Remarks on the Metric-Dynamic Gravitation

Abstract

(I call my theory of gravity metric-dynamic gravity, or MDG for short.)

First, I present some of the fundamental definitions and equations needed for what follows.

Then, a surprising connection between my theory of gravity and general relativity (GR) is introduced:

In the gravitational field of individual bodies (e.g. planets) and in solar systems, the two theories lead to identical results.

This represents a significant simplification, since the calculations in MDG are considerably less computationally intensive than in GR.

However, if the system under consideration does not contain a dominant mass, the two theories diverge considerably.

The most important consequences of this difference are:

1. Compared to GR, MDG results in *additional motions* of masses that, from the perspective of GR or Newtonian theory, can only be explained by additional gravity caused by invisible mass.

(For example, galaxies rotate significantly faster in MDG than in GR.)

2. MDG leads to a completely different view of the universe and its evolution:

In MDG, the universe is not *space* as in GR, but a *metric-dynamic structure* consisting of *metric flows* caused by *metric changes in length and angle*.

(Gravity is defined as a change in length, electromagnetism as a change in angle.)

Now to the last and most important point:

From a metric-dynamic perspective, the universe – or rather, every possible universe – must contain precisely the mass it contains.

In MDG, mass has the dimension of length, and the following holds true:

The total mass of the universe is equal to the radius of the universe.

The reason for this is that the universe must contain exactly the mass by which it is *metrically closed*.

The prerequisites for this assertion are that the universe is closed and that its size is unchanging. (What changes, is our *length measure.* See, for example, What is the world made of, page 7.)

However, a metric region (a universe) can be closed not only by *changing length*, but also by *changing angle*.

It seems that our universe contains not only precisely the mass, but also precisely the positive charge by which it is metrically closed, and moreover, this argument also yields the ratio of the strengths of gravity and electromagnetism of approximately 10^{40}.

This fact was my main motivation for this writing. In contrast to the current trend of "explaining" everything we don't know through a multiverse, this reveals – for the first time! – a genuine explanation for fundamental quantities and their relationships with each other and with the universe as a whole.

1. Definitions, Equations

For the following, the definitions of σ, the metric density of the length, and η, the metric density of the angle, are required, and also the fundamental equations (1) and (1'), which (in my physics) describe the process that produces reality through changes of the length and changes of the angle (in the book The Structure of Reality from page 20).

Definition of σ:

Let r be a spatial coordinate. Then

$$\frac{dr}{\sigma(r)} = dr' \quad \Leftrightarrow \quad dr = \sigma(r)\, dr'$$

– where r' denotes the same spatial coordinate after the metric change. σ is dimensionless.

Definition of η:

$$\frac{d\alpha}{\eta(r)} = d\alpha' \quad \Leftrightarrow \quad d\alpha = \eta(r)\, d\alpha'$$

Here, α' is the same angle after the metric change. η is dimensionless.

Equations (1) and (1'):

$$\boxed{\frac{d\sigma}{dr} = -\frac{1}{c^2}\frac{dv}{dt}} \qquad (1)$$

$$\boxed{\frac{d\eta}{dr} = -\frac{1}{c^2}\frac{dw}{dt}} \qquad (1')$$

From the changes of the metric densities σ and η follow ***accelerations of the metric flows*** v and w, where the flow v is *parallel* to r and the flow w is *orthogonal* to r.

2. The Relationship Between GR and MDG

First, a brief explanation of the prerequisites (see page 36ff. in the book Structure):

In MDG, mass is defined as *metric compression of length* as follows:

A spherical object with metric mass m (in meter) reduces the radius of the region of space it occupies by m units – where m corresponds to the radius of a black hole with (Newtonian) mass M (in kilogram), where $m = M\, G / c^2$.

Let's consider the Earth as an example. Assume its radius is exactly 6370 km and that it is perfectly spherical. It is therefore bounded by a spherical surface with this radius.

Now, let's remove the Earth from this bounding spherical surface. Then the radius of this spherical surface increases by 8.86 mm, meaning it moves outward by 8.86 mm in every direction. (8.86 mm is the radius of a black hole with the mass of the Earth.)

If, for a point outside a central mass m, the distance to the center *without* the mass m is equal to r, then *with* the mass m, this distance is reduced to r – m.

