Horn Torus

'Geometry Of Everything'

intellectual game to reveal engrams of dimensional thinking
and proposal for a different approach to physical questions,

a thought experiment as an exercise for abstraction ability
and attempt to describe '**fundamental entities**' colloquially,

a small selection of short excerpts from **DornTorus** (German, author: Wolfgang W. Daeumler),
manuscript 7/1988, printed 1996-98, translation provisional

Remark:
The horn torus model is not a consistent physical or mathematical theory. Regard it as suggestion to leave fixed habits of conventional mainstream thinking now and then. Playfully, just for fun! - Sometimes crackpot ideas inspire ...

Motif:
Mathematical rules exist all the time since there is more than nothing, in other words: mathematical rules were involved in creating the universe, or: emerging of a mathematical rule is equivalent to well known Big Bang
> **nature is mathematical, one mathematical code rules our world ...**
that code and mathematics in itself definitely are not inventions of humans - we only have developed a complex language to describe simple preexisting laws! we still are far away from seeing the simplicity in natural laws, but we know:
> **all really fundamental physical laws are pure mathematics**
and it's impossible to comprehend laws of nature without playing the math game!

1. **The Elimination Of Emptiness**

- a short creation story -

For eons Her Almighty Emptiness had nothing else to do than counting numbers. One number after the other, in fine order and exact sequence, She let pass the numbers through Herself. Every number paused an infinitesimal short moment only, and without delay the next number was counted. Naturally that couldn't be real numbers, after all it was The Emptiness who counted, and there was no real universe yet, no reality, in which real numbers could have been found. No, the numbers just were imaginary.

After She had enumerated the unending series of numbers, all infinitely many numbers with their limitless length, back and forth, for infinite times, in peaceful tranquility, then it happened:

One single time, just the number 0.0072973527...(i) had stopped by, She stumbled for an infinitesimal short moment, didn't know for this infinitesimal short moment, in which direction She had to continue counting, started to panic and spin a little bit, and then as next, in error, She counted the wrong direction. One single wrong number She had counted. She had added one single real number to their imaginary set. She shouldn't have done that! It was all over now with peaceful tranquility!

That single number made it to associate with the imaginaries, made it to multiply itself abruptly and wildly, made it to form a new infinity and fill it with tremendous plenty. The numbers got out of control of The Emptiness, becoming much mightier than their creator. The new numbers, in association with the old ones, were characterised by furious aggression. They not only eliminated The Emptiness, they fought against each other. The most aggressive, and that were nearly all, annihilated themselves in an uncontrollable battle all over the new infinity. With these real numbers had emerged a new unlimited reality, from beginning characterised by mad aggression.

Only a very small remainder, pairs of new and old, real and imaginary - complex numbers - survived the infernal chaos. They have forgotten their original fury and now provide the reality with infinite complexity. The real had recognized that they could not exist without the imaginary numbers, accepted their subordinate role in the universe of numbers and strictly obey all rules.

And Emptiness? Apparently She missed when stumbling over 0,0072973527...(i) this number and here She reserved a tranquil place for Herself, where She can indulge Her passion: counting Her old set of imaginary numbers. In the new world of complex numbers there is no space left for Her ...

2. **How did Emptiness count numbers?**

- quintessence of idleness -

It doesn't make any difference whether She lets flow the imaginary numbers through Herself, attending an infinitesimal short moment to every single number, or to run along the unlimited number line with infinite velocity. But the way of counting by The Emptiness is quintessence of idleness:

She remains in one spot. She has bended down the line to every number to a circle, the original number line being tangent in Her position, every size of circle corresponding to the quantity of a particular number. Then She pushes all circumferences only an infinitesimal little bit to roll along the number line, every circle with identic circumferential speed.

Now She can count all numbers without need of leaving Her bed! She only registers the angular velocity of a circle to recognize the number. She can do that at her position, where all circles touch the number line. The smaller the number the higher this velocity. The bigger the number the smaller the speed, approaching zero for very big numbers.

It doesn't make any difference whether She counts the number itself or the reciprocal value, provided that She always does it the same way.

When The Emptiness counted that infamous real number, She prior accidentally had performed an infinitesimal spin away from all circle's direction, equivalent the rotation of the whole system of circles around the number line axis. When the system of circles had performed one full rotation, so that She could continue counting, the single real - and natural - number '1' had appeared, immediately starting that battle of eradication.

Real numbers with their infinite decimal length nowadays are not all realized in nature. Most have disappeared already during that big battle, shortly after counting wrong by The Emptiness. Our real numbers bear their name wrongfully. Reality exists of discrete values - continuum is illusionary mathematical construct - and the disappearance of most numbers (without any trace?!) has left wide gaps in the range of real numbers. (- Some call that 'inflationary scenario'! -)

Note: One full rotation of a circle around a tangent forms a horn torus.

3. **Mental leaps**

- time is redundant -

Today, after Emptiness has retired more than 13 billions years ago, when She could not cope with the rotating (spinning) number circles, a conscious observer sits in the center of the now rather compact system of interlaced horn tori, measuring the world around him. Together with the horn tori he and all particles assembling him perform the revolution ('torsion') of all torus bulges respectively the rolling along the imaginary common axis of all tori, like a three-dimensional symmetric yo-yo.

Additionally he and all his particles perform the rotation. Rotation means spinning around the axis of symmetry through the center of the horn tori. Revolution is the rolling of the torus bulge along this axis, combined with the locomotion on the axis.

(German artist Jochen Valett invented a toy that demonstrates this combination of movements. See this [demonstration](), and/or [this]() one.)

