Dimensional physics

Theory unifying general relativity with quantum field theories

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1 Introduction

Dimensional physics (DP) is a theory that unites general relativity (GR) with quantum field theory (QFT). The QFT results, via a common basis in spacetime, from the GR as a correspondence principle. This requires assumptions about the structure of spacetime. There are different spacetimes and each is continuous. The number of space dimensions separates them from each other. The "dimensional transition" creates the quantisation.

Any form of energy or mass is a spacetime density directly in spacetime. Gravity is a spacetime strain directly in spacetime. A density creates a stretch. Therefore, all "objects and forces" are changes in spacetime itself. There are no separate objects using spacetime as a "stage". Different spacetimes are not only a dynamic stage, they are the only actors. The various manifestations of the elementary particles of the Standard Model, are a combination of low-dimensional spacetime densities. The proposed solution in the DP is thus a geometric approach.

Motivation

A unification between QFT and GR has been sought for decades. There are various theories with different approaches. A verified solution does not yet exist. One of the best-known approaches is quantum gravity. This word hides a whole bouquet of different approaches. What they all have in common is that they try to quantise gravity and/or spacetime in some form. The solutions are worked out almost entirely in mathematical form.

In the DP, the search direction for the solution path is completely reversed. The GR is set as the basis and the QFT is built up via further assumptions. There must be a clear definition and logic for every object and every relation. Therefore, for every formula there must be a statement as to why it works exactly the way it does. The formula alone is not sufficient. A formula that gives correct results but no one can explain, according to the principle: "Shut up and calculate!", can be helpful, but is not the goal here. Since GR and QFT are well confirmed, both theories must work again as a result. This requires paradigm shifts in the consideration of physical objects. At the same time, these represent the idea behind the DP:

- Gravity is understood as a stretching of spacetime. Energy and matter as a density of spacetime. A density produces a stretching.
- The statements of GR and Special Relativity Theory (SR) must be regarded as absolutely real effects. These are not just a consideration of an observer.
- There are no separate objects in spacetime. All elementary particles and quantum fields of the Standard Model, as well as gravity, are direct changes in spacetime itself. Different spacetimes are not just a dynamic stage, they are the only actors.
- Spacetime has a structure with transitions into higher- and lower-dimensional spacetimes. The speed of light (SL) is the lower-dimensional boundary. The singularity in a black hole (BL) is the higher-dimensional boundary.
- Connections between spacetimes can only exist via the space dimensions. The time dimension cannot be transferred. This is always firmly bound to the respective spacetime. Each spacetime has its own time dimension.
- D From classical to relativistic physics, time has changed from an absolute to a dynamic time. In DP, the concept of time is weakened again. Time is a distance measure in each separate spacetime to the dimensional spacetime boundary.

- A term already "discarded" in modern physics is being used anew. Every form of "force", in the sense of classical mechanics (with gravitation), represents a change in the density of spacetime. This change can occur in two very different ways.
    - Exchange of low-dimensional expressions of the spacetime density as exchange particles (QFT)
    - Change of the spacetime metric in the same spacetime (GR)
- Since spacetime is continuous, the quantisation of all objects (excluding gravity) is done via a low-dimensional mapping of the spacetime density.
- Spacetime density = state of motion = energy. It is not an object that moves through spacetime. The spacetime density itself is the movement through spacetime.

The DP does not provide a "world formula". It is, on the basis of a few assumptions and a logical structure, a reason why GRT and QFT work exactly as they are described. Their descriptions are, despite a common basis, very different, because they act differently with the spacetime density in different dimensional spacetimes.

Predictions

Since QFT arises from GR and both theories work as usual, there is no deviating statement in the DP with the Standard Model. Due to the structure, certain boundary conditions can be set and some additional predictions can be made:

- The standard model is complete. No further elementary particles may be found. The possibilities of low-dimensional geometric mappings are exhausted with the Standard Model. This also applies to dark matter and dark energy.
- There are no magnetic monopoles.
- The Higgs boson has mass as its only property.
- Gravity in our spacetime cannot, from a mathematical point of view, be described by QFT. The search for quantum gravity remains unsuccessful.

The singularity in an SL is a higher-dimensional transition. This mechanism generates the rest mass for all elementary particles. The decisive factor is the mapping of the object in a lower-dimensional spacetime as a static and imprinted BL.

Abbreviations and notation

In the DP, only the spatial dimensions are counted. 3D is our spacetime. The reason for this is that in the DP every possible spacetime necessarily has its own time dimension. These only differ in the number of space dimensions. Therefore, the time dimension does not always have to be counted separately. By "low-dimensional" we mean all 1D and 2D universes (without the time dimension).

Abbreviations are introduced in the running text. These are listed again in the appendix.

2 Basic idea

To put the GR and the QFT on a common basis it is reasonable to take one of both theories as given and to generate the other one, in a correspondence principle. At present it is often assumed that the ART must be adapted to the QFT in the area of the Planck scale. The interaction of gravity is supposed to be done by quantized exchange particles and/or the spacetime itself is supposed to be quantized. QFT is confirmed to many decimal places and can be well studied in a laboratory (albeit very large). In addition, the GR contains an ununderstood singularity in all solutions. Therefore, QFT is a good choice as a starting point.

In the DP, an opposite starting point is chosen to solve the problem. The GR is considered as correct. The problems within the GR (e.g. the singularity) are solved by the common basis. The QFT is generated, without an adjustment, from few more assumptions. Therefore, a continuous spacetime is basically assumed in the DP. An initial assumption is made so that a clean starting point is given for the following considerations.

Assumption A-01: The ART is correct.

Approach in the DP

The field equation of Einstein must be assigned a clear definition of the terms. For the first approach the simplest form of the field equation is sufficient: $G_{\mu\nu} = k * T_{\mu\nu}$

The proportionality constant k does not play a role in this chapter yet and is treated separately in the chapter "spacetime structure". The Einstein tensor $G_{\mu\nu}$ and the energy-momentum tensor $T_{\mu\nu}$ are the decisive quantities here. In order to better understand the idea of spacetime density, the equation is rearranged. The Einstein tensor is simply brought to the other side. This transformation may be done with every equation. $0 = k * T_{\mu\nu} - G_{\mu\nu}$

As you can see from the equation, the terms must cancel each other out. The following picture is the first picture of a SL. That SL is in the core of the galaxy Messier 87, a "monster" of about 6.5 billion solar masses and a Schwarzschild radius (SSR) of about 20 billion kilometers. Gravity is no longer hindered by the other fundamental forces. According to the rearranged field equation, this SL, from the point of view of spacetime, is the desired state. Explicitly a zero.

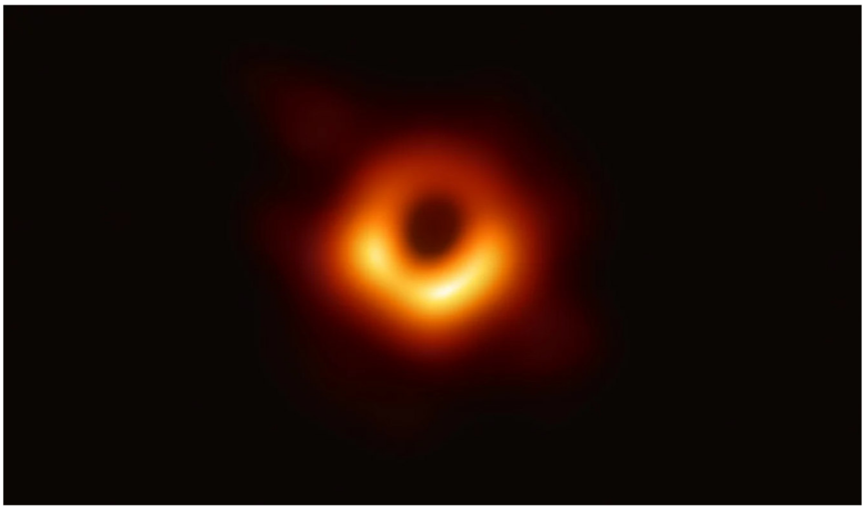


Figure 1:EHT collaboration M87

In the classical view for the field equation is:

- $G_{\mu\nu}$: A clearly localized and continuous geometrical expression of the spacetime as "space curvature". It requires only spacetime itself. No separate objects.
- $T_{\mu\nu}$: A collection of quantized energy and mass objects, with no clear localization for each individual object. All objects exist separately in spacetime, but are not themselves spacetime. Spacetime is the dynamic stage, but not the actor.

With the given interpretation, the two tensors are so different that an identity cannot be logically reconstructed. If the equation is correct (assumption A-01), the tensors must get a "better" meaning. Therefore, the DP makes the following approach:

- $G_{\mu\nu}$: Every gravity is a clearly localized, continuous and geometrical expression in the spacetime as spacetime extension. It needs only the spacetime itself.
- $T_{\mu\nu}$: Any form of energy and mass in the tensor (thus the whole tensor) is a clearly localized, continuous and geometrical expression in spacetime as spacetime density. It needs only the spacetime itself.
- A density in spacetime causes a stretching.

This interpretation is sufficient to generate all postulates and principles of GR. Therefore, this approach is formulated as an assumption in the DP. All further considerations are made on this basis.

Assumption A-02:

- Each mass-energy equivalent is a spacetime density.
- Gravity is a spacetime stretching.
- A density creates an stretching.

The interpretation as stretching and density follows from the assumption A-01. This results from the mathematical solution of the GR. The path element towards a mass becomes larger, therefore a stretching. The geometrical counterpart for it is a density. Therefore, a density and an stretching have been chosen in the consideration.

One can also explain it as follows. If a density is to be produced at a place, then the "material" must be drawn from the environment to the density, which corresponds to a stretching to the density. On the basis of these considerations it is correct that the gravity is directed to the mass. All masses attract each other, because the gravity is directed to the mass.

A stretching away from the mass, would distribute the density on the surrounding spacetime. By this stretching a "distributed density" would arise in the spacetime and there is no more mass accumulation. This does not correspond to the observed universe.

Since a stretch is formed from the totality of spacetime, it must affect the entire spacetime and must not have a limited range. The density must represent a local behavior. If the stretch is generated spherically in a radial direction towards a mass, the length/extension of the radius is longer (as seen from the outside) than is possible in the given volume. This "extension" of the radius must be accommodated in this volume. This is called the curvature of space.

In order to keep the text more understandable, only gravity is spoken of (if not necessary) and no more of a spacetime stretch or spacetime curvature.

Space density is energy and mass

The identity between spacetime density and a mass-energy-equivalent is already fixed in the assumption A-02. Here, this equality, by the simple results from the SR, is developed further. The length contraction and the increase of the energy up to infinity, if one wants to reach the SL, is sufficient. This combination can be represented by a spacetime density and explains the difference between energy and matter.

If an object with rest mass is to be brought up to the SL, one must spend more and more energy for the further acceleration. Theoretically up to infinity. The SL can therefore never be reached. If an object corresponds to a spacetime density, one can increase the density by "compressing" a space dimension more and more. Maximum up to zero. Then the object would have an infinite density. But an existing space dimension cannot simply disappear. Therefore this limit is not attainable. Thus the spacetime density can be equated with the energy. The length contraction from the SR is directly the increase of the density.

If an object possesses all 3 space dimensions in our spacetime, this object can never reach the SL. Therefore, an object with rest mass always occupies all space dimensions in our spacetime. The increase of the momentum is directly an increase of the spacetime density in a specific spacetime direction. As will be explained later in the chapter "Standard model", the rest mass is for all elementary particles, the difference in the number of space dimensions in the low-dimensional image. The more space dimensions are involved, the more difficult it is to change the space density. Since only the number enters here, the rest mass is always identical for every sort (geometrical picture) of elementary particles.

In the reverse conclusion, an object, which moves with SL, must have one space dimension less, otherwise the SL is not attainable. This object must then, without external influence/interaction, always move with the SL. The SL is the existence condition for the object, since a space dimension is missing. The absence of a space dimension is like a switch for the SL. With only two space dimensions always SL, from three space dimensions never SL.

