Gravitation from Flow Resistance: An Emergent Field View

Gravitational fields emerging as the result of mass which resists the accellerated space-expansion.

The Flow Resistance Theory (FRT)

Einstein 1911 and the FRT – A Forgotten Insight Revisited

Starting point: Einstein's 1911 Hypothesis:

In his paper *"On the Influence of Gravitation on the Propagation of Light"*, Einstein proposed that the **speed of light varies in a gravitational field**:

$$c = c_0 \left(1 + \frac{\Phi}{c_0^2}\right)$$

- c_0: constant light speed in vacuum
- Φ: gravitational potential
- Light travels more slowly in stronger gravitational fields
- Time delay and redshift emerge naturally
- Einstein later abandoned this in favor of spacetime curvature (1915), providing a further static view of Space. Following that, it reached a limit of explanatory power.

FRT Reinterprets and Extends This View:

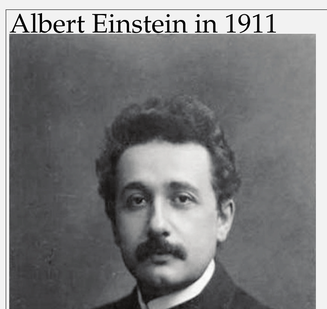
- FRT distinguishes between **absolute light speed** c_0 and **relative light speed** $c(h, \Theta)$
- Mass slows space expansion, thus reducing c
- Gravitation arises from this local deceleration, not from geometric curvature

$$g = \frac{dc^2}{dh} \quad and \quad G = \frac{spatial deceleration}{mass}$$

Conclusion:

The FRT revives Einstein's 1911 vision — but provides the dynamical structure needed and integrates all what came after 1911: Hubble, The Big-Bang-Theory and the accelerated space-expansion.This Analyzis provides an Ansatz, how to integrate Gravity with Quantum Mechanics.

Albert Einstein in 1911



The Four Postulates of the FRT.

All today presented is derivated from four Postulates and no additional assumptions or conditions are needed.

1. Space expands in four dimensions at the speed of light.

   The universe is not static but dynamically expanding in four spatial-temporal dimensions.
   This expansion proceeds at a constant absolute light speed.

2. This expansion constitutes space-time.

   Space-time is not a passive arena, but the very process of expansion itself.
   The temporal dimension arises from the local rate of expansion.

3. Time is equivalent to the local speed of light.

   Time does not exist independently but is defined by the local value of the expansion speed.
   Where space expands more slowly, time passes more slowly.

4. Mass slows down space expansion and is antivalent to time.

   Mass causes resistance to space expansion. This resistance creates gravitational effects.
   The stronger the mass-induced resistance, the slower time flows – and the stronger the gravitational field.

This Theory sees space-time as a flow, a very strong flow. It creates the gravitational force not by direct attraction of masses to each other.
Masses "reducing distance between them" in an accelerated way, because they reduce the Flow around them.
This presses the masses to each other – the farer away from the influence of masses, the stronger the Flow, pressing masses to each other, so, into areas with a weaker Flow. BTW: Accordingly to the time-wise height, there is also the related time-wise radius: $\tilde{r}$
The Schwarzschild-Radius is r_s.

The S(h,t) Function of the GM describes the Free Fall behaviour as result of the space-time screenig of mass.
The same function shows as well the "dent", which mass causes in the space-expansion, showing even, how deep the dent really is:

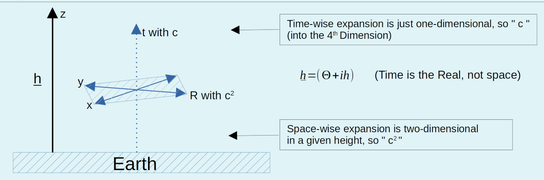
$$S_{(h,t)} = \frac{Gmt^2}{2(r+h)^2} + \frac{Gm\tilde{r}(\tilde{r}+\theta)}{(r+h)^2}$$

Left term: Free Fall; Right term: Dent.
To be accurate as well for eg. Neutron Stars, this factor is needed for both terms: $\frac{r}{r-r_s}$

The Complex Height.

A very important speciality is the complex height. In the FRT there is "height" not only space-wise.
Height is here as well time-wise to be understood.