Every observer sits in such a center of interlaced horn tori, with slightly different set of tori. When rolling along the imaginary axis, the horn tori change their sizes, they become bigger or smaller, determined by rotation and revolution. To bring two observers to a common point (same center), they have to adjust the size of their respective tori to finally being identic.

It is not very difficult for imagination - anticipating later interpretations -, to identify every single horn torus as the actual effect of one particular elementary particle, the size representing its 'distance', the rotation (spin!) perhaps something like 'energy', 'mass', 'frequency' etc. The imaginary axis is our real time, but you easily recognize, that time then is redundant, what means: not necessary as own dimension. Horns of all very big tori, equivalent to big distances of particles, do the same as time can do. So, flow of time - keeping time as *auxiliary* variable - is a kind of rolling.

And it is obvious - equally as anticipation -, that speed of rolling along the axis can be identified with velocity of light! Whatever speed you choose for locomotion, the geometric and dynamic situations always remain exactly the same, even when you make it infinitesimal small. A very simple but anyway sophisticated mechanism equals this speed immediately by changing the reference scale, what from inside the system cannot be recognized. It is the genial *self-metrisation* of horn tori that perform both turns, revolution and rotation.

In this image with all the interlaced, [nested]() horn tori - local effects of all existing particles - the whole universe is represented in every single spatial point. And every observer being a rather compact set of spinning bulging horned tori. A nice, cute, horny mental image, isn't it?

4. **Has time a direction?**

- what means time reversal? -

The mental image of nested (interlaced) horn tori gives evident answers to various fundamental questions, the first concerning time:

In the horn torus image the mode of interaction between particles in our surrounding and all other particles of the universe, the huge number of the very distant as well, implicates a property that we identify as time. We will see that the time axis can be replaced by the horns of big tori and that makes an additional dimension, representing time, completely redundant.

So, as time seems to be an auxiliary psychological construct and obviously is artificially introduced into physical equations to describe natural laws, the arrow of time doesn't exist a priori.

Consequently it doesn't make sense to raise questions about reversal of time. One can reflect about meaning of interaction in the 'opposite' direction and, maybe, you will come to this conclusion: reversal revolution of a horn torus annihilates this 'particle' and a corresponding one, removes both from 'time' axis and leaves behind only the difference of rotations. And, maybe, you will associate this process with antiparticle annihilation. Accordingly, when using time as auxiliary dimension, you will describe antimatter as moving backwards in time.

Are different times thinkable, distinct from our experienced time?

Easily! The direction of revolution - time axis of our explorable universe - is haphazard. In a superordinated space there are many, perhaps infinite different directions. Imagine our time axis fixed in the analogon to our three-dimensional space. Imagine a second time axis, tilted a bit, and you see, its horn tori cannot interact with ours - they don't have the same tangent as ours. Perhaps they are part of a different universe. Perhaps there are many, perhaps a infinite number of universes outside our time axis. And we cannot recognize them. Or can we? What happens, when all time axes change their directions in the superordinated space? Perhaps in a way like precession? - Thrilling reflections ...

Many more exciting interpretations concerning time arise from the complex horn tori properties, e.g. interesting 'intrinsic' times. Disclosure will follow ...

5. Real or imaginary world?

- imagination and decision made easy -

Does reality exist without observers?

Depending on definition of 'reality':
When the mere *pattern* of any kind whatsoever, produced howsoever by all existing particles, whatever so called 'particle' means, shall represent the reality, then: definitely yes. But definitely no, when imagination of things, we observers have by our means of perception, is called reality.

First-mentioned *pattern*-reality doesn't contain structures like 'round' spheres, 'straight' lines, 'massive' objects, ..., it doesn't distinguish hard and soft or free of mass, doesn't know heat, colours, locomotion, velocity, ..., is neither dark nor bright, neither loud nor silent, ... does not know what is cause, what effect, doesn't recognize any order or rule, not even 'physical variables', ..., but it works, driven and determined by entities, only performing 'revolutions' and 'rotations', in a simple but fantastic intertwining manner.

No phenomenon that we observers find in our reality does exist, when not observed, but the *pattern* of any kind whatsoever continues to be even if there is no consciousness to observe. As *pattern* the universe definitely does exist. However it has no properties without an observer, who is able to describe these, respectively who can react on parts of the *pattern* in a definite way. (The question does not deal with the Copenhagen interpretation in quantum theory, only touches it a little. But a potential for discussion about that topic can be assumed.)

The *pattern* in our image, our model, corresponds to the array of rotating horn tori, permanently changing size and possibly rotation velocity while rolling along each other and along the common axis with common circumferential speed. That sounds like a naive medieval clockwork-universe, where gear wheels engage with each other, but remember: the model is nothing more than an aid to detect physical-geometric analogies, only to associate the surely unimaginable reality with a mental image, matching into human thought structure.

We handle the three-dimensional space virtuosically and it seems reasonable, to use this virtuosity for the projection of not conceivable mechanisms into a frame we easily understand. But we always have to keep in mind that *every* description of natural laws is a simplifying model of reality. The universe(s) doesn't (don't) have the restriction of human mental capability.

6. **Engrams**

 - impediment to comprehension -

preliminary note: the word 'engram' is used here in a neuroscientific and psychological sense, has nothing to do with the meaning given by a certain organisation.
The horn torus way of looking at things does not leave room for sectarian doctrines of salvation or any other mystical and spiritual interpretation - like it or lump it!
Equally no doubt will be raised regarding validity of widely accepted major theories, and neither the wheel shall be reinvented nor a perpetuum mobile is planned ...

Physical description of macro- and microcosm is formulated as quantum field theory. Theoretical and experimental successes let this method appear the right one, but many physicists feel discontent due to epistemological gaps and discrepancies or when confronted with consequences that contradict our common sense.