As an example an electron and a photon. The photon occupies only two space dimensions in its geometrical image in our spacetime and always moves with SL. There is no acceleration on SL. The SL is, without another interaction, the only possible form of existence. The electron occupies in its geometrical mapping in our spacetime three space dimensions and can therefore never reach the SL. The momentum is a "directed spacetime density" and seems to increase the rest mass of an electron, because the density increases with the momentum. This difference, in the geometric mapping in our spacetime is, the distinction of energy and mass. Since both mappings are a form of spacetime density, they can be converted into each other via a interaction. Three important considerations follow from this:

- The length contraction from the SR is directly the increase of the spacetime density/energy of an object. This is absolutely real and not only an observation.
- If the length contraction from a motion represents a higher spacetime density and therefore a higher energy, then every object in our spacetime must have a state of motion. The spacetime density can be equated directly to a state of motion in our spacetime. The spacetime density itself represents motion. A completely resting object in a spacetime is not possible, because every object is an energy = spacetime density and therefore has a state of motion.

Mass-energy equivalent = spacetime density = state of motion

- In the spacetime, the spacetime does not move. The spacetime density or energy itself is the movement. Thus, a rest mass must possess some kind of "inner" motion. To the topic spin of an elementary particle at the chapter standard model more.

This is a different conception of energy, motion and spacetime than in all previous theories.

Density of the spacetime definition DRD

It is not possible to recognize a density of spacetime locally in the density itself. All objects in the spacetime are as density, a geometrical mapping in the spacetime. Since spacetime is the definition of geometry, no change in its own spacetime can be detected directly. With the density the definition of the spacetime changes and with it the geometry constant with. Locally, in any density, a meter always remains a meter. In fact, the density in an object corresponds to the "density of the definition of spacetime or a density of the metric". For this reason, in the DP, we do not simply choose the name spacetime density, but density of spacetime definition **(DRD).** The abbreviation DRD comes from the German as "**D**ichte der **R**aumzeit**d**efinition".

The definition of the recognizable geometry (metric) is always adapted to the density. The change of the geometrical basis is not detectable under any circumstances, locally in the density itself. With it all possibilities disappear to recognize this directly itself. This is an important aspect of the DRD. Thus the DRD can be determined only in the comparison with another DRD. Everybody can choose his DRD as zero point. From this the principle of relativity is derived. It does not have to be postulated. As a comparison value, for example, the energy is chosen. With an electron the rest mass is the zero point and the further changes of the DRD (other energies) come by the movement (momentum). With a photon the motion (SL) is the zero point and the frequency gives the change of the DRD. However, all indications always correspond to a DRD.

To keep the text more understandable, any mass-energy equivalent or object will be referred to only as DRD. A mass-energy equivalent could be called a positive DRD and gravity a negative DRD. To avoid confusion, gravity will continue to be referred to as gravitation rather than negative DRD. DRD is always only a higher density of the spacetime definition than the vacuum.

With gravitation almost the same statements are valid. Therefore, a free falling DRD in a gravitational field does not feel any force (change of the DRD). But there are two decisive differences:

- The gravity is directed to the mass possesses and from space time to space time a different value. The "pulling of the material" dilutes in the volume.
- The stretch must take place in a curvature of the spacetime. The "extension" of the way element must be taken up in the spacetime itself. This happens by the curvature of the spacetime in itself.

The energy represents the measure for the DRD. The curvature is the indication for the gravity. There is no need for additional new units.

Force as change of DRD and gravit

The old term "force" is dug out again and used in a new view. Everything recognizable in our spacetime is a DRD or a gravity. A change of the DRD or the gravity can be understood, completely in the sense of the classical mechanics, as a force. However, the change happens on two very different ways.

The first three basic forces: strong nuclear force, weak nuclear force and electromagnetic force, have in common that between the DRD directly an exchange of DRD takes place. This process is described by the QFT. The description of the exchange in quantized form is part of the chapter "Quanta and waves" and is not presented here further.

With the gravity the change is completely different. In a gravitational field, every DRD is from the own view, completely force-free. Gravity is not directly detectable locally for a DRD itself. One needs, as with the change of a DRD, an external feedback, in order to be able to recognize this. There are three possibilities for this:

- Something stands in the way of the DRD. On earth, this is taken over by the earth's surface.
- The gravity changes from space time to space time in the direction of mass. At a very strong gravity, like at a BH, this difference can become large. A structure of DRD (e.g. a human being) feels then a force, within its expansion, without a feedback from the outside.
- The recognition of the change of a movement by the spacetime curvature on a geodesic. For example, the gravitational lensing effect.

A DRD with a density into only one space dimension is a vectorial DRD and corresponds to an momentum. A rest mass with all space directions corresponds to a scalar DRD

Lagrangian formalism as compensation

In theoretical physics, many (almost all) equations and principles are derived via the Lagrangian formalism. Therefore, this formalism must be based on the principle of "density generates stretch" as well.

The simplest form is L = T - V. With L as effect, T as kinetic energy and V as potential energy. If we choose as an example for the kinetic energy the momentum of a DRD and for the potential energy the gravitational potential, we can see the balance directly. The effect L, is the balance between the kinetic energy "DRD" and a potential energy "gravitation" in our spacetime.

Better one sees the comparison with the Lagrange equation of the second kind. With

$\frac{d}{dt}\frac{\partial L}{\partial \dot{q}_i} - \frac{\partial L}{\partial q_i} = 0$ one can see that a variation in the system must always balance. The dynamics of a DRD always runs with the smallest possible variation of the DRD. A variation of it must run toward zero.

A DRD behaves in the dynamics in such a way that this is balanced as few as possible by a potential. Since everything consists of DRD, every object follows this logic. For the geodesic in gravitation the exact opposite results. Gravity wants to balance as much as only possible DRD by the geodesic. Therefore, the geodesic is always in the direction of the center of gravity.

In classical mechanics, the Lagrangian formalism produces the least action. In relativistic physics, this corresponds to the largest possible proper time for an object. In DP, for a DRD, this becomes the least change. For gravitation the greatest possible change.

3 Spacetime structure

Since in the DP everything consists directly of spacetime, it is useful to have a closer look at the structure of spacetime. In particular the natural constants c of SL and G of gravity are the central quantities here. A transition of different dimensional spacetimes is described. This is needed later for the QFT. For the investigation of the spacetime three aspects are considered: the dimensional boundaries, a smallest element and an absence of the spacetime.

There are innumerable treatises how big our universe can be and which borders it has. All these considerations have in common that these limits are defined by a concept of distance. This is the natural procedure for objects from the everyday life. For spacetime, this notion is not helpful. The spacetime defines the geometry with which one wants to describe the spacetime (distance). Outside of spacetime, no geometry is defined. Therefore, spacetime as a separate object is a structure that has no boundary in the sense of a distance to something else (embedded). That is why the number of spacetime dimensions is used as a boundary of spacetime. The following cases are considered as dimensional boundaries. Our 3D spacetime with one spacedimension less and one spacedimension more.

Speed of light c

If a DRD has the state of motion of the SL, then a space dimension **and** the time dimension are missing. According to the SR both dimensions are explicitly zero. From the point of view of the DP, one can use the result as a definition. The SL is exactly the state of motion where the mapping of the DRD has only two space dimensions. Thus, the natural constant c represents the low-dimensional limit in our spacetime. It becomes clear why the sL is this extreme limit for any DRD in spacetime. All DRDs are spacetime and this has a boundary at the SL itself.

If a space dimension is missing, then also the time dimension must be gone. Our spacetime has one spacedimension less at the SL. If the time is bound to the space, then this must become zero together with the space dimension. To have one spacetime dimension less and the identical time dimension as the spacetime in which the spacetime dimension was taken away is not possible. A photon, which moves with SL, cannot recognize the 3D-space and the time in our spacetime. A photon has not disappeared from our spacetime. Thus, SL represents the lowest limit at which one can still perceive a DRD. It follows that there can be no transition from 3D directly to 1D.

The state of motion of the SL is the low dimensional boundary

For the low-dimensional limit, c is the appropriate natural constant. This can be given as a equation in two different notations.

About the Planck length and Planck time: $c = \frac{l_P}{t_P}$ withl_P as Planck length and t_P as Planck time. Since the denominator and numerator of the fraction can have an arbitrary combination to represent c, there must be at least one more condition for the Planck sizes. The fraction says that you cannot get a certain length of space dimension closer to the dimensional limit (time). In other words, where there is a length, there must always be a minimum amount of time. From this follows that the length and time of zero within the spacetime do not make sense. There must be a transition in a low-dimensional spacetime.

About the natural constant of the electromagnetic intgeraction: $c^2 = \frac{1}{\epsilon_0 * \mu_0}$ with ϵ_0 as electric field constant and μ_0 as magnetic field constant. These values seem to have nothing to do with the first formula. By the dimensional transition one can already recognize that these nature constants are bound to a low-dimensional expression. For a representation of 2D in 3D, however, a basic quantity of space and time is needed. This is given by c. More about the electromagnetic intgeraction in the chapter Standard model.

Gravitational constant G

If there is a lower-dimensional limit, then there must be also a higher-dimensional limit. With the length contraction to zero by the SL, one has used an extreme event in the spacetime for the low-dimensional boundary. For the higher-dimensional limit, the only other extreme event in the spacetime is used, the singularity from the GR.

Explicitly not the event horizon (EH) of a BH. This does not represent a special boundary in the DP. The EH is explained in the following chapter "GR with DRD".

For the singularity one can choose two different views. The mathematical and the physical view.

- Mathematically: From a purely mathematical point of view, a spacetime can be stretched to infinity. The singularity can be described as follows. On a volume of zero (r = 0), an infinite curvature of space is contained. This point acquires a new spatial dimension due to the curvature. Since the dilation is infinite, there is actually no spacetime contained. This is a very good description for the transition into a higher-dimensional spacetime. From the higher-dimensional point of view, all the properties of lower-dimensional spacetime, in a volume of zero, are contained. From a physical point of view, the spacetime region with r = 0 cannot be reached by gravity in its own spacetime.
- Physical: A mathematical singularity cannot arise. This has the following reasons:
    - An BH does not receive an infinite amount of DRD. Since gravity is generated by DRD, it is never infinite.
    - According to the low-dimensional limit, there cannot be a point with zero extension in all space dimensions, otherwise this point in space and thus the singularity would no longer exist in spacetime. The gravitational effect would have to disappear in the singularity. However, gravity keeps adding up and does not decrease. The DRD is not cancelled out by gravity. Gravity is generated by the DRD.
    - The DRD is a density and thus always requires a volume. Gravity can only create strain up to the boundary of the DRD. Not within the DRD. Thus gravity cannot reach the point r = 0. If gravity were within the DRD, it would have to cancel out the DRD. Again: Gravity in an SL does not disappear.
    - Since the DRD is a density, it can overlap in the core of an SL in the same volume (more on this later). There is no "space problem" there. Any amount of DRD fits in the centre of an SL.

In contrast to SL, one loses nothing here and one remains in one's own spacetime. The time dimension does not have to become zero locally. Even if no mathematical singularity is physically reached, this singularity represents a limit. To avoid confusion, the term singularity is still used for the centre of an BH.

The singularity in the BH is the higher-dimensional boundary

This higher-dimensional limit, like the lower-dimensional limit, is assigned a natural constant: G is the gravitational constant. As with c, a statement must also be made with G about the sizes of spacetime. G must describe how a spacetime behaves when a DRD is present. It is best to start with the textbook definition of G.

$G = \frac{{l_P}^2 * c^3}{h}$ This form is not suitable for consideration within the DP. All values of the Planck scale are not considered reduced in the DP.

We rearrange the equation. A Planck time is extracted from the h and united with a Planck length from the numerator to form a c.

$$G = \frac{{l_P}^2 * c^3}{h} \Leftrightarrow \frac{l_P * l_P * c^3}{E * t_P} \Leftrightarrow \frac{l_P}{E} * c^4$$

From this conversion, 3 versions are generated, which in principle all make the same statement:

Version 1: $\frac{l_P}{E} * c^4$

G now consists of 2 terms.