Thus, the following applies to the metric density s in the exterior space:

$$\sigma(r) = \frac{r - m}{r} \qquad (2)$$

Differentiating (2) with respect to r yields

$$\frac{d\sigma}{dr} = \frac{m}{r^2} \qquad \text{According to (1)} \qquad \frac{d\sigma}{dr} = -\frac{1}{c^2}\frac{dv}{dt} \qquad \text{therefore holds}$$

$$\boxed{\frac{dv}{dt} = -c^2\frac{m}{r^2}} \qquad (3)$$

If m in (3) is interpreted as *geometric mass* $(m = \frac{MG}{c^2})$, then we get

$$\frac{dv}{dt} = -\frac{MG}{r^2} \qquad (4)$$

This acceleration corresponds to the *Newtonian gravitational acceleration* caused by a central mass M. From this, the *Newtonian velocity of free fall* (for the fall from infinity) can be derived:

$$\boxed{v = \pm c\sqrt{\frac{2m}{r}}} \qquad (5)$$

Back to (3). The acceleration of the metric flow v by the mass m is equal to the acceleration of a test body by the mass M in Newtonian theory – however, with the difference that in MDG, the gravitational influence propagates at the speed of light and does not act instantaneously, as in Newton's theory.

So much for the short introduction to the MDG.

Now we come to a surprising connection between GR and MDG:

In the MDG, the velocity v *of the metric flow is used to determine the metric ratios at any given position.* ***In solar systems and in the gravitational field of planets, the results then also apply to the GR.***

Let dr be the length differential, dt the time differential in field-free space. Let dr' be the length differential of an observer at rest along the flow direction (where "at rest" here means *moving relative to the metric flow* v *at a velocity of* -v), and let dt' be the time differential of this observer.

Then applies (according to special relativity):

$$dr' = dr\,(1 - \frac{v^2}{c^2})^{-1/2} \qquad (6)$$

$$dt' = dt\,(1 - \frac{v^2}{c^2})^{1/2} \qquad (7)$$

The length differentials orthogonal to the flow direction remain unchanged.

Since the velocity of the metric flow is calculated using the same formula as for Newton's velocity of free fall from infinity (except for the difference due to the finite propagation speed), this calculation is significantly simpler than the calculation based on the fundamental equation.

In the steady-state case – i.e. in the Schwarzschild solution – almost no calculations are required at all. Here, the velocity of the metric flow v

$$v(r) = -c\sqrt{\frac{2m}{r}} \qquad (5)$$

is exactly equal to Newton's velocity of free fall (for the case from infinity).[1]

Based on this equation and the two equations (6) and (7) above, the Schwarzschild metric can then be written down immediately:

$$ds^2 = (1 - \frac{2m}{r})\, dt^2 - (1 - \frac{2m}{r})^{-1}\, dr^2 - r^2 d\phi^2$$

The necessary calculations (Structure, page 43 ff.) are therefore much shorter and simpler here than in the GR.

As already mentioned, the perihelion precession of Mercury – at the time the most accurate test of the GR – can also be calculated in just a few lines.

Although these relationships are derived from the MDG, they can be considered facts – regardless of their origin – since they are not approximations but exact results that agree with the GR.

This situation can be summarized as follows:[2]

In solar systems and in the gravitational field of planets, the formalism of GR can be dispensed with for determining the metric facts, since there is a much simpler way:

The velocity of the metric flow v, which is equal to the Newtonian velocity of the fall from infinity, is inserted into the factor $k = \sqrt{(1 - v^2/c^2)}$ known from SR:

Then the radial differential is: $dr' = dr/k$ (6')

and the time differential is: $dt' = dt\, k$ (7')

Because of this connection, I initially thought I had merely *reconstructed* the GR – albeit in a way that allowed for much simpler calculations.

At that point, the metric flow seemed to me like an intermediate step, representing a mathematical simplification compared to the GR, where the calculations are directly feasible but significantly more complex.

So far, as I said, these conclusions from the MDG can be considered facts.

1 In the MDG, as in the GR, 2m is the radius R of the black hole with mass m (in meters) or the corresponding mass M (in kilograms).
Although the mass m is initially defined *equal* to this radius, i.e. m = R, the metric representation is non-relativistic, and upon transition to the relativistic representation, m turns into 2m. .

2 I don't know if the following fact is known in standard physics. However, an – albeit superficial – search was unsuccessful.

However, according to the MDG, they apply *generally* and not just in the scenarios mentioned above.