As seen before, space and time are symmetrically expanding. Let's imagine the effect of "shadowing", or attenuating, of space-expansion by a body. As the body (in this case) is spherically and with homogeneous mass-disribution, the gravitational field as reduction of space-expansion is the same in all directions pointing away from the bodies' surface. But- as the space expansion works in the same way in time direction, orthogonally to the space, and as well with speed of light, we have to types of height: the timely height (Θ) and the space-height (h). Because on every meter of space-expansion, one Lightmeter of time-wise expansion exists. Both types of height together forming the complex height $\underline{h}$. And there is **one important difference** between both types of height:



Time-wise expansion is just one-dimensional, so " c " (into the 4th Dimension)

$\underline{h} = (\Theta + ih)$ (Time is the Real, not space)

Space-wise expansion is two-dimensional in a given height, so " c^2 "

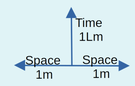
The area shown as R with c^2 is called an "Isochrone" – an area of points sharing all the same gravitational potential. As an Isochrone, the expansion of space is in that way two-dimensional, in a sphere around the body (here the Earth).
As time-wise expansion is separate and just one-dimensional, it changes linear with "c".
Every Isochrone or sphere with one single time dilation – no time difference between any two points of the sphere – has it's own expansion speed. Next, we will see, how to calculate the strength of the gravitational field and what difference the two types of expansion makes. The above equation shows time as the real part. $\underline{h}$ is a reduction of the related Quaternion. We may reduce the Quaternion to a complex number, because the height is in all directions the same, as the body is symmetrical and spherical.

The Speed of Light: Where is it coming from and may it change?

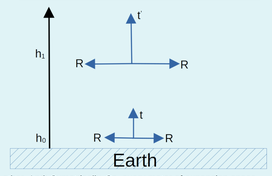
The FRT assumes in Postulate 1 that "Space expands in four dimensions with the speed of light".
But the speed of light is not an intrinsic property of light waves – like actively travelling – rather passively travelling with the space expansion.

This results in two entities of the light speed, both connected to the space-expansion:
- **Absolute**, c_0, the always constant local speed of light caused by the Symmetry of space expansion;
- **Relative**, c, depending on the gravitational potential and only as a Delta between different(ial) gravitational potentials.

Absolute speed of light, independent on Gravitation:



Relative speed of light, dependent on Gravitation:

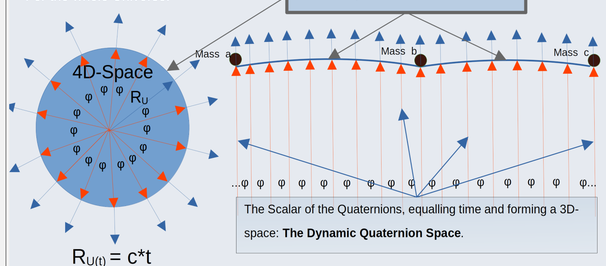


As we see, "Time" and "Space" expanding orthogonally to each other. And: Symetrically. So, every meter of expansion space-wise is connected to one Lightmeter of expansion time-wise. This has a pure geometrical reason. 1 Lightmeter [Lm] is ca. 10/3 ns → While with time in "seconds" the speed of light is ca. 3*10⁸ m/s.
While speed of light c_0 is independent (locally) always 1m/Lm, on the right graphic we can see a difference over the height h: the upper expansion is stronger than the lower expansion, nearer to ground. Relative speed of light describes the differences in the expansions' dynamics. In h_1 both time and space expanding stronger as in h_0. be-cause Earth's mass is shadowing the general space-expansion. Mostly over one radius from it's surface. That means, both Volumina and time are "less" than in greater height. So, while c_0 remains locally constant, c is different!

Expansion of Space and the Impact of Mass

For a small area of the Universe:

For the whole Universe:



$R_{U(t)} = c*t$

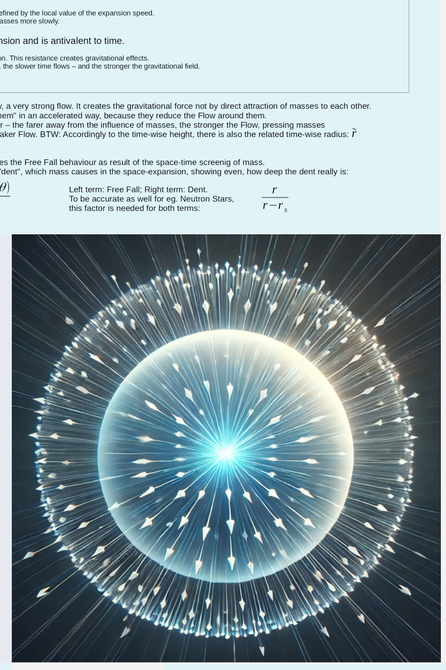
A "common direction" of time means:

Farther from the center of expansion

The Scalar of the Quaternions, equalling time and forming a 3D-space: **The Dynamic Quaternion Space**.