- c^4 : Since we want to describe G in a spacetime with 3 spacetime dimensions and 1 time dimension, we need the low-dimensional boundary exactly 4 times.
- $\frac{l_P}{E}$: This term indicates what happens to a length in which a DRD (energy) lies. We call this term the "dimensional constant (DC)". This will be expanded again later. This DC is the actual counterpart to c. The energy corresponds to the energy content of a Planck mass. If we put the DRD of a Planck mass on a Planck length, we get an BH and thus a singularity. Since we have defined the force as a change in a DRD, it is clear that a reciprocal force must appear as a counterpart in gravity. The DC is the reciprocal Planck force.

G describes exactly, the behaviour of spacetime between the two boundaries.

Version 2: $\frac{l_P}{m_P} * c^2$

Here, the same facts are described only with mass instead of energy. Since a mass is a low-dimensional image, c may only be counted for the two spacetime dimensions with which our spacetime is then connected. Explanation of the dimensional transition comes later in this chapter.

Version 3: $\frac{l_P}{m_P} * \frac{1}{\mu_0 * \epsilon_0}$

As has been established with the natural constant c, one can also write a c^2 in this form. The second term is a kind of "spacetime resistance from low-dimensional spacetimes". More on this later with the electromagnetic intgeraction.

Now one can investigate the proportionality constant k in the field equation with the DC.

$k = \frac{8 * \pi * G}{c^4} \Leftrightarrow \frac{8 * \pi * \frac{l_P}{E} * c^4}{c^4} \Leftrightarrow 8 * \pi * \frac{l_P}{E}$ The value is $8 * \pi * 8{,}267 * 10^{-45} \left[\frac{1}{N}\right]$.

The DC is sufficient for the field equation. The tensors (unlike G) are already designed for 3D spacetime and do not need any more additional c. The DC is a resistance of spacetime against a stretching. A DRD produces only a very small gravitation. As will be shown later, this has to do with the fact that a DRD is always a low-dimensional image. 2D is almost unrecognisable in 3D.

No quantisation in 3D

In the previous view of spacetime, there is no form of quantisation. This applies to spacetime itself and to gravity as well as to DRD.

DC is a reduction of change, but it is not a quantisation. In spacetime there is no reason for quantisation. Spacetime and all the mappings in it are continuous.

Why we observe quantisation in DRD is described in the chapter "Quanta and Waves".

Transition between 3D and 2D

For the QFT, a transition from 3D to 2D is still needed. The boundary itself has already been described. For this boundary, an important question remains open: What can be transferred across this boundary? To anticipate, virtually nothing. Let's take a closer look at the facts.

An object in a 2D spacetime has no volume and no surface in a 3D spacetime and thus no extension. In 3D, mathematical properties such as length, width or area can be attributed to a 2D object. Without an extension in its own spacetime, no geometric property can be determined. Properties of lower-dimensional objects in spacetime can thus not be transferred across this boundary. This is generally true for all geometric quantities. All objects are a DRD and a DRD is a density. A density requires volume.

The transition can only be made from properties that are directly contained in the spatial dimensions. These spatial dimensions must be identical. Only an extrinsic and/or an intrinsic space curvature or a DRD can be considered. Then these properties can be determined via the identity of the space dimensions. This also means that a 3D DRD must influence a 2D spacetime and vice versa.

To go from 3D to 2D, one spatial dimension must be set to zero. This does **not** happen in the first example as in all physics textbooks, please. To simplify the example (which is correct) only one space dimension is considered and the rest is set to zero. As described in the DP, there is only one possibility to physically set a space dimension to zero, the SL. This means, however, that the time dimension is also always zero. Time is bound to the given space.

As a result, the intersection of a 3D spacetime and a 2D spacetime consists of only two spatial dimensions. Time is unique in each spacetime and cannot be transferred.

Since the space dimension in only one direction can be set to zero by the LG, there cannot be a "true zero of all space dimensions" in a spacetime. The geometric quantity zero in a spacetime on more than one spacetime dimension is excluded, there can only be the SL as a low-dimensional limit.

If a 3D DRD has a connection to a 2D spacetime, via the spacetime dimensions, then this 2D spacetime must also have a DRD with identical extension. This DRD, and thus the extension, only comes via the connection and is not itself a property that is generated in 2D. All properties are "imposed" from 3D to 2D. All additional properties through the 2D-DRD mappings must be in the range of the 3D-DRD, but have no extension themselves. The view that an elementary particle has an extension (in 3D), but the properties are point-like, sounds strange at first, but is completely correct.

Time as distance to the lower dimensional boundary

From these considerations, one can derive a different interpretation for time. In the DP, time is seen as a distance measure to the dimensional limit. If one approaches the dimensional limit, time passes more and more slowly. If one moves away from this boundary, time passes faster. You do not leave spacetime. Therefore, time continues to pass in an BH until the singularity. Since in our universe every object consists of DRD and DRD directly represents a state of motion, time passes for every object unless it moves with the SL.

A direction of the state of motion plays no role in this consideration, since the dimensional limit is the same for all points in space from any direction.

Time changes from classical physics to relativistic physics. From a rigid entity to a dynamic entity that forms a unit with space. In almost all considerations, however, time is still a global time for all dimensional considerations. In DP, every possible spacetime is now assigned its own time. Only space dimensions can connect across the dimensional boundary. Time is completely separated in different spacetimes.

If a DRD exists in a spacetime, then it is directly on the boundary and no time can be determined or it is between the boundaries and thus always has a distance to the boundary. Therefore, a DRD with rest mass always has time. If a DRD were to interact with "nothing", then time as such would exist, but no time flow would be detected. Since DRD is constantly interacting (in the end only with the vacuum) the flow of time for a DRD between the boundaries is always present. The time flow is thus simply the sequence of the change of DRD through interactions. Therefore, in the mathematical description, this can go into the future and into the past. A change can also be calculated backwards. The change itself is the flow of time and thus not reversible for us.

The dynamics of time from spatial point in time to spatial point in time cannot be determined locally for a DRD and is therefore always the same. We cannot determine any difference in distance. This is only possible in a comparison with another DRD.

Vacuum energy

In the DP it has been established that the DRD is an identity to the energy. The density itself cannot fall to zero, otherwise there is no more spacetime at this point and the spacetime under consideration does not exist. Thus, based on the definition of DRD, an energy of zero at any point in spacetime is ruled out. Where there is spacetime, there is also energy. From the considerations of the spacetime boundary, a DRD with a volume of zero can also be excluded. Thus, in spacetime, the existence of any spacetime within a volume is always given.

Information and spacetime

For an understanding of QFT, one property of information is still missing. This is always bound to the spacetime in which the information is present.

A property of a single object is not yet information. No statement can be made about the property. Only when this property is known at at least one other point in spacetime has information come into being. Information refers to the knowledge of at least one property at a different point in spacetime than the object itself. This means that information is always bound to a distance in spacetime and is therefore a 3D object.

Information occupies spacetime

It follows that in the case of an interaction of many objects, information is formed in spacetime about the object as a whole. The individual object is only partially determined by this information. The existence of information is thus not necessarily binary. A piece of information can become more and more "anchored" in spacetime via many DRDs with interactions.

The connection of the information with spacetime is later in QFT the main reason why no information can be transferred in the case of entanglement. Also the double-slit experiment with the path information, especially in the "delay choice" variant, becomes relatively simple with the different time in the spacetimes and the information with spacetime.

4 GR with DRD

In this chapter, all postulates and principles of the GR will be considered with the view of the DP. It will turn out that all postulates and principles of GR can be generated by assumption A-02 (density generates strain). With assumption A-01 (GR correct), this chapter represents a ring closure. One can see that assumption A-01 can actually be formed from assumption A-02 and with the present knowledge is no longer a real assumption.

Postulate of the Principle of Relativity

The central aspect in DRD is that it is locally undetectable. The DRD adjusts the basis of all geometric objects. All objects are geometric images in spacetime. This means that no change can be detected locally. A metre always remains a metre. The DRD is at the same time the state of motion of the object. No change in geometry can be detected in any state of motion. This means that the state of motion cannot be determined locally on its own. Only in a comparison with another DRD can the state of motion be determined. This results in the principle of relativity for absolutely every DRD of spacetime.

Principle of contant proper time

From a local point of view, an object does not come closer to the dimensional limit. A metre remains a metre. Therefore, locally the course of time must not change. The result is the constancy of proper time. Only an external observer can detect a change in the course of time.

Postulate of maximum and constant SL

The LG is the low-dimensional limit in the DP. This is identical for every point in spacetime. Since no approximation to this limit can be determined locally, the SL must always be the same for all objects at every point in time. Since the state of motion is associated with a length contraction, this can only happen up to the length contraction to zero. It follows that there must be a maximum state of motion and that this always has the same value, the constancy of the SL.

Postulate of the strong equivalence principle

The DRD is locally limited. It begins at zero and ends at zero (vacuum energy). Gravity is directed towards the DRD and has a different value from spacetime to spacetime. Precisely because spacetime is continuous, a difference can always be detected from the beginning to the end of a DRD. Thus gravity continuously changes the DRD. A continuous change in the DRD is a continuous force and is thus an acceleration of the DRD. Gravity and acceleration are identical effects on a DRD. In the case of classical acceleration, this is done by an exchange of DRD and in the case of gravitation by changing the spacetime definition. Both change the DRD. In a gravitational field, this only happens continuously in the direction of mass. In a gravitational field, a DRD feels completely force-free because the change in DRD happens through the spacetime definition. Without an external feedback (for us humans, the ground), this change cannot be detected. This is followed by the postulate of the strong equivalence principle and the freedom from forces of a freely falling object in gravity.

Relativistic mass increase

The faster a DRD with rest mass becomes, the "heavier" it must become. The SL must not be reached due to an infinitely high energy. In the DP, the rest mass represents the number of space dimensions with at least one BH that is distributed over these space dimensions. Therefore, with a higher rest mass, it is more difficult to change the DRD (acceleration).

An existing density is increasingly difficult to compress further. Since it becomes increasingly difficult to increase the density for each "portion" of DRD, the mass must increase for an observer. As a result of the fact that the space dimensions involved become more and more dense, the mass seems to become more and more. The same momentum has a much greater change with a low DRD than with a very high DRD. Since the DRD adds up everything, the ratio of the change in a DRD for the same momentum becomes smaller and smaller.

The increase in energy is absolutely real. For the observer, this means an ever greater mass. Locally, the change is again not recognisable.

Mass-energy equivalence

In the DP, all objects are a DRD. No matter whether it is a rest mass or an energy. Only the number of spatial dimensions involved is different. Through a interaction between DRDs, a DRD can change the geometry in the low-dimensional expression. Therefore, energy and mass can be transformed into each other. Energy or mass can generally transform into all permitted expressions. The principle of equivalence of energy and mass follows.

Length contraction and time dilation

Length contraction and time dilation are the actual reasons why the density approach was chosen. These correspond 1:1 to the density in the DRD. These points are not explained again here.

Hierarchy problem

When comparing the forces, gravity is very small. This is seen as a problem. The DP does not change this either. But there is a reason why gravity as a "force" is so small compared to the other forces. The other forces are an exchange of DRD as expressions in 2D. Geometric expressions in 2D cannot make a big change in 3D.

It is easier if you see it from the 2D point of view. Changing DRD in 2D is much easier than in 3D. It is easier to change a surface than a volume. Any higher dimensional transition is a big hurdle for changing the DRD. The difference is the DC. Actually, it is not gravity that is so weak, but the expression as 2D DRD has almost no content in 3D. A surface does not impress a volume.

Black hole BH

Since gravity is generated from the DRD and there cannot be an infinite DRD, it follows that there is no mathematical singularity in an BH. The dilation must not be made to $r = 0$, otherwise this lies within the DRD and the mass would disappear. The generation of gravity from DRD must be extended for each piece of DRD. Therefore, an BH grows proportionally to the mass.