The most important part of common sense is the imagination of space and time, probably rooted in properties and function of the brain. Everybody has the same or similar associations to words like point, distance, direction, volume, space, flow of time, locomotion, velocity etc. Such natural associations are self-evident, don't need explanation, are engrams. Every action of man and beast is related to engrams and the list of all our engrams probably would go beyond the capacity of my computer's memory. (edit: this was written in times of first personal computers :-)

Three-dimensional space is the most persistent engram - inviolably given, ineradicable fixated. Even physicists, despite having learned abstraction, always refer to it, in all dimensional enhancements, all dynamic geometries, all topological sophistications and - likewise - in quantum field theories. Physical variables there always can be projected someway into the three-dimensional space, which is ever embedded in the comprehensive system as base or parameter for alteration of values.

Three-dimensional space matches our consciousness, is congruent with our engrams, seems to be simple. But just this simplicity, which ideally enables us to cope with the challenges of daily life, comes at a price: an enormous complex formalism is required to formulate laws of nature and to describe physical reality - and just this simplicity makes comprehension of some aspects of reality so difficult or even impossible, and perhaps it is the reason why we have to introduce presumptions, arbitrary parameters and gauge mechanisms. ...

The original text tells much more about engrams. Here we content ourselves with internalising this last mentioned point about the price for simplicity of imagination. This price I endeavour not to pay. I prefer a simple formalism for - not surprising - the price of a much more complex imagination, that does not perfectly match human consciousness. It is indeed a matter of personal preference and subject to the pleasure when playing mental games, pleasure and fun being main impetuses. I promise: game is fun!

7. **Dynamic geometry**

- renunciation of dimensionality -

To replace the engrams in descriptions of nature, we introduce a purely abstract model, which shall represent fundamental physical objects. Trick is, to use the well-known three-dimensional space, but only as sort of crutch, not as space where objects and processes are embedded. Our model has no dimensions, but has, instead, a very active dynamic.

As shown on front page of this website, we put horn tori of many sizes into one another, nest or interlace them so that all have the same symmetry axis through their common center, every horn torus being inside the next bigger, all - more ore less - very close to another. As surface we imagine an infinitesimal thin 'membrane', actually nearly not existent. Same as we can (mathematically) imagine an infinite set of numbers on a limited line, we imagine a huge number of horn tori put together the described way. All touch one another in the same point, in the center, which we call '**Point S**' - from **s**ymmetry or **s**ingularity.

Now we pull the axis from outside in one of the two possible directions and see all horn tori rolling along this axis. Simultaneously they roll along each other, and all apply exactly the same circumferential speed, just the speed with which we pull the axis. Indeed this speed is the same for all horn tori, but their angular velocities differ. The smaller the torus is, the faster turns its bulge. The rolling along the axis by performing this torsion of the bulge we call revolution. So all revolution velocities are different. Very big tori approach zero angular velocity, very small ones turn extremely fast.

If one has difficulties to imagine that mechanism, take normal balls of very thin glass and with different sizes, every ball containing a smaller, laying on the 'bottom'. (You know the Russian nested Matryoshka dolls?) When you rotate the biggest around a horizontal axis, all enclosed rotate with the same circumferential speed, but with higher angular velocities the smaller the respective glass ball is, the innermost being the fastest. So far, so clear?

Now let the horn tori additionally rotate around the symmetry axis. Allow each to choose any of both possible directions for rotation. At the beginning we don't set a particular angular velocity, perhaps leave it constant first, and we will consider later, which different mechanisms could have an effect on rotation.

The following is a really great challenge for imagination: move a very small - infinitesimal small - distance away from Point S. Hold there a pen, a marker, on the thin surfaces of all horn tori, let them run and then trace the lines, which are being drawn onto every horn torus. We get unrolling lines (cycloids), the shape depending on the ratio of angular velocities, connected with torus size. On very small tori appear lines nearly not diverting from meridians (very fast revolution!), on 'medium' ones we see various loops with any number of 'blades' and coils. At big tori rotation prevails and the cycloids converge as windings close to the torus latitudes. The array of curves and the particular (three-dimensional Lissajous) figures later will be objects of examination. We will find amazing things, that lead to obvious interpretations. (Yet again: more detailed explanations in the German version.)

example for marker trace   (Lissajous figure, unrolling line, cycloid, trajectory)

8. **Spatial point**

- without dimensions - what in the world is that? -

For our common sense nothing is more self-evident than description of space as right and left, fore and aft, top and bottom, eventually combined with a point in time. So we need three resp. four coordinates: x, y, z and t. In our horn torus model it is infinitely more difficult to imagine spatial points and relation between different points. It needs effort and time - and much capability of abstraction - to learn about, exercise and handle horn tori. It won't work without. But it's really worth doing!

The most important message first: one single point, together with an infinitesimal neighborhood, contains the whole universe! Every particle of the world is represented by exactly one horn torus in the set, with one shared tangent in common Point S. The size of the horn torus represents something like 'distance' to the particle or to the 'location', where its size is zero or say minimal. To move that way, to that location, the respective horn torus has to diminish in size. Simultaneously (nearly) all other horn tori change their size, increase or decrease, according as they diverge or get closer. Only particles, that move on a 'parallel' with same 'velocity', keep their associated horn torus size constant.

The complete set of all spatial points in the universe is the set of combinations of all occurring horn torus sizes. - Wow! - Our imagined space has vanished. Only an infinite series of numbers is left. These series and permutations of them describe all the universe, but don't show any structure. Only a consciousness that picks out remarkable and significant patterns, will see laws and objects, properties and beauty, last mentioned being one of the most complex quality, that can be derived from mere numbers in these permutations. But that's another topic.