φ:= the spatial divergence angle.

In 4D, it is composed of three individual angles, representing the vectorial part of the **Quaternions**.

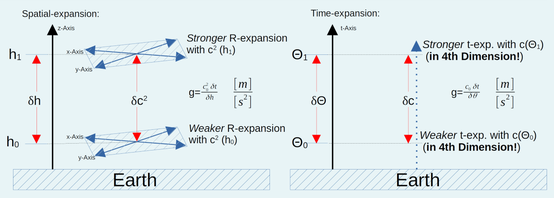


The Calculation of Small-g according to the FRT.

We may calculate the strength of the gravitational field, or acceleration, easily from the 3rd and 4th Postulate:
Time is eqivalent to the speed of light. And mass causes a deceleration of space expansion, antivalent to time.

If the four Postulates of the FRT are true and complete, it shall be possible, to calculate the strength of the field directly from them. To test this, we may measure the time dilation in a given point of the field, let's say near by ground of Earth. We take two optical atomic clocks and finding a time dilation over 1 m height of ca. 1.0941*10⁻¹⁶. This is a unit-less value, saying, that near by Earth's surface, time runs this factor slower than one meter higher. BTW, such result of our measurement is what GRT would give us.

Spatial-expansion:



Time-expansion:

c² is in height h_1 with time-dilation factor δt with ca.1.0941*10⁻¹⁶ stronger than **c²** in height h_0. This results in δc², which is "per height difference", so to be divided through the related δh. The result is Earth's accelleration, ca. 9.81 m/s².
We will get exactly the same result by dividing the linear δc through δΘ.
This shows that acceleration is a "Compound" of both space- and time-wise expansion *together*. Finally, the *units* of g showing it!
This leads us into the Gravitational Matrix GM(h), which is the Schwarzschild-Solution for the QF (quaternionial field equation).
Because the two dimensions of the GM are built on h and Θ. The GM allows to calculate the related curvature of space - even exactly to calculate how *deep* the well known "dent" is, which a mass creates in the space! This is *more* than GRT may do.

On the Units and Physical Meaning of the Gravitational Constant "G"

"Big-G", the gravitational constant, has one of the least accurate known values of physical constants.
Often measurements trying to improve this situation, resulting in yet more diffusion…
maybe the FRT will show a way out.

If the four Postulates of the FRT are true and complete, it shall explain to us as well the **real meaning** behind the units of the gravitational constant. They are:

$$G = \frac{m^3}{kg * s^2}$$

The interpretation of these units in the FRT is: m^3/s^2 has the meanings of the deceleration of space-expansion. And as a constant, related to one kilogram of mass.

So, "G" tells us, how strong the ability of 1 kg of mass is to decelerate the space expansion (4th Postulate).
And by that, mass being the counterpart of time.

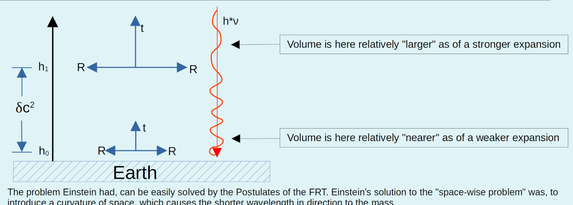
However, as we will see next, this deceleration-ability is related to the inside of the "kilogram".
Outside of the mass, the deceleration is reduced by $1/r^2$.

The GM describes the exact deceleration profile with the function $B_{(h)}$.

Interaction of lightwaves with gravitational fields.

Now let's have a look at the interaction of our gravitational field, or differences in c and Volumina, with light waves.

While Einstein analyzed this in his paper from June 1911 ("On the influence of gravitation to the propagation of light waves"), he came to the conclusion, that speed of light is changing in Gravitation and causing both light bending and change in wavelength and frequency. Whilst he could cope with frequency change, he had a serious issue with the change of the wavelength, which is always connected to a change in frequency: Space itself would have to change! The FRT has no issue with both effects:
The change in frequency is correlated to the change in time and change in wavelength is correlated to change in Space/Vo-lumina. If you think now: What about the curvature of space time? It's further there, but not as the root cause of Gravitation!



