On with the Big Bang

Author: Harald Kunde
Mail: business@harald-kunde.de
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Contents

Summary

This document is part of my project "Our universe is just curved spacetime". The agenda of the project is described in (PDF) Our universe is just curved spacetime Our universe is just curved spacetime (researchgate.net) . There, the rough model is shown.

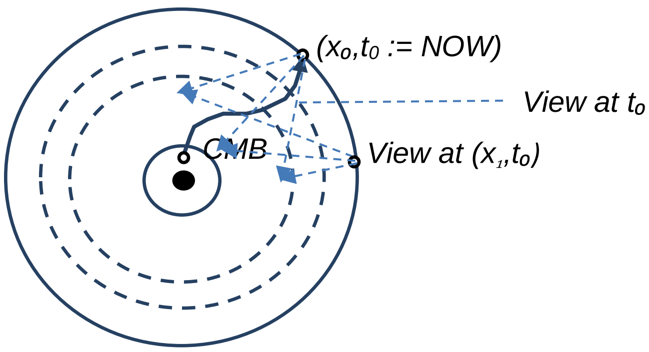
In this document the generalized Minkowski metric M* will be derived on base of Lorentz transformations with dynamic velocity preserving this metric up to scaling. For the special case of a radial dynamic velocity field, a possible process at big bang will be described, and our universe being viewed as black hole (with respect to curvature, not gravitation only). The described process leads to a cyclic universe and due to scaling to a class of black holes with periodical lifecycle. They shall be candidates for elementary particles. But this is part of another document (On Black Holes).

Our view on the universe

My big picture is, that our universe is just curved spacetime, and "matter" built up by extreme manifolds, the black holes. Through their encapsulation, they are the only manifolds that build up something we call objects. So, the words "masses curve spacetime" are modified to "*curved spacetime provides the illusion of masses*". This means of course, that especially all the objects, that we call elementary particles, should be black holes in curved spacetime, too. And one main goal will be – also by now far away -, to describe the type of black holes, how they evolved and how the Kerr-Newman-metric fits to the views we have on these black holes.

How did our universe evolve to produce our view on it?

Our universe will be modelled as a dual construction of evolution and our view on this evolution. For the calculations to come we use the following picture:



Where *CMB* denotes the phase of recombination, and *NOW* is our time, the point in spacetime of our view on the universe. The curved line visualizes the journey of a collection of black holes in a generalized Minkowski universe (non constant radial velocity).

Now, what is creating evolution and views on this evolution, if one assumes that there is only curved spacetime and matter built up by extreme manifolds, black holes? To me it seems natural, that this must be transformations of the kind that they are scaling the Minkowski metric, written as:

(R) $\partial x'^2 + \partial y'^2 + \partial z'^2 - \partial(ct')^2 = \lambda(\partial x^2 + \partial y^2 + \partial z^2 - \partial(ct)^2)$, with c speed of light and time t, and (x',y',z',ct') being a transformation of (x,y,z,ct) in $\mathbf{R}^4$.

In the beginning of the last century, scientists like Poincaré and Einstein [1] evaluated these transformations and found it to be the 15-parameter group G_{15} of conformal transformations with reciprocal radii [1]. The 10-parameter Poincaré group (containing the 6-parameter Lorentz-group) is contained as a subgroup. Cunningham [1] showed, that the transformations of G_{15} can be split into three parts:

$\lambda = 1$: The Poincaré group (Lorentz-group + translations)

◎ $\lambda \in \mathbf{R}$: Affinity transformations (contains the Poincaré group)

◉ $\lambda = \frac{k^4}{(x^2+y^2+z^2-(ct)^2)^2}$: Transformations with reciprocal radii

In [1] there is a remark on ◎ : If λ is set definite, then ◎ forms a group only if $\lambda = 1$. This is clear, since if we apply (R) twice we get:

$\partial x''^2 + \partial y''^2 + \partial z''^2 - \partial(ct'')^2 = \lambda^2(\partial x^2 + \partial y^2 + \partial z^2 - \partial(ct)^2)$. With $l := \sqrt{\lambda}$ Poincaré showed, that transformations of this type can be written as

◎ $x' = \gamma l(x - \frac{v}{c}ct)$, $y' = ly$, $z' = lz$, $ct' = \gamma l(ct - \frac{v}{c}x)$, with v<c is in direction of x, γ is the Lorentz-factor, l some real number, c speed of light.

Dynamic velocity and group G_{15}*

If we assume velocity v *not* to be constant but in x-direction, then a transformation of type ◎ in Poincare notation would generalize the Minkowski metric to:

$$\partial x'^2 + \partial y'^2 + \partial z'^2 - \partial(ct')^2 = l^2[\left(\partial x - \gamma^2 \frac{ct}{c}\partial v\right)^2 - \left(\partial(ct) - \gamma^2 \frac{x}{c}\partial v\right)^2 + \partial y^2 + \partial z^2]$$

Now, in an expanding universe a radial velocity field is of interest. Therefore, we have to change to spherical coordinates. And then the Minkowski metric will be written as:

$\partial r'^2 - \partial(ct')^2 + r'^2(\partial\theta'^2 + sin^2\theta'\partial\varphi'^2)$, and the transformation: $r' = \gamma l(r - \frac{v}{c}ct)$, $ct' = \gamma l(ct - \frac{v}{c}r)$, θ' = θ, φ' = φ polar, azimuthal angle, with v in direction of r and of type, say ◎* (v not constant) will guarantee $r'^2 - (ct')^2 = l^2(r^2 - (ct)^2)$ and change the metric to:

$$\partial r'^2 - \partial(ct')^2 + r'^2(\partial\theta'^2 + sin^2\theta'\partial\varphi'^2) =$$
$$l^2[\left(\partial r - ct\gamma^2 \frac{\partial v}{c}\right)^2 - \left(\partial(ct) - r\gamma^2 \frac{\partial v}{c}\right)^2 + \gamma^2(r - \frac{v}{c}ct)^2(\partial\theta^2 + sin^2\theta\partial\varphi^2)]$$

Since transformations of type ◎* form a group, the resulting generalized metric M* (in fact, it is a *class of metrics*)

$$\partial s^2 = \left(\partial r - ct\gamma^2 \frac{\partial v}{c}\right)^2 - \left(\partial(ct) - r\gamma^2 \frac{\partial v}{c}\right)^2 + \gamma^2(r - \frac{v}{c}ct)^2(\partial\theta^2 + sin^2\theta\partial\varphi^2) \qquad \textbf{(M*)}$$

will be preserved up to scaling by transformations of that group (∂s line element). Let us call this class of metrics «*dynamic Minkowski metric*».

