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What is *Wrong* With Physics?

Contents

Everything below refers to the contents of my two books "The Concept of Reality" and "The Structure of Reality".

Chapter 1: Truth or Nonsense?

1.0. Introduction

My intention was to present a conclusive – or perhaps even anticipatory – overview of my approach to reality and to compare it with standard physics. For two reasons, I find this unexpectedly difficult.

The first reason, although only indirectly related to my project, is nevertheless hard to ignore: the current state of the world. I will briefly describe how it appears to me:

Politicians – blinded by unrealistic ideologies that they apparently actually believe to be true (which, however, is an empty statement, because neither reason nor morality prevents them from always believing exactly what benefits them) – are highly committed to saving the world by economically ruining it and leading it into war.

Intellectuals and scientists – caught up in increasingly bizarre "narratives" – undermine trust in science and enlightenment.

More and more people are forming groups or "camps" that define themselves through radical slogans, thereby endangering social peace.

And it's almost impossible to discover the true background of this crazy theater because facts are disappearing behind bribery, propaganda, and manipulation, and there are hardly any clean sources of information left.

This is extraordinarily depressing, and I find it difficult to concentrate on questions of knowledge against this apocalyptic backdrop.

The second reason is that, even at the very beginning of attempting to outline my construction of reality, it became clearer to me than ever before how fundamental the difference is between the beliefs which current physics is based on, and what I – after my own long journey to reality – am convinced of.

With only slight inaccuracy, the following applies:

The catalog that lists everything that is considered correct in standard physics corresponds to the catalog that lists everything that I consider nonsensical, and vice versa.

1.1. First Example: Origin of the Universe

It is considered certain that reality emerged from a ***Big Bang***, then expanded through ***inflation*** at an exponentially increasing rate, and that this inflation stopped ***at exactly the right time*** and entered a phase of "normal" expansion. For structures to form, an unknown kind of matter, called ***dark matter***, is needed in ***exactly the amount required*** for the universe to become as we know it.

At a certain point in time – earlier than known matter – it must decouple from radiation so that the structures we observe can emerge. Naturally, dark matter has ***precisely the properties*** required for the evolution of our universe.

Since the expansion of the universe is not slowing down, as previously assumed, but rather accelerating, the existence of an unknown form of energy, called ***dark energy***, must be postulated, again at ***exactly the amoun***t that matches the observations.

The ***ad hoc assumptions*** are highlighted in bold.

However, the absurdity of this merry-go-round of invented entities and freely assignable parameter values is hardly noticed, and the same applies to the fact that the simulation of the evolution of the universe based on it works best when it is initially constructed only from dark energy and dark matter, i.e. *exclusively* from postulated entities with postulated properties.

It is therefore doubtful whether the entire scenario deserves the designation "science": hypotheses constructed *ad hoc* to such an extent can essentially only be accepted if they prove themselves not only in the one case to which the construction refers, but also in other cases, which, however, is not possible with hypotheses about the origin of our universe, since it only occurs once.

Fortunately, known, "normal" matter only makes up 4 percent of the total volume of the universe, so it doesn't contaminate the simulation too much.

Even the fact that the principle of conservation of energy, previously considered fundamental, has to be abandoned due to the expansion hypothesis seems to bother only very few people.

I, on the other hand, am convinced that there is no Big Bang, no inflation, no expansion, no dark matter, and no dark energy.

Why am I convinced of this?

Let's start with the claim of the variable size of the universe.

Size is a ***relational concept****:* something is compared to something else.

The universe, *by definition*, is everything that exists.

Therefore, it cannot be compared to anything *else*, but only to a *part of itself*. So let's consider any such part – an arbitrarily chosen object that exists in the universe. Its size bears a certain ratio to the size of the universe.

Now, what does it mean if this ratio changes over time – or if it even tends toward zero or infinity?

Can I then claim that the universe is becoming infinitely large or that it is disappearing?

No, of course I can't claim that. It would mean setting the size of a *part* of the universe ***absolute***, which would be nonsensical: The universe is not only everything that exists, it also ***creates*** everything that exists within it.

Setting such a thing created by it *absolute* and using it to demonstrate the disappearance of that ***by which*** it was created – that is, the universe – is obviously **contradictory**: if the size of the universe is assumed to be ***variable***, then no part of it – no object that it created – can be attributed an ***absolute*** size.

Proposition:

The size of any object can be measured by another object, and if this measurement varies over time, then it can be claimed that the size of the measured object changes.

However, since the universe is everything that exists, its size cannot be measured by anything else but only by a part of itself. This means that if this measurement varies over time, then this change must always attributed to the part chosen as the measure.

Regarding the observation that led to the expansion hypothesis – the redshift increasing with distance – assuming a shrinking scale is obviously equivalent to assuming the expansion of the universe.

What irritated me for a long time, however, is that the assumption of shrinking scales seemed to face an almost insurmountable obstacle:

The choice of scale with which we measure the expansion of the universe is completely arbitrary, and that means: not only the *chosen* scale, but *everything* that could serve as a scale – in other words, ***everything that exists*** at all – would have to shrink by the same amount, and there is simply no plausible justification for this in standard physics.

So I found myself in an awkward position: On the one hand, there was the ontologically compelling argument demanding a shrinking scale, but on the other hand, there was no physical argument in sight by which the identical shrinking of everything that exists could be justified or at least be understood.

But then the following happened:

Based on my equation, which describes the process that creates reality – *permanently*, and not in the form of a Big Bang *event* (localizable in nothingness by spatial and temporal coordinates) – the structure of the quantum mechanical atomic model can be reconstructed. This reconstruction establishes a connection between all wavelengths occurring in atoms and molecules, from which follows that *all these wavelengths change to the same extent*, when the *fundamental* wavelength changes, which here corresponds to the Planck length.

This solves the aforementioned physical problem: the alternative: "expansion of the universe" or "shrinkage of ***all*** scales" has been simplified to the alternative: "expansion of the universe" or "shrinkage of the fundamental wavelength."

This makes the decision against the expansion of the universe and in favor of the reduction of the scale obvious, because only in this way can the absolutization of the scale be avoided, as required by ontology, and the size of the universe remains unaffected.

This necessary congruence between ontology and physics was by no means intended, nor even anticipated – it arose surprisingly and naturally.

Back to the history of the universe:

If there is no expansion, then the hypotheses of the Big Bang, inflation, dark energy, and dark matter are also superfluous – the latter, however, only insofar as it is required for the development of material structures in the early phases of expansion; its necessity for structure formation and maintenance in general is only called into question by my new view of gravity, which (among other consequences) results in a significantly greater rotation speed of galaxies than the theories of Newton or Einstein.

Again, it should be noted that this consequence of my theory of gravity was not intended, i.e. not *ad hoc*.

(I didn't even notice it at first. I repeated the well-known tests of general relativity with my own theory, and when the results agreed with those of general relativity, I assumed that the two theories were identical – at least with regard to their results.

Only much later did I realize that this is only the case if the total torque of the system under consideration is negligibly small. This is true precisely where general relativity has passed all tests – in solar systems and in the gravitational field of planets – but not in galaxies: here, the total torque

is usually enormously large, and then Einstein's and my theory lead to results that differ significantly from each other.)

Let's summarize: If you replace the assumption of the expansion of the universe with the assumption of the shrinking of the fundamental wavelength, you get rid of all the nonsense listed above at a stroke.

The (small) price for this much-needed cleanup is that it raises the question of what causes the change in the fundamental wavelength.

I haven't answered this question, but I'm sure the answer requires significantly less ludicrous inventions than assuming expansion.

The reason for this certainty is that, in my construction of reality, the universe is a system that organizes itself ***through metric changes***, and these changes must also affect the basis of the system.

1.2. Second Example: The Measurement Process

I now want to continue the comparison between the standard catalog of physical beliefs and my own catalog with another example: the interpretation of the quantum mechanical measurement process.

In this case, however, there is not a generally accepted interpretation, but rather a whole series of different interpretations.

However, there are some assumptions concerning the measurement process that have the status of certainties in contemporary physics and are therefore common to all these variants.

Here again, the following applies:

The standard catalog of these certainties corresponds to my catalog of fundamental nonsense, and vice versa.

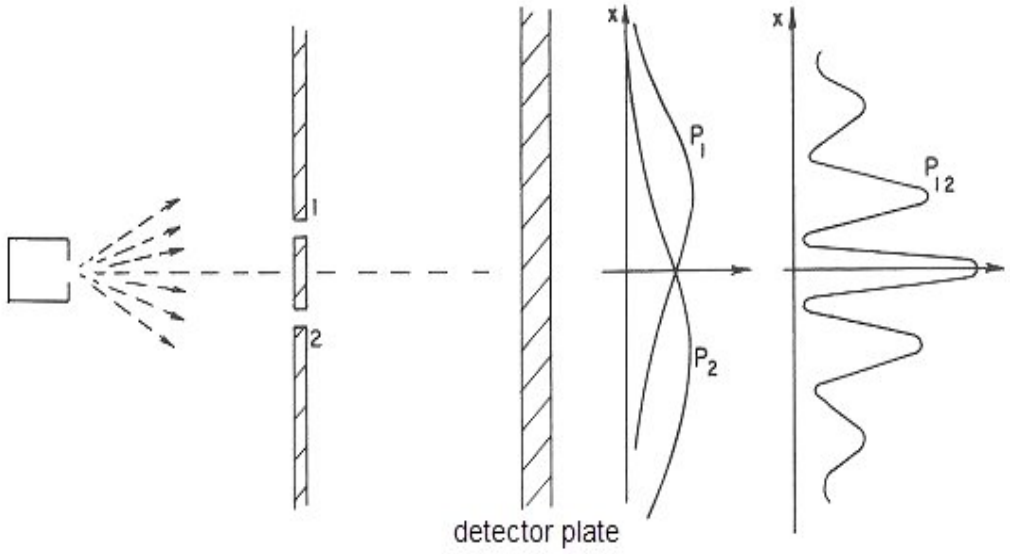
I will only briefly outline the measurement process and then present my interpretation. It will immediately become clear that it is precisely these general beliefs that make not only *my* interpretation completely impossible, but *any* reasonable interpretation in general – and by "reasonable" I mean a description which deserves the designation "interpretation" because it ***explains <u>what</u> happens and <u>why</u> it happens***, and which does not, as has been the case with all previous attempts at interpretation, either content itself with the assertion that it is impossible to understand the process – or even superfluous because everything is clear anyway – or resort to wild speculation due to the lack of real understanding.

To arrive at such an explanation, it is therefore necessary to refute all of these beliefs or eliminate their presuppositions.

To illustrate my view of the quantum mechanical measurement process, I choose the so-called "double-slit experiment": everything important appears in it in a particularly clear and unambiguous way.

The information provided to us by theory and experiment is so simple and straightforward that it can be presented in the form of a few sketches.

First, a sketch of the process:



(S1)

On the left side of the image is a device for generating particles of some kind. (For example, electrons, or photons – the following applies to all types of particles.) When this device is switched on, one blackened spot after another appears on the detector plate in an irregular sequence. Over time, the blackened spots produce the familiar interference pattern. (P_1 shows the distribution of the spots when only slit 1 is open, P_2 for slit 2, $P_{1,2}$ for both slits.)

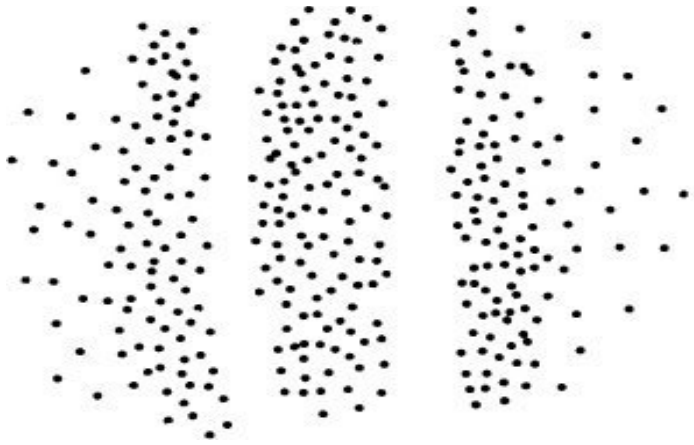
The failure of all attempts at intuitive interpretation is illustrated as follows:

On the one hand, electrons (or photons, etc.) appear exclusively as indivisible units. They must therefore be described as ***particles***, that is, they pass *either* through slit 1 *or* slit 2. However, $P_{1,2}$ is not the sum of P_1 and P_2 – there is interference, which is impossible in the particle model.

