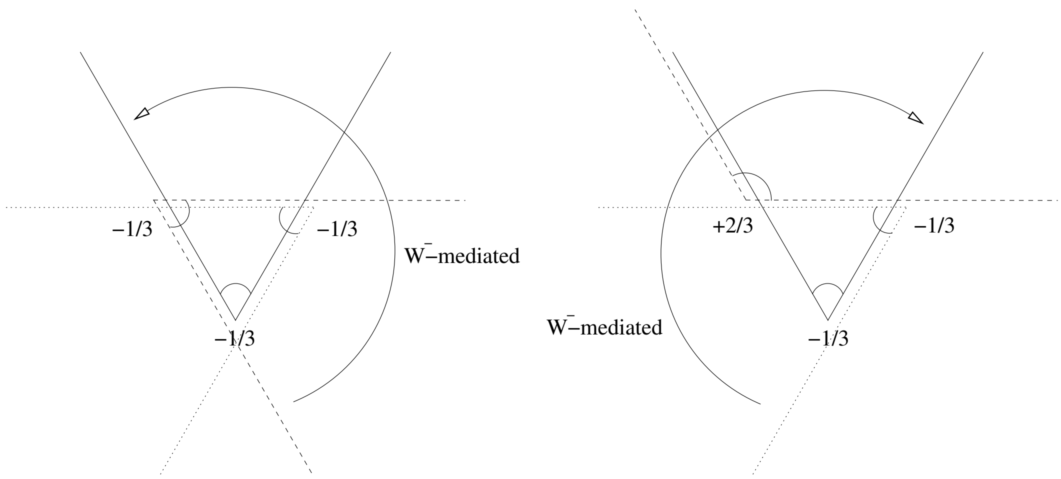

Figure 27: Nucleon creation

The initial structure (see the Universe Origin section) is explored herein, as it transforms into the stable nucleon, see Figures 27, left to right; 26 left.

Since the outer layers of the the $3T$-sheets have to form 0 rad or π rad angles, the initial structure can not stay on itself (unless under enormous energy density, forming the quark-gluon plasma). The structure discrepancy can be (easily) solved by emitting the W^- bosons (for quarks), or W^+ bosons (for anti-quarks).

Initial charges of the quarks are $-1/3$ (and $1/3$ for anti-quarks). The resulting structure being the simplest nucleon, with 3 quarks, one of them $-1/3$ charged, the other two $2/3$ charged. The net result is $+1$-charged nucleon (i.e. proton, Figure 26, left) as the wholesome structure.

6.2 Hadron Dynamics

Fermions of the pushed structures are quarks. Real quarks contain both the pulled $3T$-sheet parts and the parton structures based on corners of the attached pushed $3T$-sheets.

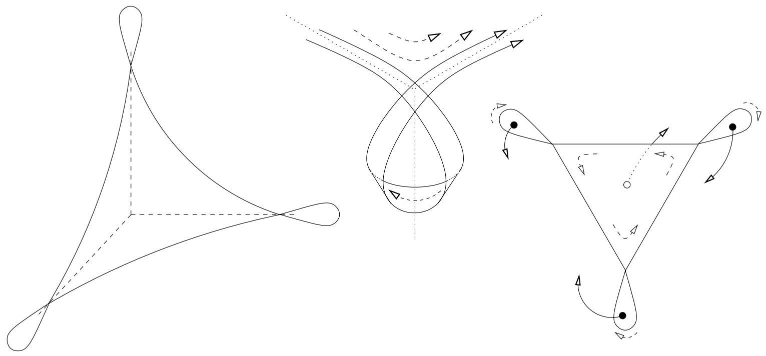

Figure 28: Pushed corners

Steric constraints on the pushed $3T$-sheets require some embedded form of their corner tip rotations, see Figure 28. A simple way to achieve it is a loop passing through itself.

The tip loops (of the pushed $3T$-sheet corners) provide orthogonal axes of the embedded flow, being an addition to the flow going along the corners themselves. Again, it results in a structure of two – mutually orthogonal – actions per corner. The loop-like rotations on corner tips of a pushed $3T$-sheet cause an overall surface rotation of that $3T$-sheet. It provides an additional (abundant) source for the overall nucleon spin.

Bosons of the pushed structures are gluons. Virtual (since living inside the $3T$-sheets of other particles) gluons are pairs of flow-causing rotations, leading to (spring-like) oscillations of the overall structure. The (virtual) gluons are – alike photons – formed by (herein virtual) corners with parallel axes. Although gluons are outer flow-causing rotation pairs, thus schematically resembling more the $W^{\pm}$ bosons, apart from the 0 rad angles of both parts of (virtual) gluons.

Rest masses of pushed matter structures are affected by the parton additions to the pulled $3T$-sheets that form quarks. The pulled $3T$-sheet moiety builds the three generations of quarks. The pushed $3T$-sheet moiety puts an additional strength on the structure, and thus making generally greater masses of quarks.

When partons of the same directions (i.e. of the same colors) belong to alike rotating quark tips (i.e. generations), the steric constraints are lesser, and thus such a system can achieve greater densities.

Pushed interaction

The strong force is a gluon-mediated color (i.e. axis) changing, see Figure 29. The color exchange is equivalent to exchanging the respective two partons, i.e. applying "*times* -1" on the pushed $3T$-sheet structure (algebraic view). Thus it fits with the double π rad rotation – carried out by the gluon-caused flow – of the two partons (geometrical view). The equivalent views are:

- exchange of $g\bar{b}$ $2 \to 3$,
- exchange of $b\overline{g}$ $3 \to 2$,
- moving the R quark relatively to the other two ones,
- π rad flip of the side connecting the G and B partons.

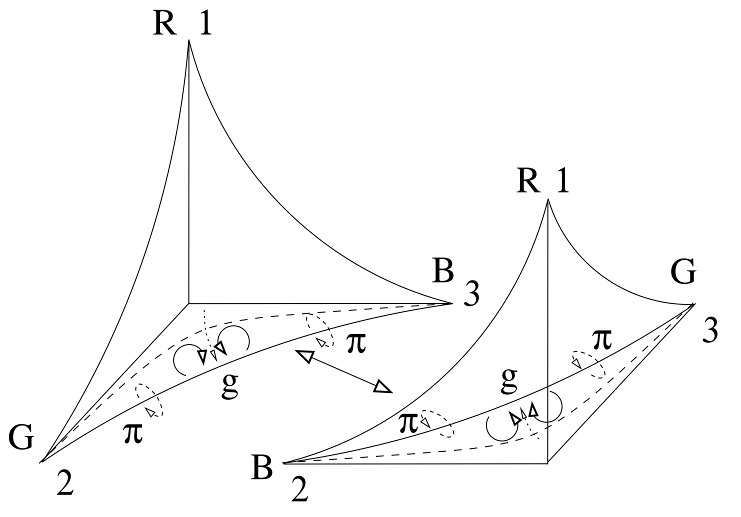

Figure 29: Pushed exchanges

The result is that *a*) the color exchange is accompanied with a quark movement; and *b*) a virtual gluon (pair) is equivalent to a pair of flip-forming rotations.

Longer distances cause a narrower tip of the displaced quark; thus the flip-forming gluons in that part can result in a chain of displacements with aligned stretches, known as the gluon tube.

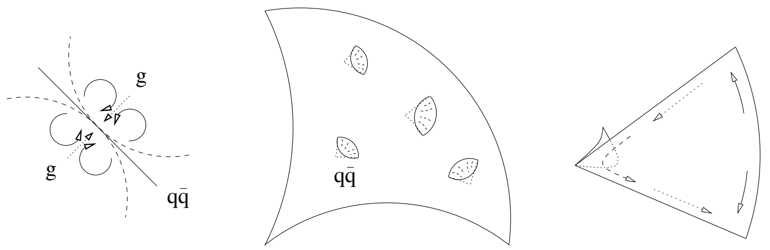

Figure 30: Pushed pairs

Taking the color exchange process as rotation-based flows, such flows can be put together, forming structures of virtual parton-antiparton pairs, see Figure 30, left. These pairs are squeezed tips on the surface then, see Figure 30, middle. Such a structure is along a single direction, thus the paired partners have the opposite (strong-force) colors. They are laid on opposite orientations of the same direction, thus they are of mutually complementary matter-antimatter forms.

Quarks vs. anti-quarks use opposite orientations for their tip rotations, therefore their sheet flow dynamics can be different. Thus it enables a (slight) CP-asymmetry on them. Short ranges of pushed $3T$-sheets (together with their overall flows) cause a (slight) influencing of the 3^{rd} corners, see Figure 30, right. It leads to a slight (local) CP-symmetry violation – effecting on the dynamics of the hadrons, e.g. a meson decays where the sheet depletion determines the meson life-time.

Since the corner tip rotations, sheet flows and (un)winding are the main parts of a particle life, their dynamics is what determines life-times of particles (as it is explored later in the Special Relativity section). The main point is that changing the (apparent) speed of the corner actions changes the life-times of particles.

7 Bubbles

7.1 Sheet Bubbles

Disturbances of the $3T$-sheet double-layer structure are materialized as bubbles inside the sheets. Since they are based on oppositely curved layer parts, they have positive energies – contrary to the rest of the aligned sheets.

Notice that the sheet bubbles are frequently called just bubbles in the sequel.

Types of sheet bubbles

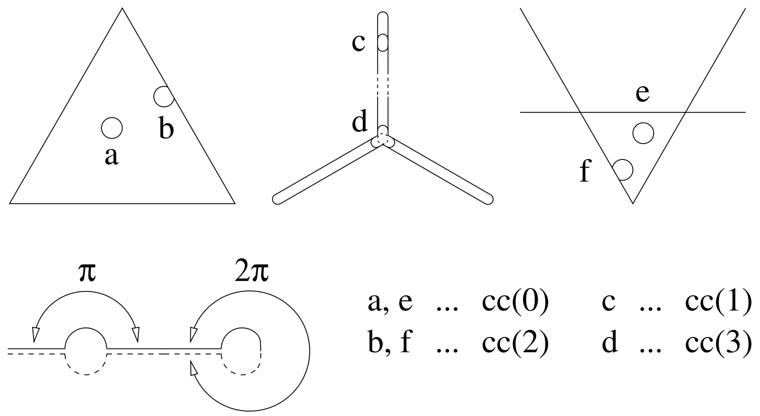

Figure 31: Bubble symmetry

Pulled $3T$-sheets are extended structures. Thus a local view on a pulled $3T$-sheet geometry is a sheet with bordering of one of the next three (local) cases, see Figure 31, top left, middle:

- free sheet with no border
- open sheet with one border
- two aligned borders with a sheet strip

It is similar for the pushed $3T$-sheets, see Figure 31, top right.

Taken together, according to locations (and binding) of the bubbles inside the (pulled or pushed) $3T$-sheet layers (Figure 31), next types of sheet bubbles can be recognized:

- free bubbles, cases a, e
- bordered bubbles, cases b, f
- strip bubbles, case c
- star bubbles, case d

Since these bubbles do not rotate, they should not interact via the electromagnetic interaction. Having no straight parts causes a lack of the weak interacting too.

According to complementarity to corners of their sheets, the sheet bubbles are coupled to:

- 0 corners for free bubbles
- 2 corners for bordered bubbles
- 1 corner for strip bubbles
- 3 corners for star bubbles

And the sheet bubbles can be seen as duals to the sets of the remaining corners (of respective $3T$-sheets) as well.