Since spacetime can theoretically be stretched to infinity, but the DRD can only be compressed to a certain point, this necessarily results in an EH. It is easy to be tempted to equate the EH with the low-dimensional limit and to assume that spacetime ends there. Here a clear no.

The EH is a point at which the change in a DRD due to gravity corresponds to the change in the DRD up to the SL and thus has no particularity locally. For an external observer, a photon must move as a DRD through a stretched spacetime and will thus contain less and less density. From the EH, the SL is no longer sufficient to escape from this stretched spacetime. The photon is locally unaware of the change in the spacetime definition. If the BH is large enough, such as the BH in M87, no force can be detected locally at the EH.

Within an BH, the metric used results in a mathematical and physical change. A simple example is the Schwarzschild metric. The signature of the metric changes from (+1, -1, -1, -1) to (-1, +1, -1, -1). The current thinking on this is that the time component and the radial space component swap character. Time becomes space and vice versa. From the DP's point of view, this is nonsense. Time remains time and space remains space. What really happens is that the spacetime boundaries in the components change.

- Time component: Outside the BH, there is only a low-dimensional boundary for time. Therefore, the signature is +1. Inside the BH, the low-dimensional boundary is still preserved locally. The event horizon now forms a new additional boundary for time. One would have to slow down to reach it. This is exactly the opposite direction. This additional boundary only exists inside the BH. Outside the BH, the boundary of the event horizon is identical to the lower-dimensional boundary for an observer. Inside the BH, these boundaries are no longer the same. The signature must change.
- Radial space component: Outside the BH, one can move towards or away from the singularity. Inside the BH, the movement in space, even with the SL, is always towards the singularity. The space component loses a possibility of movement. The singularity must change.

From the DP point of view, the information paradox does not exist in BH. All information is connected to spacetime. This does not end in the BH. The information is preserved in the BH. Every piece of information continues to exist in spacetime. The information lies behind the EH, but this is still in spacetime. The information is only no longer accessible to humans. This does not matter for spacetime. There is no problem for spacetime itself.

The GR establishes its failure in a singularity as mandatory. In addition, the GR necessarily creates singularities in the big bang or in an BH. Therefore, the GR is always chalked up to being wrong by itself. From the point of view of the DP, it is exactly the other way round. The GR is a description of 3D spacetime. Thus, it must also describe the limits of spacetime, singularity and SL. The GR defines its own range for validity. If this is left, this 3D description must no longer function. A singularity is a 4D spacetime. The GR does everything right and fails in a singularity. With the spacetime structure from the DP, this behaviour is the only correct one. This again points to a confirmation of the GR.

Summary on GR

Before dealing with QFT in the next chapter, the most important consequences that force a "rethinking" are listed again.

Spacetime is the dynamic stage and the only actor. In DP, in the classical sense, there are no separate objects in spacetime. There are only changes in spacetime itself. This corresponds to the view in QFT. All elementary particles are excitations from various fields. In DP, these excitations are density and expansion. The fields are the different dimensional spacetimes and the intersections of them.

Density generates strain. The field equation describes the identity of the local density and the global strain in spacetime.

DRD = energy = state of motion. Every object/energy/mass in the DP is a DRD and thus has a state of motion in spacetime by virtue of its existence. The DRD itself is the state of motion, therefore there is no additional "density function" moving through spacetime.

The SL is the lower dimensional limit and a singularity is the higher dimensional limit. All observations and the range of existence of our spacetime must lie between these two limits.

There are separate lower dimensional spacetimes, each with its own time dimension. If one loses a space dimension through the SL, one necessarily loses the time dimension with it. You cannot gain or lose a space dimension within the same geometric expression. An expression always has a fixed number of spatial dimensions. Therefore, the difference between energy and matter is given. The expression itself must change in an interaction.

Information occupies spacetime. A piece of information is always bound to the spacetime in which it arose.

5 Waves and quanta

It is described how a quantisation and a wave description arise. The dimensional transition is needed for this. The "oddities" in QFT almost all come from the dimensional transition without time. For a first approach, start at a different place and extend DC. The gravitational constant G is to be built up more generally in the formula with the DC. This then results in a connection that generates the dimensional transition.

Dimensional constant (DC) complete

The DC describes quite generally the possible change/resistance within spacetime. Therefore, it must also provide a description for DRDs that do not correspond to the Planck mass. In the previous chapter, the DC in G is derived from the description $G = \frac{l_P}{E} * c^4$. Here E stands for the energy of the Planck mass. Our universe is filled with DRD, which has much lower energies. Therefore, the term of the DC must be extended by a correction. A term is needed that has no effect with the Planck mass.

First, the definition of the Compton wavelength is expressed differently. As with G, we rearrange the formula until a clear statement is included. We start again with the textbook definition. It decomposes h into energy times Planck time. The energy becomes Planck mass times the square of the SL. One SL cuts out. The remaining SL is decomposed into Planck length by Planck time.

$$\lambda_C = \frac{h}{m_C * c} \Leftrightarrow \frac{m_P * c^2 * t_P}{m_C * c} \Leftrightarrow \frac{m_P * c * t_P}{m_C} \Leftrightarrow \frac{m_P * l_P * t_P}{m_C * t_P} \Leftrightarrow \frac{m_P}{m_C} * l_P$$

$$m_C * \lambda_C = m_P * l_P$$

The Compton wavelength is simply the Planck length multiplied by a mass ratio. The Compton wavelength must be directly related to the Planck length.

The relationship found is inserted into the modified formula for G. Here, the energy of the Planck mass is replaced by $m_P * c^2$. Then the Planck mass by the expression just found.

$$G = \frac{l_P}{c^2 * m_C} * \frac{l_P}{\lambda_c} * c^4 \Leftrightarrow \frac{l_P}{m_C} * \frac{l_P}{\lambda_C} * c^2$$

Now any DRD can be specified for the mass. The Compton wavelength corresponding to the mass must be used. In the case of the Planck mass, this is the Planck length. Thus the second term has no effect. The DC indicates that a wavelength is required for all masses that do not lead to an BH. This wavelength corresponds directly to the Planck length and the mass itself. The smaller the mass, the larger the wavelength. This is the first indication that a wave representation is absolutely necessary.

Does the DC also result in quantisation? Explicitly no! To show this, G is used in the given form in the calculation for an SSR. M must be equated with m_C.

$$r_S = \frac{2 * M * G}{c^2} \Leftrightarrow \frac{2 * M}{c^2} * \frac{l_P}{c^2 * m_C} * \frac{l_P}{\lambda_c} * c^4 \Leftrightarrow \frac{2 * {l_P}^2}{\lambda_c}$$

$\boldsymbol{r_S = \frac{2 * {l_P}^2}{\lambda_C}}$ **This little formula is important for the DP!**

Three important statements emerge

- In the formula : $r_S = \frac{2 * l_P{}^2}{\lambda}$, the wavelength λ is replaced by the wavelength for an BH, the Planck length. Then this gives $r_S = 2 * \ l_P$. The smallest possible BH that forms in our spacetime has an SSR of at least two Planck lengths.
- Solved for the Planck length, $l_P = \sqrt{\frac{r_S * \lambda}{2}}$ results. Since the Planck length is a constant, neither the SSR (from GR) nor the Compton wavelength (from QFT) can become zero or infinite. There is no quantisation for either quantity. Via the Planck length, one obtains a correlation for the representation of a DRD and gravity. Thus gravity and DRD in their different representations are mutually bound to this limit.
- $r_S = 2 * \ l_P$ is the smallest possible BH in 3D. For the rest mass of an electron, with the appropriate Compton wavelength, this results in an SSR of about 10^{-57} metres. **This SSR cannot have formed in 3D.** This is true for all Standard Model objects. If the equation is correct and there is an SSR for every Compton wavelength, then this SSR must have formed in a spacetime that has a different Planck scale. The hierarchy problem is the solution here. A spacetime is needed where an SSR can form with a smaller DRD at a longer length. A 2D spacetime. A 2D spacetime as a surface is much easier to change (DC) than a 3D spacetime with volume.Der SSR aus der ART und die Compton-Wellenlänge aus der QFT können gegenseitig ausgetauscht werden. Beide Werte sind nicht quantisiert. Die Compton-Wellenlänge ersetzt die Masse und die Gravitationskonstante gemeinsam für die Berechnung des SSR. Daraus kann man folgern, dass die Compton-Wellenlänge direkt die Veränderung der Raumzeit durch die DRD als Wellendarstellung angibt.

Low-dimensional representation of the DRD

The DRD in 3D does not have a specific geometric shape. This is simply a density. Even if it had a shape, we would not be able to recognise it. A metre remains a metre. This is true not only for the length, but also for the geometric shape. Here, the last assumption must now be made so that anything at all can be recognised.

Assumption A-03: There are infinitely many separate low-dimensional spacetimes.

Our spacetime was created by a big bang. Why then not other spacetimes with different numbers of space dimensions? The Copernican principle is generally applied to spacetime. Our spacetime is therefore not special. An infinite number of lower-dimensional spacetimes fit into our spacetime. The concept of quantising spacetime is applied here, in a completely different form, as the concept of separating spacetime. Not to the content of a spacetime, but to the spacetimes as individual objects. Each spacetime is a separate object in itself.

Thus, within a DRD there is an infinite set of low-dimensional spacetimes. As stated in the chapter on spacetime structure, these can be connected to each other via the spacetime dimensions. It follows necessarily from this that the lower-dimensional spacetimes must react to the change in the spacetime definition. There are basically two different ways in which these low-dimensional spacetimes can react to the DRD, with and without rest mass.

Wave representation without rest mass

As an example from the Standard Model, we use the photon here. It is the simplest particle for this representation in the DP. The DRD in 3D can simply be imagined geometrically as a sphere (volume) in which the spacetime has a definition that corresponds to a higher density. Let us stay with one metre. The sphere has a diameter of one metre. Since the density is higher, we assume that the diameter contains a total length of two metres. If a 2D spacetime now lies in these volumes, it must accommodate two metres in a length of one metre without having its own DRD in 2D. The 2D spacetime will form a transverse wave. Longitudinal is not possible, as this would again represent a DRD in 2D spacetime.

Several properties are discussed, which then also apply to a wave representation with rest mass. There is only the difference for a wave representation with rest mass. This wave must now have the following properties:

- Boundary in the volume: Since the DRD has an expansion, the 2D wave must also have a boundary from which it is flat again. Another point is added to the "boundary".
- Extrinsic and intrinsic: For an extrinsic wave to become flat again at the boundary, there must always be an intrinsic component. The proportion from extrinsic to intrinsic is directly connected. This intrinsic part is a 2D gravity and the fluctuation is a fluctuation of the electric field. In the Standard Model, an electric field is shown to be nothing more than a 2D gravity imposed by 3D.
- \- Equalisation: The wave representation equalises itself directly in 2D spacetime. This has two effects:
    - The photon is not a source for the electric field (2D gravity). It is only a fluctuation. This fluctuation of 2D gravity has nothing to do with a gravitational wave in 3D.
    - The wave is complete. There is always a wave-valley for a wave-mountain. The geometric representation in 2D is balanced in total. This property is later called spin. This is not only about the intrinsic part, but about the general interpretation of the wave from the plane.
- Static: The wave has an intrinsic component that can be directly regarded as gravity. According to GR, gravity in 2D has too few degrees of freedom for it to change. This again has two effects:
    - The curvature of space in 2D cannot form on its own. It must always be "imposed" on 2D from 3D.
    - The curvature of space is static because it cannot change. This means that the extrinsic as well as the intrinsic part of the space curvature is static. An expression in 2D remains as it was created. This applies to all expressions. This absence of the degree of freedom is identical to the conservation of energy. No change in time for any geometric expression. Only one transformation is possible. Then the geometric structure must dissolve and be redesigned. In this process, the 3D-DRD serves as a collection pot for all expressions. The view of QFT that the objects destroy and reform during an interactions is absolutely correct.
- Energy level: The 2D spacetime does not have to fully intersect the sphere of the DRD in 3D. It could also lie only partially in the volume of the DRD. Then a smaller wave must form in its expansion and amplitude. The proportion of DRD on the 2D spacetime is smaller. Thus a DRD, as a geometric manifestation in a 2D wave, has the possibility of possessing the entire energy spectrum.
- Possibilities: As can already be seen with the energy level, there are infinite possibilities in size and energy for the representation of the 2D wave. The 2D wave also has the possibility

to appear in the entire volume of the DRD. All 2D possibilities can be pronounced at the same time. In 2D, the time from 3D does not exist. Thus there is no temporal overlap for the representations. Only with interaction would the DRD have infinite energy due to the 2D expressions. This describes the renormalisation in QFT. The mathematical infinity for all interactions at the same time is in fact not relevant. Only one interaction combines the 2D possibility in time with the 3D DRD. This part is then the observation. However, all possibilities in 2D can influence each other as a sum in 3D. These are all actually present.