But when I later turned to the general case, it became clear to me that the agreement between GR and MDG only exists when the metric flow is directed exactly toward the center of mass of the system.

In solar systems and in the gravitational fields of individual bodies (e.g. planets), due to the dominant mass this is usually the case to an excellent approximation. However, if the system under consideration does not have a dominant mass, but its total mass is distributed among several bodies, then MDG and GR diverge, and the difference between the two theories becomes even more pronounced when the total torque of the system is large.

In galaxies, this is almost always the case. A large portion of the mass – usually many thousands of times the mass of the central black hole – is in rotating motion, and since the metric elements (the length differentials coming from infinity and moving in the flow) follow the masses just like Newtonian test bodies, the metric flow here has a tangential component, and this is precisely the reason for the significantly higher rotational velocity in the MDG.

From the perspective of Newton's or Einstein's theories of gravitation, this effect of the rotating metric flow can only be understood as additional gravity caused by invisible mass. (More on this below.)

MDG thus opens up the possibility of dispensing with dark matter to explain galaxy rotation and other gravitational effects.

So, in summary the following applies:

In the case of a single, non-rotating mass – i.e. in the Schwarzschild solution – GR and MDG yield identical results. If a dominant mass exists in the system and the total torque is small, the differences between the two theories are negligible in almost all cases.

In the general case, however, the results differ significantly – in the case of galaxies, so much so that they can no longer be seen as approximations.

Nevertheless, also in the general case the simple calculation methods derived from the MDG can be used. However, the results contradict the results of the GR, and therefore they have no longer the status of facts, but only that of hypotheses.

Here is a brief overview of the basics of these methods:

Consider a position where the metric flow has the velocity v. The system relative to which the metric flow moves at this velocity is our reference frame.

From equation (7), we can see that in a system moving at the velocity –v relative to the local metric flow – in other words, for an observer who is ***at rest*** in the usual view (according to GR) – time passes ***more slowly than in the flow***.

An example to illustrate this: the Earth. The origin of our (non-rotating) reference frame is the Earth's center.

We are at the North Pole. The metric flow moves through us toward the Earth's center at v = 11.1 km/s. Therefore, according to the MDG (see equation (7)), *our time* passes more slowly than the *time in the flow.*

Since the metric flow is directed toward the center of mass, the result agrees with the result predicted by the GR. (Both theories yield: dt' = 0.99999999931 dt)

Since dt is the time differential in field-free space, from equation (7) follows:

In a system S_F moving with the flow, time passes <u>faster</u> than in <u>any</u> system moving relative to the flow, and this applies not only to systems located in the area of S_F, but to all systems located at any position in the universe and moving <u>there</u> relative to the local flow.

However, the ***"fastest passage of time"*** – the "maximum proper time" – is the ***definition of rest*** in GR, and if this definition is adopted into MDG, this means:

In the MDG, "rest" is defined as: "Moving with the metric flow", or also: "At rest relative to the metric flow".

Thus, everywhere in the metric flow time passes at the same speed, and it passes faster than in any system that moves relative to the flow.

This assertion is so peculiar – judged from the conventional perspective – that it is appropriate at this point to present a sketch of the gravitational universe as it appears from the perspective of the MDG.

The MDG universe is composed of flow lines along which accelerated metric flows move.

If at a point in space the acceleration of the metric flow increases in all (possible) directions, then this point can be considered a *source* of the universal flow field.

In the universe, there is at least *one* such point where the initial velocity of the flow in every direction is 0 (i.e. which is the "highest" point with respect to the gravitation potential).

The flow lines end either in sinks – i.e. In black holes – or in points that are also sources.

The latter is the case in the aforementioned scenario (where we are at the North Pole): here, there is not only a flow *from above*, but also an opposing flow *from below*, which has passed through the Earth's center and flows through us at a velocity –v. Its *source*, lying in infinity, is at the same time the *sink* of the flow coming from above, and vice versa.

When two flow lines meet, their metric flows must have the same absolute value of velocity. (Otherwise, according to equation G3, the local time there would be ambiguously determined).

In the North Pole scenario, this condition is certainly met:

The two opposing flows begin at infinity with a velocity of 0, and their accelerations are equal at every point.