Therefore, on the other hand, we must use the ***wave*** model of electrons to describe this interference. In this image, a wave passes through *both* slits, is diffracted by them, interferes with itself, and hits the detector plate. Depending on the distance of the plate from the double slit, the wave can be arbitrarily extended.

However, we do not observe a gradual, uniform increase in the blackening of the detector plate according to $P_{1,2}$, but rather a sequence of localized events, i.e. individual tiny blackenings, each triggered by an electron, which now again corresponds to the particle concept. Only a large number of such local events produce the interference pattern.

So we are presented with a picture like this:



(S2)

With the appearance of the particle, the entire extended wave instantly *disappears* – this is the so-called "reduction of the wave function":

Of all the wave-like possibilities, only one remains, which becomes the observed event; all others disappear.

The particle and wave models are incompatible. Yet we need both for description. Thus, we seem forced to admit the limitations of our concepts and ideas and, where they fail, retreat into the mathematical scheme.

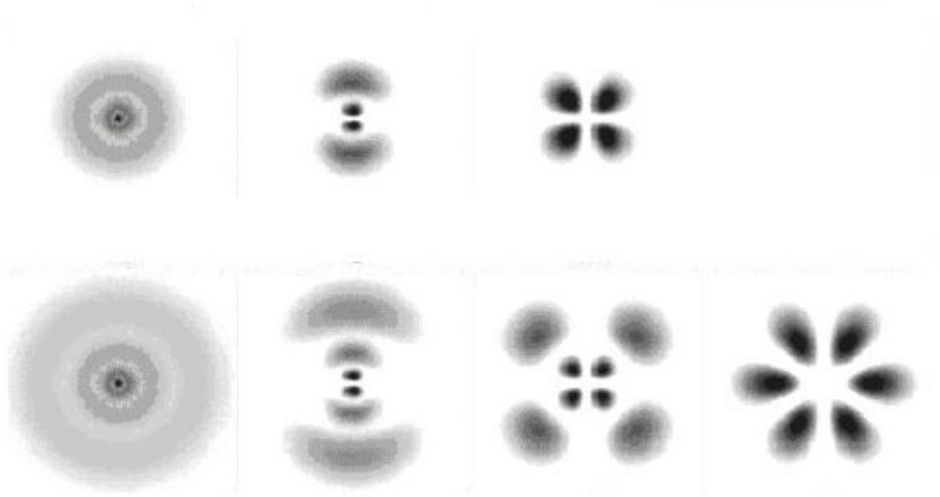
This scheme, however, is surprisingly simple:

The process is described by a wave equation. In fact, $P_{1,2}$ represents exactly the distribution that would also result from the interference of "normal" waves, except that with "normal" waves, no point-like blackening would occur; instead, a gradual increase in blackening would be expected everywhere.

Therefore, the amplitude appearing in this wave equation is not considered the amplitude of a truly existing wave, but rather a "probability amplitude": the square of its absolute value at any location on the detector plate gives the probability that an electron will appear there.

Finally, we consider a schematic representation of the objects that produce the electrons generated in sketch (S1) on the left.

Such objects are also present on the surface of the detector plate. Their sudden changes lead to the blackening points that we then observe:



(S3)

The structures depicted are *electron shells* in various states.[1] They are called "density distributions": the square of the amplitude of each standing wave depicted indicates the probability that an electron is present there (as in the case of the traveling wave after the double slit).

With this little information, we are already sufficiently prepared to now turn to answering the question:

What really happens in the double-slit experiment?

1 These are states of the hydrogen atom. For atoms with multiple electrons, adjustments must be made.

To answer this question, we must conduct the double-slit experiment in the form of a thought experiment, relying *exclusively* on the information present in our three sketches – in simple terms, ***on what we see there*** – and ignoring the ultimately fruitless discussion about it that has existed for more than a hundred years.

Sketch (S1) refers to a ***process caused by waves***, and for which, moreover, it is true that, due to interference, it can certainly be caused ***exclusively by waves***.

Sketch (S2) shows the ***blackening points*** on the detector plate, which can only be explained *as* ***the results of local processes***.

Sketch (S3), which depicts ***electron shells***, shows the ***oscillation states of a sphere***, i.e. ***standing waves***, where the gray values correspond to the squares of the wave amplitudes.

The following applies:

If one deduces what happens in the double-slit experiment from the information contained in the three sketches and (initially) sets aside all other – misleading – physical certainties, then an interpretation of the experiment inevitably follows that is surprisingly simple and essentially irrefutable.

For electrons, it is as follows:

> An electron (*a* ***traveling*** *electron wave*) breaks away from an electron shell (i.e. from *a* ***standing*** *electron wave*, see sketch (S3)) – in other words: ***part of the standing wave becomes a traveling wave***.
>
> This traveling wave then passes through a double slit.
>
> The wave interferes with itself and then hits a detector plate (*an enormous number of* ***standing electron waves***).
>
> There, in one of these standing waves that is *close enough* to the transition to the next higher state (***the state with one more node area***), it triggers precisely this transition by merging with the local standing wave – ***the traveling electron wave thus becomes part of the standing electron wave***. This transition appears ***abrupt like a jump*** (*as is* ***always*** *the case with standing waves*) and is interpreted as the ***appearance of an electron***.
>
> The rest of the moving wave ***does not disappear***, of course, but encounters other standing waves, where it does *not* trigger a transition but only increases the probability of future transitions by bringing the state of the standing wave closer to this transition.

And that's all! The entire process can be explained and understood in this extremely simple way – and only in this way.

Before I begin to refute the physical beliefs that seem to prevent this explanation, I will first list them and then, in each case, immediately state (in italics) what replaces them:

1. The wave picture alone is insufficient. As Planck, Einstein, Compton, and de Broglie (and many others after them) have proven, both matter and radiation are quantized and have wave properties. If one of these two prerequisites is missing, then it is not possible to correctly describe the interaction of matter and radiation.

There is no "wave-particle duality." It is replaced by the – trivial and completely unproblematic – contrast between moving and standing waves.

Immediately below I will show that the evidence for the "quantization" is invalid.

The usual view of states and changes of states called "particles" is incorrect.

The definition of the term "quantization" cannot be maintained in its current form.

2. Electrons are "indivisible." If there is only a single electron in the experimental setup, it must therefore be traveling as a whole in both slits simultaneously.

This absurd notion can be dispensed with, since it is simply a wave traveling through both slits.

3. With the occurrence of the event, the entire extended wave disappears.

No wave disappears.

Instead of disappearing, the parts of the wave not required for the event continue and can be involved in triggering future events.

4. The disappearance of the waves is a nonlocal phenomenon.

My interpretation eliminates the nonlocality. The entire process is evidently completely local.

5. The questions of *when* the transition from probability to reality occurs and *what* triggers it either remain open or can only be answered through additional assumptions, such as "through the act of observation" (although this only clarifies the "when" and not the "how"), or "through the consciousness of the observer," or "through the splitting of the universe," etc. 

These questions are irrelevant because there are only "normal" processes: real waves cause real events (transitions between different states of standing waves).

(The question of which physical quantity is to be assigned to the amplitude. I will answer below.)

6. The act of observation (or measurement) and/or the "consciousness" of the observer must play a role; otherwise, the description of the double-slit experiment would be incomplete, since the Schrödinger equation contains nothing that explains the "reduction of the wave function".

The measured event is in no way dependent on whether and by whom it is observed.

Expecting the Schrödinger equation to contain the description of this event – the triggering of the transition between two different states of the standing wave – would be nonsensical.

7. In all of physics, nothing can be found that could be identified with that what oscillates in the Schrödinger equation.

The physical quantity assigned to the amplitude is one of the two fundamental parameters in my system of describing reality.

(As already announced under 5, I will discuss this further below.)

8. The waves cannot be "real" waves because the Schrödinger equation contains complex numbers.

My clarification of what these waves really are provides a simple explanation for the occurrence of complex numbers.

9. In the case of multiple electrons, the mathematical representation takes place in multidimensional configuration space. Therefore, it cannot be a real process.

This objection requires a longer commentary that addresses some fundamental misunderstandings about the relationship between mathematics and reality.

I will expand on it later.

10. Electrons have the quantum mechanical property "spin," which cannot be interpreted intuitively. In particular, the electron's spin value of ½ proves that it cannot be understood as a real object, because this value implies that – for the electron – a complete rotation is 720°, whereas for real objects in real space, it must obviously be 360°.

Using the physical quantity associated with the amplitude occurring in the Schrödinger equation, the property of "spin" can be explained in a comprehensible way, and the spin value ½ assigned to the electron can also be clearly understood and is intuitively accessible.

Now to the refutations of the listed beliefs.

1: Wave-particle duality, quantization

At the end of the 19th century, physics seemed largely complete. Most of the scenarios physicists had in mind could be described satisfactorily, and only a few remained to be clarified, such as black-body radiation or the photoelectric effect.

Planck, Einstein, and Compton eventually succeeded in mathematically representing these scenarios in accordance with experiment – however, not with the methods of classical physics but only by *quantizing* the generation and absorption of radiation by atoms and molecules (Planck) or even the radiation itself (Einstein and Compton).

Let's start with the photoelectric effect.[2]

First, the experimental facts:

If a metal plate is irradiated with UV light whose frequency lies above a certain limit, electrons are released without measurable delay, the speed of which depends only on the frequency of the radiation.

This is in blatant contradiction to the wave model of light, according to which the speed of the electrons should depend on the intensity of the light and their release should occur at any frequency.

Moreover, an enormous delay (thousands of hours under realistic conditions) would be expected before the first electron was released, assuming that the light energy radiated onto an area of the order of the electron's cross-section would have to accumulate to the required value.

Einstein's solution – as is well known – is to view the interaction between light and matter as a ***collision process of particles***.

2 I will only outline my approach here. For the complete derivation, I refer to my book The Structure of Reality (p. 121 ff.). This also applies to all subsequent arguments.

This also makes it clear that the light particles – for light with a certain frequency – must always be *identical:* if there were other light particles, or if they were divisible, then also electrons with different speeds would have to appear after the collision.

This is how the quantization of radiation found its way into physics.

If, however, one starts from the assumptions which my interpretation of the double-slit experiment is based on – that is, if one simply replaces the wave-particle duality with the two forms in which waves always occur: as moving and standing waves – then the experimental facts follow trivially. The interaction of light and electrons must then be understood as a *superposition of waves* (of light waves and matter waves), and it follows that "electrons" emerge immediately and that they always have the same speed: superpositions of waves do not allow for any other results.

The result is identical to Einstein's result.

The Compton effect – the interaction between high-frequency light and electrons – can also be described in this way, and here, too, the result is correct – it agrees with Compton's result.

Planck's representation of blackbody radiation requires no further explanation: in the wave model, it is self-evident that the generation and absorption of radiation must be quantized, since the change in standing waves is always "quantized" – however, not in the fundamental *ontological* sense attributed to this "quantization" in standard physics, but in the quite trivial, or let's say, *everyday* sense that continuous processes lead to seemingly abrupt transitions that appear like "jumps" – as is always the case with standing waves.

Here, a comparison with such an "everyday" phenomenon seems appropriate:

Suppose a pipe is blown in such a way that the air column vibrates in the third overtone. By increasing the lip tension, the vibrational state of the air is changed so that the air column "jumps" to the fourth overtone.

Audible – *observable* – is only the abrupt change, the *continuous* processes that cause it remain hidden.

Therefore the definitions of the terms "quantization" and "particle" change as follows:

1. The traveling waves – *all* waves, including light waves and matter waves – ***are not quantized at all, they are <u>never</u> "particle-like"***.