  - o The DRD specifies the total amount of energy for the possibilities. These possibilities are all in 2D. The possibilities (virtual particles) have no effect on gravity in 3D, only the DRD in 3D itself has that.
  - o The path from the possibilities to the single expression is described in the section "Superposition, probability and collapse".

- Limitation in spacetime: According to QFT, a wave may occur in the entire universe and not only in the volume of the DRD. This is absolutely correct. Since the DRD is a density of spacetime itself and there cannot be a spacetime with zero energy, the wave has the possibility of using all of spacetime as its location. A DRD has no boundary with an absolute zero energy except the boundary of spacetime itself. Therefore, the entire spacetime is allowed, not just the volume of the DRD. The probability of an interaction outside the 3D DRD volume is just very small. Thus, the 2D DRD theoretically has the entire spacetime available, even if the DRD is clearly localised for gravity in 3D. The question of how the spatially not 100% determined behaviour and gravity fit together is thus solved. The problem does not exist in the DP.
- Wavelength for the energy: The wavelength is sufficient to describe the energy content of a DRD. This was also used for the DC. Why not the amplitude? A wavelength always indicates the energy in a DRD. If you increase the amplitude, the volume automatically increases. This does not result in higher energy. If the energy content of a DRD is to be compared, the volume must be kept constant. Then the amount of 2D spacetime, of a wave in the volume, is only determined by the wavelength. More spacetime in a volume is a higher DRD.
- Amplitude for probability: If one wants to generate a WW in the volume of a DRD, one must actually (physically) meet an expression of the possibilities. Since 2D always meets 2D, it is not the volume but the area that is decisive. The 2D plane from which the amplitude emerges is irrelevant. Only the deflection of the wave is the expression of the DRD and is relevant. The deflection of the wave can always be understood geometrically as a circle. The area of the circle is $\pi * r^2$for every wave. The circle number π is the same for all possible manifestations. Only the radius differs. Therefore, the square of the amplitude is the only important quantity for the "hit probability". Since they are waves (mountain and valley), the wave with the largest area is not always hit. Even waves with a small amplitude can be hit.

Since there are only the photon and the gluon without mass in the standard model, here is a short advance on the standard model. With the gluon, the interpretation of a wave lies on 2 different 2D spacetimes. It has the spin 1, since everything balances out across the 2D spacetimes from a 3D point of view. But at the same time it is the carrier of the charge, since only a part of the wave lies in the respective 2D spacetime. Thus a gluon always has a positive and a negative charge. Although it has no rest mass, its range is very small. The wave lies on two different planes and has no clear direction for the momentum. A gluon cannot get out of the superposition of the DRD, which creates the quarks in the atomic nucleus.

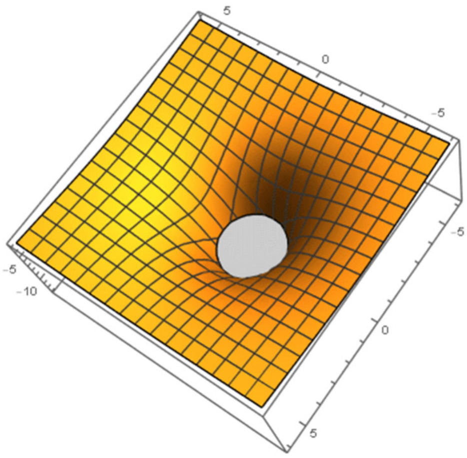
Wave representation with rest mass

The second way in which a DRD is transferred to 2D is that a DRD is directly imposed in 2D spacetime. In this illustration, one must be careful with which values are calculated. The Planck scale in 2D is a different one. Until now, the DC was designed for our 3D spacetime. In 2D, these values must be different. Because of the hierarchy problem, it is clear that a 2D spacetime can be compressed or stretched much more easily than a 3D spacetime. For a greater length, a smaller energy must trigger the higher-dimensional transition. In 2D, a very small mass creates a BH with large SSR (relative to the Planck scale in 3D).

Across the dimensional limit, only the SL and the Compton wavelength remain as quantities. The SL is defined by the compression of a single spatial dimension. This is identical in 3D to 2D. The Compton wavelength comes from the connection of the spatial dimensions and must have the same length. All other dimensions are different. Therefore, one cannot simply "calculate into" from 3D to 2D.

Once you have the DRD of the rest mass of an electron, it is sufficient to create an BH in 2D. The mass in 3D is not the same mass from itself in 2D, because the number of spatial dimensions involved in the mass is different. According to GR, this BH cannot form in 2D by a pure intrinsic mapping. An extrinsic mapping is needed again. In 3D, nothing else could be determined in the volume of the DRD. The BH gives the 2D image a higher-dimensional transition and occupies all spatial dimensions again in 3D. The trick is that a 2D image occupies all spatial dimensions in 3D through the singularity in a BH and thus has a rest mass.

However, the illustration is not a full wave. This corresponds to the given image. This is often used to explain gravity in 3D. There the picture is wrong. It explicitly shows a mixture of extrinsic and space curvature. Wrong in 3D, exactly right in 2D intrinsic.



It is only half a wave from the point of view of a wave representation. Therefore, the spin is only ½ for this mapping. Since the mapping does not balance in 2D, the volume of space is "occupied". No two equal mappings of this type can be placed in the same volume of space. The BH creates a constant gravitational field in 2D. Therefore, an electron has an electric field and is the source of the field. More detailed explanation at the Standard Model.

Quantisation

Quantisation generally has two characteristics. One is that energies actually only exist in certain levels and another is that the energy can be arbitrary, but the energy must always enter an interaction completely or not at all.

The simpler part is all or nothing in the interaction. The DRD expressions are always in 2D. There in different spacetimes. Spacetimes cannot "cut off" anything from each other. Neither 3D to 2D nor 2D to each other. This is especially not possible because time is not divided. An interactions cannot stop after "half the time". Here 3D is the "collection pot" for all lower-dimensional expressions. It all goes in and is all distributed out again in the interaction.

For the quantisation, that the DRD expression itself can only take certain levels, the lower-dimensional expression is again responsible. Whether half or whole wave, the representation is always a wave. Otherwise, a 2D expression is not recognisable in the 3D volume. Now the wave must start and end at zero. The volume could only change if the amplitude were to change. But this is fixed by the interaction. Thus, only a half or a full wave can be introduced into this volume. It follows that the representations in 2D themselves form a potential well. In 3D alone there is no reason for quantisation. This only occurs via the dimensional transition.

In DP, no further fields are needed in addition to spacetime. The difference lies only in the respective geometric expressions in the different space dimensions. More on this in the chapter Standard Model.

Superposition, probability and collapse

Since there are infinitely many low-dimensional spacetimes, there can be infinitely many expressions for a single DRD. An infinite number of real expressions from the lower dimensional ones results in infinite energy. This is not observed. Here it is important to remember again that the DRD itself is in 3D with a concrete expression. In the lower dimensional, the DRD has infinite possibilities of a real expression. In the first approach, the DRD has no reason to choose an expression. As long as no concrete expression is selected, all possibilities exist simultaneously in the low-dimensional from the 3D view. The spacetimes are connected to space and not to spacetime. There is no temporal problem that all expressions are possible at any time. Thus the representation of the DRD in the low-dimensional is a superposition of all possible expressions for all possible states. Only with an interaction must an expression be connected with 3D for the matching geometry of the interaction. If at least two 2D expressions want to influence each other, this is only possible in 3D. Therefore, one can only obtain a special mapping from all possible mappings with a probability.

An interaction has a concrete geometry. For example, the photon is a transverse 2D wave of spacetime itself. If a DRD has no possible expression for this geometry, it cannot participate in the interaction, here e.g. a surface. The possibilities must commit to a concrete expression of this geometry. The interaction as DRD overlaps with another DRD and must react to it. The DRD takes the interaction and creates a new state. The determination happens in the collection pot 3D and is thus not a process in the lower dimensional. Therefore, for example, the Schrödinger equation cannot describe the "wave collapse". The 3D determination must only be unique within the geometry required by the interaction. Therefore, in the case of a particle, only those properties are determined which are specified by the interaction.

If the determination of the property is bound to the 3D space via information, this property is part of the 3D DRD and cannot change again immediately. If a certain geometry ("property") is determined, this geometry is observed again in a second measurement.

Entanglement

Entanglement is very easy to understand in DP. The crucial idea here is that entanglement is not an exchange of DRD in 3D spacetime.

An interaction is triggered by a DRD in 3D. The interaction itself is a DRD that exists in 3D spacetime. It is only at this level that entanglement cannot be understood. A DRD has a manifestation and thus property in the lower dimensional. Two different objects with the same wave function have this property in the same low-dimensional geometry. Thus, from the point of view of 3D and 2D, no distinction is possible in the wave description. These characteristics must be described with a single wave function. These objects can be brought to any distance in 3D in any time. This spacetime does not exist for the common low-dimensional geometry.

For entanglement, therefore, the following compelling conclusions can be drawn:

- Entanglement is low-dimensional, an interaction is connected to 3D spacetime. Therefore, no interaction in 3D is exchanged during entanglement.
- Since entanglement is unaware of 3D spacetime, any change to the low-dimensional geometry must happen instantaneously throughout the 3D universe. There is explicitly no delay possible.
- Since only the property is in the lower dimensional and information is bound to a 3D spacetime, no information can ever be transmitted faster than the SL via entanglement.

The problem of "spooky action at a distance" does not exist because there is no "distance" for the wave description of the entangled objects.

Indeterminacy

For an explanation of where the indeterminacy comes from, the classical example with momentum and location ($\Delta p * \Delta x$) is used. The momentum is a direct density in spacetime. If a density is to be measured, one necessarily needs a volume/distance. If the volume is made smaller in order to better determine the location, the density will always be more difficult to determine in relation to the rest. If, on the contrary, one wants to determine the density exactly, one would have to do this in relation to the entire remainder. In this case, the rest is spacetime itself.

For this measurement, the required amount of spacetime is opposite. Therefore, one does not get below a certain limit in the measurement. Since everything in DP is a mapping in spacetime, only a few combinations of measurements can be made exactly. The indeterminacy is already contained due to the definition of the DRD as space density.

Vacuum fluctuation

In the DP, a real vacuum with zero energy content cannot exist. At every point in spacetime, a "space density" and thus a non-zero DRD is given simply by the existence of the spacetime point. A point in space with no additional DRD is simply set as the zero level of the vacuum. There is always DRD/energy in the vacuum because there is always spacetime.

In QFT, every point in space has vacuum fluctuation due to its vacuum energy and indeterminacy. Here, there is a difference in the view between QFT and DP. Thus also a different statement on vacuum fluctuation. In QFT, the value zero may not be reached exactly due to the indeterminacy. The value may deviate positively or negatively from zero, but not exactly zero. In DP, zero is not attainable because there is a point in space. It is not possible to go from positive energy to zero. It is described in this chapter that the DRD needs a reason, in the form of an interaction (geometry) between DRDs, to get from the probability statement to a concrete expression of the geometry. In the DP, the spatial point remains in the superposition and thus does not generate a fluctuation. An "incentive/geometry" is needed. In the DP, fluctuation only occurs if there is already a DRD with at least one geometric expression. Gravity does not trigger fluctuation because it is in 3D and does not contain geometry for 2D.