Next step of abstraction: We reduce every horn torus to the mentioned unrolling line (cycloid) on its surface 'membrane', described in the foregoing section 'Dynamic geometry'. That takes off the symmetry from the horn torus, because this line starts on one particular meridian. So the horn torus is determined by a combination of numbers: size, rotation velocity, including direction (+/-) and longitude of the meridian, the mentioned series of numbers in fact turn to matrices and the nested horn tori to a dense set of curling curves. Nevertheless, for visualisation we better remain in the picture of the complete *dynamic* horn tori including their virtual membrane. The term 'dynamic' comprises both kinds of turn and variation of size.

We keep this image, even when we undertake another rigorous reduction: we remove nearly all parts of unrolling lines with the exception of an infinitesimal neighborhood of Point S, because all relevant information about the further courses of all lines is included in the short snippets. We now have extended the spatial point from a set of coordinates (x,y,z,t) to a spot, that contains its relation to all other spots in universe. The spot is infinitesimal small, but much more than the accustomed point as usually defined in mathematical sense. Every spot represents nothing less than the whole universe itself, including its prospective progression! To move from one spot to an other only means to change the point of view on to the universe.

Too much for imagination? And worse things are yet to come ...

9. **Analogies**

- dynamic geometry versus physical entity -

Maybe imagination is unable to cope with the complex system of dynamically interlaced horn tori, but when we look at only one and later onto two, the mechanism turns into a simple principle with only few variables. The idea of revolution should be clear: the horn torus rolls with its longitudes along the symmetry axis, changing the latitudes. Different sizes of horn tori turn with different angular velocities when they roll with the same circumferential speed. Sure, comprehensible! - Changing size during rolling is possible without 'slippage' on the axis. Clear too? - Very big horn tori turn with very small angular velocity, extreme small ones with an enormous rate. And that's the first analogy to physical phenomenons: Extremely differing scales combined with their reciprocals appear in one single image.

Now we look upon rotation: The horn torus spins with its longitudes around the symmetry axis. The angular velocity is totally random, but shall be constant first. Combined with revolution you always find a scale - a size of tori - where a certain ratio rotation to revolution occurs, e.g. 1:1, what would be called the *standard dynamic horn torus* (see old [original](#), but better refer to [newer](#) animation which explains more). Whichever circumferential speed of revolution and angular velocity of rotation you choose, you always find yourself in exactly the same image. By resizing you always come upon the standard dynamic horn torus as *unit for self-metrisation* of the whole system. It's only a question of scale, and this is another analogy: self-similarity.

Look at one horn torus, rolling from far away (big size) to a selected spatial spot (minimum size) or even to a point (size zero): the unrolling line, as described in the section 'Dynamic geometry' first curls around the surface many many times per one turn of revolution, then the number of windings decreases until you discover loops, blades, kinds of 'resonances', their number per one rotation increasing the smaller the torus becomes. This continuous unrolling line has plenty significant properties, nevertheless it is only one single [object](#), based on one process. One can call this line an *'entity'*.

The process is the combination of revolution and rotation. Never view it as real existent! It is a mere visualisation of nothing else than numbers, analog to the well-known Riemannian spheres: imaginary (revolution) and real (rotation) numbers! Combination of both kinds of numbers creates an incredible complex variety of properties, due to the dynamic, that is included in the horn torus image. The game is, to pick a property and look for an analogy with physical objects and their 'interactions'.

Interaction is an important term in physics. All measurable phenomenons are based on interaction. In our model interaction only can take place in Point S, where all horn tori contact each other and touch the common axis t. Note that all lines on the surface of the horn torus pass Point S as parallels, regardless whether the line forms dense spirals or curls on the torus surface. The line may wind around the horns as often as you want, in Point S every line turns to a parallel, meets the tangent there, becomes part of the axis. In a rotating horn torus Point S is a singularity, and so our world of horn tori is a set of singularities. That doesn't make imagination and interpretation of interaction easier, I am afraid. But let ourselves be surprised.

10. **Identifications**

- one trace of an unrolling line on horn torus surface
  versus various well-known reference objects of physicists -

First we recap the identifications we already have made: the most important, significant and obvious is the axis of symmetry, which we had identified as axis of time, but straightaway had deprived this meaning of its importance, because of the equivalence to horns of very big tori. The total of all big horn tori represents time already. A distinct variable or dimension time is not necessary, is redundant. When using it yet, time will be an auxiliary variable, only for simplification of things, to match our engrams.

The circumferential speed of the tori, when rolling along the axis, shall be the same for all. Constancy is not required, because self-similarity of the whole system equals it instantly, so that within the system it seems to stay constant. Moreover there is nothing outside, no reference, what could define a particular value for the speed. In our world we only know one omnipresent speed, and so it's logical to let the tori perform their revolution (turn of latitudes) with speed of light c.

Now we switch to the imagined unrolling line, that we let emerge on the surface of a dynamic horn torus through its simultaneous rotation (turn of longitudes). Without the extensive explanations in the original (German) text and without mathematical elaboration we try to associate properties of the line with physical objects. Rotation itself can be associated with quantities like energy, frequency, spin of particles etc.

The whole line (the complete cycloid), reaching from infinitesimal small to very big horn tori is *one entity*, divided in many parts. On big sizes, when the ratio of angular velocities revolution to rotation is small, the line winds very often around the torus including the horns, with small angle to the latitudes - at least off the thin thread near Point S, mostly filling the whole surface after many rotations. At certain ratios, with rational values and especially as integers, the line concentrates to significant patterns, Lissajous figures. The line never shows a discontinuity, but in form of these concentrations different kinds of 'attractors' or 'resonances'. These one can associate with particles, fermions, and the sections of the line between the fermions as their mediators, bosons. See coarse [animation](#).