2. The term "particle" refers to ***stationary states of waves or transitions between such states***.

3. Most important, however, is the following:

The term "quantization" does not refer to reality itself, but only to observations and measurements.

The fundamental layer of reality itself is <u>continuous</u>.

This already eliminates a large part of the whole nonsense: There is no wave-particle duality, no particles that are in different places at the same time or occupy different states, etc.

I won't continue this list any further, but will simply refer once again to the **sketch (S3)**, which shows the **oscillation states of a sphere**, i.e. **standing waves**, and ask the question:

<u>Why</u> are there standing waves in the shape of a sphere in this sketch – which is supposed to depict the calculated probabilities of the presence of a (point-like?) electron?

The only sensible answer is obviously:

Because they are waves.

But then it is impossible that the wave amplitudes are only the *roots of the probabilities* of positions (or events) ***and nothing else***, for the following reason:

After the double slit, *interference* occurs. This means that two phenomena are *influencing* each other. And since this is not just mathematics ***and nothing else***, but mathematics ***that describes something***, to these two phenomena must be attributed ***existence***, because only under this condition is it possible for them to influence each other.

But then the wave amplitude cannot be nothing but the root of an event probability:

Roots of probabilities are ***purely formal quantities to which existence cannot be attributed*** *under any circumstances.*

From this follows that all known interpretations are contradictory and therefore false.

They are therefore not ***interpretations*** at all, but rather a ***total failure of interpretation***, or, to put it quite clearly: a ***complete loss of reality***.

2: Indivisibility of electrons and **3: Disappearance of waves**

Both points are included in my interpretation and do not require separate commentary.

4: Nonlocality of the disappearance of the waves

Regarding the double-slit experiment, no further explanation is necessary. However, I would like to take this opportunity to comment on the question of nonlocality in general:

Proposition:

There is no such thing as "nonlocality." Reality is completely local.

Nonlocality is simply ***fundamental, catastrophic nonsense***.

The assumption of nonlocal connections violates the most important principle of the description of nature: the **principle of local causality**:

There is no connection between distant states of affairs that is transmitted faster than the speed of light or even exists without any mediation.

What then about Bell's proof? What about all the experimentally proven nonlocal connections?

I will now address this. However, I will not elaborate on the refutation of Bell's proof in full here, but will only present the crucial error.[3]

First, the facts:

(1) The quantum mechanical description of an object does not specify a unique value for some of its attributes, but only the probability distribution of possible measured values.

3 The book Structure contains the complete proof (starting on page 152). The book Concept also includes Bell's derivation. (John Stewart Bell: *On the Einstein Podolsky Rosen Paradox*, Physics, 1, 195-200, 1964). The corresponding chapter begins on page 42, and the formal part is on page 58. Further explanations follow starting on page 143.

(2) This also applies to two spatially separated objects that interacted with each other in the past or that originate from the decay of an object.

(3) A connection called "entanglement" then exists between the results of certain measurements on these two objects. For example, for two identical objects A and B that resulted from the decay of a stationary object and are moving away from the position of the decay in opposite directions, the velocities are linked in the same way as in classical physics, i.e. they are equally large and opposite to each other.

Let's assume no measurement has been performed yet. In this case, only the probability distribution of the possible measured values is known.

However, if the velocity of A is now measured, then, due to (3), the velocity of B is also known *at the same moment*.

Here, it seems obvious to argue as follows:

B is arbitrarily far away from A. Therefore, measuring the speed of A cannot have any influence on B. This means: if – ***after*** measuring the speed of A – also the speed of B is known, then the result of the measurement of B must have existed already ***before*** the measurement of A, in other words: object B must have had this speed already before measuring A. Otherwise, measuring A would have caused a *change of the state* of B. However, since the quantum mechanical description does not include this speed, it must be *incomplete*. (The speed would be a so-called *hidden parameter* in this case.)

However, *John Bell* refuted precisely this seemingly plausible argument by proving that there are cases in which it leads to results that contradict quantum theory. Numerous experiments have shown that the results predicted by quantum theory are correct. Therefore, the above argument must be false.

This conclusion is undoubtedly correct, and in physics it is considered proof of the existence of nonlocal relationships, because it is now clearly established that the state of B has indeed changed as a result of the measurement on A.

To refute this belief, let's briefly return to the double-slit experiment. Here, the wave function (the Schrödinger equation) specifies the probability of where the electron appears on the detector plate.

So here, too, just as in the case of entanglement, the following applies: ***before the measurement, this electron had no definite position; after the measurement, it has a definite position***.

The crucial point, however, is:

Before the measurement, this electron did not exist at all!

Before the measurement, there was only the extended wave, and it is **not** identical to the electron that appears afterward, because in my interpretation, the transition of the local standing wave – which is commonly understood as the appearance of an electron – is not triggered by the ***entire*** wave, but only by a (very small) ***part*** of this wave.

The same is true for entanglement experiments: here, too, the correlated events are always *transitions* triggered by *parts of waves* and not by "particles" such as "photons".

For example, in my interpretation of the experiments with "polarized photons", it's not *whole photons* that pass through the polarizers with certain *probabilities*, but rather *parts of light waves* that *actually* pass through and then accumulate until a transition occurs, exactly as in the double-slit experiment.

Therefore, both in the double-slit experiment and in the entanglement experiments, the following applies:

The object to be measured is only created by the measurement process.

Before the measurement, it did not exist.

And this means:

It is nonsensical to speak of an attribute that the object had before the measurement.

This collapses the entire logical structure which underlies the general discussion of nonlocality and on which Bell's proof is based:

Both the claim that object B must have had the property already before the measurement and its refutation by John Bell become irrelevant because they refer to a nonexistent fact: The object whose change of state is being proven has no state before the measurement because it does not exist before the measurement.

This invalidates Bell's proof, and it follows that the discussion about cases of entanglement and the correlations that arise in them can *only now* truly begin, because until now it has inevitably led to absurd conclusions due to incorrect model assumptions.[4]

I repeat what I said before:

Nonlocality is fundamental, catastrophic nonsense.

Since understanding what is happening requires insight into the *causal structure* of an event, accepting nonlocality is tantamount to a total abandonment of understanding and reason.

This opens up a realm of fool's license in which many of the evil spirits that were defeated by the Enlightenment are resurrected. The consequences for physics and philosophy, but also for human society as a whole, are extremely negative, and we have long seen them spreading ever further.

5: Transition from Probability to Reality (Reduction of the Wave Function)

When and why this transition occurs is answered in my interpretation; there is no "reduction" of the wave function at all, at least not in the usual sense: a *part* of the moving wave triggers a transition in a standing wave and thereby becomes part of that standing wave, while the *rest* of the moving wave simply continues.

However, I want to use this central point of the failure of all previous interpretations of the quantum mechanical measurement process as an opportunity to point out the extent to which the development of theoretical physics – especially the complete failure of all attempts to overcome the standard model of "particle" physics – has confirmed my negative assessment of these "interpretations": based on such a fundamentally false view of reality, further development of the theoretical foundations is hardly possible.

Viewing the wave as a "probability wave" also implies the assumption of nonlocality, and in the realm of fool's freedom that I just associated with this assumption, a number of bizarre characters have, as is well known, settled, who not only cause mischief in physics but also provide

4 If the correlations are *not* based on a nonlocal connection, it follows that the necessary symmetry of the correlated systems can only develop over the course of the respective test series – and *through* this series. (See Concept starting on page 143.) This also explains why there is always a "run-up phase" and why it has never been possible to verify the correlations between distant systems by using individual processes *separated in time*, but only by using the statistics of *series* of processes.

entertainment in Hollywood: observer consciousness, Schrödinger's cat, Wigner's friend, the self-observing universe that only becomes real through this observation, the splitting of the universe into a series of universes that differ from each other only with respect to the measured value just determined, quantum erasers, effects into the past (see here), etc.

In particular, the idea of the "multiverse" is now fully established in popular literature and in the film industry and has even won an Oscar ("Everything Everywhere All at Once").

Finally, the well-deserved success for theoretical physics!

6: Observation and Consciousness of the Observer

Everything important has already been said.

7: What oscillates in the Schrödinger equation?

This is a point of extraordinary importance: My assertion that these are real waves presupposes that there is a physical quantity that can be assigned to the amplitude in the Schrödinger equation, or more specifically: that ***something existing*** oscillates.

Moreover, given the fundamental position of the Schrödinger equation in the physical description system, it is to be expected that the answer to this question relates directly to the basis of reality.

This suggests two possibilities where one could begin the search for the answer: either in the *measurement process* or in the *creation of reality*. Since neither the measurement process nor the Schrödinger equation contain any clue to the physical quantity sought, I settled on the second option several years ago.[5]

The first important premise has already been established:

The assumption of a variable size of the universe is false because it is self-contradictory (as already shown at the beginning of this text). So there is ***no expansion*** and therefore ***no Big Bang***.

The idea of an ***initial even***t localized in space and time must therefore be replaced by the idea of a ***permanent process*** of creation that occurs ***everywhere and anytime***.

This idea can be concretized as follows:

If one wants to ***substantiate*** existence, one cannot start with something that already exists.

That which produces reality must therefore – in the ontological sense – ***precede*** all existence.

Without comparison, there is no distinction. Therefore, distinction presupposes existence. Thus, that which precedes all existence must *in itself* be ***indistinguishable***.

This means: it has no structure and therefore no memory.

To ascend to existence, it must abolish this indistinguishability. It must therefore ***change***, in other words: it must be ***active***.

Since it has no memory, every temporal change can only originate from the previous moment, and every spatial change can only refer to an immediately adjacent position.

5 What follows is a greatly simplified and abbreviated version of my line of thought. For the complete version, see Structure starting on page 14 .

With these few observations, we have arrived at the following conjecture:

Reality is produced by an active, changing continuum.

Our considerations have thus brought us close to our *conceptual space* and its mathematical representation.

The next question is:

How can a continuum – or let's just say space – change?

The answer is:

In two ways: by ***changing the length measure*** and by ***changing the angle measure***.

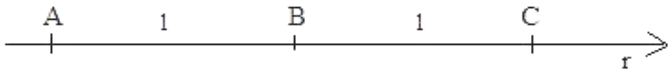
To describe these changes, I use the term "metric density." [6]

There are two types of metric density:

*The **metric density of length** and the **metric density of angle**.*

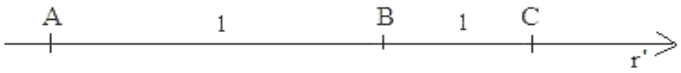
First, the metric density of length. Here is a sketch to illustrate it:

Let A, B, and C be three points along the coordinate r. The distances between A and B and between B and C are equal to 1.



(S4)

Here, the metric density of length is constant. Now we change the circumstances as follows::



(S5)

The distances have remained equal to 1, but the *length of the scale* has increased between A and B, but decreased between B and C.

This means: the ***metric density of length*** is ***greater*** between B and C than between A and B.

What does in (S5) result for B? A continuum flow arises, which I call **metric flow**, i.e. B experiences an acceleration in the direction of A.[7]

This essentially corresponds to the intuitive idea of the changes in an elastic band. However, this vivid comparison has limitations: Since we are not dealing with a *material* but with a *continuum*, actually *nothing* flows, and this means that there are also metric flows – let's say, from an area X to an area Y – that persist for an arbitrarily long time without anything changing: Y does not increase, and X does not decrease.

It's like the number line: if you compress the range between 0 and 100 to the length of the range between 0 and 1, then nothing has changed: there are neither *more* numbers than before nor are they

6 I'll skip the math here, but the following definitions are intuitively understandable.

7 In the complete version in the book Structure, this is derived mathematically. However, here I will at least try to make the geometric ideas understandable

closer together. In other words: the metric density itself actually doesn't exist; there is only its *change in time:* the density itself causes *nothing*; its change causes *acceleration*.

Here's an example that also makes it clear how ***mass*** is defined as ***length*** in my theory of gravity. (I call it *metric-dynamic gravity*, or MDG for short.)