Exchange of two sheet bubbles is accompanied with exchange of corners they are coupled to. This way, the free and bordered bubbles (coupled to even counts of corners and dual to odd counts of corners) are of bosonic nature, while the strip and star bubbles (coupled to odd counts of corners and dual to even counts of corners) are of fermionic nature.

Rotational symmetry of sheet bubbles is twofold as well. It is of π rad for the free and strip bubbles, while it is 2π for the bordered and star bubbles.

Energies of sheet bubbles

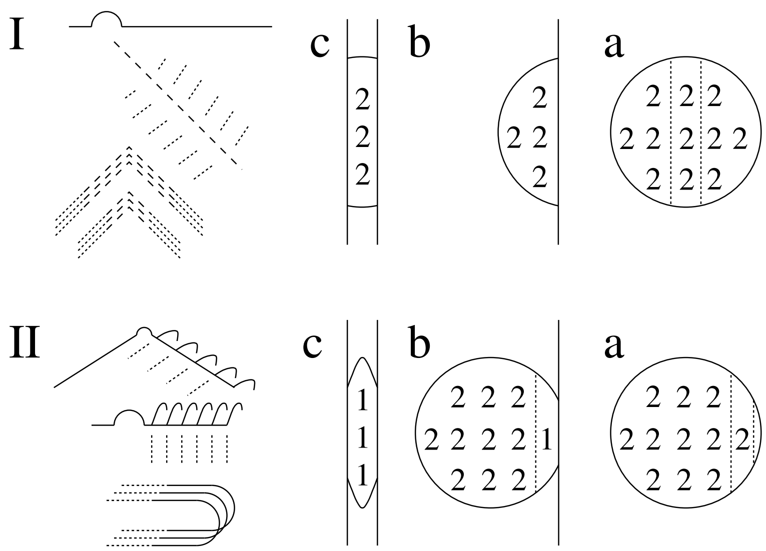

Figure 32: Bubble energy

Relative potential energy of a bubble part that is far from borders is a summation of differences of *a*) zero vs. (negative) potential energy of aligned sheet layers; and *b*) (positive) potential energy of bubble hemispheres vs. zero. This is roughly twice as much as the potential energy of a bubble part attached to a (real) border, since the sheet borders themselves are curved.

Borders of virtual particles are taken as effectively with no curvature changes, thus causing no energy changes in the neighbouring parts of the sheet bubbles.

These approximate values are used for estimations of sheet bubble energies, see Figure 32.

Regarding the shapes of sheet bubbles, changes of the bubble energy by borders of real particles is taken as an analogy to the hydrophobic effect, see below by the Figure 33 for more explanation.

It is assumed that there is no structure change of sheet bubbles by borders of virtual particles. Borders of virtual particles thus effect as a neutral agent for structure formation.

The result is that the bordering parts of attached bubbles are greater for bubbles attached to borders of virtual particles (Figure 32, I) than those attached to borders of real particles (Figure 32, II).

The sheet bubbles are kind of excitations of the $3T$-sheet layers. Since the $3T$-sheets themselves are a source of mass, the notions of Higgs field and its excitation (i.e. the Higgs boson) can be viewed as a pre-tangloidal version of the $3T$-sheet layers and bubbles. It enables a search for signals that correspond to creation or decay of sheet bubbles.

As for bordered and free bubbles, the 125 GeV signal (of colliders), and 130 GeV and 135 GeV signal (of gamma ray emissions) are relevant as described below.

As for the strip bubbles, the 5 GeV signal (of gamma ray emissions), and the 10 GeV signal (of dark matter detectors) are relevant as well.

$$E_a(270\text{G}) \approx 2 \cdot E_{b_I}(125\text{G}) + E_{c_I}(20\text{G}) \quad (1)$$

$$E_{b_{II}}(260\text{G}) \approx E_a(270\text{G}) - E_{c_{II}}(10\text{G}) \quad (2)$$

$$E_{c_{II}}(10\text{G}) \approx \frac{1}{2} \cdot E_{c_I}(20\text{G}) \quad (3)$$

This way, the proclaimed signal of the Higgs boson belongs to the bordered bubble attached to a border of virtual particles. The low energy signal belongs to the strip bubble (of virtual particle borders) then.

The gamma-rays based signals are halves of energies of the respective bubble decays – i.e. of a sheet bubble into two photons.

The 260 GeV and 270 GeV signals should go against themselves, as it is described below.

Bubbles of pushed $3T$-sheets should be generally of free and bordered types. Since the nucleon structure contains a sea of virtual particles, the general density of energy is much greater inside the nucleon than in a free pulled $3T$-sheet.

It should result in much lesser relative energies of such bubbles in the pushed $3T$-sheets. The proclaimed $E(38)$ boson, i.e. the 38 MeV and 76 MeV signals (of detectors), could belong to bordered bubbles – attached to borders of virtual vs. real particles – of the pushed $3T$-sheets.

The proposed cca 1 MeV force carrier (of Lamb shift measurements) should belong to a strip-like version of bubbles in pushed $3T$-sheets then.

Comparing it to the pulled $3T$-sheets cases, the cca order lower energy is in accordance with a case where the borders constitute a larger part of the sheet bubble. It can happen when two hadronic borders get aligned, e.g. during interactions of a nucleon with a muon.

Since it should be attached to those hadronic borders, it should alter the nucleon-muon interaction then. And it is, in fact, the very reason of its proposal.

The sheet bubble structure itself is a result of two forces (Figure 33, a). First, the opposite curvatures of bubble hemispheres try to separate the layers and to spread the bubble content out of its center. Second, the surrounding aligned layers try to hold the layers together and to limit the bubble size.

Since the curvature counter-alignment of sheet bubble hemispheres is lessened for growing bubble sizes, the result bubble size is held at a constant (steady) value.

For the cases of sheet bubbles attached to borders of real particles, relative energies of the curvature counter-alignments (and thus the spreading forces) are lesser. It results in lesser bubble spreads at such areas, as it was announced above.

Stabilities of sheet bubbles

The bordered and strip bubble cases should be lead by the borders toward a corner where they can decay (e.g. into $\gamma\gamma$ pairs, Figure 33, b, c).

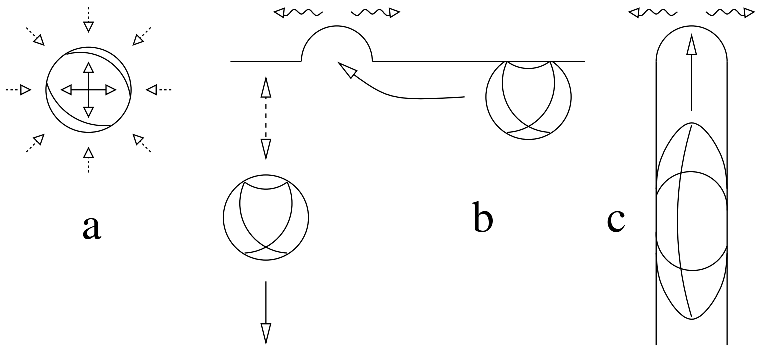

Figure 33: Bubble stability

The free bubble case is repelled from borders and thus it remains stable – until the ambient energy content gets so great that the bubble-border barrier gets negligible. It happens e.g. when the free bubbles are in the high-energy environment around a black hole.

In this way, the free bubbles of pulled $3T$-sheets are a natural explanation of the dark matter. It is supported by the γ emission signals.

The process of a coupled production and decay of a sheet bubble has to overcome an initial barrier of the sheet disalignment. If the production (i.e. collision) energy is low, separation of the decay results is not complete.

Thus e.g. fermion-antifermion pairs (of a sheet bubble decay) can lead to immediate annihilation for fermions of 0 rad angled corners. This can be a reason for the initial (based on a lower beam energy) abundance of photons with a deficiency of $\tau\overline{\tau}$ pairs.

Along with that, the bordered 260 GeV bubbles are unstable while the free 270 GeV bubbles are hyper-stable. It should result in an abundance signal at the 260 GeV, and deficiency signal at 270 GeV. These signals can obliterate themselves, especially for low beam energies.

Since the 7 to 8 TeV beam energies seem to be the limit cases for reasonable detections of the 125 GeV bordered bubbles (of virtual particle borders), doubling the beam energies may be necessary for a reasonable detection of the greater-energy bubbles.

For the lower-energy sheet bubbles, the strip vs. star bubble cases are unstable vs. stable bubble types. Since they are of fermionic type, they can serve as a materialization of the proposed axion particles.

Here, the star bubbles should be locked inside the structure. The bubble size should be three times half of a strip bubble (for the bubble rays), with a lesser (cca half of a bubble ray) central part. It is approximately $\frac{1}{2}(3 + 1/2) \cdot E_c)$. Thus, it should be cca 17.5 GeV for star bubbles attached to borders of real particles, and cca 35 GeV for the ones attached to borders of virtual particles.

It could be the reason for a deficiency at the γ emission signal at 35 GeV. Then a deficiency at 17.5 GeV and abundance at 20 GeV (of the strip bubbles attached to borders of virtual particles) can obliterate themselves. As for the star bubble types, they can alter the γ emission spectrum by star bubbles combining borders of real and virtual particles for their rays. It should go by 1/3 of the $35 - 17.5$ GeV difference.

7.2 Closed Bubbles

Curvatures of the closed bubbles tends to be equal throughout the formation, since the more curved parts undergo a greater pressure along the surface. The result is the spherical shape of such formations.

The closed bubbles themselves can be seen not only as the particle objects of classical physics, but they can form the inter-environment for the $3T$-sheet structures as well, see Figure 34.

It is reused at the Quantum Gravity part in the sequel as the outer environment for the rod massif that is described there.

Closed bubbles can be aligned to the other structures, as it is described at several places in the sequel. Closed bubbles thus provide a solvent material that envelop the (osmotic solute-like) $3T$-sheets and fill the 3D-space in between them.

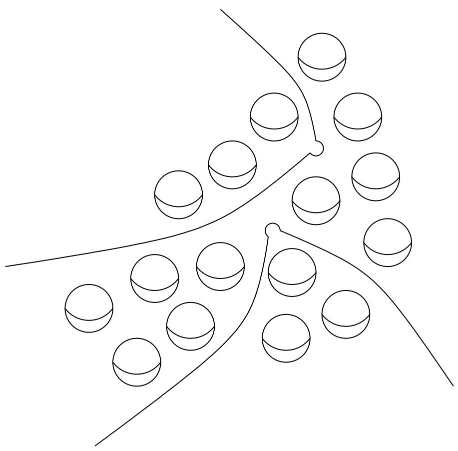

Figure 34: Bubble environment

The closed bubbles (lacking single-layer parts) do not form matter structures by themselves. It means that they can not be directly detected. They affect structure and dynamics of the matter structures though.

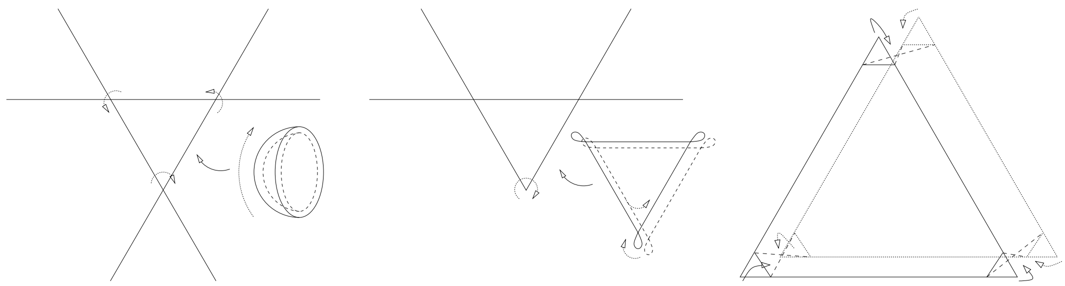

Figure 35: Bubble pushing

When a closed bubble gets close to (the initial state of) a nucleon formation, the rotating corners of the (pre)nucleon structure spin the closed bubble. It results in relative circular movements and thus attraction between these two structures, see Figure 35, left, middle. This way, the closed bubble forms a doubled structure of the (already double-laid) sheet. And it is the origination of the pushed $3T$-sheets of nucleons.