The transformations with reciprocal radii (type ◉), defined by:

$r' = \frac{k^2 r}{r^2-(ct)^2}$, θ' = θ , φ' = φ , $ct' = \frac{k^2 ct}{r^2-(ct)^2}$ yield: $r'^2 - (ct')^2 = (\frac{k^2}{r^2-(ct)^2})^2(r^2 - (ct)^2)$ and

also preserve M* up to scaling with scaling factor $\lambda = \frac{k^4}{(r^2-(ct)^2)^2}$ [1]. Moreover, every transformation of type ◎*, followed by one of type ◉ will be of type ◉. Transformations of type ◉ will be candidate for changing inner and outer view on a black hole.

Let us call the group of transformations of type ◎* and ◉ **G_{15}*.**

There is another transformation, that preserves M* up to scaling. This is given by

$r' = -lct$, $ct' = -lr$, θ' = θ, φ' = φ. For this transformation we get:

$r'^2 - (ct')^2 = -l^2(r^2 - (ct)^2)$ and

$$\left(\partial r' - ct'\gamma'^2 \frac{\partial v'}{c}\right)^2 - \left(\partial(ct') - r'\gamma'^2 \frac{\partial v'}{c}\right)^2 + \gamma'^2(r' - \frac{v'}{c}ct')^2(\partial\theta'^2 + sin^2\theta'\partial\varphi'^2) =$$

$-l^2[\left(\partial r - ct\gamma^2 \frac{\partial v}{c}\right)^2 - \left(\partial(ct) - r\gamma^2 \frac{\partial v}{c}\right)^2 + \gamma^2(r - \frac{v}{c}ct)^2(\partial\theta^2 + sin^2\theta\partial\varphi^2)]$. So, signs will be inverted. The transformation is of type ◎, although it can not be written in Poincaré form.

So, M* is invariant up to scaling by all the transformations of G_{15}*. Note also, that for a transformation of type ◉, say $r' = \frac{k^2 r}{r^2-(ct)^2}$, θ' = θ , φ' = φ , $ct' = \frac{k^2 ct}{r^2-(ct)^2}$ the quotient $\frac{v\prime}{c}$ results in:

[1] The calculation is a little bit exhausting. One step is to show that $\gamma'^2 \frac{\partial v\prime}{c} = \frac{2r\partial(ct) - 2ct\partial r - \gamma^2(r^2-(ct)^2)\frac{\partial v}{c}}{r^2-(ct)^2}$

$\frac{v'}{c} = \frac{2rct-(r^2+(ct)^2)\frac{v}{c}}{-2rct\frac{v}{c}+(r^2+(ct)^2)}$. This means, that if $v \to c$, $v' \to -c$. So, transformations with reciprocal radii invert the behaviour of expansion.

If we claim preservation of $r^2 - (ct)^2 = const$ and continuity of $\frac{v}{c}$ i.e. $\frac{v'}{c} = \frac{v}{c}$ after transformation of type ◉, we get $k^2 = {r_0}^2 - (ct_0)^2$ at transformation-point (r,ct)= (r_0, ct_0) and $\{(rct = 0\ and\ \frac{v}{c} = 0)\ or\ (rct \neq 0\ and\ \left(\frac{v}{c} = \frac{r}{ct}\ or\ \frac{v}{c} = \frac{ct}{r}\right))\}$.

What happens, if velocity v approaches the speed of light?

A short calculation yields

$$\lim_{v\to c}\left(\gamma^2\frac{\partial v}{c}\right) = \lim_{v\to c}\left(\frac{1}{(1+\frac{v}{c})(1-\frac{v}{c})}\frac{c-v}{c}\right) = \frac{1}{2}$$

Since the limit value of a sum is the sum of the limit values of the summands, if these exist, and the same is true for products, we can conclude:

$$\lim_{v\to c}\left[\left(\partial r - ct\gamma^2\frac{\partial v}{c}\right)^2 - \left(\partial(ct) - r\gamma^2\frac{\partial v}{c}\right)^2 + \gamma^2\left(r - \frac{v}{c}ct\right)^2\left(\partial\theta^2 + sin^2\theta\partial\varphi^2\right)\right] =$$
$$\left(\partial r - \frac{ct}{2}\right)^2 - \left(\partial(ct) - \frac{r}{2}\right)^2 + \lim_{v\to c}\left[\gamma^2\left(r - \frac{v}{c}ct\right)^2\left(\partial\theta^2 + sin^2\theta\partial\varphi^2\right)\right]$$

In order to avoid a singularity for v→c, we need the limit of the last summand to exist. We show, that this is possible and that the solution (case 2) will fulfil the project agenda. Nevertheless, this solution may not be the one, our universe is based on.

(*r* → *ct with v* → *c and* $\lim_{v\to c}\left[\gamma^2\left(r - \frac{v}{c}ct\right)^2\right]$ $exists$) or ($\lim_{v\to c}[\gamma^2(\partial\theta^2 + sin^2\theta\partial\varphi^2)]$ $exists$))

1st case: (*r* → *ct with v* → *c and* $\lim_{v\to c}\left[\gamma^2\left(r - \frac{v}{c}ct\right)^2\right]$ $exists$)

In this case the term $\left(\partial r - \frac{ct}{2}\right)^2 - \left(\partial(ct) - \frac{r}{2}\right)^2$ vanishes due to $\partial r = \frac{\partial r}{\partial(ct)}\partial(ct) = \frac{v}{c}\partial(ct)$ and *r* → *ct with v* → *c.*

Let us denote $\lim_{v\to c}\left[\gamma^2\left(r - \frac{v}{c}ct\right)^2\right] =: {\rho_s}^2$. Then the metric M* degenerates to:

$\partial s^2 = {\rho_s}^2\left(\partial\theta^2 + sin^2\theta\partial\varphi^2\right)$, with $r = ct =: r_0$ (time is frozen)

2nd case: $\lim_{v\to c}[\gamma^2(\partial\theta^2 + sin^2\theta\partial\varphi^2)]$ $exists$