The metric elements (this is how I call the length differentials *in* the flow) that move along the flow lines, behave (except for the propagation velocity of gravity, which is finite in MDG) like mass points in the Newtonian gravitational field: the flow velocity at a given point is always the integral over the acceleration along the flow line from the source up to that point.

Since in the metric flow, *time is the same everywhere and passes most quickly*, the system of flow lines with the metric flows in them can be understood as an "absolute" (time) system, which, however, is non-relativistic and only accessible to the view from the "outside".

I'm sure that every physicist reading this statement will find it completely absurd, because I felt the same way.

Einstein has so strongly committed us to judging metric relationships *only* from *reference frames* moving relative to each other, that a time system like that of the metric flows seems nonsensical. In an Einsteinian ensemble of reference frames, everything is relative.

(But even in the usual view, time in regions that are *moving away from us* due to the expansion of the universe is assumed to be *the same* as our time, i.e. it is *not* considered *relativistically* but seen as *absolute*.)

However, something very essential can be lost in the relativistic view: precisely that what is the *cause* of this relativity.[3]

This cause – the "absolute" beneath the relativity – is also the main reason for considering the *system of metric flows*.

These flows are the *fundamental level of being:* everything that exists must be understood as a *state of space* – or, better, *of its dynamic metric structure*. Therefore, it makes sense to relate the passage of time to the metric flow.

This way of looking at the universe creates a simple and understandable image:

Light moves *in the metric flow*, i.e. it is a *wave of the flow*. The reason for this is that *all* waves with light speed are waves *in the flow* (Structure, pages 29-32).

This means: *In the flow*, light has the *shortest path*. In any system moving relative to the flow, light must compensate for this speed difference to reach its destination.

The simplest example is a system moving against the flow at flow velocity: here, in order to move perpendicular to the flow direction, light must move *against* the flow – like a swimmer crossing a river.

In this new, initially seemingly absurd perspective, the following applies:

> 1. Unlike in the relativistic view, it is not about the relationships between the times of observers based on the relative velocities of their reference frames, but rather about the relationships between the times based on the velocities relative to the respective local flow velocities.
>
> 2. There is an extremely important *fundamental* difference between the two perspectives: the relativistic view is about how the observers located ***in*** a system *perceive* another system, i.e. how they *judge* the lengths and times of this system in comparison with their own system based on their observations, whereas the view based on the flow systems is about comparing the different times from a standpoint ***outside*** the universe, so to speak with an "absolute" view of "the whole".

The North Pole scenario is excellently suited to illustrate the relationship between the two perspectives:

> Let's call the flow moving through us from above F_O, the flow from below F_U, and the systems moving with the flow S_O and S_U.
>
> From the outside, the systems S_O and S_U appear perfectly symmetrical. From this perspective, it is therefore *self-evident* that the passage of time in them is identical.[4]

3 In the book Structure, pages 162-168, a detailed, illustrative justification of SR *based on an absolute rest system* is provided. Einstein himself ultimately revoked relativity through GR and reintroduced the absolute system, the ether – albeit with one restriction – as the following quote shows (Albert Einstein: Selected Texts, Wilhelm Goldmann Verlag, Munich 1986, pages 183 and 184): "According to the general theory of relativity, space is endowed with physical qualities; therefore, in this sense, an ether exists. (…) This ether, however, must not be thought of as endowed with the characteristic properties of ponderable media, that is, consisting of parts that can be traced through time; the concept of motion must not be applied to it." This restriction, however, was dropped later: as is well known, space in the vicinity of rotating masses must be attributed motion.

4 In comparison with the flow system, the following applies: due to the motion of S_O *relative to **us***, for an observer in S_O, an event occurring *behind* him is – compared to ***us*** – displaced *into the future* (because the according information reaches him *later*), and an event *before* him is displaced *into the past*. For an observer in S_U, with respect to the same events the *opposite* is true.

It is equally obvious, however, that for an observer in S_O, time passes more slowly in S_U, and for an observer in S_U, time passes more slowly in S_O.

Therefore, there is no contradiction between the two perspectives. Rather, they *complement* each other: each perspective emphasizes a different aspect.

Thus the contradiction between MDG and GR arises not because the two perspectives – the "relativistic" and the "absolute" – are incompatible, but because GR lacks the concept of the metric flow.

In scenarios where the flow velocities in the compared systems are approximately the same – which is also true if they are *small* enough – the results of the two perspectives hardly differ from each other.