Let's consider the Earth. Let's assume its radius is exactly 6,370 km and that it is perfectly spherical. So it is bounded by a spherical surface with this radius.

Now we remove the Earth from this bounding spherical surface.

Then the radius of the spherical surface increases by 8.8 mm, i.e. it moves outwards by 8.8 mm everywhere. (8.8 mm is the radius of a black hole with the mass of the Earth.)

As explained in the remarks following sketch (S5), this creates a time-constant metric flow (in the MDG), which leads to metric changes that exactly correspond to those calculated from general relativity. The physical consequences of the GR and the MDG are therefore identical.

For example, the rotation of Mercury's ellipse is exactly the same in the MDG as in the GR.

So the (geometric) mass of the Earth is:

m_G (Earth) = 8.8 mm

In the MDG, mass is therefore defined as follows:

Geometric mass has the dimension <u>length</u>. A spherical object with geometric mass m reduces the radius of the region of space it occupies by m units.

Mass thus corresponds to a <u>metric compression</u> that causes a metric flow.

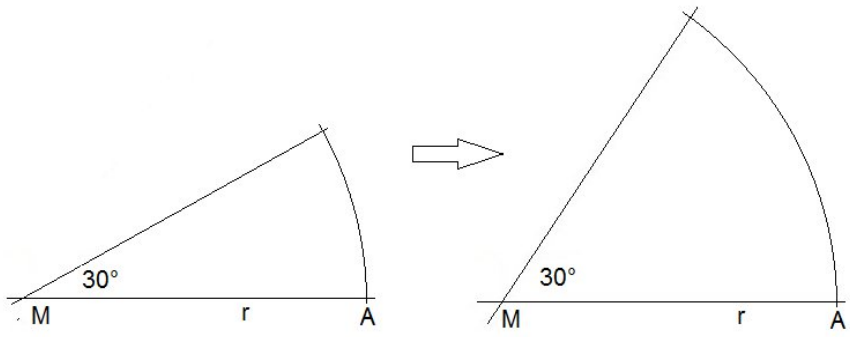
This means:

In MDG, gravity is the acceleration of the metric flow resulting from a metric compression.

More will be said about this later. However, with regard to our project to determine the physical quantity that can be assigned to the amplitude in the Schrödinger equation, what has been said so far is merely an introduction. It is a bit long, not only because of its importance, but also because the ***change in length*** is somewhat known from GR, thus facilitating the introduction to the concept of metric change in general.

In contrast, the ***change in angle***, which we now come to, is, to my knowledge, completely new, although it seems so obvious.

Here is again a sketch for illustration:

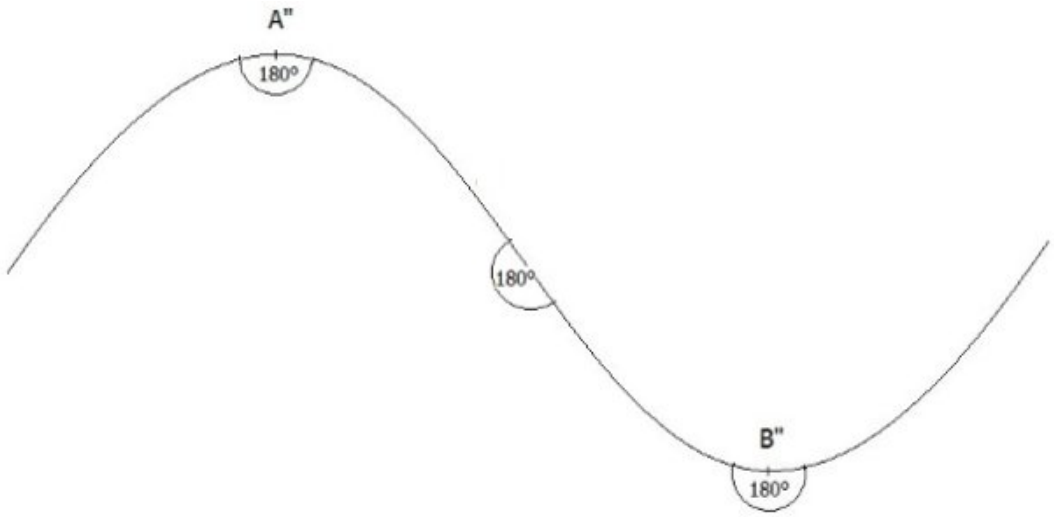


(S6)

An angle of 30° is shown on the left. The angle shown on the right is still 30°, but the *angle measure* has increased, which means that ***the metric density of the angle constructed according to this measure is lower*** than that of the "normal" angle shown on the left.

What does this change mean for A? Here, too, a continuum flow occurs, but this time *orthogonal* to r, i.e. A experiences an *upward acceleration*.

The next sketch shows that, under these conditions, it is possible to consider transverse waves as ***waves of angular density*** if the change in amplitude is interpreted as a metric change in the angle:



(S7)

In my construction of reality, the following has emerged:

The concept of the ***metric density of length*** leads directly to a ***theory of gravity*** that is consistent with general relativity in solar systems and in the vicinity of planets, but results in a ***significantly greater rotational velocity in galaxies***.

Completely analogous to gravity, ***Electromagnetism*** can be defined using the concept of the ***metric density of angle***. Based on this definition, the ***quantum mechanical model of the atom*** can be reconstructed – and, moreover, also *understood* – using simple mathematical means.

In this way, the problem that theoretical physics has been trying to solve unsuccessfully for decades – the incompatibility of *gravitation theory* and *quantum theory* – disappears, so to speak, all by itself: the common origin of both lies in the formation of reality.

This suggests the following **assumption**:

Reality is based <u>exclusively</u> on the metric changes of the continuum: the change in length and the change in angle. Everything that exists and everything that happens follows from these changes. They are the fundamental level of reality.

From this follows:

Since gravity is *defined* as a change in length, all other interactions must arise from a change in angle.

And this means:

<u>Proposition:</u>

The metric density of the angle can be assigned to the amplitude in the Schrödinger equation. An example of the corresponding waves are the transverse waves shown in sketch (S7).

Note:

The question arises as to how one arrives at the mass in kilograms, if – as assumed above – there are only the dimensions of *length* (angle is *arc length*) and *time*, and thus only the units of *meter* and *second*.

The answer is: One can place an object with the geometric mass m (in meters) on a scale and thus establish the connection with the usual mass M (in kilograms), which is thereby *defined*.

"Defining" here therefore means: *establishing the connection with a specific experience*.

It should be noted, however, that the mass in kilograms is then no longer part of the causal structure. It loses its status as an independent fundamental unit.

The causal structure itself remains limited to purely metric facts. This is of fundamental importance because *only in this way* can causality be established. More on this follows in Chapter 3.

8: Complex Numbers in the Wave Function

Following the explanations in the previous section, it is easy to establish the occurrence of complex numbers in the Schrödinger equation.

To represent the increase in length in GR or MDG, an auxiliary dimension is introduced.

The extended differential can then be represented as follows, as shown in the sketch on the left (dr is the unchanged differential, dr' is the changed differential, dz is the differential along the upward auxiliary dimension):

(S8)

Evidently applies: $dr' = \sqrt{(dr^2 + dz^2)}$

However, if the unit of measurement of the coordinate r is not to be *increased* but *decreased*, then an imaginary auxiliary dimension iz must be used instead of the real auxiliary dimension z, so that the following applies, as shown in the sketch on the right:

$$dr' = \sqrt{(dr^2 + diz^2)}$$

As required, dr' is now smaller than dr.

The same is true for the angle measure. If it is reduced, then angles *constructed from it* and their corresponding arc lengths become smaller, and their representation requires imaginary numbers.

This means:

If the amplitude in the wave function is understood as metric angular density, then the occurrence of complex numbers in the wave function is self-evident and does not cast doubt on the assumption that the waves are real.

9: Representation in multidimensional configuration space

As announced, here are some explanations of the relationship between reality and mathematics.

The first and most important thing to understand is this:

Reality doesn't use mathematics. It doesn't calculate.

It would be beyond absurd to assume that the blade of grass ***calculates*** where to move – it simply follows the wind that touches it.

We, on the other hand, need mathematics to describe the movement of the blade of grass. If we succeed in doing this with sufficient approximation, then we tend to believe that our description accurately reflects what nature does, that our ***differential equation*** and the ***process*** taking place in reality are ***one and the same***.

This equation of mathematics and reality goes back a long way, even further than the Pythagoreans.

In the 16th century, it was so self-evident that even when real solutions to equations could only be found using roots of negative numbers, some time had to pass before the existence of such numbers was accepted in mathematics – the certainty that they *could not exist* was simply too strong.

Something similar happened in the 19th century with the mathematical infinities discovered by *Georg Cantor*.

The mathematical community had made an (uncertain) peace with infinity by dividing it into *actual* and *potential* infinity and acknowledging existence only to the potentially infinite. The massive rejection Cantor experienced can only be understood in light of the widespread belief that there is a close *ontological* relationship between mathematics and reality, so that Cantor's claim that there is not just *one* infinity, but an *infinite number* of infinities – each of which is *infinitely* larger than the previous one – could only be viewed as a sacrilege against reason or even as madness.

In these two examples, the concept of reality dominates over mathematics: if something appears in mathematics that doesn't fit with the concept of reality, it is initially rejected, even opposed.

Since then, however, this relationship has reversed, as is evident in the following case:

After the death of his friend Michele Besso, Einstein wrote to his family: "For us believing physicists, the distinction between past, present, and future has only the meaning of an illusion, albeit a persistent one."

To this, it must be said:

This illusion is not only persistent, but *insurmountable* – simply because it is not an illusion. The infinity of the time coordinate does not, as with spatial coordinates, indicate their unlimited availability. In fact, only the totality of local – causally linked and constantly changing – present moments actually exists. Past and future remain inaccessible.

Therefore, no consolation for those left behind can be derived from the relativistic fact that the temporal classification of events depends on the observer's state of motion. What *actually* belongs to the respective reality of an observer is determined *exclusively* by the causal structure, and from this follows: the dead person remains dead.

Even if – assuming that the death occurs at a great distance, e.g., in the Andromeda Galaxy – the time of death can be shifted a few days into the future simply by the observer getting up and moving *away* from the Andromeda Galaxy, this shift is completely meaningless:

Although the friend is still alive "now," he remains excluded from the observer's reality as a "living person" just as he was previously excluded as a dead person. Therefore, nothing has changed. The

statement that he is not yet dead "now" is empty, since an encounter with the truly living friend – or the prevention of his death – is in no way made possible by such relativistic shifts.

In general, statements that refer to the temporal classification (past, present, or future) of events to which no possible causal connection exists are empty and therefore meaningless.

In this case – but *only* in this case – Einstein's claim is correct.

In this example, mathematics dominates the perception of reality:

According to Einstein, this perception *deceives* us, and mathematics tells us how things *really* are.

However, this claim can easily be refuted by experiments: one only needs to try to move along the time coordinate. Anyone who, after a sufficiently large number of such unsuccessful attempts, nevertheless remains steadfast in their conviction that reality is four-dimensional in the Einsteinian sense – that is, "the separation between past, present, and future is only an illusion" – can then rightly be accused that ***they*** are clinging to an illusion.

However, this illusion is extraordinarily powerful: the widespread view that gravity is not a force because in four-dimensional, curved space-time all bodies move along straight lines (geodesics) – that is, by definition, on *force-free* trajectories – is apparently based on the assumption that reality – ***our*** reality – **is** four-dimensional.

However, as just established, this is simply wrong – four-dimensional in the Einsteinian sense is only the structure of the description, not reality itself. (In the reality, there is no coordinate ict.)

What is true, as all three examples show, is that mathematics is *necessary* for describing reality, and that mathematical structures (four-dimensional spacetime, configuration space, Hilbert space, etc.) and concepts (imaginary unit) can arise that cannot be attributed existence "in nature" – and I would like to add that this is actually *self-evident: numbers* do not exist in nature either.

If mathematicians in the 16th century had been aware of this, the imaginary unit would not have given them sleepless nights.