The limit may be dependent from the value of $(r - ct)^2$. It may only exist, if θ approaches a value of $0\ for\ v \to c\ (and\ \frac{\pi}{2}\ for\ v \to 0)$, in a proper order. So, if we set $\theta = \arccos\left(\frac{v}{c}\right)$, we get $\partial\theta = -\gamma\frac{\partial v}{c}$ and therefore: $\lim_{v\to c}\left(\gamma^2\partial\theta^2\right) = \lim_{v\to c}\left((\gamma^2\frac{\partial v}{c})^2\right) = \frac{1}{4}$ and since $sin^2\theta = sin^2\left(\arccos\left(\frac{v}{c}\right)\right) = 1 - \frac{v^2}{c^2} = \frac{1}{\gamma^2}$ we get $\lim_{v\to c}\left(\gamma^2 sin^2\theta\partial\varphi^2\right) = \partial\varphi^2$

Together:

$\partial\theta^2 + sin^2\theta\partial\varphi^2 = \gamma^2\left(\frac{\partial v}{c}\right)^2 + \frac{1}{\gamma^2}\partial\varphi^2$ and hence:

$\lim_{v\to c}[\gamma^2(r - \frac{v}{c}ct)^2(\partial\theta^2 + sin^2\theta\partial\varphi^2)] = (r - ct)^2(\frac{1}{4} + \partial\varphi^2)$ and so:

$$\partial s^2 = \begin{cases} \left(\partial r - \frac{ct}{2}\right)^2 - \left(\partial(ct) - \frac{r}{2}\right)^2 + (r - ct)^2(\frac{1}{4} + \partial\varphi^2),\ for\ v = c \\ \left(\partial r - ct\frac{\partial v}{c}\right)^2 - \left(\partial(ct) - r\frac{\partial v}{c}\right)^2 + r^2(\left(\frac{\partial v}{c}\right)^2 + \partial\varphi^2),\ for\ v = 0 \end{cases}$$

For the universe as a black hole, I prefer case 2 (for special black holes within the universe this may be different). Let us call such a universe a case-2-universe.

Note, that the above limit would also exist, if $\gamma^2(r-\frac{v}{c}ct)^2(\partial\theta^2+sin^2\theta\partial\varphi^2)=const$ for some kind of spin preservation reason. In this case, this property would be preserved up to scaling by transformations of G_{15}*, and preserved by transformations of type ◎* with parameter l=1 (for constant v this would be just members of the Poincare group).

Case-2a

In a case-2-universe the dynamic Minkowski metric M* will be without singularities if $\theta=\arccos\left(\frac{v}{c}\right)$. In this case the metric can be specialized to:

$$\partial s^2=\left(\partial r-ct\gamma^2\frac{\partial v}{c}\right)^2-\left(\partial(ct)-r\gamma^2\frac{\partial v}{c}\right)^2+(r-\frac{v}{c}ct)^2\left((\gamma^2\frac{\partial v}{c})^2+\partial\varphi^2\right) \qquad \textbf{(M}_2\textbf{*)}$$

As mentioned above, the metric collapses to

$\partial s^2=\left(\partial r-ct\frac{\partial v}{c}\right)^2-\left(\partial(ct)-r\frac{\partial v}{c}\right)^2+r^2(\left(\frac{\partial v}{c}\right)^2+\partial\varphi^2)$, for v=0.

If we denote $a:=\frac{\partial v}{\partial t}=c\frac{\partial v}{\partial ct}$ as radial acceleration, we can rewrite:

$\partial s^2=\partial(ct)^2(\left(\frac{v}{c}-\frac{ct}{c^2}a\right)^2-\left(1-\frac{r}{c^2}a\right)^2+r^2(\left(\frac{a}{c^2}\right)^2+\left(\frac{\partial\varphi}{c\partial t})^2\right))=$

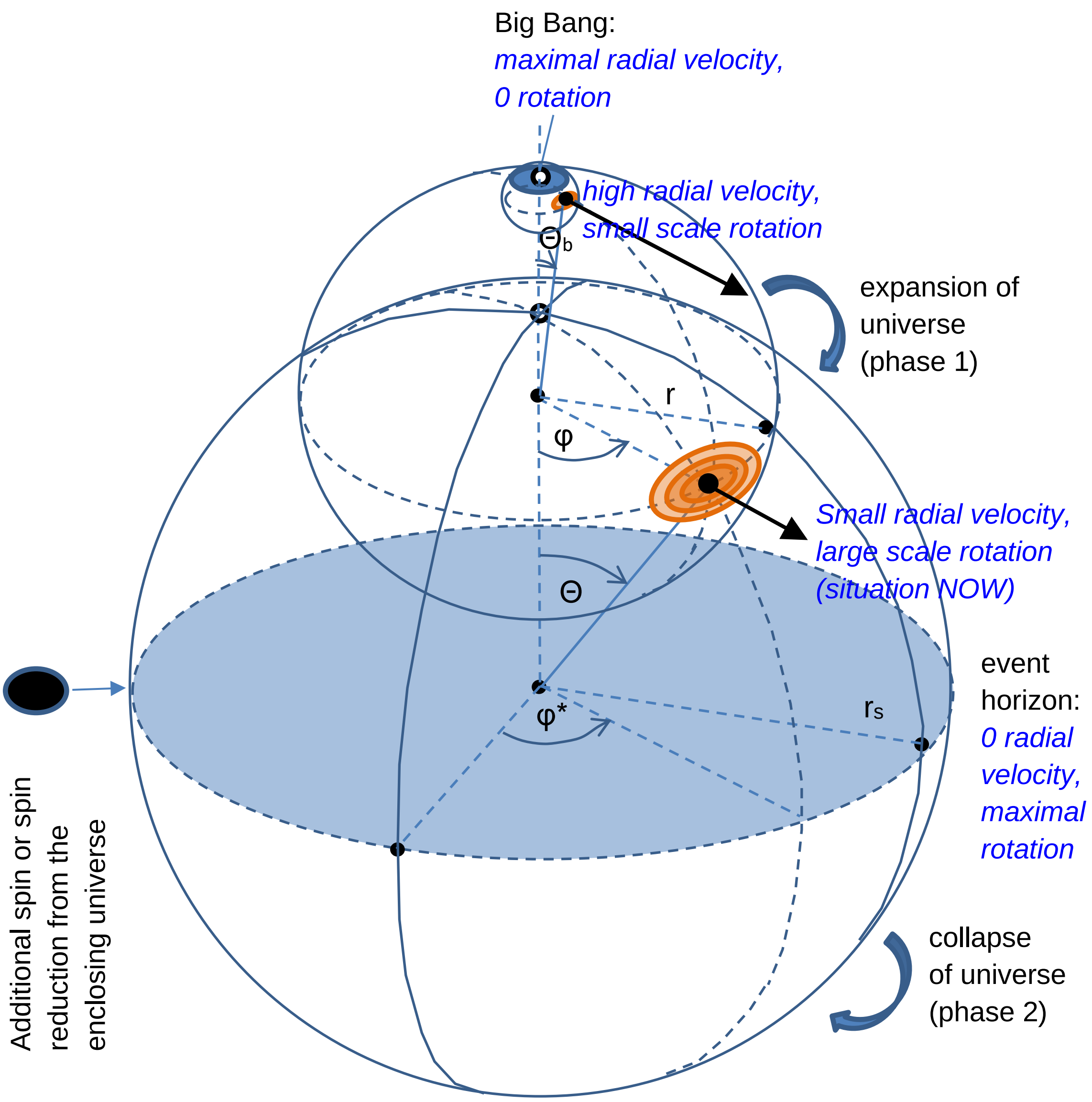
$\partial(ct)^2(\left(\frac{ct}{c^2}a\right)^2-\left(1-\frac{r}{c^2}a\right)^2+r^2(\left(\frac{a}{c^2}\right)^2+\left(\frac{\partial\varphi}{c\partial t})^2\right))$