The same applies to systems with a dominant central mass (solar systems, gravitational fields of planets), as mentioned above. In the general case, however, the results can differ greatly, as in galaxies.

One more remark on the MDG's view of space:

When considering the universe *globally*, it seems reasonable, according to the usual view, to consider any local space-region as "at rest".

Thus, the following holds: If we focus our attention on any particular *local* region of space, then – from the conventional perspective – this region is ***at rest***. Therefore, *in it*, time should pass ***the fastest***. But seen from the MDG, this region is *moving against the local metric flow* at the speed of that flow, and therefore its passage of time is ***slower*** than that of the flow system, and, moreover, the *faster* the local flow is, the slower is the time of this region.

This means:

From the perspective of the MDG, the entire three-dimensional continuum, which in standard physics is considered "resting" space[5], consists of regions (more precisely, of differentials) with different time scales.

What was previously seen as "space" can then only be understood as a coordinate system. The term *space* itself takes on the meaning "metric-dynamic structure" in MDG and refers to the system of metric flows.

The old term *space* is only needed for the comparison between MDG and GR or between MDG and Newton's theory of gravity, as will be demonstrated shortly.

I will thus conclude this brief introduction to the structure of the universe from the perspective of MDG and return to the simple calculation options that MDG offers in the general case.

Before I elaborated on the sketch of the metrically dynamic universe, I noted:

Since the metric elements (the length differentials originating from source points and moving in the metric flow) follow the masses just like Newtonian test bodies, in (rotating) galaxies the metric flow has a tangential component.

To calculate the speed at which a star moves around the center of a galaxy, one can therefore proceed as follows:

The acceleration of the metric flow is divided into a radial and a tangential component. The radial component can be interpreted as Newtonian (or Einsteinian) gravitational acceleration. However, there is no Newtonian (or Einsteinian) interpretation for the tangential component – the only possibility is to view it as *rotation of space*.

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5 In the usual view, space also expands, but this is not the case in my construction of reality (see e.g. What is the world made of?, page 7).

Bodies moving at the resulting rotational velocity are thus to be considered "bodies at rest in space", and the previously determined gravitational acceleration must therefore be applied to *these* bodies.

This means:

To calculate the rotational velocity of a galaxy, the tangential component of the velocity of the metric flow must be <u>added</u> to the rotational velocity calculated according to Newton (or Einstein).

I'll stop here and conclude this section with a note about the relationship between GR and MDG:

If MDG – or at least the concept on which it is based – is correct, then it follows that GR is built on an incomplete foundation: from GR, the basic concept of MDG, the metric flow, is unattainable.

Thus, in the scenarios where GR has proven itself, its complexity would be, to a considerable extent, superfluous and misleading ballast, and in other areas – especially in galaxies – it would be incorrect.

3. The Equation $R_U = M_U G/c^2$

The radius of the universe is equal to the mass of the universe times the gravitational constant divided by the square of the speed of light.

Arthur Eddington was the first to discover that there might be a connection between, on the one hand, the fundamental natural constants G and c, and the universe as a whole, on the other. He noticed that the two quotients

- (Radius of the Universe)/(Mass of the Universe)
- (Gravitational Constant)/(c^2)

are almost equal.

The most famous physicist who studied this coincidence is *Paul Dirac*. Like Eddington, he did not see it as coincidental but suspected a deeper connection.

Since in an expanding universe, the equation $R_U = M_U G/c^2$ can only be correct if G and/or c change, Dirac's conjecture prompted a review of the constancy of G. However, no evidence of change was found.

Due to the assumption of an accelerating expansion of the universe, this equation currently receives little attention – it is impossible for G or c to change to the required extent.

I cite the equation because it is both fundamental and self-evident in my construction of reality. Due to the identity $m = MG/c^2$ (m is the geometric mass, M is the "normal" mass), in my theory of gravity the equation takes the form:

$$R_U = m_U$$

– and this identity follows directly from the

<u>definition of the geometric mass:</u>

The geometric mass m condenses (i.e. reduces) the radius of the region of space it occupies by m units.

So if you start with a region of space of radius m, then ***nothing*** remains, and this is the metric expression for the fact that the mass m ***closes*** a region of space with radius m.

m is therefore the radius of a closed universe with mass m.

(For further details, see Structure starting on page 43)

This means:

The universe <u>must</u> contain exactly the mass it contains. Its radius and mass are equal.