Fluctuation only occurs when a DRD is present. The difference between DP and QFT cannot be determined by a direct measurement (Casimir effect), since a DRD is always present during a measurement. Indirectly, this is possibly possible through the vacuum energy of the entire spacetime. See the chapter on cosmology.

Hilbert space and QFT

Since the DRD has a geometric mapping, a vector space is a suitable mathematical basis for the description. If exactly one geometric expression is chosen, none of the other possibilities can have a share. Thus, the vector space is necessarily orthogonal and the scalar product must be defined.

If one wants to change from one state description to another state description, they have the same geometric basis. This geometric expression must not change, as it defines the DRD. Thus, this operator must necessarily be unitary.

There must be a sub-vector space, since the geometry is not completely determined for every interaction. The more the geometry is to be determined, the more information is needed in the wave equations. For every possible single geometry. One goes from the Schrödinger equation to the Pauli equation and then to the Dirac equation.

The Schrödinger equation must have a complex representation. The wave described has an expression in 3D and in the lower dimension. Therefore, one needs two different "levels" of representation in one equation. This is what the complex numbers bring.

In QFT, the operators create and annihilate the objects. This corresponds to the real representation better than the operators in quantum mechanics. The reason is that the DRD is in 3D and the interaction and the object pay into this "collection pot" and a new object is formed with the changed properties. The 3D DRD is the "mediator" between the lower dimensional mappings.

The path integral method in QFT is the correct mathematical calculation for any particle. The low-dimensional expression is connected via space and not spacetime. A particle thus has "infinite" time to actually do anything. In addition, this DRD has all possible low-dimensional spacetimes for a movement in its own spacetime. As crazy as the idea may sound. The particle can, without a restriction in 3D (e.g. a wall), test out the entire 3D spacetime in "zero time". Only the sum of all possibilities must then again adhere to the limitations from 3D.

Quantum mechanics and the OFT are indeed the physically correct descriptions for the real representation. It is not just a mathematical auxiliary construct that delivers the appropriate result.

6 Standard model (construction site)

The structure of the Standard Model (SM) of particle physics is explained in a "fly-over". All objects of the SM are geometric images of the 3D DRD in the different low-dimensional spacetimes. In 3D, only the Compton wavelength is known as a mapping of the DRD. This determines the content as energy or the density of the DRD itself. The curvature of space, intrinsic as well as extrinsic, is the only property that presents itself differently over the different geometries. The quantum fields of QFT are the various combinations or intersections of the lower dimensional spacetimes. An intereaction between objects can only exist if the objects have an expression of the respective geometry of the interaction.

QFT thus represents the low-dimensional DRD as "portions" in 3D and cannot describe continuous gravity in 3D. The low-dimensional geometry does not arise by itself in these spacetimes. The DRD is statically imposed by 3D on these spacetimes.

Difference between fermion and boson

The DRD also begins and ends with zero in the low-dimensional. Gravity is also generated in the low-dimensional spacetimes by the DRD. With bosons, the DRD is balanced directly in the object. Like a wave with full wavelength. The fermion corresponds to only half a wavelength. The DRD does not cancel itself out in the individual object. This property is mapped via the integer or half-integer spin. Since a DRD is always a state of motion, a rest mass is in itself a "scalar state of motion". This is understood as a kind of torque that can be measured in all directions, the spin.

The 2D expansion plays no role in 3D because of the dimensional transition. Thus, the assumption of a point-like particle is as correct as it is wrong. Only the Compton wavelength corresponds to the extrinsic expression and is directly recognisable as a geometric quantity.

The three particle families of the fermions arise from the fact that the geometric expression of the first families can intersect orthogonally a maximum of 3 times in a 3D spacetime. The particle families become heavier and heavier through the connection of more space dimensions. The more space dimensions involved in a DRD, the harder it is to change a spacetime. Since these objects are composed of intersections of several spacetimes, they are not stable. With elementary particles, there are two possibilities.

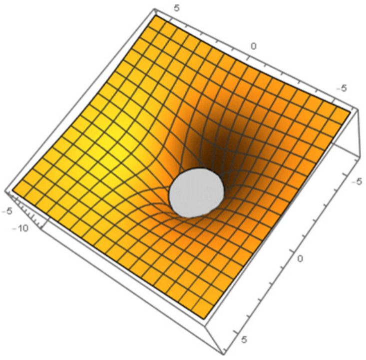
- Bosons: If the spin is 1 and the DRDs cancel out, these objects cannot form intersections with other objects in spacetime. Thus, no particle families can form. A boson can be composed of intersections. However, it itself cannot form any more intersections.
- Fermions: If the spin is ½ and the DRD does not balance out, the expressions can influence each other over the possible 3D space dimensions and form particle families.

The Higgs boson as well as the neutrinos have a special role.

The different charges are the geometric alignments of properties in spacetime.

Electron, muon, tauon

The electron is the simplest particle in the DP. An BH in a 2D spacetime. For a pictorial idea of the geometry, the Flammer paraboloid is suitable. This shows an BH in a 2D version with intrinsic as well as extrinsic space curvature. The properties of an electron are as follows:



Mass: The mass is the number of spatial dimensions occupied together with the BH. The size of the BHS in 2D does not play a role here. Since all fermions have a rest mass, they must occupy at least 3 space dimensions. The mass is a resistance to reach the dimensional limit (SL). The more space dimensions involved, the heavier the DRD of the object can be increased. In the case of an electron, a 2D spacetime, with the dimensional transition from the singularity of the BH, has become 3D again. In the case of a muon, a second 2D spacetime with a separate BH is added. At least one space dimension of the two spacetimes must be identical. The second space dimension must be identical to the extrinsic deflection of the second BH. This means that the two 2D spacetimes are orthogonal to each other. In the case of a tauon, 3 surfaces and 3 BH. The jump in mass from electron to muon is larger, because here a new space dimension is added with the new surface. With the jump from muon to tauon, all spatial dimensions are already present. Therefore, this jump is not so big. The stronger "anchoring" by the BH is added.

With more than one BH, the new space dimension cannot remain orthogonal to the surfaces. The SLs in the different spacetimes have identical space dimensions. Therefore, the BHs must merge. This is not a stable state. Therefore, muon and tauon have a decay time. The more different spacetimes the shorter the decay time. An electron cannot have a decay time because its BH is a static image.

Here is a picture of the intersections for muon and tauon

Charge: The electric charge is described in more detail in interaction. Here it is only a question of why an electron always has the same elementary charge. An BH must also have a gravitational field and a deflection in 2D. Since there are infinitely many 2D spacetimes, other 2D spacetimes must intersect. All 2D spacetimes that have exactly one identical spacetime dimension must participate in this gravitation and also have a gravitational field. Even though the gravitational field here is a 2D field, our 3D spacetime is filled via the infinite number of 2D spacetimes.

The simplest way to imagine this is to give the 2D space point a 3D coordinate system. Through the BH, all 3 are again present. Here, on each axis, any set of 2D spacetimes can have a common spatial dimension and fan out around that axis. This works exactly 3 times in 3D. Therefore, the elementary charge of 1 is actually 3 * 1/3.

Muon and tauon have no higher charge than an electron, because all 3 space dimensions are already present in the electron.

Here picture of fanned out intersections

Spin: Spin is not a rotation in the classical sense. It corresponds to the extrinsic "deflection" in the space dimensions. Since the electron is an BH, this deflection is not balanced in the spacetime in which the BH lies. It corresponds to only half a wave. Hence a spin of ½. The interpretation as rotational motion comes from the scalar state of motion of the DRD in 3D. This is motion without a preferred direction. The same in all directions. The closest thing to this is a rotational motion in all directions simultaneously. Therefore, the spin can be measured to all possible axes. In the superposition, this must move in equal parts "up" and "down".

For muon and tauon, there is no change in this view.

Quarks

The difference from the previous leptons to the quarks is that the SL is distributed directly over two or three 2D spacetimes. Not a composition as with muon or tauon. The BH itself is directly distributed on 2 or 3 surfaces. For d, s and b the BH is on 2 faces and for u, c and t it is on 3 faces simultaneously. Thus the DRD from 3D, above the image of an BH, can be distributed on 1 (electron, muon, tauon), 2 (down, strange, bottom) or 3 (up, charm, top) surfaces. More possibilities are not available in 3D for 2D.

The d-quark is the simplest case. Think of the geometry as an angle. The BH has 2 planes combined into one object. But the BH cannot be "crossed" in both planes. It can only be half on one plane each. The two planes have a 1D intersection. The d quark is not a muon! There are not 2 complete BHs intersected. Here, the one BH is divided into 2 planes. Therefore, the properties of the BH are in the 1D intersection. A single quark can thus not appear in 3D. There is no additional spatial dimension due to a single quark. Not even all 3D space dimensions are fully occupied.

Here image of angle

Mass: There are 2 surfaces connected to an BH. Thus the mass must be greater than for electron and less than for muon.

Charge: The property of the BH lies in the 1D intersection. Therefore, only those 2D spacetimes can connect to the BH that have a common space vector in the 1D intersection. They are only 1/3 of the spacetimes as in the case of leptons.

Spin: The spin remains at ½ for d, s and b because there is no compensation on the plane.

In the case of the s quark, one part of each of the 2 BHs lies together in one plane.

Here picture of 2 angles with overlap in height. Not a complete cross as with the muon

Mass: 2x2 surfaces are connected with 2 BHs. Whereby 2 surfaces are identical in each case. This means that the mass is greater than that of the d quark. The structure is close to the muon, but not identical. Therefore, the s-quark has a very similar mass to the muon. Since a part of the "cross" is missing, the mass must be somewhat lower.

The b-quark is two s-quarks, these now cover the cross completely with 4 BHs.

Here is a picture of the cross with 4 BHsMasse

There are 2 surfaces connected with 4 BHs. This means that the mass is greater than that of the s-quark. Since there are 4 BHs, the mass is higher than that of the tauon.

The u quark already occupies 3 surfaces.

Picture 2 Wrap where the bottom surfaces overlap but the height is at a 90 degree angle.

Mass: There is a deviation here. The mass is lower than that of the d quark, although 3 surfaces are already involved. The difference is the area where the BHs overlap. This area is not sufficient for the actual geometry! Therefore the area of the overlap must be smaller and the mass falls below the mass of the d-quark.

Charge: The charge is now 2/3, since there is 2 times a 1D overlap.

Spin: Remains the same for all quarks at ½.

c-quark is like u only 180 degrees to the right.

The t-quark must have the expression of the c-quark 4 times in order to occupy the complete geometry. Therefore, it is also the hardest to divide. The two 1D intersections, are extended in length. The t quark, occupies all spatial dimensions and therefore cannot combine with any other quark.

4x c quark, to occupy all the spaces

Neutrino

Like all fermions, the neutrino is divided into 3 different particles of the families. These can then transform into each other. In the DP, the neutrinos are constructed somewhat differently. The neutrino has a special position among the fermions. The neutrino forms from a 1D spacetime and is thus subject to different conditions than the other fermions.

- In 1D, there can be no intrinsic space curvature. The space curvature in 1D is only extrinsic. This is sufficient in 3D or 2D to produce a higher DRD. Neutrinos cannot participate in electromagnetic WW because they have no surface. In 1D, no SL can form.
- Since a transition from 3D directly to 1D is not possible due to the limits of spacetime, the neutrino always appears in combination with other fermions. A pure neutrino reaction cannot exist. Not even with neutrino and anti-neutrino. Therefore, neutrinoless double beta decay must not exist. All recognisable properties of a neutrino must be above 1D at least in 2D. Therefore, they appear like leptons.
- For 1D to be detectable and have mass, a neutrino must occupy all 3 spatial dimensions via a 2D mapping.
- There is only one neutrino that transforms into all 3 versions based on spin and state of motion. Actually, it does not transform. It changes appearance via occupying 2D.
- Since it is only 1D with a 3D appearance, the neutrino has by far the smallest rest mass.
- As shown with bosons, the weak nuclear force is a mixture of 1D and 2D. Therefore, a neutrino can only participate in this interaction, for DRD exchange.