Now, if $r\frac{\partial\varphi}{\partial t}=c$, we get $\frac{\partial s}{\partial t}=0$, if $\frac{(ct)^2}{c^4}a^2+\frac{2r}{c^2}a-\frac{r^2}{c^4}a^2+\frac{r^2}{c^4}a^2=\frac{(ct)^2}{c^4}a^2+\frac{2r}{c^2}a=0$. This is true for $a=0\ or\ a=-\frac{2rc^2}{(ct)^2}\ (with\ (ct)^2>0)$. In the first case, it is indefinite, whether the universe comes to an end, or v=0 being a minimum and the universe goes on expanding, or it changes to collapse. In the second case, we get $a<0$, and so the universe could shrink again. In a similar way we get for $r\frac{\partial\varphi}{\partial t}=0$ and $\frac{\partial s}{\partial t}=0$: $ct=0\ and\ r\neq0\ and\ a=\frac{c^2}{2r}$ or $ct\neq0\ and\ a=\frac{c^2}{(ct)^2}(-r\pm\sqrt{r^2+(ct)^2})$. Let us call a universe with $a>0\ for\ r\frac{\partial\varphi}{\partial t}=0$ and $a<0\ for\ r\frac{\partial\varphi}{\partial t}=c$ a «*case-2a-universe*». So, a case-2a-universe would meet the agenda of the project *«Our universe is just curved spacetime»*.

Cyclic universe

The project agenda stated that our universe is just curved spacetime and objects inside are collections of extreme manifolds: black holes (with respect to curvature, not just gravitation). Moreover, our universe would be a black hole, too. In a document on black holes to come the case will be handled, that all the black holes are – up to scaling - of the same type, the type of our universe. But there is a main difference: As to the objects (built up of collections of black holes) in our universe we have an outer view, whereas we have an inner view on our universe. The transformations of inverse radii ◉ shall achieve the transformation of views.

So, from an inner perspective, the black hole, called our universe, starts at some point in spacetime with a definite "spin" $r^2-(ct)^2$, inner parameters θ=0 and local spherical center $(r_0,ct_0)=(\frac{ct}{2},\frac{r}{2})$ with $r^2-(ct)^2=const$ to $\theta=\frac{\pi}{2}$ and local spherical center $\lim_{v\to0}\left((\frac{\partial v}{c}ct,\frac{\partial v}{c}r)\right)$ in a phase, call it phase 1. Then it shrinks from $\theta=\frac{\pi}{2}$ and local spherical center $\lim_{v\to 0}\left((\frac{\partial v}{c}ct,\frac{\partial v}{c}r)\right)$, reaching $(-\frac{ct}{2},-\frac{r}{2})$, and via $\lim_{v\to 0}\left((-\frac{\partial v}{c}ct,-\frac{\partial v}{c}r)\right)$ at last reaching local big bang at spherical center $(\frac{ct}{2},\frac{r}{2})$. The whole process under restriction of $r^2-(ct)^2$ being invariant under transformations of the Poincaré group.



In the document «On Kip Thorne's limit for rotation of black holes» a derivation of Kip Thorne's limit on the rotation of black holes of 0.998 the total mass was shown, based on the hypothesis that the fine structure constant α is not constant at all and its value is nothing else than twice the quotient $\frac{v^2}{c^2}$ with v=v(t) being the radial velocity of the expansion of our universe at time NOW, i.e.: $\frac{\alpha}{2}=\frac{v(NOW)^2}{c^2}$.

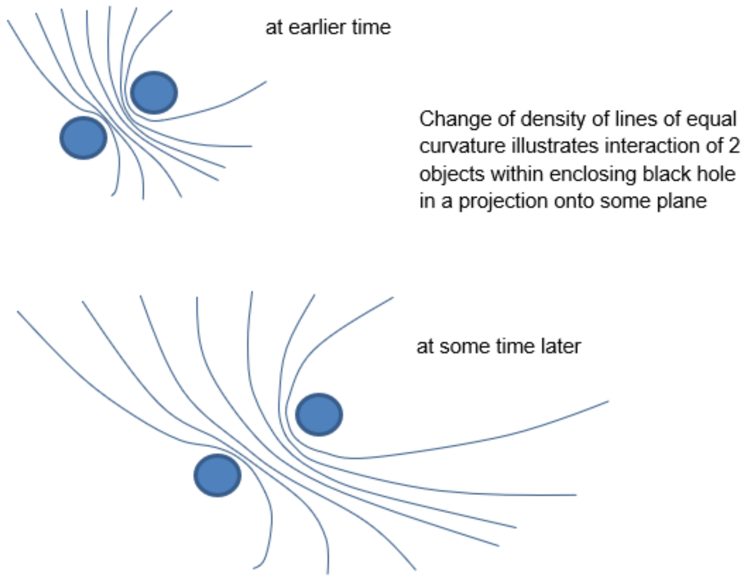
Implication on electric and magnetic fields

For the electric field constant in vacuum ε_0 we have the (non-relativistic) formula: $hc = \frac{e^2}{2\varepsilon_0 \alpha}$ with Planck constant h, elementary charge e. So, if we assume, that h and c will be constant throughout the expansion of the universe, $\frac{e^2}{4\varepsilon_0}$ will not be. We get: $\frac{e^2}{4\varepsilon_0} = hc\frac{v(t)^2}{c^2}$ with radial expansion velocity *v(t)*. What about the evolution of the electric field of an elementary load and the magnitude of the force associated with it? Obviously, this depends on the function *v(t)* of radial expansion velocity of our universe. In the «event horizon model» there is a statement on the quotient of $\frac{v(t)^2}{c^2}$ for time *t=CMB*. In this model CMB is associated not only with the "escape" of photons due to recombination but with a gigantic explosion corresponding to a blueshift factor of exactly 0.5. This leads to $\frac{v(t)}{c} = 0{,}6$ hence: $\frac{v(t)^2}{c^2} = 0{,}36$. For time *t=NOW* we have: $\frac{v(NOW)^2}{c^2} = \frac{\alpha}{2} = 0{,}0036_{48676628139357}$. So, shortly before CMB electric force was about 100 times stronger than today – assuming the model is true.