In some cases, the appearance of such structures and concepts helps us better understand reality, but in most cases, their introduction and use are merely necessary because without them, either no mathematical representation at all or only a much more complicated one would be possible.

Configuration space is such a case.

However, their appearance only becomes a problem when mathematics and reality are identified or confused with one another.

In order to clarify the error that occurs in our three and in numerous other examples in a similar form, it is therefore not necessary to analyze the relationship between mathematics and reality in more detail.[8] The simple assumption, sufficiently supported by our examples, suffices:

Mathematics is an indispensable means of describing reality. But it is neither identical with reality nor is it the actual reality.

Thus, if a mathematical representation takes place in a space other than the three-dimensional space of our perception, this is no indication that elements of this representation, or even the entire process represented, are not real.

8 I did this in the book Structure.

Note:

I encountered Cantor's infinities when I was very young. This encounter was important to me. I, too, had previously intuitively understood infinity in the sense of "potential" – as the possibility of "endless counting."

From this naive standpoint, even the fact that the rational numbers are countable was surprising to me.

But it wasn't until Cantor's wonderfully simple proof that the real numbers between 0 and 1 have no place even in an infinitely long list of infinitely long numbers – and, of course, even more so through his fantastical infinite sequence of ever "larger" infinities – that I realized how different reality and mathematics are.

Unfortunately, many physicists seem to lack this experience – otherwise, the identification of reality and mathematics, or the confusion of the two, wouldn't be so widespread.

10: Spin and the 720° Rotation

The general belief that spin cannot be understood as a property of an object that exists in the same way as the objects of our everyday experience is correct.

The claim that the electron cannot exist in this way because it has this property, however, is false.

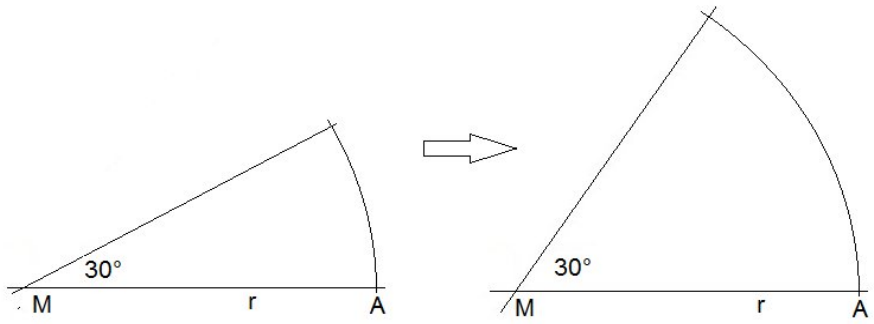
Isn't this a contradiction?

The answer is no. To explain this, we must return to the metric changes from which reality emerges:

Mass is defined as change in the *metric density of the length*, which causes a *metric flow toward the compression*, whose velocity increases with decreasing distance. A steady state is established (the flow is constant over time).

Analogously, electric **charge** is defined as change in the *metric density of the angle*, which causes a *metric flow orthogonal to the direction of one side of the angle*.

Here again sketch (S6): The flow generated by the reduction of the angular density (the increase of the 30° angle) is *orthogonal* to r, which means: A is accelerated *upwards*:



(S6)

Here, too, a stationary state develops: a temporally constant flow arises, the velocity of which increases with decreasing distance between M and A, if in M an electrical charge is present.

r passes through M; The position of r in the plane containing the angle shown is arbitrary. This means that the flow rotates around the center point M in this plane.

Every point on the circle with center point M and radius MA must therefore be assigned the same *tangential velocity*. There are always two possibilities for the direction of this velocity: in the sketch, the metric flow at A can point upwards or downwards.

Since the position of the plane through M and P that contains the angle is also arbitrary, the following applies:

Every point P on the spherical surface with center point M and radius MA must be assigned *the same tangential velocity* ***in every direction*** on the tangential plane defined by P.

To put it another way: We have arrived at a rotation in every plane whose magnitude is fixed and for which there are two possibilities for each specific direction.

This corresponds to the definition of ***quantum mechanical spin***, but with the key difference that here it does not appear as ***attribute of an object***, but as ***attribute of the continuum***, which is metrically altered by the presence of an electric charge.

This change then represents the necessary and sufficient prerequisite for the formation of *stationary wave states*.

Only these stationary wave states can be considered ***"objects"***. They contain the rotating flow just determined, present in every plane through the center – the rotational velocity – not as an **attribute**, but as a **prerequisite**.

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

Why this is so, becomes clear from the definitions: In the case of mass, *lengths* are changed, i.e. *lines*; in the case of charge, *angles* are changed, i.e. *surfaces*.

What follows from the fact that *spin* is not a property of objects, but a property of the continuum?

It means that the argument that the electron cannot be considered a real object because of its spin is invalid: As property of an object, spin would not be possible, but as a property of the continuum it is unproblematic, albeit highly abstract: conceiving the continuum as composed of *planes* to which certain properties are assigned is just as possible as conceiving it as composed of *lines* to which certain properties are assigned, as in the case of gravity.

Of course this act distances the concept of a continuum from our naive initial conception, but this distancing is unavoidable anyway: even the assignment of real numbers to points in the continuum is by no means as self-evident as it seems to us today.

Accordingly, in the continuum altered by charge *stationary wave states* form, as in our sketch (S3). So whenever we encounter a state that we perceive as an "electron," we encounter it in one of these states, and in each case, the rotational speed that we call "spin" also appears.

It is therefore natural that we consider this spin to be a property of the electron – and yet it is wrong.

After we have restored the electron as a "real object" – at least in the form limited by my interpretation: as a stationary wave state or transition between such states – we still have to answer the question of why it only returns to the same position after a rotation of 720°.

In order for my metric-dynamic reconstruction of the atomic model to agree with the quantum mechanical specifications, the unit charge – defined as length – must be equated to the classical electron radius. (Just as in gravity the length of the mass must be equated to the radius of the black hole with that same mass to achieve agreement with the GR.)

In the case of negative charge, the angular density *increases;* thus the *angle measure* becomes smaller, and the circumference of the entire circle *measured by it* becomes larger.

It turns out that *at a distance of the Bohr radius* – i.e. on the first electron "orbit" – the angular density is exactly twice as large as in normal space, so that the circumference of each circle is not $2\pi r$, but $4\pi r$, and the same applies to all other orbitals.

In the metric-dynamic model, it is therefore self-evident that for the "electron" in the ground state as well as in excited states, a complete rotation is always 720°.

This concludes my comparison of the catalog of common beliefs with the catalog of my own beliefs, based on examples.

It turned out to be more extensive than I expected: although there were only two examples, a large part of the foundations of contemporary physics had to be addressed.

Chapter 2: Systematic Comparison

In this chapter I will compare the usual versions and interpretations of some of the fundamental physical theories with the form they have taken in my construction of reality.

2.1. Special Relativity

The best-known path to the special theory of relativity leads through the relativization of simultaneity.

In his book *On the Special and General Theory of Relativity,*[9] Einstein introduces the reader to the correct definition of simultaneity in a fictitious dialogue as follows:

Lightning strikes simultaneously at two distant locations A and B.

Einstein asks the reader how this statement can be specified so that it is verifiable.

The reader replies:

If an observer located at the center M of the line AB perceives the two lightning strikes simultaneously, then they are simultaneous.

Einstein objects that one must first know whether light travels along the line A→M at the same speed as along the line B→M.

This objection refers to the question posed a few pages earlier in the book:

If the speed of light for a stationary observer is c, then – for an observer moving at a speed v – wouldn't the speed of light be $(c - v)$ or $(c + v)$?

After some consideration, the reader replies: (Translated from the German version)

"(...) The only requirement that must be placed on the definition of simultaneity is that it always provides an empirical decision regarding the validity or non-validity of the concept to be defined. (...) That light takes the same amount of time to travel the distance A→M and the distance B→M is,

9 A. Einstein, Akademie-Verlag, Berlin 1973. What follows is from Part 1, § 8, p. 21 ff.

in truth, not a *presupposition or hypothesis* about the physical nature of light, but rather a *determination* that I can make at my own discretion in order to arrive at a definition of simultaneity." (Italic in the original.)

Einstein agrees with this, and that is astonishing because this statement is false, and, at that, *fundamentally* false.

I emphasize this not to prove Einstein wrong – that is even unpleasant for me – but because this false claim ***completely blocks the path to a correct explanation of special relativity***, as I will now show.

The fact that this statement is false is immediately apparent from the Michelson experiment, which Einstein mentions in the book (at the end of §5, although not by name).

This experiment was intended to determine the change in the speed of light due to the Earth's motion through the ether. Despite the greatest care in preparing and conducting the experiment, no such change was detected.

Thus, the experiment shows that the speed of light does not depend on the observer's motion.

Since this seemed unthinkable to him, Michelson declared the experiment a failure.

From Einstein's perspective, however, this result ***must*** have been a clear indication that it is by no means ***our decision*** whether light has the same speed for all uniformly moving observers: the experiment shows that this is not decided ***by us***, but ***by nature***.

But even more important is this:

If Einstein believes we could also choose any other process with a *different* speed to define simultaneity[10], if it "gives us an empirical decision about the correctness or incorrectness" of this concept, then he is mistaken, because the following applies:

The determination of time is only correct if it is carried out by light – or more generally: by processes at the speed of light. With any other type of time determination, nature would resist and refuse experimental confirmation.

So it is by no means true – as Einstein believes – that we can freely choose how we determine time relationships; we ***must*** do it with light.

To demonstrate this fact, I described the consequences of determining time using sound signals in the book The Concept of Reality (from page 69 below). This makes the speed of sound identical for all uniformly moving observers. However, time defined in this way applies ***exclusively*** to sound and phenomena derived from it and to nothing else. For observers moving at approximately the speed of sound, the time shown on their sound clocks passes considerably more slowly, but they obviously do *not* age more slowly.

The same would be true for any other choice: time would apply only to the process chosen for the time-determination and to all phenomena derived from it, but for nothing else.

Only with light is this different: the time relationships determined by light apply *universally*. And only once this has been clarified do we face the crucial question:

10 Elsewhere (*Grundzüge der Relativitätstheorie*, 4th edition, Vieweg und Sohn, Braunschweig 1965, page 19), Einstein expresses himself even more clearly: "In order to give the concept of time any physical meaning, it is necessary to use some processes that can establish relations between different positions. What kind of processes one chooses for such a definition of time is in itself irrelevant." (Translated from the German version)

Why is this so?

Why does <u>all of reality</u> obey the space and time relationships determined by light?

If, however, we do *not* ask this question, but rather justify the special theory of relativity through the well-known postulates,[11] then – although the correct result is obtained – the fundamental mechanism by which the temporal relationships are generated remains undiscovered, as do its preconditions, which – as we will see shortly – *take us directly to the basis of reality.*

What is this "mechanism"?

We know that time does not – as Newton assumed – "flow uniformly in and of itself and of its own nature". This means, however, that every local passage of time, as well as the relationships between these local times, must first be ***generated*** or ***caused*** by something.

This causation must obviously be attributed to the causal processes by which the objects of reality are connected.

To understand how these temporal relationships arise, we conduct the following thought experiment:

We consider two objects. Initially, they are both at rest. However, if they now begin to move along their connecting line in the same direction at the same speed, the relationship between the times that apply to them ***changes*** – simply because ***each*** of the causal, time-generating processes that begin at the front object and end at the rear object now arrives at this rear object ***earlier*** than the same process in the case of the objects at rest, because the rear object now runs counter to this process.

But this means nothing other than that – with respect to the rear object – the time at which the process *originated* at the front object is now ***shifted into the past*** compared to before.

Obviously, however, the extent of this shift depends on the speed of the process in question: the smaller this speed, the greater the shift.

From this, the following – surprising and far-reaching – conclusion can be drawn:

Let's assume that the objects of a system are linked by processes that propagate at speed c.

Then we obtain a time structure that is completely determined by c – as is actually the case.

Now let's additionally assume that there are other processes that propagate at a different speed d, which is *independent* of c.