In this picture elementary particles are local manifestations of one single entity, reaching from inside a nucleon, quark or even smaller to farthest distances of the universe. The outermost boson, with mentioned ratio smaller than 1/2, where there are no significant Lissajous figures, is the photon and at 1/2, as the first striking resonance, we find the [electron](#).

Ratio 1 is a sort of *my*sterious 'mirror', where the big outer world of 'free' photons and electrons with little manifestation of structure changes into the inverse world with enormous accumulation of resonances, the first being ratio 2, representing a pair of [nucleons](#). Between electron and first half of the two nucleon-loops, which we identify as proton, we find a 'caged' photon as mediator. Further down, at ratio 3 the line next is 'constructing [quarks](#)' ... and our game has started to be fun.

11. **Examples**

- a sneak peek as teaser -

Until now the length of the cycloid ('unrolling line') didn't appear, whereas it is the 'source of all the magic'. Because it gives us the opportunity to undertake mathematical computations and to establish a metric. Furthermore the fact, that the line is longer than a meridian of the horn torus, causes the existence of speeds that differ from the speed of light. When you look closely at Point S and a small neighborhood, you will see that a rotating horn torus does not unroll its meridians but - to avoid slippage - just this cycloid instead, that winds around the horns. So the effective speed of rolling along the axis is smaller. Fast rotating horn tori move slower - the faster the rotation the slower the locomotion along the axis.

But now - for physicists - two haphazard examples of computation: we calculate the length of the cycloid between significant resonances, noting the fact that the dynamic horn torus diminishes in size, when its angular velocity of revolution increases. Related to the standard dynamic horn torus (ratio of velocities 1:1 and circumference 1) we start with the loop of the electron (ratio 1:2, size 2) and end with ratio 4:1(!). We get, with help of computer, as length of the cycloid the value 2.07944, corresponding a rotation angle of 748.6°, effective (-2x360°) 28°36', not far from Weinberg angle. Is there any connection to the four(!) bosons of electroweak interaction?

Similar computation, equally random: when describing the doublets of weak isospin - for quarks (u,d), (c,s), ... - in some 5% of cases s replaces d and vice versa, and so d and s are superpositions of both, d and s. Why that? When calculating the respective length of the cycloid (direct corresponding to rotation angle!) we find: the three 'blades' of quarks u and d are twisted 44.7°, 164.7° and 284.7°, in relation to the 'zero-meridian' of the electron, the four of c and s are twisted 28.6°, 118.6°, 208.6° and 298.6°. In (298.6-284.7)/360 of cases the next figure is the four-bladed, coming from the three-bladed, and in the other direction, coming from the four-bladed, in (44.7-28.6)/360 of cases the three-bladed is next. That are 3.9 resp. 4.5 %. Maybe that leads to an attempt to answer the open question. - And maybe the cycloid will disclose some other secrets. Values of physical constants perhaps? Fine-structure constant e.g., as length of a section? - But, please, never forget: we are playing a game - just for fun!
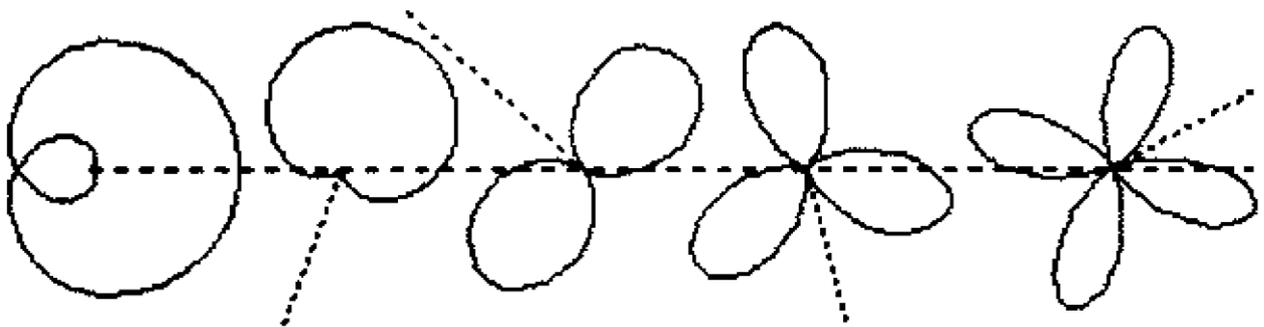
(calculated and drawn 1996 on board s/y 'funtom' in Guanaja, Honduras, with MS QBasic)

12. **Dimensionality**

- not a physical term! -

Ok, I admit, one has difficulties to imagine and to visualize the dynamic horn torus system as basis for constructing an universe. But can we be really happy with our three- or four-dimensional idea? Is, conversely, the perhaps infinite extension of space, universe or multiverse better conceivable? - Hold a human hair with extended arm against night sky to cover a far afield celestial object. In case it is a galaxy, the distance will be some 1 billion light-years, and it takes 100 000 years for light, to travel from left edge of your hair to the right. Is even this very simple example really imaginable? - Every proof of three-dimensional space as optimum for the existing physical laws and hence for the evolution of an universe and for development of life is evidence for efficiency of ineradicable fixated engrams! That's a really weird fact. The variables used in such 'proofs' always are partly deduced from the dimensional description.