Corners of two pushed $3T$-sheets could be put together (Figure 35, right) if their tips would get mutually accessible. It is exploited in the Equivalence Principle section.

8 Special Relativity

Relativistic effects are based on the apparent time, as it is described below.

8.1 Apparent Time

The special relativity description in this section is based on rotations of corners, shapes of bubbles, and alignments of sheet layers.

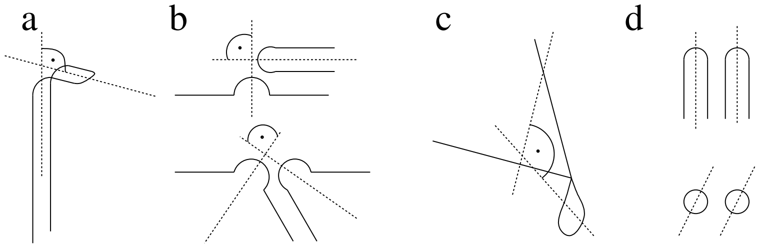

Figure 36: Rotation axes

For the (corner-based) massive particles, rotation dynamics employ pairs of orthogonal axes. Thus massive (i.e. of non-zero rest mass) particles feel the apparent time changes for movements at any direction. It is alike for sheet bubbles, since they are voluminous (and massive as well).

For the massless particles, the time changes are felt for directions perpendicular to the rotation axes (thus enabling movement direction changes), while changes parallel to the axes result in frequency changes.

Particular cases according to Figure 36:

a: two axes on single corners of fermionic pulled $3T$-sheets, regardless of their bending;
b: two axes for paired corners of $W^{\pm}$ (top), Z (bottom) bosons;
c: two axes for flows through the tip loops and corner bodies of pushed $3T$-sheets;
d: parallel axes for photons (top), gluons (bottom).

Changes on this rotations result in altered perceived times of all dynamics processes. Since time is actually measured by events based on such processes, the perceived changes on the measured time are taken as apparent.

Thus the measured time is called the **apparent time** throughout this exposition.

Generally, a corner tip at rest (with an inertial observer) does (generally) different counts of rotations comparing to e.g. an accelerating corner tip.

In the sequel, connections between the apparent time and movements of the whole structures (vs. observers) are unleashed. It forms the core of the special theory of relativity.

Acceleration

The body and the tip of a corner are aligned (Figure 37, I left) when under zero acceleration, i.e. at an inertial state – since at this section, the environment is that of special relativity, i.e. without gravity.

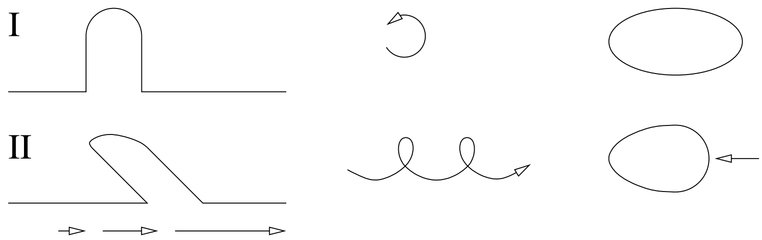

Figure 37: Absolute time slow-down

An acceleration happens when the alignment is broken, e.g. by a force acting on the corner body (Figure 37, II left).

For fermions, ticking of the apparent time is executed by corner tip rotations. The length of the corner tip circling (around the corner body) gets longer under accelerations, i.e. any change based on the tip revolving – thus by dynamics any evolving – gets slower. I.e. the apparent time slows down, see Figure 37, middle.

For bosons, ticking of the apparent time is executed by rotations of their two corners. Thus it is alike for fermions, with the exceptions for massless bosons as it was presented above.

For an example, the corner body can be disaligned by actions of virtual photons of the electromagnetic interaction. The corner tip then moves (during its rotating) toward the disaligned corner body. When the interaction-based corner body disalignment continues, the particle gets a continued acceleration.

This type of slowing-down of the apparent time does not depend on an inertial observer state.

While sheet bubbles do not rotate – and thus they do not have an apparent time – they have shapes, and those are modified according to the special relativistic description. Thus for sheet bubbles, the shape of the their structures is relevant for relativistic effects.

The free bubbles at rest with an (inertial) observer are of the spherical shape, i.e. they are symmetric along all directions. For inertial movements, free bubbles have ellipsoid structures, i.e. still symmetric in forward vs. backward orientations along the movement direction, as described in the sequel.

An acceleration changes the shape of free bubbles into drop-like – i.e. asymmetric – structures, as it is common for (otherwise spherical) structures passing through an environment that exerts pressure onto those structures, see Figure 37, right.

This special-relativistic description is analogical for the other types of sheet bubbles.

Pressure

Acceleration alters local shapes and displaces structures, and thus it affects the apparent time as well.

Analogically to the (acceleration-based) local pressure effecting, ordinary (directed) pressure can alter the shapes and displace the structures as well. Such ordinary pressure effects are mediated by the closed bubbles, thus it is natural that they have a minuscule impact under ordinary (i.e. not a huge pressure) circumstances.

Velocity

The core of special relativity is shown-up on velocity. It provides the special relativistic structure without a necessity to deal with all the particular phenomena of the special theory of relativity.

This is a relative – i.e. observer dependent – view. It can be formed over an absolute structure via putting in a grid that the matter structures have to pass through and rotate around, see Figure 38, e.

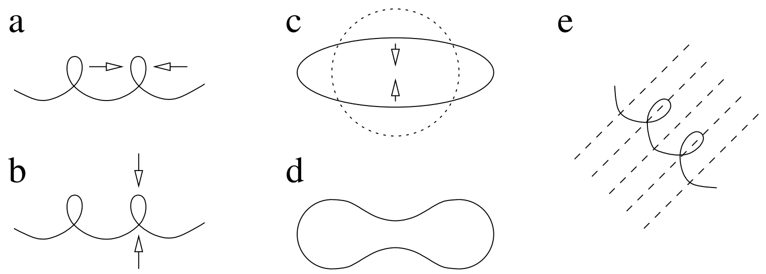

Figure 38: Relative time changes

For an inertial observer at rest with an (inertial) corner, the corner rotation scheme is a repeated connected trajectory.

For an inertial observer with a non-zero velocity relative to the inertial corner, a view of it changes to a mode similar to that of an accelerating corner. It gives inertial observer-dependent apparent time.

The rotation scheme curve can be taken as the basis of the whole description from the point of view of special relativity, see Figure 38, left.

Velocity additions result in constringing or stretching over the rotation curve. When adding a velocity at the same direction, the curve is just simply constringed or stretched (Figure 38, a). When adding a velocity at an orthogonal direction, just the free rest (in the respective direction) of the curve is changed (Figure 38, b).

If the velocity would went to c for a massive particle, the curve would change to a non-smooth (with crisp points) trajectory.

The spring-like structure naturally exhibits the property that attempts to change a curve structure of a lesser-than-c speed into a curve structure of a speed closer-to-c undergo an ever-stronger adversity.

This description is the same as that based on fuzzy logic where the same-direction additions are those of co-uninorms, and a view reversion (i.e. choosing an inertial observer) is based on the co-implicator functors. Again, it can be seen here that any non-extremal point on the fuzzy-logic domain interval can be taken as the neutral element (i.e. inertial observer).

Inertial movements of bubbles are accompanied with ellipsoid shapes of the bubbles, since they exert lesser pressures to the sidewise directions – as it was already discussed in the Structure Borders section.

As the relative speed approaches c, bubble shapes come closer to the one-dimensional (i.e. line) structure (Figure 38, c). The same narrowing holds for the asymmetric shape of accelerating bubbles.

If a bubble would undergo a (relative) velocity greater than c, its apparent shape would revert the central widening into a narrowing (Figure 38, d). It is exploited in the Exotic Matter Applications section.

8.2 Mass Action

Matter structures, as presented below, employ single-laid sheet parts.

Rest mass

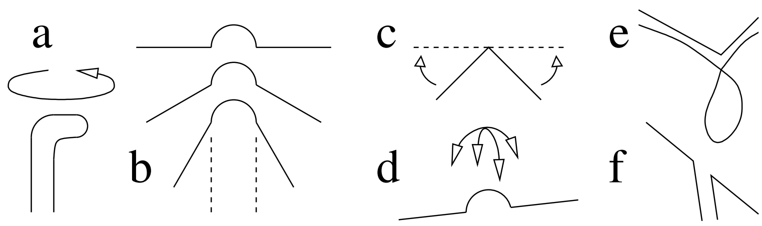

Figure 39: Corner rest mass

The rest mass is – avoiding the point of view of Quantum Gravity – based on the acting that the corners and bubbles effect on the ambient environment.

It is based on connectivity of single-layer parts (i.e. corner tips and bubble hemispheres) to the double layers of $3T$-sheets (Figure 39, b). Greater is the connectivity, greater is the basic part of the rest mass of the respective matter structure. The closed bubbles have no single-layer parts, no connectivity to the $3T$-sheets, and thus no mass at all.

This way, neutrino-type corners, photons, and (virtual) gluons stand aside from the other corner types and bubbles.

Additions to the basic mass action by sheet corners, according to Figure 39, are:

a: the flipped tip of fermionic corners adds a minuscule mass, making the neutrinos massive,

c: a lesser than π rad (but non-zero) corner angle that tends to extend to the π rad angle,

d: tip bending of fermionic corners, adding two (higher-mass) generations for fermions,

e: structure toughening by attaching the pushed $3T$-sheets, for quarks,

f: structure toughening by aligning two (massive) pulled $3T$-sheets, for $W^{\pm}$, Z bosons.

For the general description on leptonic fermions and respective bosons, see the Pulled Sheets section; for the quark and gluon cases, see the Pushed Sheets section.

Fixing effects on double-laid $3T$-sheet parts (that bear a corner or a bubble) increase their sheet stiffness and thus the respective mass acting. According to that, the composite structures of (massive) bosons increase their mass acting – while it precludes the corner flipping for bosons along with that.

The stiffness-increase effect holds on quarks as well, since they are a composition of partons of the pushed $3T$-sheets and of common fermionic corners of the pulled $3T$-sheets.

Rest mass of sheet bubbles is based on their curved hemispheres. Greater is the Casimir-like force (and thus their stiffness), greater is their mass action. See more in the Sheet Bubbles section.

Dynamic mass

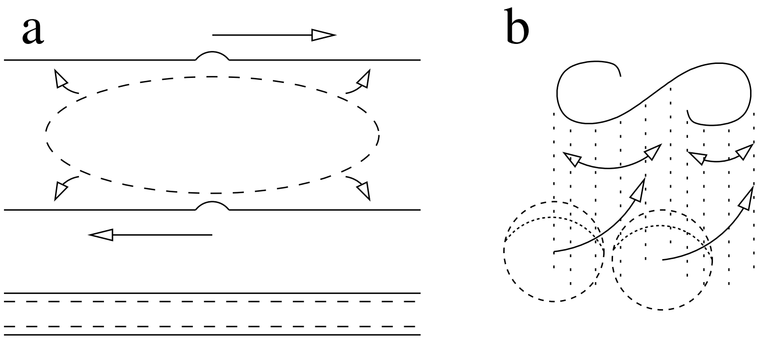

Figure 40: Relativistic mass

Sheet parts by a corner (or a sheet bubble) passing along an observer have non-zero relative velocity to the (double-laid) $3T$-sheets of that observer. Thus it lowers the pressure in-between and attracts (other) sheets there.