I assume, that the lifecycle of a black hole is hidden for the enclosing black hole, i.e. our universe. So, there is an essential thing with this picture: **Interaction takes place in the embedding black hole, i.e. our universe, at coupling constants that correspond to *the phase our universe is in*.** This is illustrated in the picture below.

The picture illustrates the fact described below, that the smaller black holes are, the bigger the density of curvature of the universe in their environment, and thus the force induced by them in their nearby environment.

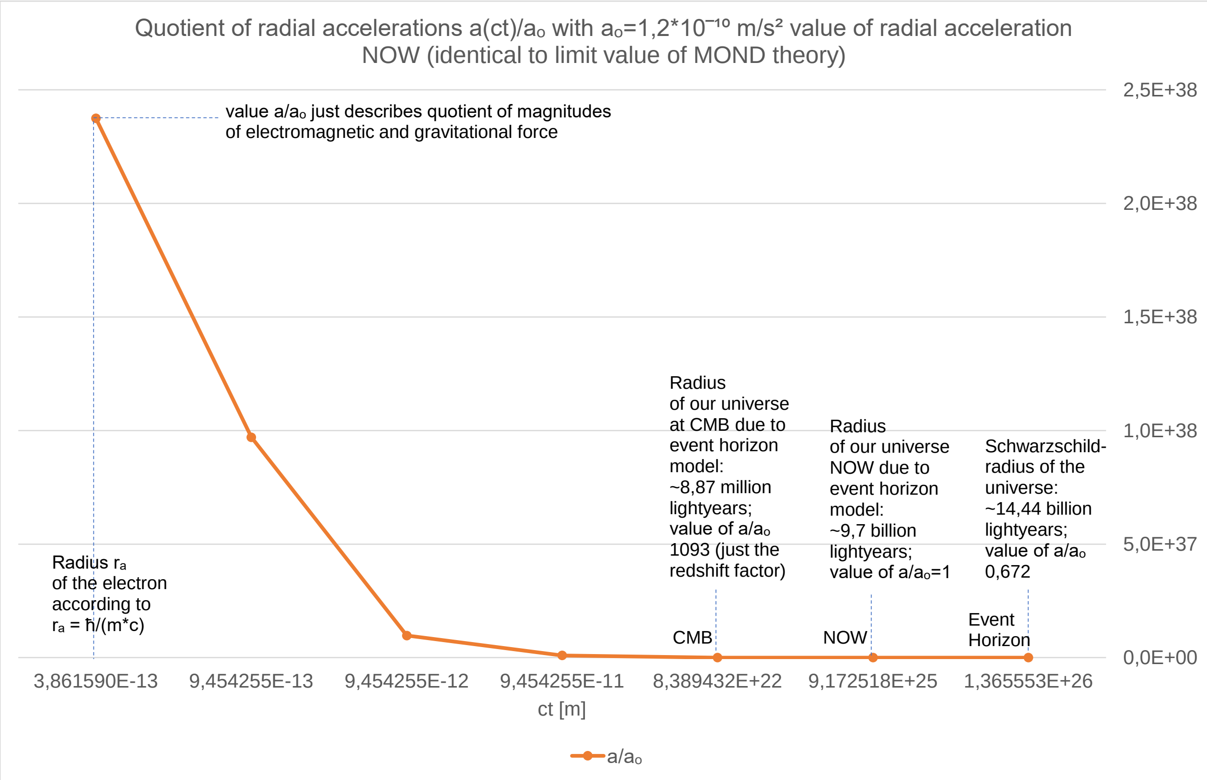
In [2] we derived a certain identity on M* which led to a formula for the radial acceleration $a = a(ct)$ present in all rotational systems of the universe:



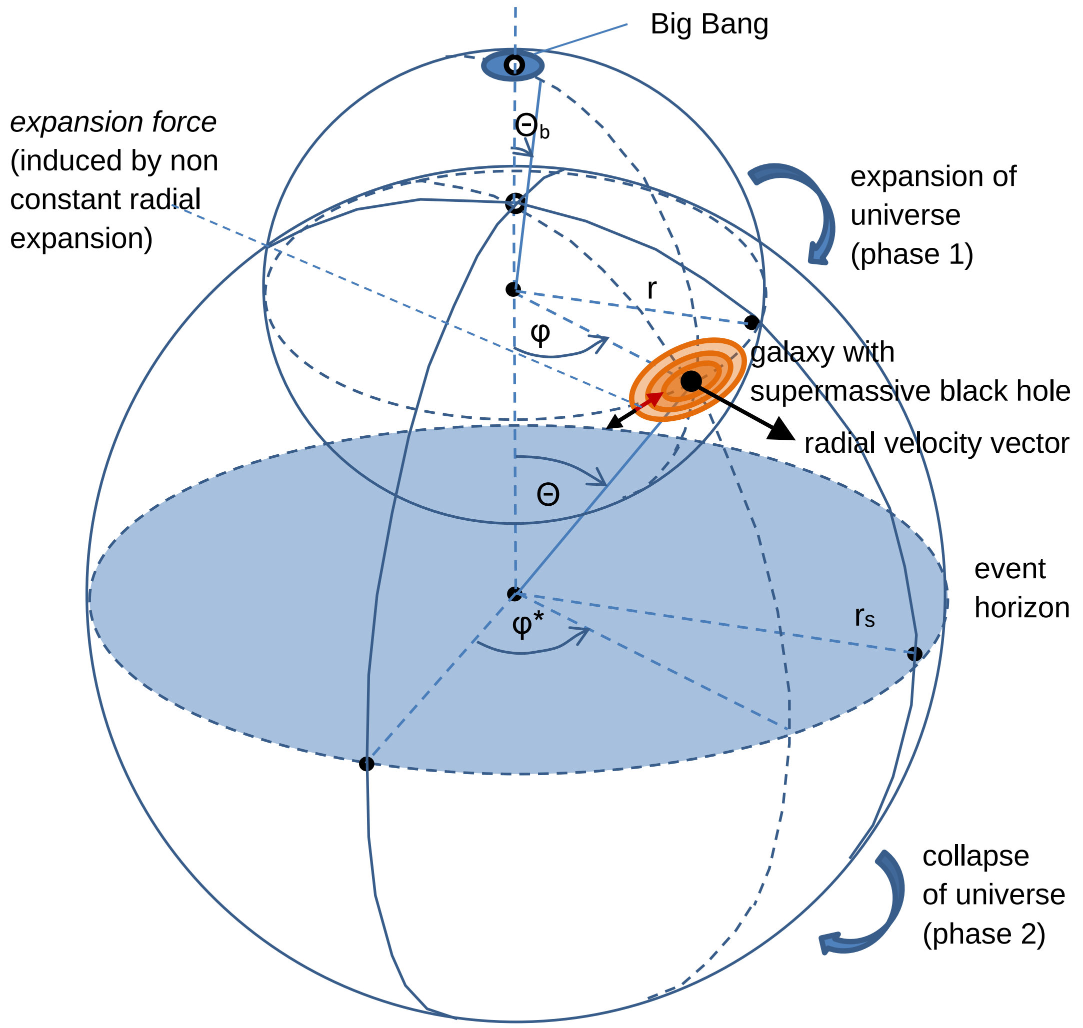
$$a = -\frac{2c^2}{3\sqrt{3}\pi^2 ct}$$

For ct=ct$_o$=NOW (~9,7 billion light years according to the event horizon model) we got the value $|a_0| * \pi = 1{,}2 * 10^{-10}\frac{m}{s^2}$ which is the value of MOND theory. If we evaluate the quotient $\frac{a}{a_o}$ for different values of ct we get a value of ~2,4*10^{38} for the radius of the electron (which describes the quotient of magnitudes of electric and expansion forces), 1093 for CMB according to event horizon model (which is just the redshift for CMB), 1 for NOW and 0,67 when reaching the event horizon.

This is shown in the following diagram:



This indicates, that **expansion "force"** (gravitation will be split into an expansion part and a rotational part, the latter describing the original Newtonian part) is time dependent, and its former value is just a multiple of the one at time NOW by redshift factor. The following picture illustrates this.

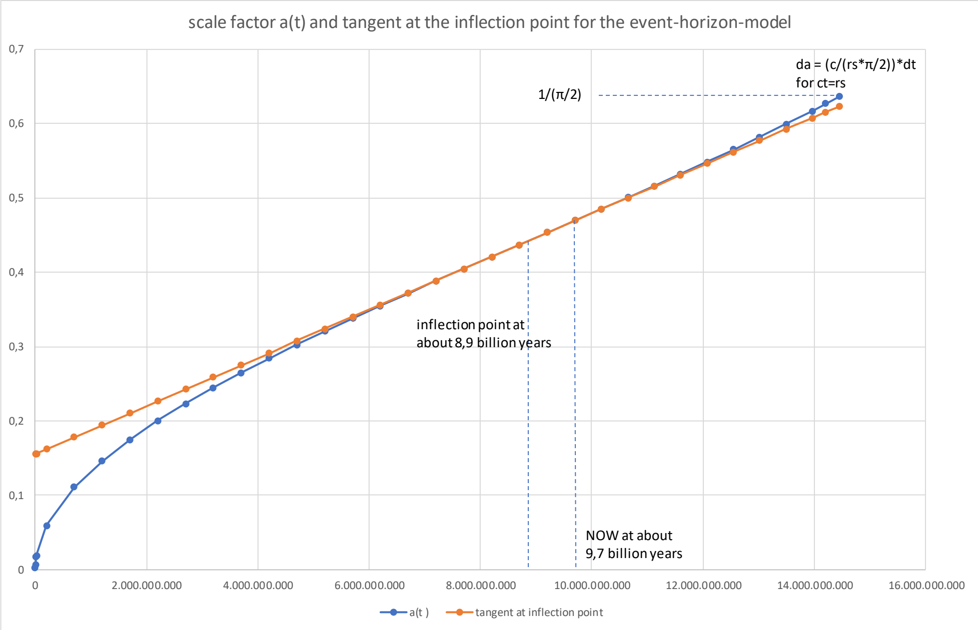


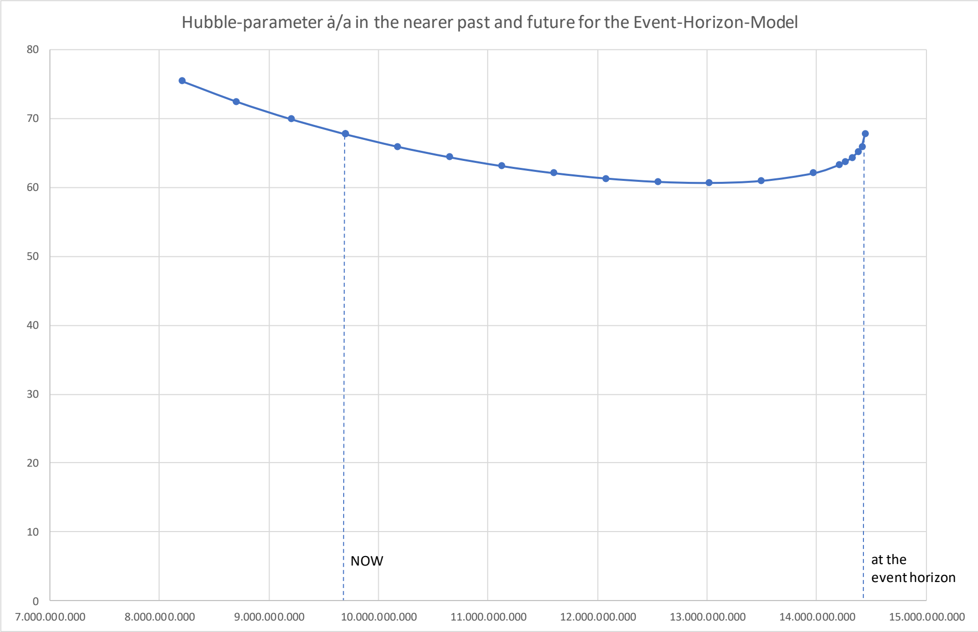
The radial expansion with non constant velocity corresponds to a radial acceleration, say a. The expansion induces in a galaxy (see picture) a force, radial relative to the galaxy with amount - aπ, that induces a counter force a= aπ.