Then these processes generate a second time system, *different from and independent of* the one generated by c. But that is impossible. The time system must be unique.

From this follows:

There is only one speed, namely c. All other speeds must be <u>derived from it</u>.

Previously, we asked ourselves the question:

Why does reality obey the spatial and temporal relationships determined by light – while the time determined by a process with a speed different from c would *in any case* only apply to the process chosen for the time-determination and to all phenomena derived from it, and to nothing else?

11 These postulates are: (1) the special principle of relativity (indistinguishability of uniformly moving systems with respect to *all* physical phenomena) and (2) the principle of the constancy of the speed of light for all uniformly moving observers.

Now we know the answer:

Reality obeys the relationships for spatial and temporal measurements determined by light, because there is only the speed of light and phenomena derived from it.

How, then, do other speeds derived from light arise?

From superpositions of the waves. The speeds of the superpositions depend on the frequencies of the waves.

I did this in the book The Structure of Reality (Chapter 6) and derived the special theory of relativity from it, without assuming the principle of relativity or the constancy of the speed of light for all uniformly moving observers.

This is possible because the wave superpositions adhere to the spatial and temporal relationships determined by light, or more precisely: because they too – just like light itself – *create* this space-time structure.

Thus, just by this simple step, all velocities $v < c$ are integrated into the relativistic space-time structure.

Finally, let us compare Einstein's introduction of special relativity with the explanation I have just presented:

Einstein justifies the assumption of the constancy of the speed of light by claiming that it is our free choice to make this assumption. The justification is false: this choice is made by nature, not by us. Since the assumption itself is correct, the error has no effect on the result.

However, this error – since it purports to be an *explanation* – prevents the search for the true reason ***why*** time relations are determined by light. Einstein's false assumption, revealed in the above quotations, makes it impossible for him and all who have followed him to recognize the ***true cause*** of the fundamental importance of the speed of light.

So how should one judge the introduction of special relativity?

Of course, it is a magnificent achievement. It would be downright absurd to imagine physics without it, and it took Einstein's genius to achieve the detachment from the Newtonian concept of time.

But on the other hand, the way in which Einstein accomplished this separation is also a misfortune for the development of physics, because, as we have just shown, *the knowledge of the true causes of the relativity of time and space would also have made it possible to see the fundamental level of reality.*

But that didn't happen, and so it took more than a hundred years before this knowledge was finally obtained.

But now to the consequences of my explanation of special relativity.

It begins with the question:

Why does reality obey the spatial and temporal relationships determined by light?

– then it continues with the description of the process of generating the relationships of local times, from which directly follows the fundamental **proposition about reality**:

There is only one single speed, namely c. All other speeds must be derived from it.

– and from this follows the answer:

Reality obeys the relationships for spatial and temporal measurements that are determined by light, because there is only the speed of light and phenomena derived from it.

The few statements contained in this explanation obviously completely change the foundations of physics. However, within the framework of my construction of reality, this is not the only reason for this transformation: the changes to which my interpretation of the quantum mechanical measurement process leads largely coincide with the changes resulting from the foundation of relativity.

The most important change is:

There are only waves – not "probability waves", but actually existing metric waves.

What is referred to as "particles" are stationary states of waves or transitions between such states. Only the measurements are quantized – observable events are always transitions! – reality itself is continuous.

I described how physics is transformed by the explanation of the measurement process in the first chapter.

Through the explanation of relativity, we now learn that there is only the speed of light (which again implies that there are only waves), and moreover, we arrive at ***matter waves*** in the simplest way, because the following applies:

A standing wave in a moving system, generated by two waves traveling at the speed of light, is – viewed from the rest frame – the superposition of a matter wave and a wave with the speed of the group, i.e. of the associated particle. (Structure page 110f.)

Before I conclude this section, I would like to briefly address a consequence of my interpretation of SR, which I consider important:

So far, there has been no *explanation* of the special theory of relativity but only its derivation from principles. This inevitably created the impression that, although the necessity of SR can be understood, it itself is incomprehensible because it contradicts our *a priori* notions of space and time – with the consequence that these notions must be abandoned.

Based on my interpretation, however, the opposite is true:

While we must certainly recognize that spatial and temporal relationships are *generated*, under this premise it is then *intuitively* explainable how spatial and temporal measurements change due to relative movements.

The argument required for this by no means abolishes our *a priori* notions of space and time – on the contrary, they are *presupposed*. However, since this argument is a bit too long, I will not expand on it here. In the book Structure, it begins on page 164.

I consider this important because the previous view of SR highlights the impotence and thus the superfluity of the *understanding-oriented*, pictorial and descriptive thinking – just as the standard interpretation of quantum theory, which I will discuss below.

This has contributed decisively to the dominance of mathematics over this type of thinking, and it has certainly become clear in the course of my remarks that I clearly recognize the leading role on the path to knowledge of reality in the search for understanding.

As theoretical physics has impressively demonstrated over the past decades, mathematics without this guidance goes astray and gets stuck in dead ends.

2.2. Gravitation

In Newtonian mechanics, gravity and inertia are different properties. However, their measured values are always identical (using the same unit of measurement kg).

Einstein interpreted this numerical equality as evidence that they are *one and the same* property.

This assumption enabled him to expand the special principle of relativity (SRP) into the general principle of relativity (GRP):

SRP: *Every uniformly moving observer is entitled to consider themselves at rest.*

GRP: *Every arbitrarily moving observer is entitled to consider themselves at rest. They only need to relate all accelerations they experience to a (variable) gravitational field*.

Here's an example:

We consider an accelerating observer – let's say, an observer on a rotating disk.

In Newton's view, the force acting on them is a consequence of their inertia.

According to GRP, however, they are entitled to relate this force to their gravity, i.e. to consider themselves at rest and to attribute their acceleration to a gravitational field.

This creates connections to both metrics and mechanics:

The metric changes arise from the special theory of relativity: due to the observer's movement, the tangential lengths are shortened and the passage of time is slowed, and of course, they can also express their state using mechanical quantities – mass, force, energy, momentum.

Thus, their state is uniquely defined in both ways, so that *equating* the metric description with the mechanical description can be interpreted as *definition of the gravitational field*, as is done in a generalized form in Einstein's gravitation equation:

(Einstein tensor) = (energy-momentum tensor)

As magnificent as this line of thought is, it already prefigures the later failure of Einstein's attempt to generalize his equation to describe *all of physics* – a goal to which he dedicated the last three decades of his life.

While the identification of gravity and inertia does indeed make it possible, *purely formally*, to relate any acceleration to a gravitational field, this gives rise to two unsolvable problems:

If ***all*** metrically altered states of the space-time continuum are interpreted as effects of gravity,

- then, *on the one hand*, there is no room for the "rest" of physics in the resulting formalism. It is, in this sense, "too narrow"
- *on the other hand*, also physically impossible cases find their way into the formalism, because not everything that is processed as gravity by equating gravity and inertia **is** really gravity. In this sense, the formalism is "too wide". and it is to be expected that there will be solutions that have no equivalent in reality.

The first point is the reason for Einstein's failure.

The second point is the reason why, for many solutions to the field equations, it is merely a matter of personal preference whether one assesses them as real or considers them to be mathematical artifacts.

Now to my view of gravity.

As described in the first chapter under "7: What oscillates in the Schrödinger equation?", mass is defined as ***metric compression*** that causes an ***acceleration of the metric flow***.

Of course, here, too, gravitational and inertial mass are identical.

Consider, for example, the Earth: it causes a metric flow directed toward the Earth's center, whose velocity at the Earth's surface is 11.1 km/s. What presses us against the Earth's surface is therefore not our weight, but our inertia: the Earth's surface counteracts the acceleration we experience due to the metric flow moving (accelerated) through us. (We ourselves, like everything that exists, are states of the metric.)

In other words: gravity **is** inertia.[12]

However, here – unlike in Einstein's derivation – this is not a problem, since my theory of gravity is not derived from this identity but from the process that creates reality.

The equation of this process is as follows (σ is the metric density of length or angle, ζ is the metric density of time, c is the speed of light):

$$\frac{d\sigma}{dr} = -\frac{1}{c}\frac{d\zeta}{dt}$$

In words:

The spatial change in the metric density of length (or angle) is proportional to the temporal change in the metric density of time. The proportionality factor is the velocity c.

The metric density s has two interpretations in this equation: as density of the length and as density of the angle.

If σ is interpreted as the density of length, this leads directly to gravity; if σ is viewed as the density of angle, this leads to electromagnetism. [13]

From this equation, five types of metric waves can be derived – without requiring any further assumptions: four of them result from changes in the density of length and angle, and one from a change in the metric density of time. All waves have the velocity c. (See Structure Chapter 3)

This reveals another fundamental agreement:

Just as the explanation of special relativity implies that there is only the speed of light and that therefore everything that exists and occurs must be derived from it, and just as the explanation of the quantum mechanical measurement process implies that there are only waves and that the Schrödinger equation refers to waves of angular density, so too does the representation of the origin of reality lead to results consistent with this.

And I emphasize: none of this was intentional – quite the opposite: I hadn't expected it in the slightest.

For me, this agreement of results, which stands in stark contrast to the disharmony of the fragments that make up standard physics, is an important indication of the correctness of my conclusions.

---

12 Here this identity has a more fundamental meaning than in GR. In GR, it is a generalization suggested by examples, in my theory it is of *ontological* nature: gravity **is** inertia.

13 However, I didn't elaborate on that, but simply *defined* electromagnetism analogously to gravity. EM thus exists only as a concept, although this concept is at least sufficiently developed to allow the construction of an atomic model that is consistent with the quantum mechanical atomic model.

Where general relativity has been so perfectly confirmed: in the Earth's gravitational field and in the solar system, my theory of gravity agrees almost perfectly with general relativity. The Schwarzschild solution is identical.

In galaxies, however, this is not the case: here the two theories lead to very different results.

However, the deviation of my theory from GR does not result from a correction at sufficiently large distances, as is the case with MOND (modified Newtonian dynamics). Rather, it is rooted in a fundamentally different conception of space: space itself – understood as metric space – is set in motion, and this is precisely the cause for the significantly higher rotation speed of galaxies.

From the perspective of GR, this dynamic view of space – what I call *metric flow* – is unattainable, and the high rotation speed must therefore be understood as an indication of invisible matter.

What about the "incompatibility" of gravity (G) and electromagnetism (EM)?

The explanation consists of several steps.

First, both originate from the same source. From this descent, their differences and their justifications follow quite directly:

G is defined as the acceleration of the *longitudinal* metric flow. In this sense, G **is** this accelerated flow.

In EM, however, the metric flow is *transverse* (see sketch (S6) on page 18) and unaccelerated.

Therefore, the EM – unlike G – cannot be *identified* with the flow: it does not act directly through the flow, but rather through the waves, whose frequencies have also changed as a result of the continuum being metrically altered by electric charge.

This view of EM is very similar to the standard description, where the interaction occurs through "exchange particles," but with the difference that this interaction is now – since there is no quantization and no "particles" – simply replaced by *wave superposition* and the resulting change in velocity, just as in the photoelectric effect and the Compton effect. The result remains the same.

It's easy to understand that EM can be isolated, but G cannot:

G **is** the metric flow from which **everything** consists. This flow is fundamental and thus not "isolatable" because it flows ***through everything***, whereas EM can be isolated because it acts through waves, and waves can, of course, be stopped.

Also the Aharonov-Bohm effect becomes understandable in this way:

Although EM itself is *not* caused by the metric flow, the *phase shift of the electrons* is caused by the rotating metric flow associated with the charge, so that even if the waves are interrupted – i.e. the EM is isolated – the phase shift still occurs because the flow cannot be isolated.

(In standard physics, the effect is attributed to the magnetic vector potential and considered one of the "miracles" of the quantum world.)

In summary:

G and EM both originate from the *purely metric process* of generating reality, which occurs everywhere and anytime. They can be explained and derived from it.

However, it also follows that their mechanisms of action are different, and that attempting to "unify" them would be pointless, since they do not *contradict* but *complement* each other

2.3. Quantum Theory

Every object has a position and a velocity at every moment – at least as long as you imagine an object as something that occupies a well-defined volume of space at every moment.