This is also a lesson in the fact that size only exists as a relation:

You can start with a small m, e.g. with the 8.8 mm of the Earth, or let's just say: with a total mass that corresponds to the geometric mass of the electron $m_e = 6.763\ 10^{-58}$ meter, and form a universe with this radius according to equation (0).

This universe is then – in terms of its laws and possible content – completely identical to our universe.

However, in my theory of gravity, these claims can only be correct if the universe is *not expanding* – the gravitational constant is missing here, and the speed of light is the proportionality factor in the fundamental equation, thus immutable.

But here, too, as so often before, everything fits together beautifully: as explained in What is the world made of?, page 7, there can be no variable size of the universe, because this assumption leads to a contradiction. Changes in the measured size of the universe are therefore always to be understood as changes of the scale.

And with the above relationships, the following again applies: none of this is *ad hoc;* each of the logical building blocks was developed exclusively from within itself and not for a predetermined purpose.

4. The Analogue Electromagnetic Relation

The analogy between my definitions of gravity and electromagnetism suggests that there is also a connection between *geometric charge* and the size of the universe.

Unlike the connection just described between geometric mass and size, however, this is only a conjecture, albeit an extraordinarily seductive one.

First, the prerequisites.

As just explained, the geometric mass m causes a reduction in *length* by m units in every possible direction. If one begins with a region of space of radius m, then this entire spherical region disappears: its ***<u>radius</u>*** becomes 0.[6]

The ***geometric Charge*** ± μ, however, causes a change in *angle:* with a negative charge, the angle measure becomes smaller and the angle measured by it becomes *larger*, with a positive charge, it becomes *smaller.*[7]

In the case of a negative elementary charge –μ, the following applies:

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6 However, this is only the case if the state of this region of space increasingly approaches spherical symmetry due to the *collapse of the masses coming from outside*, because only then can the parallel metric flows, which are accelerated toward *different* masses, merge into a common flow. Then this region of space becomes a black hole. If this merger fails to occur, however, the parallel metric compressions with their associated accelerated flows are sufficient to close the region of space, but no collapse occurs and no singularity is created. Instead, a uniform curvature forms.

7 Like the geometric mass m, the geometric charge μ also has the dimension *length*. To comply with the quantum mechanical requirements, the elementary charge must be equated to the classical electron radius. Therefore: $\mu = 2.818\ 10^{-15}$ meter.

A circle with radius μ and with the center of the charge as its midpoint has twice the circumference of a circle in charge-free space. Its circumference is therefore 4πr, i.e. it is *larger* by 2πr.

With a positive charge μ, however, this circle is *smaller* by 2πr, which means: it *disappears*.

Since this metric change applies to *all* circles with the same midpoint and radius μ, it follows that – as with gravity – *the entire spherical region of space disappears:* its ***circumference*** becomes 0.

Now we apply this metric fact to the universe, as with gravity.

So the question is:

What geometric charge is required for the ***universe*** *to disappear?*

In contrast to mass, the total charge of the universe consists of components that are always the same size, the so-called *elementary charges*.

For the following reasoning, we need to express the radius R_U of the universe in terms of the length of the elementary charge. I will use Dirac's value for R_U, because the currently accepted estimates are unusable in my system due to the presupposed accelerated expansion.

Dirac estimated R_U to be approximately 10^{40} proton diameters.

However, we don't need the diameter of the proton as measure, but rather the geometric charge μ.

The diameter of the proton is 1.67 10^{-15} meter, μ is 2.818 10^{-15} meter. For our estimate, we can neglect this small difference.

So we set

$$R_U \approx 10^{40}\,\mu$$

In the case of gravity, we could simply add up the length changes caused by all masses, and the sum then corresponded to the total length change in each direction. However, this method is not applicable to electromagnetism, for the following reason:

Gravity is about changes in *length:* a *one-dimensional* object – a (straight) line – is shortened.

In electromagnetism, on the other hand, a *two-dimensional* object – an *angle*, i.e. a *surface* – is changed, and – in the case of a positive charge – *reduced*.

So, one does not have to add up changes in *length*, but rather changes in *area*.

Let's look at a plane. Let's consider a circle of radius μ in this plane, with a positive elementary charge μ at its center. Then this circle vanishes: the 360° angle of a complete rotation becomes 0°, and thus the circumference of the circle disappears.