This of course would mean, that the force being bigger, the older the rotational systems are, we inspect.
Such an increasing value of the expansion force with the distance from NOW could explain, why supermassive black holes arose so soon after CMB.

Expansion and Hubble constant

The spherical model of our universe and its non constant expansion in phase 1 of its lifecycle shows, that a quotient of physical and comoving coordinates will not describe the dynamic expansion correctly. The model states, that our universe – in the phase of expansion (one of 4 phases of a cycle) it is in – starts with radial velocity c and rotational one equal to zero, and ends phase 1 reaching the event horizon with radial velocity zero and rotational one equal to c. So, as the rotational part of movement gets more important during the expansion phase of our universe - **although it is *not* contributing to expansion** -, it is clear that the expansion rate depends on quotient $\frac{v}{c}$ with radial velocity v, rather than the quotient of physical and comoving distance of objects. Nevertheless, in the event horizon model, which describes the evolution of the universe as a black hole on base of Schwarzschild metric expanded in a rigorous way (some call it voodoo-physical way) to the inner side, we get for the evolution of the scale factor $\mathrm{a} = \mathrm{a}(t)$ and the Hubble constant $\frac{\frac{d\mathrm{a}}{dt}}{\mathrm{a}}$ the following dependencies:

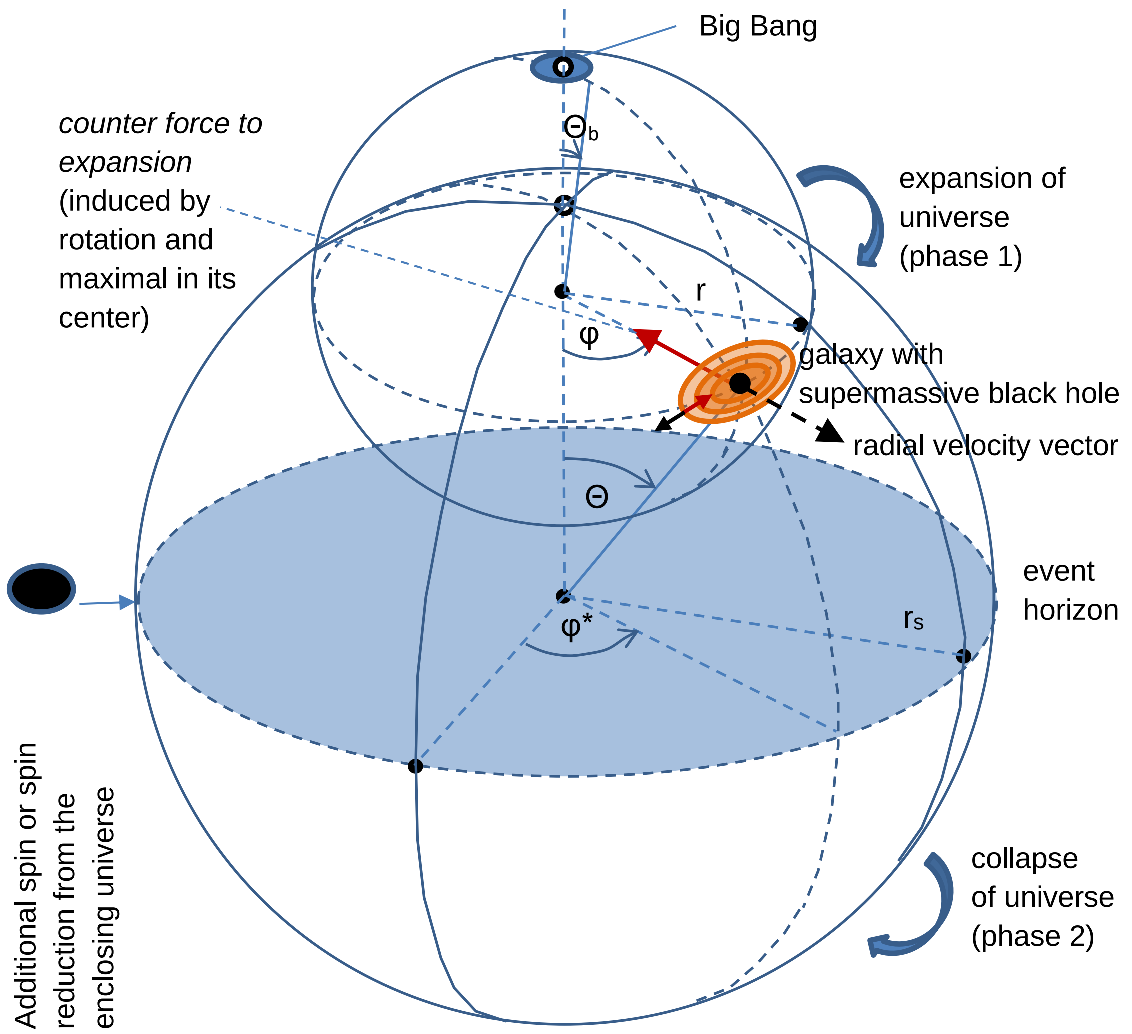




(the last diagram being just an extract of our nearby environment in past and future). One recognizes a slight acceleration of expansion at time NOW in the first diagram and a Hubble "constant" having a value of 67,4 [km/(s*Mpc)] at time NOW and of 72-74 [km/(s*Mpc)] at time 1-1,5 billion years before in the second diagram.