Physics before the 20th century was based on exactly this idea, and that is why there was great surprise when it turned out that it was impossible to precisely determine both position and velocity at the same time for *very small* objects.

Initially this was justified by limitations of measurement, but over time it became clear that it is a limitation that applies to nature itself.

At this point it was already known that objects on atomic scales could be described by the matter waves discovered by de Broglie, and that energy and momentum of such objects are determined by the equations

$$E = h\nu \quad \text{and} \quad p = h * 1/\lambda$$

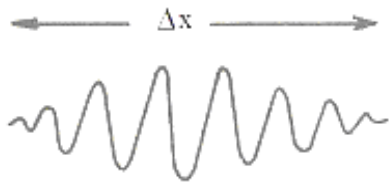
This means that actually all the prerequisites were in place that are needed to establish the connection between the two worlds: between the abstract causal metric world of waves and the concrete, tangible world of objects that physics had dealt with up to that point:

Firstly, the *type* of wave (or wave class) by which energy and momentum are defined was known: matter waves are *sine waves* – and secondly, there was a bijective relation between the values of the wave properties *frequency* and *wavelength* and the values of the associated object properties *energy* and *momentum*.

Unfortunately, none of the physicists was able to interpret this connection correctly – except Schrödinger, whose attempt, however, failed because he expected his wave groups to remain *spatially limited,* in accordance with the particle concept, but they *diverged*.

If someone had recognized that electrons or other objects in this order of magnitude could not only be *represented* by wave groups made up of matter waves, but that they actually ***are*** such wave groups, then it would not have been confusing at all, but rather self-evident that an "uncertainty principle" applies for the quantities position and momentum.

According to our realistic view, this is simply the case because to spatially limited wave trains (wave packets) like in the following sketch



(S9)

always an "uncertainty relation" of the form

$$\Delta x * \Delta(1/\lambda) \geq 1$$

applies. Such wave trains just *do not possess* a definite wave length. Instead, they are composed of waves with different wave-lengths. The smaller the spatial extension is, the greater is the interval of

the required wave-lengths. Reversely, the more exact the wave-length is – and, in our case, at the same time the velocity – the greater is the uncertainty of the position Δx.

If one connects this fact with the equation

$$p = h * 1/\lambda$$

then follows

$$\Delta x * \Delta p \geq h .$$

Of course this is perfectly well known. Nonetheless it had to be mentioned here again, because in the usual interpretation of quantum mechanics, it must be seen as a purely formal fact and not as an explanation. It can only turn into an ***explanation*** if it is assumed that particles ***are*** stationary wave states and that momentum is defined by wave-length exactly ***for this reason***.

Therefore to the quantities momentum and position the following applies:

1. Both quantities are *defined* as wave properties, and they correspond to certain *types* of waves: sine waves are assigned to momentum, and to position pulse waves (i.e. waves, whose amplitude is only in one point not equal to zero).

2. The prerequisite for the assignment is that there is a bijective relation between the wave property (wavelength or amplitude) and the assigned object property (momentum or position). This condition is fulfilled here.

3. To the values of the two object properties applies an uncertainty relation. *This uncertainty is a* ***purely wave-mathematical fact*** (more on this later). It is ***transferred*** to the two object properties through their definition.

As regards position and momentum, everything that seemed strange from the conventional viewpoint has disappeared. While, in the usual interpretation, it seems outright absurd that a particle should not possess exact values of position and momentum at the same time, in the alternative interpretation – where objects (wave superpositions or "wave packets") simply *do not have* a definite spatial volume – it is just an evident fact.

The question is: *Can this scheme be transferred to all physical object attributes ?*

The answer is *yes.* Strictly speaking, nothing at all has to be transferred – quantum mechanics ***is*** exactly this scheme. Thus what has to be done is just re-interpreting the formalism.

So let us look at the quantum mechanical scheme:

Quantities to be measured are *observables*. To them, *operators* are assigned. By applying an operator to the vector in Hilbert space, by which the state of the object to be measured is represented, this vector is decomposed into a series of *eigenfunctions*, i.e. a ***spectral analysis*** is carried out: eigenfunctions are waves whose form depends on the kind of the operator.

(E.g. de Broglie matter waves are eigenfunctions of the momentum operator. Spherical harmonics – i.e. standing waves on the surface of a sphere – are eigenfunctions of the angular momentum operator.)

Therefore, assigning observables to operators is tantamount to assigning them to *wave-categories*.

However, in any set of wave categories, into which a wave superposition ("wave packet") can be decomposed, there are *pairs of categories* to which – in the same way as to sine waves and pulse waves – an *uncertainty relation* applies. [14]

Thus this must also be true at the spectral decomposition of the state vector. And this uncertainty is again ***transferred*** to the physical quantities *defined* by these wave categories.

This means:

The scheme just described for position and momentum, applies equally to *all* physical attributes (observables): They are ***defined by wave classes***, and the uncertainty relation valid for so-called canonically conjugate attributes is therefore a ***purely wave-mathematical*** – and as such, *perfectly understandable* – ***law*** that is *transferred* to the attributes through their definition [15]

So how is this formal scheme to be interpreted?

The most important elements of the interpretation have already been described and explained. Here is a short summary:

The object that *emerges* as a consequence of the measurement is *not* the same object as the object that has been measured. The measured object is (in general) a wave group, the partial waves of which will *contribute to various measurements* – exactly as was described it in the explanation of the double-slit experiment.

The state vector represents the object to be measured. Thus it relates to the wave packet *before* the measurement, and accordingly the spectral analysis relates to the decomposition of this wave packet into waves, which belong to the category to which the attribute to be measured is assigned.

Since the wave category in which the state vector is decomposed is *freely selectable*, the state vector contains all measurable attributes *as possibilities* – however not in the sense of "another kind of existence" but in a completely ordinary sense: each of the waves contained in the wave packet, which belong to a certain wave category, can contribute to the formation of an object, i.e. of the object of the actual measurement or an object of subsequent measurements.

At an experiment, it is (in most cases) necessary to *actually* decompose the wave packet. The distribution of the measured values will then – as will be elucidated in the following example – correspond to the distribution of the amplitude squares of the waves contained in the state vector.

Here is an example:

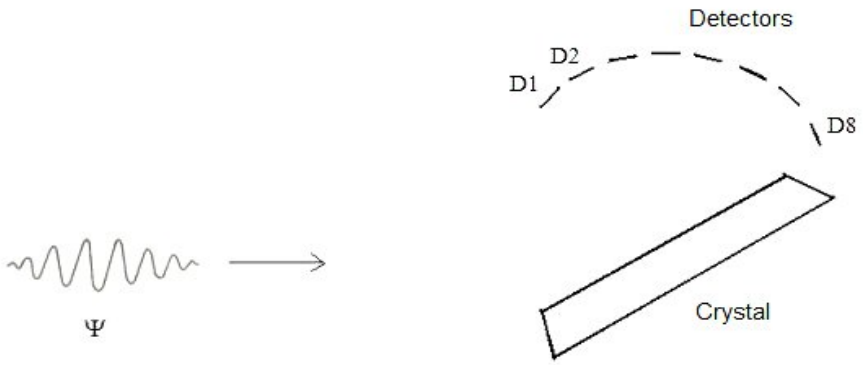
> Let's assume the object being measured is an electron. Its momentum is first to be calculated and then measured.
>
> To calculate the probability distribution of the measured values, the momentum operator must be applied to the wavefunction Ψ, which represents the electron.
>
> As stated above, this procedure is a *spectral analysis:* Ψ is decomposed into *sine waves* with different wavelengths, and the corresponding amplitudes are determined. Their squares give the desired probabilities.

---

14 At a division in two such classes of waves, the product of the *bandwidths* cannot be smaller than 1.

15 I emphasize again: since *there are only waves*, all causal connections ***must*** be traced back to waves. Therefore, the assignment of the properties of objects to wave classes is a ***necessary act*** that occurred in physics precisely at the time when it had advanced to scales at which the fundamental wave nature of reality was revealed.

In the experiment, the wave-packet must *actually* be split. This splitting could be carried out e.g. by the following arrangement:



(S10)

The wave packet Ψ is dispersed at a crystal, which means that the waves with different wave lengths contained in Ψ are diffracted at the crystal surface. This surface acts as a plain diffraction grid which decomposes the wave packet into virtually monochromatic radiation bundles.

Near the crystal surface all waves interfere, yet at a sufficient distance the rays separate, such that all waves that arrive at a certain detector have a (nearly) identical wave length.

So we have sorted the wave packet by *wave-lengths* (momentums).

Thus the *formal* division by the application of the momentum operator corresponds to the *real* division of the wave packet into sine waves with different wave-lengths by the experimental setup.

According to the usual interpretation, the measurement has the effect that one of the eigenfunctions of the momentum operator leads to the measurement result, that is: it becomes *real,* whereas the others *disappear.*

In one detector we now have an electron with a certain momentum – which did *not* exist before –, in the other detectors we have *nothing*.

In the interpretation proposed here, there is *no reduction:*

None of the eigenfunctions disappears. All eigenfunctions will contribute to future events (measurements) – exactly as in the double-slit experiment. The amplitude squares of waves with a certain wave-length add up in the respective detector, until a transition occurs: a momentum measurement has been carried out (which in general is again not the consequence of a single wave-packet but requires the adding-up of amplitude squares of many wave packets that had arrived earlier).

Also here it can be seen clearly that quantitatively nothing changes:

The wave packets are divided into sine waves with different wave-lengths, which arrive at the corresponding detectors. If now, according to our basic assumption, the characteristic re-*organization* of a local spatial oscillation state – i.e. the "appearance of an electron" – is *caused* by the adding up of wave intensities, then the probability of the events in a certain

detector must depend on the amplitude square of the waves that *actually* hit this detector – exactly as predicted by quantum mechanics.

Doesn't it somehow *contradict* the QT formalism to assume that a particle develops somewhere and later *the same* particle appears again – even if formally (*and* experimentally) a partition takes place and the parts are displaced arbitrarily far from each other?

It would not be totally absurd to call this an interpretation *against the formalism*.

In contrast, my proposal keeps close to the quantum mechanical formalism and permits connecting the concepts of the formalism with a *local* reality:

If, *before* the measurement, a particle X is generated at a certain position, and *after* the measurement an identical particle appears at another position, then this is not *the same* particle: the waves originating from the decomposition of the characteristic oscillation pattern X split up according to their formal description – they *actually* diverge – and *contribute* to the development of another oscillation pattern X, which however deserves to carry the same identifier X not because it is *substantially* but only *formally* identical with the first one.

Let us now return to our general interpretation of formalism.

The measured object – the carrier of the measured variable – is always *reconstructed* or even *newly formed* by the measurement process, provided it is an object of atomic or molecular scale. Only through this new formation of the measured objects can the waves contained in the state vector become measured properties; in other words, can the possible become the real.

Of course, in every case of assigning an attribute to a wave class, the physical reason for this assignment must be explained. The book Structure provides part of the explanation:

In the chapter on theory of special relativity, the *speed* of objects is defined by *superposition of waves*, and changes in movement by changes in *frequencies*.

Matter waves are generated by the Lorentz transformation of standing sine waves. This provides the conceptual basis for the definition of energy and momentum, and it can be seen why *energy* is assigned to the (undirected) quantity *frequency* of matter waves, and why *momentum* is assigned to the (directed) quantity *wavelength* of matter waves.

These definitions are formally demonstrated and confirmed in the descriptions of the photoelectric effect and the Compton effect.

Why *spin* and *angular momentum* are assigned to *spherical harmonics* (standing waves on spherical surfaces), is explained in Chapter 9, starting on page 200.

This already traces some of the most important assignments back to obvious relationships.

So it can be stated

Quantum theory is not about the ***wave and particle properties of objects of the fundamental layer of reality***. Rather, it is the meeting point of the ***fundamental world of waves*** and the ***world of the objects of our experience*** generated from it.