Alike using the closed bubbles for the pushed $3T$-sheets, the closed bubbles can serve as a source of the additional sheets used for the dynamic mass increase.

Under a relative motion to a $3T$-sheet part (by a matter structure), the lessened pressure in-between the passing $3T$-sheets makes the closed bubbles be plane-deflated and aligned more to those $3T$-sheets. Eventually, some such closed bubbles become additional sheets on the respective matter structures, see Figure 40, a.

The greater amount of double-layer sheets by a corner (or a sheet bubble) increases its stiffness and thus its effective (i.e. dynamic) mass – fulfilling the process of relativistic mass increase.

Regarding the bosons of zero rest mass, the relevant sheet parts are those being exchanged between their two corners. Hence a greater frequency (i.e. exchange speed) of that exchange process means a greater amount of attracted sheets, and thus a greater dynamic mass, see Figure 40, b.

Here it can be seen that a hypothetical particle of the original $U(1)$ group of the electroweak algebra – i.e. a particle with parallel rotation axes, and without any inter-corner sheet exchanges – would have both zero rest mass and zero dynamic mass.

Such a particle can not be directly detected then. Still, virtual particles of this type could serve as an interaction mediator for photons – making them (self) interacting.

If there would be a reason for having a 3 + 1 space-time, this could mostly be the end of the story, with special-relativistic particles interacting and living in a stale space.

Part III
Quantum Gravity

9 Space Structure

9.1 Dimensional Hierarchy

Having developed the model for particles, several natural questions come together:

- on the dimensionality of the overall system
- on the actual forms of mass actions
- on the origins of the $3T$-sheet structures themselves

Answering the third questions, i.e. the origin of the $3T$-sheets, is a clue for all these questions.

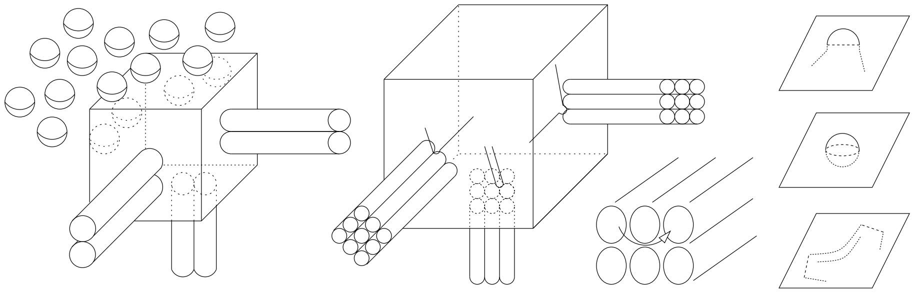

Figure 41: Rod massif

For the extended tangloids, one-moment shots of the $3T$-sheets apparently occupy a three-dimensional space. Then all the next evolving of the extended tangloids is due to dynamics of the $3T$-sheets.

It means that an initial state without such dynamics should not have the $3T$-sheets open to the evolving. It is possible when the $3T$-sheets themselves are wound-up, i.e. forming the structure of rotating – mostly one-dimensional – rods.

The extended tangloids have topological constraints on crossings as described in the Tangloidal Geometry section. The wound-up structure is prone to (pressure-based) alignments to other (single-laid) sheets as well. Thus the initial wound-up rods would clutter if they would occupy a three-dimensional space.

As the non-trivial (i.e. with non-zero effective diameter) rods can not pass through each other at the three-dimensional space, adding one more dimension is a solution for the issues herein.

→ The initial rods occupy a four-dimensional space, forming a rod massif.

→ The (unwound) $3T$-sheets occupy a three-dimensional space where their single-layer parts (including corner tips, as rudiments of the initial rods) direct into the 4^{th} dimension. There, they can be bent for fermions, forming the two more energetic generations, as described in the Pulled Sheets section.

In this way, the tangloidal structures can generally occupy surfaces of a sequence of dimensions. A greater dimensionality have a gradually lesser influence on the dynamics, since any tangloidal geometry can pass more freely through each other there.

The two-dimensional sheet-based tangloidal objects form the 3D-space (that is surface of the rod massif) with the help of closed bubbles that fill the places in-between of them. The closed bubbles form a sea that extends out of the rod massif then. For the overall picture, see Figure 41, left, middle.

This brings up a question on allowed dimensions of possible tangloidal objects, apart from the two-dimensional $3T$-sheets. The connections between particle-forming parts – e.g. $3T$-sheets between the $3T$-sheet corners – are taken as parts of the wholesome structures.

Zero-dimensional objects (i.e. just points) means no connections, and thus no meaningful dynamics.

One-dimensional objects are the classical rope-based tangloids. One-dimensional spaces allow no structuring, while an infinite amount of geometry classes arises on rotations in 2D-spaces. In 3D-spaces, the $2\pi \circ Ex$ actions still result in inseparable (i.e. they can not be untangled) objects when applied onto more than two such objects, while 4D-spaces allow untangling of any structure based on one-dimensional tangloids. Thus no regular structure of matter-forming complexity is feasible either.

For the $3T$-sheets, 2D-spaces lead to infinity classes of rotations, while 4D-spaces allow too easy untangling.

For three dimensional objects, the sphere eversion is a prototype of unifying the clockwise and counter-clockwise rotations, since inner vs. outer views of a single rotation on a sphere bear opposite orientations. Thus from three-dimensional objects on, the distinction between fermionic and bosonic objects is lost.

As a result, the $3T$-sheets occupying a 3D-space (herein a surface of the rod massif) is the only case left with a reasonable complexity. Lower dimensions of inter-connectivity lack the regularization that is necessary for solving the $2\pi \circ Ex$ process. And the greater dimensionalities of objects provide too powerful regularization then.

Matter acting

Mass property is defined just for structures that interact with the rod massif, i.e. corner tips and bubble hemispheres. The double-laid sheets themselves do not have mass, even though they cooperate on the mass acting of the corner and bubble structures. A natural distinction between massive and massless particles is presented below.

Since the rod massif is four-dimensional, there are three principal axes for the rod directing out of the 3D-space. Corner structures that undergo a pair of rotations with orthogonal axes have to pass through (some of) the rods. It is the same for generally voluminous structures, as the sheet bubbles are. It actually provides the rest mass – even for the nearly massless neutrinos.

Contrary to that, corners with rotations of parallel axes can (align to and) pass along the massif rods.

The passage generally slows all these matter structures down (to c or below c), and thus it can be seen as the mass generation. This is a process similar to the (classical) mixing of photons with electrons when the photons pass through matter.

Taken together:

- the structures of non-zero rest mass pass through (surfaces of) massif rods over all three (spatial) directions,
- the structures of zero rest mass only pass through (surfaces of) sideways rods, taken relatively to the movement directions of the respective matter structures.

Corner tips and bubble hemispheres protrude into the rod massif. It is notable that one hemisphere of each bubble goes the other way – toward the outer environment made of closed bubbles – where it is presented as a stable (i.e. non-rotating) structure. It is advised at Figure 16, and it is exploited in the Exotic Matter section.

The protruding of sheet bubble hemispheres is fixed by its structure. Structure of (genuine) bosons is fixed as well – via their corner coupling. The fermionic corners can (apart from their flip-based rotations) bend inside the rod massif surface and thus form the two more generations.

As the matter structures pass through the rod massif surface, they flow around the rods. One such passing around a rod shall be equivalent to the elementary Planck action (Figure 41, middle).

The necks of matter structures – i.e. the one dimensional cuts where the single-laid parts of corners and bubbles enter the rod massif – can be seen as structures by themselves. Then sheet bubbles are closed strings, while corners are open strings, with some mutual dualities as it is mentioned in the Sheet Bubbles section.

Along with that, the $3T$-sheets can be viewed as (spin-based) connections of the neck-based strings. And since the $3T$-sheets are the basic space-forming structures, these connections are a version of the spin foam of the LQG. Thus the extended tangloids provide a unification of the string and LQG approaches, see Figure 41, right.

9.2 Volume Tension

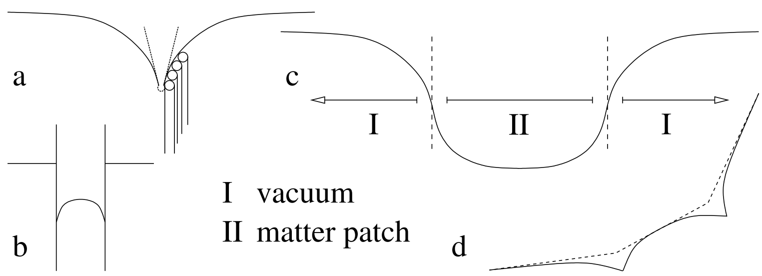

Figure 42: Massif surface curving

The interactions between the rod massif and mass-making sheet structures can be seen as an analogy to a complex of water with a hydrophobic stuff. Since the lengths of the rods are quite greater than the lengths of the interlaced (single-layer) sheet structures (i.e. bubble hemispheres and corner tips), rods align greatly more to themselves than to those sheet structures. Still, the matter structures prefer to align to the (massif) rods. As a result, the rods repel off the matter structures – curving thus the 3D-space at its surface (Figure 42, a). It is similar to the two-dimensional analogy of water in a capillary made of a hydrophobic material (Figure 42, b).

A case of (spherical) central clutter of matter is presented at Figure 42, c. The whole matter clutter is dragged (by the hydrophobicity-like tendency) toward the rod massif. The (hydrophobicity-like) dragging causes the 3D-space curvature at the places where it acts.

Taking centered subparts of the matter clutter, such regions are dragged (by the central matter rest) even in the whole matter clutter. Though, this sub-dragging is performed via a lesser drag, since a central subpart is (by definition) lesser than the whole matter clutter – thus it undergoes a lesser (hydrophobicity-like) sub-dragging. It means that more inner parts (of the matter clutter) have lesser 3D-space curvatures.

The result is that:

- the greatest dragging (and curvature) is exerted by the border of the matter clutter,
- the dragging (and curvature) is lessened by each matter structure, see Figure 42, d.

The elementary curvature changes are smoothened by a process depicted later at Figure 59, a.

If – for a reason – the rods were interacting more with the matter structures than with themselves, the $3T$-sheets would get dissolved in the rod massif, alike to water with a hydrophilic stuff. It apparently does not happen (for the standard matter).

The corner tips – that are logged into the surface layer of the 4D-space of the rod massif – alter contact interactions among the rods. These rods have lesser ability to align where the matter structures are present. The greater is mass acting, the greater is the eroding of the inter-rod aligning.

This way, the volume tension (as an analogy to surface tension of classical physics) is lowered in the presence of the matter structures. The volume tension decreasing executes the hydrophobic-like mass action. It results in bending of the 3D-space (as a surface of the rod massif) towards the rod massif, according to the varying volume tension. A case of a spherical clutter of matter structures (in surrounding vacuum) creates the common Flamm's paraboloid of the Schwarzschild embedding.