Volume is here relatively "larger" as of a stronger expansion

Volume is here relatively "nearer" as of a weaker expansion

The problem Einstein had, can be easily solved by the Postulates of the FRT. Einstein's solution to the "space-wise problem" was, to introduce a curvature of space, which causes the shorter wavelength in direction to the mass.
The curvature is there, as well in the FRT, however, the curvature is a difference in expansion dynamics.
While we assume in the GRT, that the curvature is the root cause of Gravitation, the FRT sees the curvature just as a side effect.
The real root cause of the Gravitation is with the FRT just and only the change in spacetime dynamics. This change over the height of a mass causes over time the shortening of the distance between any point over ground and the ground itself! And the bending of light? As light follows space-expansion, it follows the curvature as well. BTW: The differences in space-time over height forms a "space-time funnel". The funnel is in reality for Earth not so extrem as shown in this Graphic.

The Quaternion-Field Equation for the FRT.

The **Quaternion-Field Equation, or QF,** results directly out of the four Postulates with no additional assumptions.

$$\nabla_Q^{c^4} S^{\mu\nu} = G_{(t)} \frac{R_{G(x^\mu)}}{r_{(x^\mu)}} \qquad S^{\mu\nu}_{(Schwarzschild)} = \begin{matrix} \frac{\partial c}{\partial \theta} & 0 & 0 & 0 \\ 0 & \frac{\partial c^2}{\partial x} & 0 & 0 \\ 0 & 0 & \frac{\partial c^2}{\partial y} & 0 \\ 0 & 0 & 0 & \frac{\partial c^2}{\partial z} \end{matrix}$$

The left side of the QF describes the gravitational field.
The right side of the QF describes the Source of this field.

The Equation is very flexible regarding the concrete conditions, which may occure: Not only in case of the Schwarzschild-Solution but as well for any distribution of mass in space and time. The development of the Universe is contained in the time-dependence of "G", the gravitational Constant. The FRT assumes a slowly reduction of the accelerated expansion of space and so a slowly reduction of the strength of Gravity as such.

Both sides describing the strength of the field and only this – all other attributes of Gravitation are noted in the GM with 12 Functions for static fields and additional four Functions vor gravitational waves and other dynamic Field-situations.

The Tensor S contains 10 independent Components, same as the Metric Tensor in Einstein's Field Equation (EF), however, the 10 Components in S describing the Strength of the Field, not the Curvature of Space. The Curvature is described in one of the Functions of the GM, which is a non-linear Function-Space (Hilbert-Space of Functions). All Functions are derived from one most-upper-integral Function, the Volume Function, which describes the development of Space over time.

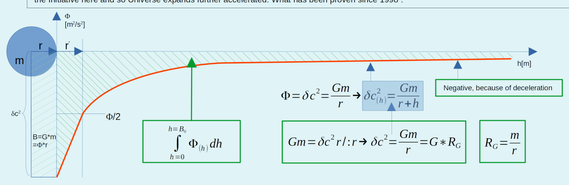
The Nabla-Q-Operator extends the possibilities of the S-Tensor dramatically. c^4 means that all components of the S-Tensor are derivated from the speed of light-change (relative speed of light) in all four dimensions.

All Components of the S-Tensor are derivations of the relative speed of Light and always symmetrical.

The Function for the Gravitational Potential.

While the deceleration of space-expansion through mass is just mass-related, what about the gravitational Potential?

The Graph below shows the Effect of the shadowing or screening of space-expansion by mass.
This screening works half-wise on one radius of height, half-wise from one radius height to asymptotically approaching "Zero"-Potential. However, the Potential has a Null-point and after that the deceleration turns into acceleration, like a mirror. "B" stands for "Bremswirkung", the effect of deceleration of space-expansion by mass. The Graph differentiates between inner and outer deceleration. Radius and Height are not the same! This forms the evolving dynamic equilibrium. And provides the answer to the old question, heard already by Newton¹: "If Gravity works just attracting, why is the Universe then not collapsing?" Well, mass and space-expansion compensating each other, however, space-expansion has the Initiative here and so Universe expands further accelerated. What has been proven since 1998².



$$\Phi = \delta c^2 = \frac{Gm}{r} \rightarrow \delta c^2_{(h)} = \frac{Gm}{r+h}$$

$$\int_{h=0}^{h=B_r} \Phi_{(h)}\, dh$$

$$Gm = \delta c^2 r \,|\, r \rightarrow \delta c^2 = \frac{Gm}{r} = G * R_G \qquad R_G = \frac{m}{r}$$

The area between the Potential-function is the space-deceleration. As the Integral function of the Potential. The deviation of Potential is the Acceleration. R_G is a new physical Unit, the gravitational Resistance in [kg\m]. R_G creates the Potential.