(This is consistent with the fact that the *rotating metric flow* on any circle with radius μ has the speed of light, so any circumference measurement results in 0.[8])

Now we place another circle of radius μ in the same plane, which does not intersect the other circle and also has a charge μ at its center. Then this circle also disappears, and if we continue this procedure until the sum of all circle radii is equal to R_U, then we have made 10^{40} circles with radius μ (metrically) disappear.

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8 The formula for the velocity of the rotating flow w is: $w(r) = \pm c \sqrt{(\mu/r)}$. (Structure p. 184)
In the case of gravity, the radial metric flow v reaches light speed at a distance of 2 m:
$v(r) = -c \sqrt{(2m/r)}$. (Structure p. 38)

What we want to achieve, however, is not the disappearance of 10^{40} circles with radius μ, but the disappearance of *one* circle with radius R_U.

If we place our 10^{40} circles side by side so that their diameters lie on a straight line, then they cover a distance equal to the diameter of the universe.

As expected, we achieve the disappearance of the area of a circle spanning the universe with $R_U = 10^{40}\,\mu$ not by the disappearance of 10^{40} circles along a *straight line*, but only by the disappearance of $(10^{40})^2$ circles on a *plane*[9], because obviously

$$(10^{40})^2 * \mu^2 \pi = (10^{40}\mu)^2 \pi = (R_U)^2 \pi$$

Thus, we don't need 10^{40} positive elementary charges, but rather $(10^{40})^2 = 10^{80}$.

10^{80} is exactly the number of positive elementary charges assumed by Dirac.

If this assumption is correct, then it means:

The positive elementary charges μ existing in the universe cause a circle with radius R_U to disappear.

If we now apply the same procedure to *all possible circles* with the same center and radius R_U, then the entire sphere vanishes, in other words, ***a region of space disappears with the expansion of the universe*** – just as with gravity, except that in gravity, the *radii vanish*, and in electromagnetism, the *angles vanish*. [10]

The relationship just presented is, as already mentioned, only a conjecture. Many questions remain unanswered. But it would be a wonderful result for three reasons:

(1) because it establishes a connection between the total positive charge of a universe and the radius of that universe. Let Z be the number of positive elementary charges μ. Then:

$$\sqrt{Z} * \mu \approx R_U$$

In our universe, $Z \approx 10^{80}$, and the equation is thus

$$10^{40}\,\mu \approx R_U$$

(2) because the reason for this connection is *the same* as for gravity: just as the *total mass* of the universe

$$m_U = R_U$$

is exactly sufficient to metrically close the universe, the same is true for the *total positive charge:* in *our* universe, this is the sum of $(10^{40})^2 = 10^{80}$ elementary charges.

(3) because finally a fact comes into our field of vision that is capable of explaining the almost unbelievable ratio of approximately $1{:}10^{40}$ between the strengths of gravity and electromagnetism: Only with this ratio can the demonstrated connection exist between the *size of our universe* and the *total positive charge* contained in it.

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9 While the continuum altered by *mass* is made up of *lines* – in the spherically symmetric case of straight lines through the center – the continuum altered by *charge* consists of *surfaces* – in the spherically symmetric case of planes through the center.

10 Just as with gravity, the following applies: The region of space can only vanish if its state approaches spherical symmetry. If that doesn't happen – and in this case, it's impossible because the positive charges repel each other – then the mutually parallel vanishing surfaces remain on different planes. The angles compressed on these planes are sufficient to *close* the region of space, but it doesn't *disappear.*

From the above, it follows that to every (possible) universe applies:

The ratio of the strengths of electromagnetism and gravity must be greater than the square root of the number of positive elementary charges.

$$\frac{F_E}{F_G} > \sqrt{Z}$$

I'll leave it to you to verify this.

But can it even be assumed that gravity and electromagnetism *actually* exist in every (possible) universe?

The answer is yes, and it's even been proven (e.g. in the paper What is the world made of?):

- Every reality is *purely metric*, because only then is causality possible.
- Thus, every reality consists *exclusively* of metric changes. (The mass in kg can be defined, but it does not belong to the causal structure of reality.)
- However, there are exactly two types of metric changes: changes in *length* and changes in *angle*.
- Changes in length lead to gravity, changes in angle lead to electromagnetism.

Therefore, gravity and electromagnetism exist in every possible universe.

Heinz Heinzmann, Vienna, May 2026