Dynamic transfers

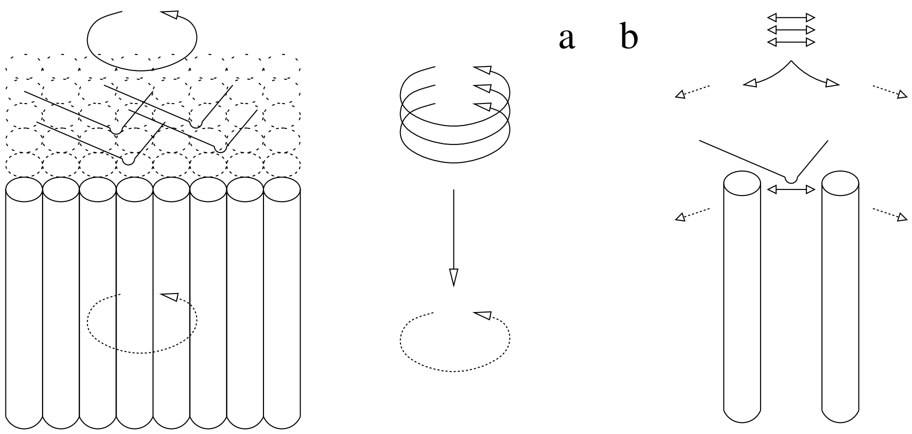

Figure 43: Massif coupling

Since the matter structures (partially) overlap with the massif rods, the movements of the matter structures are partially transferred onto the massif rods. Thus, when a matter clutter undergoes a rotation, the massif rods (slightly) rotate as well. And since the massif rods constitute a natural reference frame, the whole perceived space (slightly) rotates, see Figure 43, a.

Volume tension based on classical pressure of matter structures is another source of massif rod alignment decreasing, along the (mass-based) alignments of matter structures to the massif rods, see Figure 43, b. Alike for the rotation transfer above, this is of a minor effect under ordinary circumstances.

If the structure of 3D-space bending changes during $3T$-sheet evolving, the respective double-layer sheets undergo collision-like events. Such double-laid sheets can get locally disaligned, with a new (free) sheet bubble creation as a result, see Figure 44. Since the free bubbles obey π rad

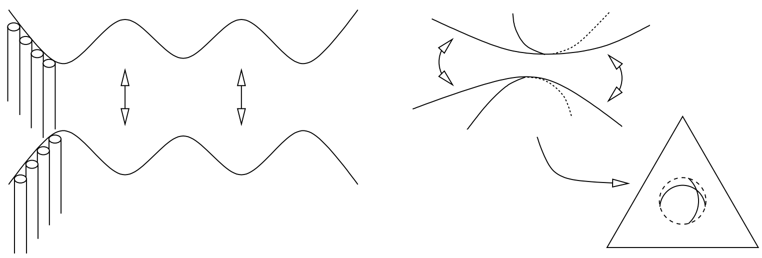

Figure 44: Bubble production

rotation symmetry, they can be thought of as graviton-like particles. And the bubble production should correspond to the energy releasing seen at the binary-star situations.

An effect of the double-laid sheets is that both the rods of the massif and matter structures can slide over them – since they contain a lower amount of virtual particles, see Figure 45. The rod massif sliding should generally help to (partially) overcome the rod alignment obstacles, and thus to counteract the volume tension decreasing.

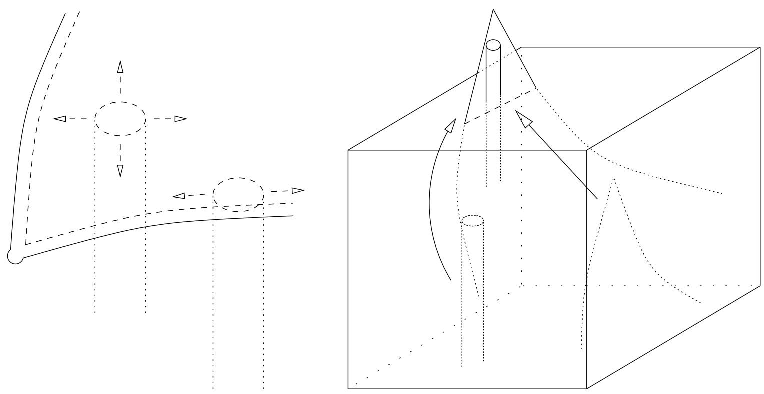

Figure 45: Massif sliding

In a (hypothetical) case of some $3T$-sheets being directed out of the rod massif (surface), this sliding can lead the rods towards the outer sea of closed bubbles, see Figure 45, right. This is explored more in the Exotic Matter and Cosmology sections.

10 Time Structure

10.1 Equivalence Principle

Rotations of corner tips proceed in their rotation planes. However, when a region of 3D-space is bent over the four-dimensional rod massif, the rotation planes are laid (i.e. projected) onto the curved space.

Thus the (effective) lengths of rotation curves that lie on curved regions become greater. This is the same result as for $3T$-sheet corners undergoing accelerations, see the Special Relativity section.

Nearby matter means a bent 3D-space region. It means acceleration structures of corner tip rotations, and it means slowing down the apparent time too. Then a present corner tends to move into a direction where the 3D-space curvature is maximal. When its acceleration corresponds to the 3D-space bending, it undergoes a steady-state version of inertial motion. It holds analogously for the sheet bubbles, as it is described in the sequel.

The case of a central clutter of matter is presented below. It is simpler to use (free) sheet bubbles for exploring the curvature effects, thus they are used throughout the rest of the text.

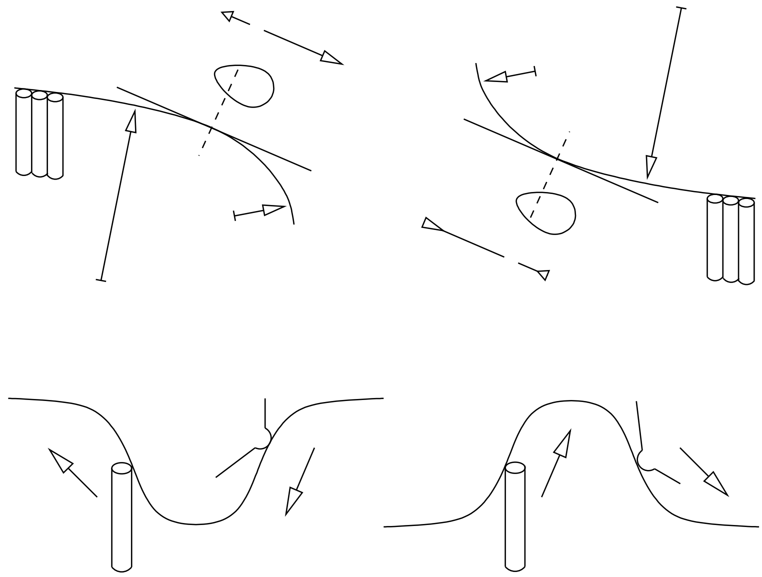

Figure 46: Gravitation

A situation of 3D-space curvatures caused by a matter clutter is shown at the bottom left part of Figure 46. The local structuring is presented at the top parts there: vacuum section on the left, matter patch section on the right.

The 3D-space curvatures cause geometry changes of matter structures and thus their accelerations. Sheet bubbles are used for the exploring herein.

For the vacuum section, the 3D-space curvature increases as a concave function in the center-wise pointing, thus sheet bubbles can spread more toward the center there. For the matter patch section, 3D-space curvature decreases as a convex function in the center-wise pointing, thus sheet bubbles are hindered less toward the center there.

For the both cases, shape changes of the sheet bubbles are the same as for sheet bubbles accelerating toward the center. Since the very reasoning is the same here and in the Special Relativity section, the sheet bubbles tend to form symmetric structures and thus they accelerate toward the center.

It holds analogically for the corner-based matter structures, fulfilling the basic part of the equivalence principle.

Two more additions are to be added to complete the picture:

First, a case of a region of the (hypothetical) exotic, i.e. anti-gravitating, matter is shown at the bottom right part of the Figure 46. The concave vs. convex forms of section functions of 3D-space curvature changes are exchanged – relatively to the case of the standard matter. Therefore, the matter structures accelerate out of such regions, accordingly to the definition of the exotic matter. This case is thoroughly explored in the Exotic Matter section.

Second, classical pressure causes both *1.* effects relating special relativity (see the paragraphs on pressure in the Apparent Time section), and *2.* the rod massif surface changes (see Figure 43, b). These complementary changes comprise a part of the equivalence principle that is of a minuscule effect under ordinary circumstances.

Black halls

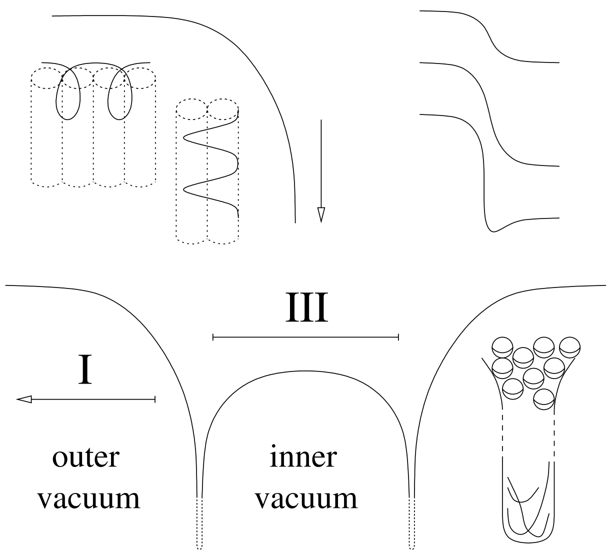

Figure 47: Black hall formation

As the bending of the 3D-space increases, the lengths of corner rotation curves (closer to the central matter clutter) grow. Eventually, the rotation is not fast enough to overcome that length increase. At such point, the apparent time cease to grow. Then the corner rotations slide over the massif rods instead of passing through them. It means that the rod massif surface leads directly toward the massif there, see Figure 47, top left.

The 3D-space curvature of a matter clutter (of effectively constant density) is greatest on the border of the matter clutter. It is reflected by the lessened gravitational acceleration inside the matter clutter when approaching its center.

Thus a growing mass of such a clutter has the most stringent effect onto the 3D-space curvature at the clutter border. Eventually, the curvature gets infinite, meaning the rod massif surface goes directly into the massif itself, see Figure 47, top right. Such a region starts to accumulate all the matter from its surrounding, including the matter clutter itself.

It creates a two-dimensional region where the matter structures are accumulated at a fissure protruding into the rod massif – and thus forming the third dimension of the structure. As the matter structures enter the black hall fissure, they separate from the – otherwise enveloping – closed bubbles. For the black hall formation structure, see Figure 47, bottom.

When a corner reaches the matter fissure of a black hole, it meets the other $3T$-sheet structures. As the amount of the $3T$-sheets grow there, they separate from their – formerly coupled – closed bubbles. Thus the (tightly tangled) matter structures fill the growing fissure.

The matter fissure of a black hole is filled up with $3T$-sheets. It looks alike a structure that mimics the Hopf fibration in 3D-space.

Since an arbitrary amount of entangling can be formed, no information should be lost during this process.