[1] It is well known that the Anglican theologian Richard Bentley (1662–1742) corresponded with Newton in the 1690s, discussing cosmological questions. Bentley, who later became Master of Trinity College in Cambridge, was particularly interested in the stability of the universe under the force of gravity.
In his correspondence with Bentley, Newton argued that an infinite universe uniformly filled with stars would not collapse under its own gravity, since there would be no preferred center toward which matter could be drawn. This exchange took place between 1692 and 1693 and contributed significantly to the cosmological debate of the time.

[2] Saul Perlmutter et al. [1998] Supernova Cosmology Project and Brian P. Schmidt et al., High-Z Supernova Search Team.
Nobel Price for Physics 2011.

$$G_{M(\underline{h})} = \begin{array}{c|cccc} & (Raum) & (Flaeche) & (Strecke) & (Deformation) \\ & [m^3] & [m^2] & [m^1] & [m^1] \\ \hline [s^3] & c^3_{(h)} & E_{(h)} & F_{(h)} & f^3_{(h)} \\ [s^2] & B_{(h)} & c^2_{(h)} & a_{(h)} & f^2_{(h)} \\ [s^1] & V_{R(\underline{h})} & V_{I(\underline{h})} & c^1_{(\underline{h})} & f^1_{(h)} \\ [s^0] & V_{(\underline{h},t)} & A_{(\underline{h},t)} & S_{(\underline{h},t)} & c^0_{(\underline{h},t)} \end{array} \begin{array}{l} \\ \\ (Gravitationswellen) \\ (Beschleunigungszeile) \\ (Geschwindigkeitszeile) \\ (Streckenzeile) \end{array}$$

Testig the Existence of the Relative Speed of Light: Space-Dilation.

The relative speed of Light is the foundational idea of the FRT. If it could be validated, the FRT can be seen as "true".

A test of the relative speed of Light would have to show a change in speed of light over a gravitational Potential. That is equal to showing differences in the Dynamic of space-expansion in the full meaning, not only time dilation, which has been long proven, but as well space-dilation.
To measure beneath the time dilation as well the space dilation, we need to have some very sensitive and stable Instrument, which would both time- and space-sensitive enough.
We could use cw-Lasers for it, if they are stable enough. Because they have a relation between speed of Light and length of the Resonator:

Setup: Two long HeNe's built of ULE-Glass. Mirrors on the tubes. Both Lasers with several longitudinal modes, in TEM_{00}. The connection between time (f), space (L) and speed of Light inside the Laser is:

$$f = \frac{c}{2L * n}$$

with f as the resonator-own Frequency and n as the refractive Index of the active Media (HeNe). The Frequency is the Frequency with which the light is oscillating between the two mirrors at the ends of the tube. In a cw-Laser, f shows up as the frequency-difference between the longitudinal Modes, called longitudinal Mode-spacing. This frequency is like a clock tick. It can be used by mixing the laser-modes of the beam of each Laser in a fast SI-PIN Photo Diode, resulting in the difference-frequency, so the Resonator's own frequency, and can be further electronically extracted, formed, amplified, counted and so on. That way, we get a "Laser-Clock".
The jumping point here is this: As the Resonators of the two Lasers are of mass and very stable, it resists the given space-expansion. In other words, these Laser-clocks can not only measure time but space as well.
For the test, both Laser-clocks ticks will be counted for a longer term (as the clock frequency is only around a few hundred MHz).
One measurement would be with both clocks parallel in horizontal position – so *without* gravitational Potential between them.
The other measurement would be again in parallel but vertically mounted – so *with* a gravitational Potential between them.
The overall-result of the test would be the difference in ticks between the two measurements. If this difference shows exactly **two times** the pure time dilation in the given height difference (vertical position), the test would have clearly shown that a space dilation exists as well, not only a time dilation and that the expansion of space runs with speed of light (see Formular above). It would also showing the symmetrical expansion of space, independent of a gravitational field.

Alternatively, a similar setup as above, but with one Laser and one Atomic Clock, could be used.

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