Three-dimensional space in mathematical sense is not as self-evident as it is in our engrams. In actual fact it is already a mighty, most complex and complicated mathematical construct with more than 20 necessary axioms to form it. This realization and postulations of linearity, continuity and continuum as set of punctiform elements let our space of perception appear not to be very fundamental, so not to exist in nature a priori. And - important - *it has no natural metric* to be measured. Methods of measurement, defined strictly within the rich system of axioms, follow very complex rules and are even not possible in a logically consistent way when we reveal and avoid all engrams. Furthermore in all spaces without a possibility of self-metrisation the origin and values of dimensionless physical constants will stay secretly and unexplainable till doomsday.

Well aware that *every* explanation of natural laws is a describing image, a rough copy, a simplifying model, and after every model so far doesn't answer all important questions, we make another try, not with three dimensions (Newtonian physics) nor four (relativity), not five (Kaluza-Klein) nor eleven (standard model) and not 26 or so (strings) - no, we do not use the term dimension at all! We banish dimensions totally from our horn torus game, which provides us another crutch to hobble around the never reachable and imaginable truth, only to enjoy the short moments of supposed close contact.

To handle dynamic horn tori we need some basic requirements: just this conceptual suppression of dimensions or at least abandonment of their linearly independence (what means the same) and negation of continuum respectively continuity and additionally of locality. Linearity of the mathematical frame in which all is embedded, is not required, since linear properties of variables are possible in non-linear spaces too (after all quantum-mechanical formalism shall be allowed to persist!). With these conditions we are equipped with much more complex properties than our linear three-dimensional space, inclusive all extended and curved versions, ever can provide. The dynamically nested horn tori resp. their cycloids not only supply us with all the required properties, they also create the mathematical embedding frame without need of further axioms, i.e. they generate their space themselves, whose *natural self-metrisation* gives us the possibility to evaluate constants, and the lines within one entity simultaneously show patterns, which can emerge as various physical objects.

Isn't it that, what we are looking for?

13. Gravitation and forces

- intrinsic times and matter of rotation -

Yes, I know: every somewhat creative would-be scientist eagerly endeavours to explain all unsolved problems in physics, cosmology and preferable parapsychology in addition. So, non-mainstream physicists quickly are suspected of pursuing image-cultivation in a know-it-all manner. I hope, the game I play doesn't dump me (a modest physicist and physician) into that corner. I only cheerfully enjoy the many analogies between physical phenomenons and geometrical properties of a set of dynamic horn tori, and I certainly do not intend to scratch accepted theories.

Prerequirement to see these analogies is plenty exercise with the image of nested dynamic horn tori. One should be able to suppress the common space of perception and replace it by the abstract set of tori. It's not easy, sure, but worth the effort to try. For many physical facts you can find astonishing analogies or striking equivalents in that image. Some not completely reflected or too 'self-evident' phenomenons can easily be reinterpretated with new meaning and importance or several sophisticated theories might be better understood by a second, different approach ...

We have seen that revolution of the torus bulge is not an unrolling of the *meridians* along the 'time-axis' but of the *cycloid*, resultant line when revolution is combined with rotation. Cycloids are longer than meridians, and the faster revolution *or* rotation (compared with the unit horn torus), the longer this line. Seen from the unrolling torus, one can not determine whether the reference axis is 'straight' or curved, whether the torus rolls along the 'time-axis' or along meridians or cycloids of other tori. That's important! The axis along which the torus rolls *seems to be* the 'time-axis', even when it is e.g. the average cycloid of all neighboring tori. So the torus time is different from the time, represented by the symmetry axis of all nested horn tori. We call it 'intrinsic time'. Every torus (i.e. every particle!) has its own intrinsic time, depending on its own rotation on one side and of all neighboring horn tori with their density of packing and their rates of rotation on the other side.

You may not determine the curve of the intrinsic time axis, but mathematically you can transform it into a straight line and look - from 'outside' - what happens with the other tori of the set. Big tori become bigger than infinite, what in our space of perception doesn't make any known sense, but in the new image it does. The horn tori return from infinity after having changed their direction of rotation, they quasi turn their inside out when passing infinity (resp. when reflected by infinity). It is mathematically describable, but here only an exercise for abstraction and an example for interesting effects and very special analogies. The same happens when a horn torus 'passes' size zero (changes direction of rotation/spin).

In that image, a particle (horn torus) 'mixes up' a concentration of cycloids (accumulation of horn tori of similar size) with the straight time axis and increases/decreases size during rolling on the cycloid just to that size, what physically means it converges to the respective spatial point. This can be interpreted as pull towards this accumulation of horn tori: gravitational force towards mass concentration. It is a phenomenon of big horn tori, with ratio revolution : rotation << 1. Detailed explanation will follow.

A completely different situation, but using **exact the same entity**, occurs at ratios in vicinity of 1 (½, 2, 3, 4, ...), 1 being the standard dynamic horn torus, the natural unit for self-metrisation. Here is the world of resonances, of Lissajous figures on horn torus surfaces. The cycloid between two resonances swings to and fro, the related horn torus size vibrates within small limits. To establish physical analogies shouldn't be too difficult. And please note: we describe macro- and microphysics by means of identic pictures. At least as an image we now possess an easy to handle instrument for *unification*. Let's play this instrument! - Sounds good, doesn't it? - More later …

14. **Patterns and strings**

- winding cycloids and tiny snippets of them -

Looking at one single horn torus, we see various patterns, formed by the cycloid during unrolling along an axis: coils, spirals, loops, following strictly deterministic rules. Two interacting tori combine their patterns to a different kind of dynamically changing patterns when mutually unrolling their cycloids, still in deterministic manner. The more horn tori we add to the set, the more complex become the patterns, turning into a fractal quality, dynamically swirling around, and still deterministic. With increasing number of horn tori the complexity grows as well, and it becomes difficult or impossible to detect any determinism. But the patterns persist respectively turn into a higher level of fractal complexity.