Black hall evaporation

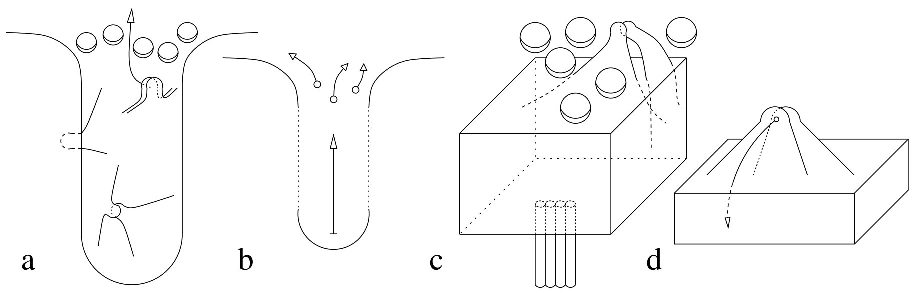

Figure 48: Escaping a black hall

As the tangled sheet structures of a black hole evolve tightly, their single-layer parts can connect. Thus they form (temporary) structures where (some of) the single-layer parts – originally pointing into the rod massif surface layer – are freed from the rod massif, see Figure 48, a.

When all the original rod-massif connectors of such a structure get interconnected, a pseudo-knot is formed. If such a pseudo-knot gets nearby orifice of the black hole fissure, it can escape into the outer environment that is formed by the closed bubbles (Figure 48, a, b).

It forms a kiting-like structure where the inter-aligned matter structures form the body of the kite, and the rest parts of their $3T$-sheets hold them back to the 3D-space (Figure 48, c).

Among such pseudo-knot structures, there are e.g. coupled pushed $3T$-sheets, as depicted at Figure 35, right. Pseudo-knots based on sheet bubbles are explored in the Exotic Matter section.

The escaped pseudo-knots fall back into the 3D-space eventually (Figure 48, d). If it is at the outer vacuum part by the black hall, the outcome of it can be detected. Apart from the original matter structures themselves, the momentum of falling back (to the 3D-space) shall materialize as a radiation. It should be of a wide energy distribution.

10.2 Manifold Time

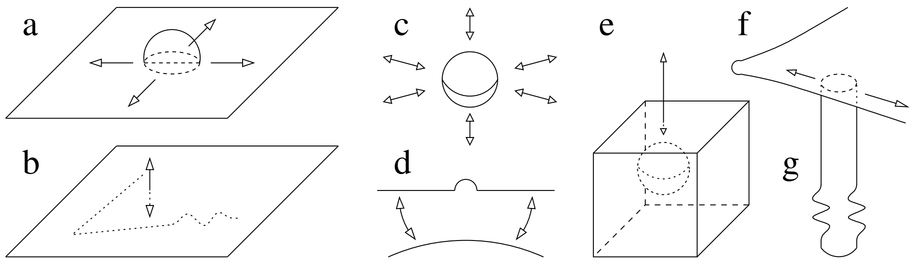

Figure 49: Time structure

The whole – up to know presented – picture lacks some parts yet. It is the nature of the sheet material itself, and the real – i.e. manifold, not just the apparent – time.

Double-laid sheet structures can evolve in several ways, see Figure 49.

Notably, a corner or a sheet bubble can arise or cease where either a sheet part (forming a new structure) go towards the 4^{th} dimension to interact with the rod massif, or a sheet part (forming the old structure) goes backwards, again along the 4^{th} dimension.

A corner or a sheet bubble can move inside the 3D-space. It is done via moving its sheet neck (i.e. matter structure connection) in a direction that is normal to the 4^{th} dimension axis, i.e. normal to the connector itself. Alternatively, it can be seen as a structure annihilation at a former place and its creation at a latter place.

Together with it, a sheet double-layer or its border can move, again to a direction normal to its spreading.

All together, it is that the evolving of the sheet layers and their structures goes in directions that are perpendicular to the sheet material.

It means that no external evolving is equivalent to just mixing of the sheet material within itself, while any structure change adds movements that are orthogonal to it. This is a behavior that is generally expected from the time dimensions of a manifold.

A reasonable conclusion is that the sheets themselves play the role of manifold time. Along with the already discussed space dimensionality, this provides the time dimensionality, so that it need not be set artificially.

While this manifold time has effectively one dimension for (outer) particle movements, it has two-dimensional structure (of the sheets) amenable for inner information transfer. Since this sheet-based inner information processing does not need to put structures through the massif rods, it is not bound by the – otherwise limiting – c speed.

Thus particle movements – that are practically the outer information transfer – are limited by the speed of light. Still, inner information transfer is not obligated to these limitations. It can be seen as follows: The lack of interactions with the rod massif during a change means the lack of speed limitations.

It explains the dichotomy on the speed bounds:

- outer information transfer, like (continuous) particle movements, limited by c,
- inner information processing, e.g. during measurements on a part of an entangled system, without speed limitation.

Changes on the $3T$-sheets-mediated entanglement employ two-dimensional sheets, i.e. time-like material that does not need to move any structure through the rod massif to achieve a new (result) state.

Since sheet layers are considered to be the manifold time, the closed bubbles form a closed time structure. Time paths are closed inside of them.

The sheet winding of rods should enable steady waves over them. Thus the rods can possibly serve as mirrors for holding the information on events.

Quantum mechanical dynamics

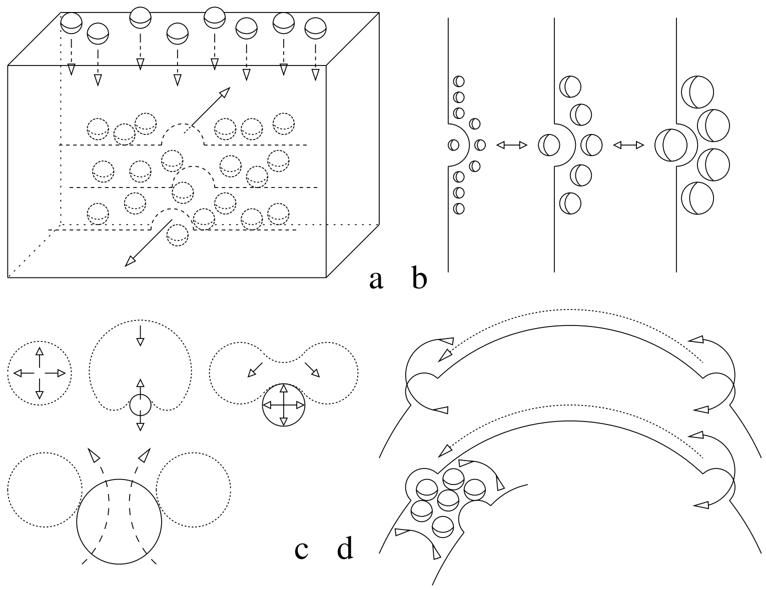

Figure 50: Quantum mechanics

For the Figure 50, the next items explain the schemas. It is presented for corner-based structures herein, but it holds for any matter structure.

- a Closed bubbles penetrate among the particular sheets of matter structures. Tighter is an initial packing of the particular sheets of a single particle, greater is the penetration action of the closed bubbles. I.e. greater is the momentum distribution for the penetrated matter structures. They form together a coupled system.
- b The closed bubbles pulsate (and exchange with closed bubbles at other layers along the 4^{th} dimension going out of the rod massif) with frequencies set according to dynamic masses of the coupled systems. The pulsation coupling is only to matter structures, since the sheets themselves are of zero (dynamic) mass, thus without a stiffness for the pulsing. When (flowing) parts of a coupled system mix, pulses of their closed bubbles add together according to the met phases.
- c When hitting another coupled system (e.g. a screen), a pulsing closed bubble of the coming system can destroy a closed bubble of the reached system. Greater is the pulsing of

a closed bubble, greater is the probability of such a breakage. As the newly created closed bubbles are void of matter structures, the matter structures of the coming system follow the breaking closed bubble and flow into (or orient along) that place. The sheet structures that can pass in, are those that are not interconnected, i.e. those of a single particle. The flow is immediate, since it avoids passage through the rod massif, as the sheet structures just swing over the closed bubbles. It is a materialization of the alternative view on matter structure transfer, as it was described above.

d When a corner tip undergoes a (breakage-based) change, a respective compensating change is (immediately) propagated onto the other corner tips. In the case of existence of a corner tip that is not coupled to another system, such an (entangled) corner can undergo the respective change. Otherwise the respective compensation is melt in a whole (distant) coupled system.

Whenever a breakage into a colliding system happens, it provides a sheet concentration gradient that acts as a funnel for injecting the approaching sheet structures.

This process (immediate from the point of view of apparent time) finishes when all the parts of the respective matter structure – i.e. all of its actual sheets – couple to a single set of (steady) closed bubbles.

Since the state change triggering requires an already present (sheet-based) matter structure, and since the transformation core is set effectively random, the immediate inner information transfer does not lead to paradoxes that would be inevitable if such an immediate transfer should happen for the outer information.

Any information on the coupled sheets should be immediately accessible to all sheet structures that are parts of the respective wholesome coupled state. It holds e.g. for entangled sheet structures. The immediate inner information transfer can be seen as a preservation of inner pressure along the double-laid $3T$-sheets.

Disconnection of particular sheet structures is done via the (closed bubble breakage-based) abrupt transitions that are triggered by decoherence situations themselves.

A careful environment preparation can (temporarily) avoid the abrupt transitions – alike sustaining a phase state even when an environment condition was shifted to a value adhering to a different phase state. It is at the background of the quantum condensate states.

Taken together, this can be viewed as a two-way acting of the environment onto the foam of ($3T$-sheets based) matter structures:

- the rod massif as a source of strict properties and a guiding for deterministic evolving,
- the sea of closed bubbles as a source of wave properties and effectively random changes.

11 Exotic Matter

11.1 Exotic Matter Creation

The matter structures – i.e. corners and bubbles – on the $3T$-sheets act as the standard gravity-causing agents, while the double-laid sheets themselves lessen any curvature of the 3D-surface of the rod massif by making the massif rods sliding over them (when those double-laid sheets are located inside the 3D-surface).

Microscopic amounts

Some suitable amenable structures inside the outer sea of the closed bubbles (i.e. inside the outer environment) are necessary for making the 3D-curvature lead out of the rod massif, i.e. the opposite way than caused by the standard matter structures.

The situation when a pseudo-knot is kite-like flying through the closed bubbles inside the outer environment is exactly what is necessary herein, see Figures 48, 51.

The massif rods can slide (the outward way) over the double-laid sheets that connect the pseudo-knot structures back to the 3D-space. As the structures of pseudo-knots are in the outer environment, the sliding massif rods are naturally guided there as well.

This exotic matter form provides the curving of the rod massif surface out of the rod massif. Thus it really implements the geometrical structure of the exotic matter as it is described in the Equivalence Principle section above.

As the kiting pseudo-knots align to the slid rods, the exotic matter structures (follow the slid rods and thus they) are attracted to the regions of the exotic matter. This fulfills the anti-gravitating part of the exotic matter properties.

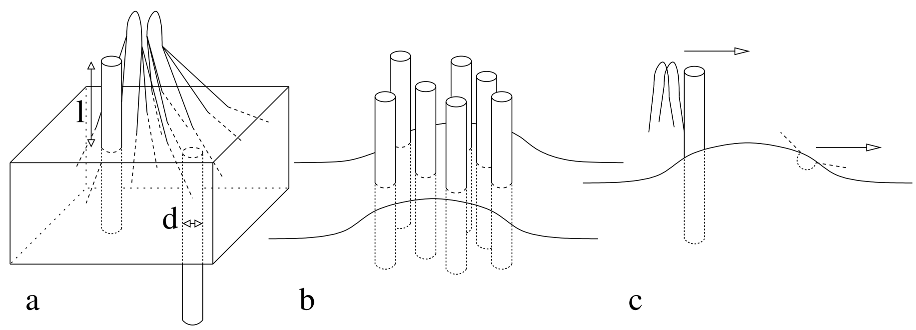

Figure 51: Microscopic exotic matter

Macroscopic amounts

A single pseudo-knot provides just a microscopic amount of the exotic matter. Macroscopic amounts are necessary for practical applications though. A possible way for creating such an amount of the exotic matter is as follows, see Figure 52.