Bosons and interaction

Gravity falls out of this consideration. This is the curvature of space in 3D without an exchange particle. Gravity changes the definition of space directly in 3D and does not have a different lower-dimensional image. Thus also no exchange particle. All other fundamental forces have a lower dimensional geometry and for this geometry an exchange particle.

It is a much simpler assumption that all quantum fields should be a combination of low-dimensional spacetimes than to have a separate field for each particle and each fundamental force. The transformation of the types of particles and matter and energy is then much more natural than with various different fields.

Since bosons are self-equilibrating in spacetime, there can be any number of bosons at one point in space from a 3D point of view. If the spin is 1/2, spacetime is not balanced and the fermions are subject to the Pauli principle.

Electromagnetic interaction

The electric field and the magnetic field are directly the gravitational fields in 2D. The difference in the fields is that the electric field is the original gravitational field in 2D. The magnetic field is created by the movement of the electric field. Through the movement of the electric field, other 2D universes are "pulled along/pushed through". These are then the magnetic field and can never have a source for the field and must be divergence free. Therefore, there can be no magnetic monopole.

The electric field is created by a particle with an BH. Then there is always a source. The similarity of gravity and electric field is thus obvious. Electromagnetic interaction, like gravity itself, must therefore have no limit in range.

The exchange particle photon is a gravitational fluctuation in 2D. Thus more space comes together in a volume and the fluctuation corresponds to a DRD. A photon does not change its representation as a wave without an interaction. The gravitational fluctuation is explicitly static in 2D. According to the GRA, there are not enough degrees of freedom for dynamics in 2D.

Since an electric field is a 2D gravitational field, only a 2D gravitational fluctuation can produce an interaction between the objects. Without a 2D component in the geometry (surface), one never participates in the interaction.

The intrinsic space curvature is always bound to an extrinsic space curvature. From 2D, this results in a positive and a negative expression. These can cancel each other out. However, the DRD cannot simply disappear. Therefore, it must remain as a pure fluctuation without a source. Since spacetime wants to balance itself out, charges of the same name repel each other and different charges attract each other. Every 2D-BH has already reached the limit of spacetime in 2D. If another 2D-BH with the same deflection is now added, the boundary cannot "expand" again within 2D. If an opposite interpretation is added, the DRD can be mapped away from the boundary back into 2D spacetime as a fluctuation.

Weak interaction

Is an interaction that uses 2D and 1D at the same time. Thus all other particles participate in this interaction. Since the interaction consists of intersections of 2D, this can be united with the electromagnetic interaction. All bosons of the Weak interaction have BHs themselves and must fully occupy the geometry. Are not a full wave and still spin 1, because the overlap on the space dimensions closes again via the geometry. Same state as wave. Short range due to enormous mass, as linked in all dimensions. The vectorial DRD lies opposite in the space dimensions, also therefore no range.

Z-boson is electrically neutral, since the 1D intersections cancel each other out. Is particle and anti-particle in one. Has the shape of a cube.

The W boson is a star that occupies all space dimensions and thus has a full charge.

Strong interaction

Is a wave that imprints itself on 2 different planes. 1 time in the horizontal plane and once on the vertical plane. Both wave planes have a bend of 90° to each other. Thus no clear vectorial DRD and no range. The wave itself is balanced, hence spin 1. However, there is only half a wave in each plane. Therefore the gluon as exchange particle is itself carrier of the charge. Always positive and negative in different charges.

There are several versions of gluons. However, these do not represent a family as in the case of fermions. The gluons themselves are not composite objects. There are several ways in which a wave can split into 2 levels.

The confinement results from the geometry with a corner/winding in the case of the quarks and gluons. One quark alone does not completely occupy the 3D space. Therefore, there must always be at least two quarks. These are connected by the gluons. If you now want to remove two quarks from each other, you have to "tear" the gluon. To do this, you have to put so much energy (DRD) into it that you can create new quarks.

Higgs field

The Higgs field is the maximum combination of the low-dimensional spacetimes in 3D. If the t-quark did not have so many BHs, the Higgs boson would be the heaviest particle.

The H boson is the only particle that is directly a 3D particle. Therefore it does not participate in the other interaction and cannot have a spin. The only property it can have is mass.

7 Cosmology (construction site)

In cosmology, as with the SM, the BHs are the central objects in our spacetime. The idea of spacetimes with different numbers of spatial dimensions must be expanded again. There are also infinitely many 3D spacetimes, which can influence each other. Dark energy (DE) and dark matter (DM) can consist of different components. In the DP, the actual origin of the universe from the Big Bang is not clarified. We assume a very small but given spacetime.

Beautiful, but not mandatory

From a purely philosophical point of view, the following train of thought is very "nice and round", but unfortunately without a really compelling logic. Since in DP a lot depends on the spacetime structure and the BHs, one can come up with the idea that our universe is the result of an BH out of 4D. Then a 3D BH is an elementary particle in 4D and an BH in 4D is a universe in 3D. The whole thing recursively down to 2D. There are certain observations which might suggest that our universe is an BH. A 4D spacetime is much harder to change than a 3D spacetime. The total mass of the universe (with DM) would then have to correspond to the Planck mass in 4D. As nice as the idea is, we put it aside and take our spacetime as given.

What emerges from this consideration as compelling is that the Big Bang must have happened out of a higher- or lower-dimensional transition. The GR fails in the singularity of the big bang. Thus, it must not have happened out of our spacetime. The GR describes everything completely in our spacetime.

Other 3D spacetime

As a first conclusion, the Copernican principle is to be further extended to spacetime. In the previous chapters, this principle was used to refer to lower-dimensional spacetime. A higher-dimensional limit of spacetime is the singularity in an BH. Since our spacetime itself has BHs, this means that there must necessarily be at least one other 4D spacetime. Then there can be any number of other 3D spacetimes. These other 3D spacetimes must have the same physical laws as our spacetime. In the DP, the physical laws depend only on the spacetime structure. This is the same for all 3D spacetimes. This means that there are also BHs there and, in particular, their own dynamics in spacetime. Therefore, these spacetimes can influence each other. Thus, there can be structures in our spacetime that cannot be explained by the content or dynamics of our spacetime alone. This will be illustrated by part of the DM.

Very small and very early BHs

In the early universe, the DRD of the vacuum was very high. In fact, interaction can occur where an BH was created directly from a Planck mass. These BHs have an SSR of 2 Planck lengths. This makes the interaction cross-section extremely small. All other objects in the universe are much larger than these BHs. Even though many of these BHs have formed, it is very unlikely that an BH of this type will continue to grow. Only a few have managed to do so. BHs have already existed since the beginning of the universe. This process solves several problems at once:

- Some of the BHs may have merged or grown by absorbing DRD. This means that very large BHs can be observed very early in the universe.
- The BHs that could not grow (almost all of them) remain as Planck BHs. These form the second part of the DM. The BHs cannot be destroyed by Hawking radiation, because not

enough particles with "small" wavelengths can be produced in the vacuum due to the strongly falling DRD. These Planck BHs are BHL corpses".

- An BH is a connection to a higher-dimensional spacetime and also simultaneously to other 3D spacetimes. Once a connection is made, our spacetime must align with the other spacetimes. The first BH created the inflation phase. The inflation phase is the alignment with the already existing spacetimes. Since this works across dimensional boundaries, it happens almost instantaneously. As usual in DP, no other field is needed for inflation.

Let's move on to the two most important points for cosmology. What are DM and DE?

Dark matter (DM)

Dark matter is made up of two components.

The first component is Planck BHs from the Big Bang. These react only by gravity. The interaction cross-section is so small that they produce interaction with almost nothing. Even if two BHs were to merge, no radiation would be detected and the effect as DM would be almost unchanged. All other objects of the Standard Model are too large in their Compton wavelengths to be "eaten" by the BH. This DRD is as a single "quantum" and many orders of magnitude larger than the Planck BH itself. Thus we have a geometric manifestation that interacts only by gravity and has virtually no interaction with other objects. In contrast, even neutrinos are reactive.

The second component is gravitational interaction with other 3D spacetimes. As with 2D, this again only works with an BH. This effect exists with all forms of an BH in our spacetime or with an BH in the other spacetime. Therefore, there is a reinforcing effect when an BH has formed. In addition, correlations can be created that cannot exist in our universe alone due to its size (e.g. the Great Arc). Preferential directions can form that cannot otherwise exist. For example, the ring structure of dwarf galaxies around a large galaxy.

Dark energy (DE) (construction site)

There are three alternatives for the DE. Due to the state of work of this version, no prioritisation has been made as to which of the alternatives is the better one. It is also possible that there are only different descriptions for the same issue or that there are mixtures.

Vacuum energy:

In the DP, vacuum energy is defined by spacetime itself. Where there is a point in space, there is also energy. Thus, particles can also form for this energy in the lower dimension. For a particle formation, however, one needs a given geometry. This means that the entire volume of spacetime does not take part in this process. Only the part that is occupied with a specific DRD. If we look at the average occupancy of the universe with DRD, we come to approx. 1 -2 atoms per m^3 , 410 photons per cm^3 and 340 neutrinos per cm^3. Only these objects generate a fluctuation. Then this fluctuation comes on average only with the energy of the objects. The 10^{122} orders of magnitude difference in energy from vacuum to DE is nonsense. The values are not that far apart.

Disadvantage of the solution: the DE then spreads out with the expansion and would also have to dilute. This is not observed. Advantage: The Hubble constant from the supernova would then have to be larger than the measurement from the background radiation. Since here measurements are always taken from mass accumulation to mass accumulation and a mass accumulation must always have a high DE.

Gravity without mass:

In the case of photons, a gravitational fluctuation is generated in 2D. However, there is no DRD in these spacetimes. According to the field equation, this actually results in a negative mass, since this is missing. Then the photon in 2D (not the complete spacetime) would have to have a spacetime expansion away from the DRD and expand on its own. Then the universe would not explicitly expand strongly, but only the photon. There is then no rapidly expanding universe. This is only a mirage from the expansion of the single photon. Even if the universe has almost come to a standstill, the photons show a different picture.

Disadvantage: If the universe started with a big bang, it must also continue to expand. Where does the energy come from then? Only from inflation?

Cosmological constant:

The field equation describes the effects of gravity very precisely even without the constant. The constant is only needed if one wants to apply the field equation to the universe as a whole. Then it can create a global balance and represent a certain scenario. At present, an expanding universe is needed.

If one sets the energy-momentum tensor to zero for the field equation, the Einstein tensor disappears. Only this cannot be set to zero in the DP. There is always a DRD, the vacuum energy. Thus lambda cannot be set to zero either. Even if there is no recognisable DRD with gravity in 3D (no fluctuation in spacetime between DRD and gravity), there must be a counter term for the vacuum energy. Then gravity and DRD are only the compensation for the fluctuation in spacetime. The cosmological constant is then a repulsion from positive energy. No DRD is actually needed. This is a property of spacetime itself. This is then a constant dilation without curvature away from a DRD. Thus an expansion. Elementary particles other than photons would only undergo this dilation for the vectorial part (momentum) of the DRD. The SL in 2D cannot be pulled apart by this. The redshift in the photon is then directly the expansion of spacetime. An SL would then have to become explicitly larger, since it is a geometric manifestation in the stretched spacetime.

Disadvantage: Then the Planck SL of the DM would also have to become larger. The term simply determines a property of spacetime without direct proof.

8 Additional topics

Here individual topics are elaborated, which are not needed for the basic explanation.

Distance between two Planck lengths

It is calculated how far 2 electrons can approach each other. Two boundary conditions are set:

- The largest possible force between the electrons is the reciprocal of the proportionality constant from Einstein's field equation $\frac{c^4}{8*\pi*G}$ the Planck force.
- Since the 2 electrons should be very close, the fine structure constant α must be used. The force between the electrons is exchanged via a photon and a consideration from a quantum mechanical point of view must be chosen.