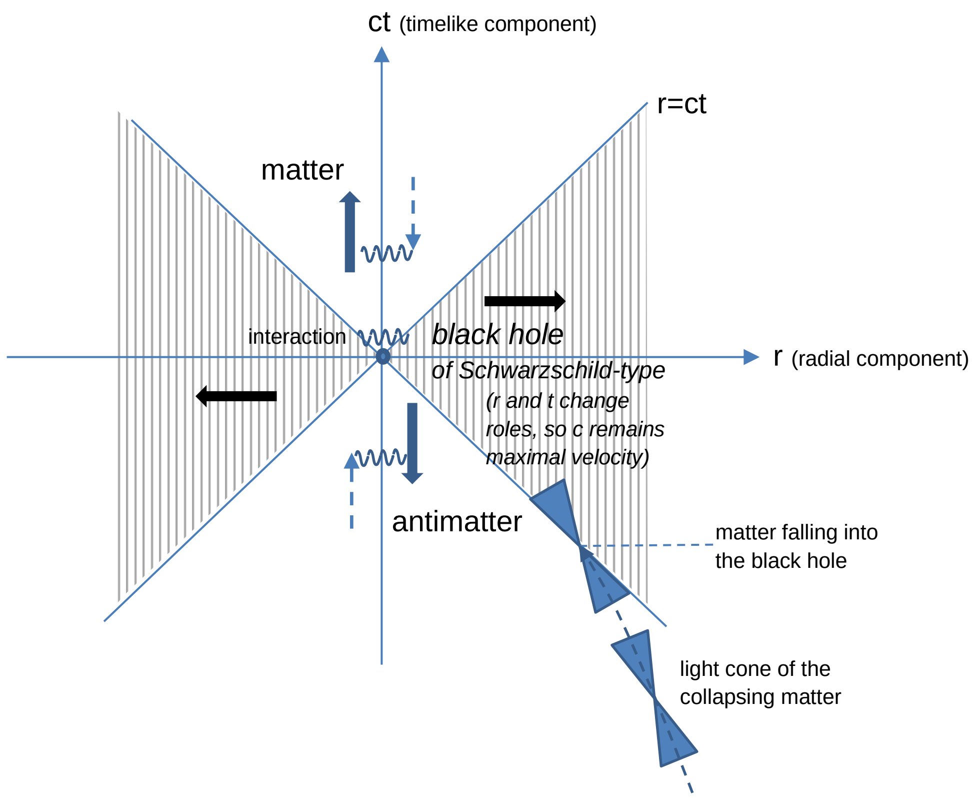
Black holes

Just like expansion induces an additional acceleration in rotational systems, there shall exist a counter acceleration to expansion induced by rotation and maximal in the center of such rotational systems[2]. This means, that in extreme cases it may happen, that expansion stops in such a center, rotation getting maximal in some environment of the center, and radius and time changing role inside. This will be illustrated in the both pictures below.



The next picture illustrates the principal behaviour of black holes with respect to infalling matter.

[2] Note, that the value $a = -\frac{2c^2}{3\sqrt{3}\pi^2 ct}$ for accelerated expansion a of our universe, derived in [2], is the result of both (real) expansion acceleration and the one of counter force. Note also, that in case of approaching the event horizon, its value may be small, but not zero. Could this indicate, that the event horizon is not a real border of action?

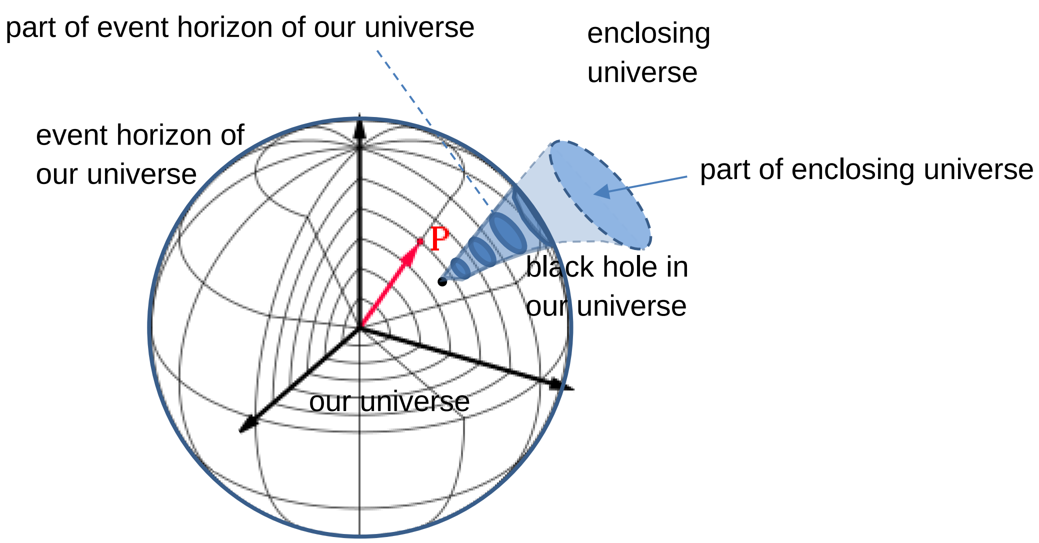


The resulting black hole represents an encapsulation object with its own lifecycle and the rotational system around it interacts with other rotational systems at coupling constants given by the enclosing universe and its lifecycle state. Since collections of black holes represent what we call masses, masses are centers of rotation. Such, the filaments of our universe are just constrictions of our expanding universe. This expansion being maximal in what is called voids. Recent measurements of Doppler effects in the filaments show, that they indeed are places of high rotation (twisting along the axes of the filaments).

Open questions:

1) Since radial acceleration of expansion has come to an end at the event horizon of a black hole in our universe, does this mean, that this horizon is already part of the event horizon, that our universe will reach at the end of phase 1 of its expansion? Will these black holes be smoothed out then?

2) Our universe is – as a black hole – part of an enclosing universe. In this universe, radius and timelike coordinate have the same role as in our enclosed black holes. If the event horizons of the enclosed black holes would be part of the event horizon of our universe, could this mean, that there is a connection to the enclosing universe via the black holes? In this case the event horizon would not be a smooth sphere, but would contain holes to the inside, meaning that black holes would not be totally encapsulated (see next picture).



So black holes in our universe would be like a “finger” from the enclosing universe into our universe. If the note on non-zero radial acceleration at the event horizon of black holes of type universe is true (the event horizon not being a real border for action), this would mean, that there is a kind of interaction with the enclosing universe across the black holes contained in our universe. The most curious thing however would be, that we – as collections of black holes, interacting at conditions given by our universe – would be part of the enclosing universe.

In a case-2a-universe objects shall be built from collections of black holes[3]. What types of black holes may exist? One candidate is a type similar to our universe itself, since there is no reason, why preservation of above metrics *up to scaling* should not lead to black holes like our universe, but of smaller scale than our universe. On the other hand, we know from Kerr, Newman, Reissner and Nordström, that there exist metrics for black holes with or without rotation and with or without electric charge – valid outside a certain radius. Discussion on these themes shall be part of another paper.

References

[1] Kugelwellentransformationen, WIKIPEDIA, Mai 2020, Link: https://de.wikipedia.org/wiki/Kugelwellentransformation

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[3] Spezielle Relativitätstheorie, F.Hassler, RWTH Aachen, 2014, Link: https://www.quantuminfo.physik.rwth-aachen.de/global/show_document.asp?id=aaaaaaaaaamgdst

3 Remember, that we use the term black hole with respect to curvature in spacetime not with respect to just gravitation. The goal is to describe other forces than gravitation by curved spacetime too.