It shall start with a region that is doped with a greater amount of free bubbles of pulled $3T$-sheets. Sheet bubbles are composed of pairs of single-layer hemispheres where one of them is exposed to the outer environment. Thus they are amenable for alignments to possible (single-layer) structures approaching them from the outer direction (Figure 52, a).

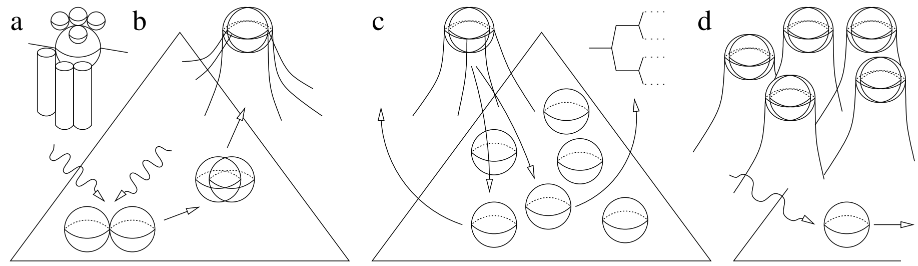

Figure 52: Macroscopic exotic matter

Then a greater amount of energy should allow a (3D-space laid) sheet bubble pair to overlap, thus providing a pseudo-knot for triggering the creation of next sheet bubble pair-based pseudo-knots (Figure 52, b).

When a triggering kite-like pseudo-knot falls back to the 3D-space (i.e. into the surface of the rod massif), it can separate and its parts align with two other (free) sheet bubbles. As a result, a single sheet-bubble-based pseudo-knot causes creation of two such sheet-bubble-based pseudo-knots – when the respective region is doped with free sheet bubbles (Figure 52, c).

When the bubble-based pseudo-knots fall back, they should align with other sheet bubbles easier. Since they approach the – 3D-space laid – sheet bubbles from the 4^{th} dimension, they do not start interactions via (mutual) partial overlaps.

As a result, they are not repelled from each other by the pressure interaction, contrary to sheet bubbles coming from inside of the 3D-space.

In fact, the kiting bubbles should be attracted to the 3D-space-laid sheet bubbles – by lowering the overall distances between alike shaped sheet layers – when not being too distant for sufficient overlapping when the separation over the 4^{th} dimension vanishes.

As one sheet-bubble-based kiting pseudo-knot creates two new such pseudo-knots (on the free-bubbles doped region), the exotic matter formation undergoes a (possibly exponential) chain reaction.

When the pseudo-knots start to form dense enough structures of exotic matter, they align to each other and stabilize the exotic matter formation. The remaining rest of free bubbles can be put away via a lower energy addition to the region (Figure 52, d), since it is sufficient to release the free bubbles – as it is described in the Structure Flows section.

Thus the main predisposition for the exotic matter formation process is to have a great concentration of – otherwise inert – free sheet bubbles, and an initial energy density impulse. See the Sheet Bubbles section for information on stability and dynamics of the sheet bubbles.

A greater amount of the exotic matter should create a system with both pseudo-knots and (some of) the massif rods being slid toward the pseudo-knots. The holding $3T$-sheets of the kiting structures are partially oriented along the 4^{th} dimension, and thus greater parts of them are amenable for alignments with the massif rods.

The result is a region of unstable to meta-stable (according to its size) exotic matter, itself resembling the restricted system of classical physics.

Since the actually measured 3D-space part does not behave according to classical physics (i.e. it obeys the dynamics of $3T$-sheets being laid on the rod massif surface), it is fortunately not a transient region of the exotic matter.

11.2 Exotic Matter Applications

Warp drive

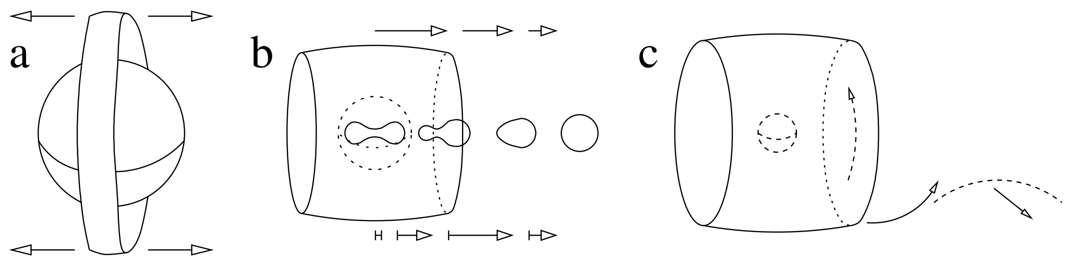

Figure 53: Warp drive driving

An application of the exotic matter is a warp drive-like system, i.e. crafted combination of standard and exotic matter that causes a (possibly faster than c) movement of a neighboring part of the massif rod – together with its respective surface, i.e. neighboring space region.

The standard construction of the warp drive-like system is a central clutter of standard matter surrounded by a ring of exotic matter. A prolonged ring of the exotic matter should *a*) lessen location instability of the central matter; and *b*) help to loosen the alignments of massif rods along the separation between the drive region and the rest of the rod massif, see Figure 53, a.

The central standard matter clutter helps to keep the exotic matter patches away off (centrally) collapsing together.

A simple exploration of the warp drive-like system can be done by putting a testing sheet bubble (of the free type) into various distances off the system (while considering separately the standard and exotic matter gravity sources).

The testing free bubble is intact at an (effectively) infinite distance, thus having a spherical shape.

Then, the testing free bubble acquires both speed (Figure 53, b, top) and acceleration (Figure 53, b, bottom) by the action of the moving drive region.

The greatest acceleration shall be by entering the region of the drive. While a testing matter in front of the exotic matter accelerates, it has its actual relative speed (to the distant observer) lesser than the drive region itself. Thus it approaches the drive system.

The central narrowing of the testing free bubble (inside the drive region) is caused by the repelling (i.e. anti-gravitating) effect of the exotic matter.

Since the local speed is limited by c, the greater than c speed (perceived by a distant observer) means that the whole drive – including the belonging rod massif part – moves through the rest of the (surface of the) rod massif.

Additionally, as the drive moves through the rod massif surface, it should constrict the massif rods in front of itself, and loosen the rods in behind of itself. It thus resembles the Alcubierre drive.

Any (through the front) injected standard matter causes the overall drive system to have more standard properties. I.e. the system speed lowers this way. Ejecting a matter in the rear counteracts it and thus it increases the system speed. It is in accordance with the overall momentum conservation. Merging with an (initially) zero-speed matter decreases the drive speed while cutting off some such matter increases the speed of the remaining system.

Microscopic amounts of the exotic matter are unstable, with their pseudo-knots falling back to the 3D-space. It should cause severe radiation, still it should not matter if being used as an anti-impact projectile. A greater amount of exotic matter should stabilize itself by inter-alignments though.

Avoiding the (possibly) approaching matter structures is another issue, see Figure 53, c. Since the exotic matter repels from matter (and vice versa), an auto-avoiding should work by itself – unless the center of the approached matter is exactly in the drive (tube) direction. A randomized direction (e.g. via using a rotating asymmetric shape) should solve the issue even for the matter clutters being (otherwise) exactly approached.

Massif mining

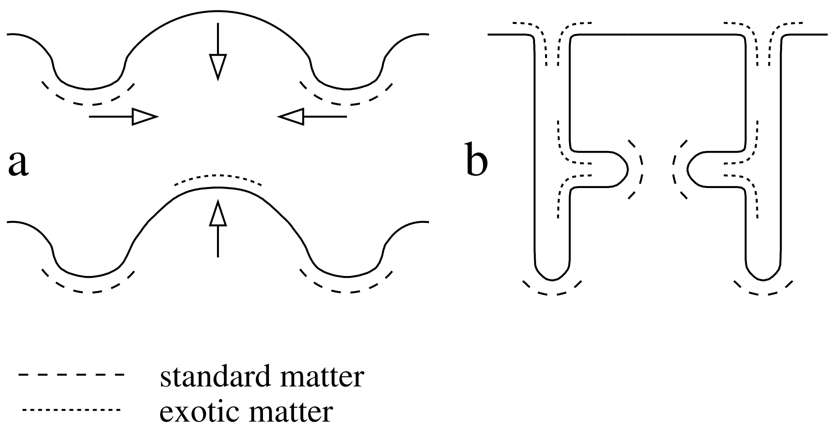

Figure 54: Pipe system

The exotic matter can help to shape the 3D-space to form structures of rich curving of the rod massif surface, see Figure 54, a. Clouds of exotic matter can e.g. fix orifices and branching points of a worm hole-like pipe system, see Figure 54, b.

If a 3D-space from a different part of the rod massif surface is reached by a protruding pipe of the worm hole-like pipe system, it should be without tangloidal connections to the source surface of the pipe. Then the only interactions between the two sets of $3T$-sheets would be via alignments based on pressure interactions. Even when the reached 3D-space is the same as the source one, the interactions would be affected via the lengths of $3T$-sheets going through the pipes. It would be kind of realization of the many-worlds (interpretation of) quantum mechanics.

Reaching the massif rods at other (distant) places could be used for dealing with possibly mirrored events from other parts of space and time as well.

A variation on the previously described drive system is as follows, see Figure 55.

Starting with a warp drive-like system (Figure 55, a), when it gets (via injecting) a sufficient amount of standard matter – but still with a reasonably high speed – the ring of the exotic matter should be spread over the whole drive surface (Figure 55, b).

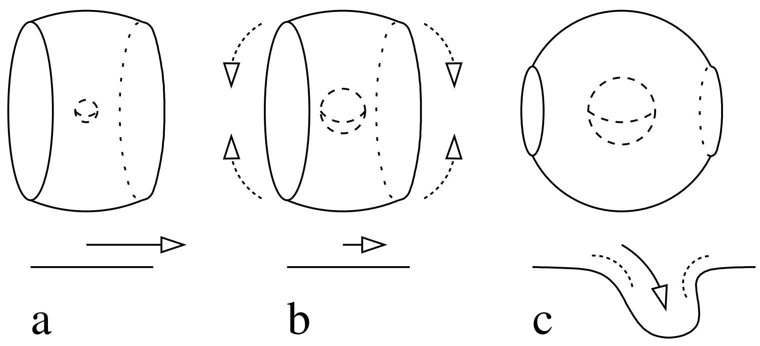

Figure 55: Worm drive

This way, the central matter would start to create a (new) pipe of the worm hole-like pipe system – both because of its gravity and because of its repelling off the exotic matter (Figure 55, c).

A part of the exotic matter would stay (fixing the orifice), part would follow the central matter clutter, helping to disintegrate and pass through the rod massif surface.

It could be reusable for creation of rod massif surface irregularities and disturbances. Such regions could get greater amounts of bubbles and exotic matter patches during the rod massif surface smoothening. This can be viewed as a rod massif mining.

Together with it, a stale region of the 3D-space would be put into a more dynamic state.

12 Cosmology

12.1 Universe Origin

Having the rod massif as the initial state, an event of disturbance should alter the overall structure of rod alignments, see Figure 56.