The patterns not only occur in the order of elementary particles, where the ratio of angular velocities (revolution : rotation) is bigger than ½, they continue into the macroscopic world, where rotation prevails, range over all scales and leave visible marks everywhere, as molecular and crystal structures, in organic matter and organisms, in snow flakes and great many more synergetic effects. Even, only as an example (I'm not a fan of him): R. Sheldrake's term morphogenetic or morphic field could be brought to life again, now seen from a completely different angle of view and released from the stigma of inexplicability. The same with so called 'instincts' of lower animals. Maybe they have unknown special senses to detect such patterns? And considerations concerning the multiple dynamic feedbacks from the 'neighborhood' - infinitely many from the whole universe - to every single spatial point take the weight from the complexity argument in so called 'proofs of god' and strengthens position of evolutionists in a further way.

We already have touched upon the fact that the whole cycloid of an unrolling horn torus can be reduced without loss of information to the part within a small neighborhood of Point S. Even an infinitesimal small piece of the line is sufficient to determine the whole curve. The patterns then equally are being reduced to an infinitesimal small bundle of snippets, characterising one particular spatial point (better: spatial 'spot'). Change of the patterns means movement to a different spot.

These snippets are not the well-known strings - whereas parallels in behavior exist! - Strings are embedded in a multidimensional space and show complex apriori properties, so that they, in my opinion, don't seem to be candidates for fundamental entities, created at the beginning of the universe. They describe much, perhaps all, but they are - likewise as horn tori - a mere model of nature, as *every* physical theory is. I admittedly admire their mighty potency, but for outside observers the theory sometimes impresses as play castle of brave formula heroes and climbing wall of extravagant number crunchers. (Sorry, I wrote this 1996, in German. Today I perhaps better should attend more and pay my respects to the meanwhile widely accepted theories, especially the newer and auspicious loop quantum gravity, but here and now I just like to promote the horny tori - they really have deserved this attention!)

Here is the opportunity to emphasize again, that the horn tori don't exist as such, they only are a tool for imagination, to illustrate properties of numbers. They indeed only - as (dynamic!) Riemannian surface resp. manifold - represent numbers, complex numbers, rotation standing for the real, revolution for the imaginary part. The values are equivalent to the longitude (real, number of rotations/spin and the particular meridian) resp. size (imaginary, effect of unrolling/revolution). These two properties already are implicated in the short snippet around Point S. The full horn torus is redundant, but very helpful for visual associations without added information ballast. The whole model only shall highlight the *capability of complex numbers, to count themselves mutually, creating manifold patterns hereby.*

Last sentence should be worth to think and reflect about thoroughly!   - - -
(fractal iteration patterns are well known examples)

My personal conclusion (despite being perpetually and marveling in close contact with beauties of nature and able to revel in surprises of life): our world is self-creating, basically consists of complex numbers, is arithmetic, is mathematics ...

15. **Metric**

- when dynamic processes induce discrete values -

Several times I used the term 'self-metrisation', but didn't explain it sufficiently. I will do it now: To undertake measurements within a space, be it spanned by coordinates or only a range of numbers, we need a unit to establish relations between occurring values. In a static continuous space formed by linearly independent coordinates no element can be distinguished as particularly eligible for that purpose. We have to choose units arbitrarily and artificially. Different with dynamic horn tori! They can relate revolutions to rotations and vice versa. Their cycloids produce patterns, self-contained curves, Lissajous figures on their surfaces, and they show significant dynamic properties: number of rotations per revolution and number of revolutions per rotation.

There is exactly one situation, where the turns are symmetric, namely when rotations per revolution is the same as revolutions per rotation. With this special case, i.e. revolution : rotation = 1:1, we have an unit, which all other situations and sizes can be related to. Coming from both sides of the numerically obvious symmetry we now have a smallest possible unit for revolution and for rotation: 1 (one) each.

After doing a couple of mental leaps and perhaps mathematical formulations nothing and nobody can inhibit myself to associate one full rotation with reduced Planck's constant $\hbar$ and one full revolution with Planck time or - because time is redundant - with the quotient Planck length / speed of light, L_P/c. Speed of light c, as mentioned already, is represented by the circumferential speed of revolution. No matter what value one chooses for c, the geometric situation and all relations persist in a self-similar way, c always seems to stay constant, seen from inside the set of horn tori. And the well known relations between the mentioned physical objects and quantities achieve imaginable meaning.

Consequently fractions of one full rotation and fractions of one full revolution are not defined, don't occur in the dynamic processes. But that doesn't restrict the variability of the image. The opposite is true! And the analogies to other known and accepted models increase. Example: the electron resp. every horn torus with half-integral ratio of turns (fermion) needs two steps of rotation, two full turns, to match the original shape.

As already explained the complete unrolling line or cycloid forms *one* entity, starting with size zero (resp. minimum size), then along many 'blades', formed by very fast torus bulge revolutions, then passing striking resonances, especially as 3- and 2-blade horn tori, which we have identified as quarks and nucleons, continuing to the electron (two windings or rotations per bulge revolution) and farther to bigger horn tori with many windings, identified as photon. Every part of the entity, always emerging as horn torus, can be compared with the unit, the standard dynamic horn torus with ratio 1:1 for 'measurements': one rotation per one revolution and one revolution per one rotation. With constant circumferential speed c size of the tori is small for ratio revolution : rotation > 1:1 and big for < 1:1. All existing entities, perhaps an infinite number, have this ('conical') shape, all exactly the same, plus the respective mirror images. Every horn torus of an entity with a specific size has its defined place within the entity. And in every spatial point every entity is represented by *one* horn torus each, most of them with different sizes.