Step one is the comparison of the force from the field equation and the force between 2 electrons

$$\frac{c^4}{8*\pi*G} = \frac{e^2}{4*\pi*\varepsilon_0*r^2}$$

Step two is the fine structure constant because of the exchange of a photon. The largest possible force must be reduced by this value.

$$\frac{c^4}{8*\pi*G} * \frac{e^2}{4*\pi*\varepsilon_0*c*\hbar} = \frac{e^2}{4*\pi*\varepsilon_0*r^2}$$

Step three is shorten everything and resolve by distance r.

$$\frac{c^4}{8*\pi*G} * \frac{1}{c*\hbar} = \frac{1}{r^2} \Leftrightarrow r^2 = 4*\frac{\hbar*G}{c^3} \Leftrightarrow \mathrm{r} = 2*\mathrm{l_P}$$

Electrons can approach up to two Planck lengths. Then the force would rise above the maximum. If a photon is to be exchanged, then the wavelength must be larger than the Planck length. Otherwise the photon is a BH. Thus the distance must be larger than a Planck length.

The same result is obtained if again the largest possible force is multiplied by an unknown length to obtain an energy. This expression is compared with E = h * ν. Where the wavelength in ν must be the same as the length in the force. From this follows:

$$\frac{c^4}{8*\pi*G} * \mathrm{r} = \mathrm{h}*\frac{c}{r} \Leftrightarrow r^2 = 4*\frac{\hbar*\mathrm{G}}{c^3}$$

The difference is that h in the result, must be the reduced quantum of action. It follows that the largest force can be $\frac{c^4}{8*\pi*G}$ or $\frac{c^4}{4*G}$. Depending on whether one chooses the reduced view or not.

Also in the Bekenstein limit, the smallest footprint is calculated to be 2 * 2 lP.

It seems that in our spacetime a geometrical expression must always be assumed with at least two Planck lengths.

Fine structure constant α

To define the fine structure constant, the term "force" must be clarified. Without a force, all objects remain constant in their states of motion. Therefore, force means the change of a DRD. The gravitational constant G is the proportionality constant for the calculation of the force. Thus, G represents the resistance of spacetime to intrinsic change and is defined in value as the higher dimensional limit of our spacetime.

For the fine structure constant, the force must be considered at an electromagnetic interaction. This lies, because of the photon as exchange particle in the 2D. Therefore, for a comparison of the forces between the gravity and the electromagnetic interaction, the following two conditions result:

- The electromagnetic force must be much larger than the gravitation. A spacetime with only two spacedimensions is easier to change than a spacetime with three spacedimensions. The difference for the charge and rest mass of two electrons is about $4 * 10^{42}$. The hierarchy problem is "only" the dimensional transition.
- In interaction, the photon between two 2D objects generates a force which is measured in 3D. This must be smaller, because the photon again represents a gravitation, which weakens the DRD. This difference is the fine structure constant.

The fine structure constant is the difference of the force between an E-field and a G-field at the limit of the spacetime structure. Therefore, for a comparison of the forces, we choose the respective maximum conditions.

Gravitational force is given by F = $\frac{G * m_1 * m_2}{r^2}$. Maximum mass of a single object is the Planck mass and thus F = $\frac{G * m_P{}^2}{r^2}$.

The force in the electric field is given by F = $\frac{1}{4 * \pi * \varepsilon_0} * \frac{e * e}{r^2}$. Maximum charge of a single object is the elementary charge and thus F = $\frac{1}{4 * \pi * \varepsilon_0} * \frac{e^2}{r^2}$.

The two forces are put into the ratio.

$$\frac{\frac{1}{4 * \pi * \varepsilon_0} * \frac{e^2}{r^2}}{\frac{G * m_P{}^2}{r^2}} \Leftrightarrow \frac{e^2}{4 * \pi * \varepsilon_0 * G * m_P{}^2}$$

$m_P{}^2$ (reduced) is replaced by m_P = $\frac{l_P * c^2}{G}$, with l_P for the Planck length.

l_P (reduced) is then replaced by l_P = $\sqrt{\frac{\hbar * G}{c^3}}$.

$$\frac{e^2}{4 * \pi * \varepsilon_0 * G * (\frac{l_P * c^2}{G})^2} \Leftrightarrow \frac{e^2}{4 * \pi * \varepsilon_0 * G * \frac{l_P{}^2 * c^4}{G^2}} \Leftrightarrow \frac{e^2 * G}{4 * \pi * \varepsilon_0 * l_P{}^2 * c^4} \Leftrightarrow \frac{e^2 * G}{4 * \pi * \varepsilon_0 * (\sqrt{\frac{\hbar * G}{c^3}})^2 * c^4} \Leftrightarrow$$

$$\frac{e^2 * G}{4 * \pi * \varepsilon_0 * \frac{\hbar * G}{c^3} * c^4} \Leftrightarrow \frac{e^2}{4 * \pi * \varepsilon_0 * \hbar * c}$$ The result is α, the fine structure constant.

It follows that the force of the G-field is α larger than the force of the E-field under the given conditions. One could also have replaced mP directly by $\sqrt{\frac{\hbar * c}{G}}$. In the DP, everything is normalized by the Planck length.

For a better understanding of what α represents, the result from the force comparison is transformed. The transformation is to be based on the space-time structure, as in the case of G.

$\frac{e^2}{4*\pi*\varepsilon_0*\hbar*\mathrm{c}} \Rightarrow \frac{e^2}{2*\varepsilon_0*\mathrm{h}*\mathrm{c}}$ transform into the unreduced variant of h

$\frac{e^2}{2*\varepsilon_0*\mathrm{E}*t_P*\frac{l_P}{t_P}} \Rightarrow \frac{e^2}{2*\varepsilon_0*\mathrm{E}*l_P}$ transform into $h = E * t_P$ and $c = \frac{l_P}{t_P}$

Split the found description into two parts

$\frac{e*e}{2*l_P*\mathrm{E}} * \frac{1}{\varepsilon_0}$ other representation with magnetic field strength $\frac{e*e}{2*l_P} * \frac{\mu_0}{m_P}$

The first term describes how two charges act on the maximum DRD (from Planck mass), which is in two Planck lengths (change - force). The two Planck lengths are again the result from the previous section. The second term describes the behavior of the electric field constant as a proportionality contant. Resistance from a 3D point of view.

The fine structure constant α, like all other fundamental quantities, is thus bound to the spacetime limits. Since α is an attenuation of any DRD across the dimensional boundary, no units of measure are available. The electromagnetic interaction is again a gravity in 2D and thus attenuates a DRD from 3D. All objects in an electric field must be reduced by α. For each space dimension involved, α must be used once.

At very high energy, α changes its value and becomes larger. The higher the energy, the more 2D approaches 3D. From the energy of a Planck length, 2D becomes a 3D spacetime. Thus, at the maximum energy, the value of α must go to 1. Since α is composed only of natural constants, it is an interesting question which one should change? Since from the DP the values m_P, l_P or c cannot change, only two possibilities remain:

- The elementary charge: As the DRD increases, more 2D gravity fits into a small area. This would correspond to an increase in charge.
- ϵ_0 and μ_0 in opposite directions: the combination of both values must always result in c. However, since a higher DRD can also produce a stronger resistance in 2D, ϵ_0 could increase. Since this can then penetrate another 2D spacetime more easily, μ_0 could fall.

It is possible that all 3 values change. Therefore the changes are only very small per single value.

Binding energy

Systems with less energy are more stable. Therefore, no physicist is surprised when several subcomponents combine to form a system and must release energy to reach a stable state. In DP, the reason for the low energy results from the overlap of DRD. Binding energy comes in all colors and shapes. The two examples atomic nucleus and atomic shell are chosen.

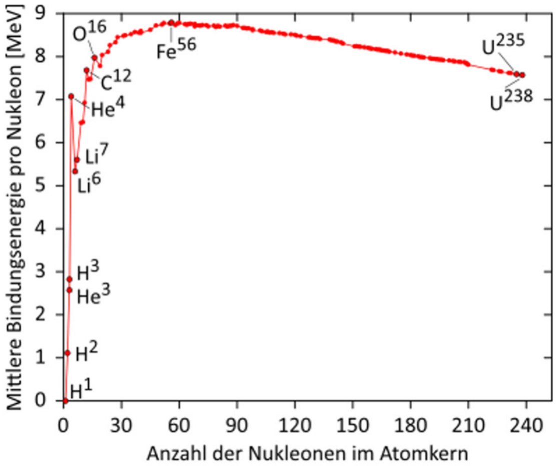
Atomic nucleus

In the sun, hydrogen is fused to helium. Binding energy is released during this process. The classical view is that the helium nucleus represents a more stable state than the individual parts and that this is always associated with a lower energy. This does not take into account the full complexity of the process. We are only concerned with the fact that energy must be released. The energy difference is given off in the form of radiation or particles. In which form the energy is given off is not important for the argumentation.

The helium nucleus consists of 2 protons and 2 neutrons as ensemble. These 4 components have less energy/mass after the fusion than the same components individually. The particles have remained the same in all their properties. Only the mass as equivalent of the energy is smaller in the combination. If the strong nuclear force captures the components and forms a helium core, there is actually no reason why energy has to be given off.

When the particles in the core are permanently close together due to fusion, the volume regions of the DRD overlap. This increases the DRD for the nucleus as a whole. From the DP point of view, the whole system has to give up energy to stay at the same energy levels. With this view, there is a reason for the release of energy. The individual neutrons and protons want to retain energy. This higher DRD has to go away. Now, if the nucleus is to be "decayed", this energy must be put back in, otherwise the individual components such as the neutron and proton will have too little energy.

For the DP no energy is given away to reach a lower and more stable level. Energy is given off to stay at the same level. Therefore, the binding energy increases sharply with the number of nucleons at the beginning and flattens out with more and more nucleons. The overlap cannot increase arbitrarily in relation to the nucleus. Due to the repulsion of the charges, less and less "overlap" occurs.



Reference: https://lp.uni-goettingen.de/get/text/6933

For a nucleon number divisible by 4, the geometry of the arrangement seems to have a strong overlap of the volumes. Based on the binding energy, one must be able to obtain conclusions about the geometry of the nucleons. As a further derivation from this approach, it is clear that the volume of an atomic nucleus does not simply increase linearly. Therefore, the volume of an atomic nucleus does not vary as much as one must assume in a "spherical model" without overlap. In addition, depending on the measurement method, the size of an atomic nucleus does not necessarily give the same results. Depending on how the measurement method interacts with the DRD, different results may be available. This should also be the case for a single proton or neutron. These are also composite. As of iron, another nucleon does not bring a higher DRD to the total volume, but a lower one. The binding energy decreases. The overall overlap decreases due to the new configuration.

In addition, there are so-called "magic numbers" 2, 8, 20, 28, 50 and 82. This number of nucleons seems to have a very stable bond. According to QFT, when the nucleus is "deformed", these numbers result in an almost exact sphere, for the entire nucleus. A smooth sphere as a whole has the highest possible overlap of the individual parts.

Atomic shell

When an electron is attracted by the electric field of the proton, the electron is forced into an orbital cloud around the nucleus. The electron thus loses degrees of freedom for motion in space. The beginning and end of the volume for the DRD are now the same (closed geometry). The electron overlaps with itself. For the electron, the DRD and thus the energy has increased. It must give up some of the energy as a photon to keep its energy constant.

For an atom with multiple building blocks, all the individual building blocks overlap. Also the electrons and the nucleons. Thus the structure, the possible energies becomes very fast complex.

9 List of abbreviations

BH	Black Hole
DC	Dimensional Constant
DE	Dark Energy
DM	Dark Matter
DP	Dimensional Physics
EH	Event Horizon
GR	General Relativity
QFT	Quantum Field Theory
SL	Speed of Light
SM	Standard Model
SR	Special Relativity
SSR	Schwarzschild Radius