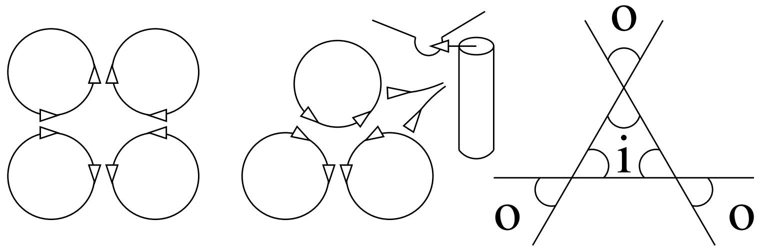

Figure 56: Geometry creation

The quaternary – chess like – alignment has a perfect matching of clockwise and counter-clockwise orientations of the rods. Such an alignment structure is more sparse than the most dense, i.e ternary, alignment.

A disturbance put onto massif rods of the quadruple structure can force the rods to be packed more closely. Such a structure change can spread itself via direct contacts among the rods.

Additionally, it could be enhanced by rod reversals. When a rod (laid along a direction) is turned by π rad, it reverses its rotation orientation.

As two of the rods of the ternary alignment collide via their (same-orientation) rotations, they unwind and form the double-laid (since two rods unwound) three-corner (since based on ternary rod structure) sheets.

This endorse and constructively develop the $3T$-sheet structure of extended tangloids as it was found in the Tangloidal Geometry section.

Choosing the rotation orientation of the colliding rod pair is (effectively) a random process. Therefore it is practically impossible to end-up with equal counts of clockwise and counter-clockwise rotating corners. It means that the newly created 3D-space has to have an abundance of corners of one rotation orientation (i.e. of either particles or antiparticles).

Since the unwound rods – now corners of the $3T$-sheets – have a lesser interaction with the intact rods, they are expelled from the inner of the rod massif. Sheet structures reconnect during the 3D-space formation, so that each corner-based particle is made of a multiple of actual sheet layers. At the end, the $3T$-sheets form a part of the rod massif surface.

The single-layer tips of corners can be seen as residua of the initial (wound) rods.

The starting structure of the unwound $3T$-sheets is the one on the right at Figure 56. The initial $3T$-sheets either stick together (the inner orientation) forming nucleons via the process depicted at Figure 27, or they separate (via choosing the outer orientation) and form leptonic corners of the pulled $3T$-sheets.

Alike rotating corner tips originally choose the same layers of the double-laid structure of $3T$-sheets to not destroy the starting structure. Thus for the corner tips, particles vs. antiparticles use the opposite layers of the double-laid sheet structure.

In fact, the corners can still be based on pairs of single-laid tips when the second ones lead into the outer sea of closed bubbles. Such a structure is generally more symmetric, while effectively with one single-laid corner tip – since the second tip fragment do not mix with massif rods.

As a main difference, the second single-laid fragments on corners should make faster the process of black hall evaporating – via an easier pseudo-knot creation.

12.2 Universe Evolving

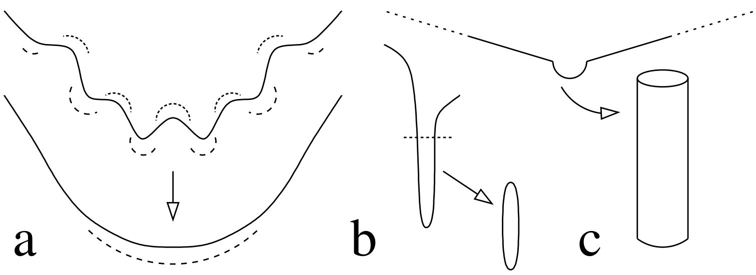

Figure 57: Geometry evolving

As the formation process of the rod massif surface shall be vigorous, a vast amount of disturbances on the $3T$-sheets had to be produced. Then the starting state of the newly created 3D-space should be full of regions of sheet bubbles and exotic matter.

As the greater regions of exotic matter are meta-stable with long life-times, the large primordial exotic matter regions would stay for (astronomically) long times. Since the exotic matter fixates curvatures of the rod massif surface, the 3D-space had to stay with generally greater curvatures initially.

Once the pseudo-knots of the primordial exotic matter fall back to the 3D-space, the curvature profile can start to smoothen (faster). It is the nature of the so called 3D-space inflation, see Figure 57, a.

As the the curvatures and disturbances of the 3D-space lessen, the amount and strength of virtual particles that keep the double-laid $3T$-sheets aligned should diminish. Eventually, both the black hole matter fissures should split themselves from the rest of the rod massif surface (Figure 57, b), and lone corner tips should wind back into the massif rods (Figure 57, c).

A black hole shard flowing through the rod massif can collide with another such shard, causing a (local) structure switch of the aligned massif rods – creating, in turn, a new 3D-space.

Universe status

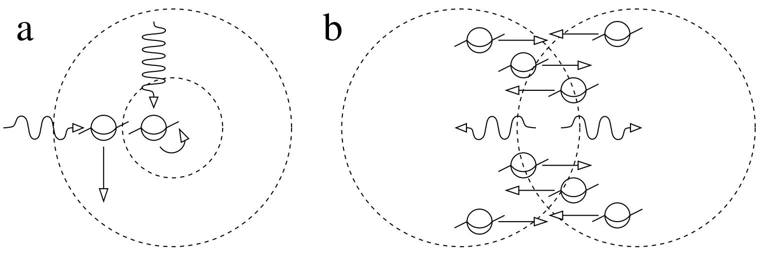

Figure 58: Dark matter effecting

The dark matter – i.e. (free) sheet bubbles of pulled $3T$-sheets – should be confined by the corner-based matter clutters, unless it gets released during a situation of an overall (slightly) increased energy density, see Figure 15. Such a releasing can happen in hotter (central) parts of galaxies – leading to dispersing (of some) of the sheet bubbles out of the galaxy centers (Figure 58, a left).

Another such situation (on mild energy increase) is when two galaxies collide. The bubble-based dark matter is released and flow – in the original directions – out of the galaxy (corner-based) matter clutters, see Figure 58, b.

A different situation is when the energy content is greatly increased, like around (central) black halls (Figure 58, a center). Then the (free) sheet bubbles decay, leaving the gamma signal, as discussed in the Sheet Bubbles section.

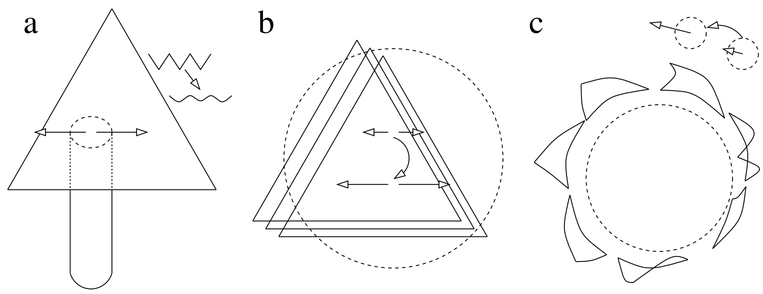

Figure 59: Dark energy effecting

As the massif rods slide over $3T$-sheets, they can pass through the distractions made by the matter structures (i.e. corners and sheet bubbles). This (together with fuzzifying via the sheet multiplicity) makes the rod massif surface more smooth on the microscopic level, see Figure 59, a.

The same way as massif rods slide over the $3T$-sheets, matter structures can slide over the sheets as well. It can – for large and massive bodies, like stars – lead to significant sliding over the $3T$-sheets. It can be the case for the supernovae observations, see Figure 59, b.

Analogically, the matter sliding can be the cause of the (over-effecting) fly-by effect. A (large) rotating body can align its $3T$-sheets around itself. Then a matter body flying around it slide over the sheets, see Figure 59, c.

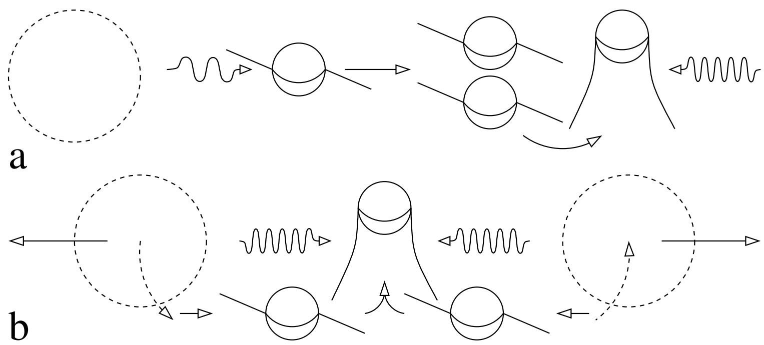

Figure 60: Exotic matter effecting

Energy content inside a star system allows a local bubble releasing, so that the free bubbles flow away off the star – leaving the bubbles by the borders of the respective star system. Then wind collisions between the star vs. galaxy sources provide the triggering energy for creation of a bubble-based pseudo-knot, see Figure 60, a.

It starts a local exotic matter patch creation, size of which depends on the amount of sheet bubbles (of the free type) locally available. It should usually lead into microscopic unstable patches of exotic matter, causing particle flows (and matter repelling) from the whole star system surface. Since it is a random process, it should occasionally create a moderately larger patch of exotic matter – resulting in a greater source of ionizing radiation, as detected by geological measuring. It can also play a role in destabilizing the local standard matter clutters, thus triggering e.g. comet origination.

For a binary star system, the geometry changes (caused by the rotating stars) create (free) sheet bubbles, as discussed previously. Concurrent radiation from the stars provide the energy content for triggering the creation of pseudo-knots based on those (free) sheet bubbles. It shall continuously provide small amounts of exotic matter. That exotic matter repels the stars apart then, see Figure 60, b.

Conclusion

This endeavor had started with basic assumptions on geometry that lead directly to algebraic characterization of the system. The crucial step was taking the $2\pi \circ Ex$ process as the fundamental symmetry operation of the system.

Having the tangloidal system, peculiarities of the quantum physics and cosmology were got for free. The basic structure-forming interactions were found to be the pressure of the Casimir-force type and sheet flows.

Particle life and interactions of the Standard Model followed as applications of the basic processes onto the respective building blocks.

Trying various possibilities around the fundamental structures, the originally axiomatized ones were found to be the ones able to form reasonably complex structures – i.e. neither unbearable chaos, nor fade uniformity.

Along with that, (dimensionally) restricted systems of closed bubbles and wound rods that serve as ambient environments, were described.

Two notions of time – the apparent one that defines measured rates of changes, and the manifold one that provides the substance for inner and outer information transfer – were identified.

For basic relativistic properties, the apparent time is sufficient. The manifold time provides a deeper view, including the resolution of the quantum information features.

The (general) system that is rooted in general relativity, naturally provides the origin of both the universe and elementary particles.

After exploring the dark matter and dark energy structures, a way how to transform them into the (anti-gravitating) exotic matter is provided. Some applications and possible natural occurrences are described as well.

An interesting feature of the (general) system is that views confined on particular properties are (kind of) versions of theories already previously known.

Quite a few dualities are present in the (general) system, e.g.

- pulled vs. pushed $3T$-sheet types for leptonic vs. hadronic structures,
- $3T$-sheet parts that are effectively one-dimensional vs. two-dimensional provide manifold time for classical vs. quantum information processing,
- orthogonal vs. parallel rotation axes of corner-based matter structures for less than c vs. equal to c speeds.

Passing the matter structures through the rod massif – via a mixing with that – puts the c-limit restrictions on the achievable (local) speeds.

For the fundamental matter and energy formations, a basic set of geometrical and dynamical structures – based on sheet alignments and rotations – is reused for all the necessary developments. Together with it, the (general) system serves as a unifying explanation for puzzling physical phenomena, without requiring ad-hoc assumptions. It for example naturally contains both the symmetries of space-time, and separate asymmetries.

It is notable that actual predictions and applications are provided.