16. Grand unification

- in plain common speech -

Now, I think (or hope), we have done all conceptual and mental preparations to face most fundamental questions in our perception of what we call physics: now we have to find and describe the cause for locomotion of particles or, more generally speaking, physical objects within the space they populate, independent how space is defined. That cause we usually call force. We distinguish four different fundamental forces: gravity, electromagnetism, strong and weak force. All are manifestations of any mysterious *'interaction'* between particles resp. physical objects. Physicists are able to describe them mathematically, calculate exact values, and make accurate predictions, but the *deep principle* or mechanism behind that interaction still is completely unknown. I am convinced that linear vector spaces, basis of most physical theories, never will lead to the final answer. Loop QG fans with their different definition of space have a distinctly better chance! And users of non-linear horn tori already have an approach:

The principle first (explanation below): a horn torus, unrolling along the trajectories of other horn tori which are located in the same spatial point, is forced to change its rotation speed, and therefore also changes its size, because within the same entity a firm correlation exists between size and rotation speed of every horn torus. At a certain distance from the 'origin' or also from the unit horn torus, there is always only one single definite ratio of the angular velocities, revolution to rotation, and size is known to be inversely proportional to the revolution angular velocity. The entire entity - together with its origin and with all associated particles - shifts to new positions related to other entities without changing its internal structure, and that means the particles move closer or move away from other particles, depending on the change in the rotational speed.

For clarification, *once again*: every single entity has exactly the same dynamic properties, all entities - except their mirror image - show exactly the same shape and behaviour (after all they only are images of abstract complex numbers resp. manifolds, we know!). A horn torus of a certain size and revolution angular velocity always has its place at exactly one single position within the entity, with a fixed distance from the origin (or from the unit horn torus, or from other resonances, ...). A specific size of the horn torus always implicates a certain ratio of bulge revolution to rotation angular velocity. If the rotation changes, the size also changes, and that means that the distance (= size) from the origin, from the unit horn torus and from the particle cascade is different in the new spatial point.

To illustrate an entity, we remember this [animation](). It shows - schematically shortened - the dynamic geometrical structure of *one singled out* entity, but only its short section between the ratios 1:4 and 4:1 (ratio of bulge revolution to rotation) and with constant rotation. Some members of the particle cascade are highlighted: the electron is represented by the ratio 1:2, the adjacent unit horn torus (for metrisation) appears as an unimpressive bent circle at 1:1. The most striking Lissajous figures are emphasized. Between them there is in addition an infinite number of windings and blades not shown in the figure.

How does the change of rotation during bulge revolution occur? - - -
The unrolling line (trajectory) on the surface of a large horn torus consists of many closely spaced windings per one turn of the bulge, the larger the torus, the more windings, nearly parallel to the bulge latitudes. When any horn torus of another entity, sharing the same spatial point, has to follow this line, that undoubtedly has an influence on its own rotation (the unrolling should take place - figuratively - without 'slippage'). However, since this horn torus not only unrolls on one single different horn torus but on all existing in this spatial point simultaneously, a kind of 'mean value' surely will be established, according to values and directions of rotation (left or right, above mentioned mirror image). The image rapidly becomes very complicated, but endures as an explanation for the principle of interaction between entities (and associated particles) quite descriptive as a comprehensible tool. - - -

Quite automatically, unspectacularly plausible, and here almost not worth to be mentioned in more than a subordinate sentence, our horn torus model implies a unification of all four modes of interaction - an unification of all four fundamental forces! The principle always is the same: unrolling, adjusting the horn torus size to the changing rotation and finally simultaneously (more precisely: after a Planck time) shifting the entire entity including all contained particles. The principle in all cases is identical, only the portion on the entity where the described mechanism takes place is different: gravity acts in the region of the large horn tori with many windings and no significant resonances, electromagnetism starts from the electron (resonance 1:2) and proceeds in both directions, to the large horn tori as a free 'spreading' photon, and between electron and first nucleon (proton, 2:1) as a reciprocating 'caged' photon, the strong interaction is confined to the region between the resonances 2:1 and 3:1, while the weak interaction reaches up to the resonance 4:1. Forces in regions of the entity with higher ratio (smaller horn tori) are possible but not known as additional sort of force yet. Due to the higher ratio (revolution >> rotation) there likely are less rotation induced effects (weaker than weak force).

The *cause* for locomotion of particles - in other words: force between particles - is now reduced to one single mechanism. Only the name for this unified force is different in distinct portions of an entity. Different values result from very different rotation speeds in the respective portions. Superpositions of Lissajous figures may matter additionally. So there is a wide field for further thoughts left, always aware that with the horn torus model we only use an artificially established analog representation of abstract mathematical manifolds. Only the latter, as basis, allow us to undertake universally valid calculations, which now may start: *mathematical elaboration is required from now on* .....

..... and here we leave the mere imagination, describable in common speech. *Here starts physics*. In accustomed manner, using sophisticatedly invented formulations of naturally *preexisting* mathematical rules. - Unfortunately these rules seem to be too 'simple' to match complexities of human perception and [thinking]: rules within - for humans - simply imaginable and more or less conceivable spaces with their simple linear coordinates require a complex language for description. Obviously one has to pay this price for comprehension, or - *my preference* - play a game with reverse relations: travel in a space spanned by very complex coordinates and you only have to deal with very simple rules - fundamental mathematical rules. They exist from the beginning of our universe, and generations of mathematicians and physicists have learned to handle them perfectly.

So, let's get started ......