This also clarifies why quantum theory is indispensable: all physical descriptions – no matter how abstract – ultimately serve to explain tangible, objective facts.

Therefore applies:

Quantum theory is precisely the theory that makes it possible to describe the foundation of reality, which consists *exclusively* of waves, by quantities that originate from the tangible

world of objects. Quantum theory forms the connection – the "interface", so to speak – between these two areas.

As has been shown, the epistemological confusion that has lasted more than 100 years and continues to the present day, is rooted not in the quantum mechanical formalism itself, but in its interpretation: it is only the inability to break away from thought patterns formed through *objects of our everyday experience* that creates paradoxes and ultimately leads to the loss of any understanding of reality.

I conclude with a brief summary:

The central assumption of the local and objective interpretation of quantum theory is:

If event probabilities can be predicted using a quantum mechanical wave function, then there is a really existing wave that causes these events.

Quantum mechanical amplitude squares are therefore never merely formal tools; they correspond to probabilities only because *they refer to the intensities of really existing waves*.[16]

It immediately follows that ***no reduction of the wave function takes place:*** what exists cannot disappear.

Since in the wave functions of "particles" moving outside of matter the waves generally diverge, a realistic interpretation is tantamount to abandoning the concept of particles in its usual form. It is replaced by another concept, defined as follows:

The phenomena commonly referred to as "particles" are stationary states of waves – in the simplest case, standing waves or regions of standing waves separated by nodal surfaces – or transitions between such states.

Outside of these states, there are only moving waves or diverging groups of waves; the term "particle" then loses its meaning.

Since the identity of the "particle" initially *created* by a transition and later *measured* by a transition, is now abolished, the assertion of its existence between creation and measurement is misleading.

Waves ***and*** *particles* – or, let's better use the term "objects" instead of "particles" – therefore exist only in the everyday realm of phenomena.

The fundamental, causal level of reality is wave-like.

Note:

As with all previous explanations and conclusions, the following applies also to the explanation of quantum theory:

The correct interpretation of the quantum mechanical formalism leads to the same conception of reality as all other interpretations presented in this paper.

16 What about the probability amplitudes for *non-occurring* events? The state of a radioactive nucleus, for example, is a superposition of the states *decayed* and *non-decayed*.

About this the following can be said: If amplitude squares are defined as probabilities, then this requires the introduction of amplitude squares, which represent the complementary probabilities. It is this act of formal completion to which the "complementary" amplitudes owe their existence. It can still be claimed that they refer to real waves, but only via the formal intermediate step just described.

Chapter 3: Philosophical Excursion

After the exertions of the previous chapter, we deserve a little relaxation.

Therefore, here are two philosophical anecdotes that entertainingly demonstrate the fascinating yet ridiculous detours even the greatest thinkers can take when they develop – with extreme consistency – completely absurd systems based on assumptions they consider *absolutely certain*, but which are nevertheless false.

However, I present these anecdotes not only for their entertainment value; they also serve as an introduction to what follows, because afterwards, we will seriously address the central motive of both anecdotes: the question of the *origin of causality*. Even if this question does not directly belong to physics, it is nevertheless closely linked to it: without some form of causality, physics would not be possible.

3.1. Two Philosophical Anecdotes

According to *Leibniz*, reality consists of an infinite number of simple (i.e. *non-composite*) substances, which he calls "monads".

In his *Monadology*, he writes (under point 7):

"We have absolutely no means of explaining how it is possible for one monad to experience a change or alteration within itself through another. For nothing can be transferred from one to another, nor can an internal movement be generated in the latter by the former, which could be awakened, guided, increased, or diminished from without, as is possible with composite things, where the multiple parts allow for interchange or displacement among themselves. Monads, however, have no windows through which anything could enter or exit. Accidents must not detach themselves from their substances if they are not to flutter about helplessly in empty space, somewhat like the visible phantoms of the Scholastics. Neither Substance nor accident can find entrance into a monad from without."

Expressed in modern language, this means:

It is not possible for a monad to exert any effect on another monad. No monad has the slightest connection with reality; each monad is completely isolated.

But since *all reality* consists of monads, it follows that *there is no interaction at all*.

Applied to you and me, this means: I don't write, you don't read.

If we were to converse, we really would ***not*** be conversing: you don't speak, I don't hear. *Within us*, everything happens just ***as if*** we were actually conversing, but only because every monad has been designed by God from the beginning of time so that its internal states and changes would, for all time, be exactly the same as the internal states and changes that would have occurred as the result of the *actual* interactions.

In Leibniz's words (point 51):

"... among simple substances, there is only an ideal influence of one monad on another, and this influence only comes into effect through the intervention of God himself, since, within his sphere of thought, every monad can rightly demand that he also takes it into account in arranging and regulating the others from the very beginning of things. For since no created monad can exert a physical influence on the interior of another, this remains the only means of maintaining the one in dependence on the other."

Let's pause for a moment to consider what Leibniz is doing here:

Based on his arguments – which, in his view, are *absolutely imperativ*e – he considers it proven that interactions are impossible. Therefore, he must everything that ***would*** occur in a monad as a result of an interaction, incorporate into the monad itself.

In his words (point 56):

"This intimate connection or the perfect agreement of all created things with each individual, and each individual with all others, causes every simple Substance to bear relationships that are an imprint of all other simple substances, and consequently each individual appears, as it were, as a living, perpetual mirror of the entire universe."

The causal process, which is impossible in reality, is thus relocated t*o the interior of each monad* (point 22):

"... every present state of a simple Substance [is] necessarily a consequence of all its preceding states, and the present is therefore (so to speak) the pregnant mother of the future."

Leibniz remains silent on how this "internal" causality is supposed to function; he merely states its existence. For him, it is sufficient that the arguments that exclude *natural* causality do not apply within the monad because it is not *composite* but *simple*.

Leibniz therefore does not solve the problem of causality; on the contrary, he multiplies – or more precisely, "infinitely multiplies" – this problem, because everything that could otherwise be interpreted as a consequence of universal laws must now take place *in each monad* – individually and completely independently of all other monads.

What Leibniz still needs to explain, however, is the *synchronization* of the experiences of all monads.

He assigns this task to God (II. Eclaircissement p. 134):

"...imagine two tower clocks or pocket clocks that are in perfect agreement. This can be achieved in three ways. The first consists in the reciprocal influence of one clock on the other; the second in the care of a person who constantly watches over both; the third in crafting both so skillfully and expertly that one can be certain of their agreement in the end."

– and further:

"From the beginning of things, God has so arranged each of two substances that, according to their inherent laws, received at the same time as their existence, the one constantly agrees with the other, as if there were a truly reciprocal influence between the two, or as if God constantly had his hand in it."

One wonders why Leibniz postulates this tremendous complication. Couldn't he have simply transferred the universal causality to God, instead of requiring him to perform this infinitely enhanced watchmaking art of synchronizing all monads?

No, that would not have been possible, since even God himself could not create anything that contradicts the absolutely true, logical arguments that Leibniz presents against causality.

Furthermore, Leibniz doesn't perceive this complication as a problem at all; rather, it appears to him as miraculous proof of God's omnipotence (point 59):

"Moreover, it is only this assumption alone – I dare to consider it proven – that can restore the prestige of God's greatness, as it should be. Bayle himself admits this, merely remarking in response to his objections that I attribute too much to God, and more than is possible. But he is unable to

offer a reason why this general agreement, which makes every Substance, through its universal relationships, provide an image of all the others, should be impossible."

Here, however, Leibniz makes a mistake:

His "proof" of God's greatness is untenable in this form, since it is not necessary for all monads to be synchronized. We ourselves – or let's just say: all living beings – could also lie as tiny gray spheres in a very large, lightless cellar of the almighty Being, arranged arbitrarily and unsynchronized. Since no interaction is possible anyway, nothing has changed at all: each monad experiences what it has to experience, each one gets its due.

Leibniz could – like Descartes – argue that God would not deceive us. But that wouldn't be a valid argument, since he deceives us anyway by making us believe we communicate with each other.

Or he could claim that God would then lose the pleasure he feels when observing his creation. But that wouldn't be valid either: God is *outside of time*, so synchronicity is meaningless to him.

I'll stop here. I think it's become clear that even the utmost intelligence and consistency are insufficient prerequisites for creating a viable understanding of reality.

And – as you've probably already guessed – I certainly see a connection to contemporary theoretical physics: anyone who doesn't sufficiently examine the ontological scope of their basic concepts, is bound to fail.

This also applies to the second anecdote. It concerns *Kant's* attempt to establish causality.

In 1740, David Hume wrote in his "Treatise of Human Nature":

"...that there is nothing in any object, considered separately, which can induce us to draw any inference beyond the object itself; and that, even when we have observed the frequent or constant conjunction of certain objects, we have no reason to draw any inference concerning other objects than those which have been given us in experience."

Kant agrees with Hume's argument. However, he believes he can remedy this deficiency by assuming that causality does not lie *in the things themselves*, but *in us* – in the way things appear *for us*. According to Kant, it is *our mind* that structures observations as causal processes. According to Kant, this structuring is given *a priori* and thus inevitable.

Therefore, the only reason that the principle of causality is *universally valid*, is that *everything that can be experienced at all* is subjected to this categorical structuring through our mind.

In this way, Kant avoids Hume's arguments, which only apply to the assumption of causality in the things themselves.

He writes (Kritik der reinen Vernunft, 2nd edition of 1787, § 26. Translation by me and Google):

"Things in themselves would necessarily possess their lawfulness, even apart from an understanding that cognizes them. But appearances are only representations of things that exist unrecognized, according to what they may be *in themselves*. As mere representations, however, they are subject to no law of connection other than that prescribed by the connecting faculty."

– and further (Prolegomena, § 36):

"(…) since (...) lawfulness is based on the necessary connection of phenomena in an experience (without which we cannot know any object of the sensory world at all) and therefore on the original laws of the understanding; it may sound strange at first, but is nevertheless certain, when I say with regard to the latter: *the understanding does not derive its laws (a priori) from nature, but prescribes them to it*." (Italic in the original)

What Kant completely overlooks here is that we are by no means *free to prescribe* anything to the *thing-for-us*, because the *thing-in-itself* – even if it is not in space and time and we don't know what it *actually* is – must still be **connected** to the *thing-for-us:* thus, if we push the *thing-for-us* around, we are definitely *also* pushing the *thing-in-itself* around, even if (perhaps) not in space and time.

One could say: in a sense, the *thing-in-itself* and the *thing-for-us* "stick" together, and from this it follows that there must be a *close connection*, or more precisely, a *structural agreement*, between the law we prescribe to the *things-for-us* and the behavior of the *things-in-themselves*.

Therefore, Kant's claim has completely absurd consequences. The *thing-in-itself* is now completely at our mercy. It cannot have any *own* determinations – i.e. no determinations *in itself* – since it must fulfill *our* causal expectations.

One wonders what such a *thing-in-itself* is actually doing when it is not affecting the senses of an *a priori* structured being that dictates it what it has to do. It must then hang around helplessly in *nothingness*, since it has been deprived not only of all regularity of its behavior – which is, after all, only the categorical determination that comes *from us* – but also of space and time, which, as *forms of perception*, also belong *to us* and not to the *thing-in-itself*.

Only when it again affects the senses of such a being is it released from its helplessness and then finally knows again ***where*** and ***when*** it is and ***what*** it has to do.

An example: the planet Mercury. We observe it for some time. It behaves according to our a priori rules (which, by the way, have changed since Kant: back then they were from Newton, now they come from Einstein, and recently there are some from me too).

Then we interrupt our observations. Now the *thing-in-itself*, which *for us* is Mercury, staggers lawlessly around in nothingness, but, if we look at it again, it appears nonetheless exactly at the position in space and time where we expect it.

This idea is obviously nonsensical. The *thing-in-itself*, which *for us* is Mercury, must also have a determination *in itself* that guides it when it is not observed.

Moreover, the fact of its appearance at the predicted location proves not only the existence of this determination in itself, but also that it corresponds either exactly or at least to an excellent approximation to the law we assume.

It follows that the observed lawful behavior of things cannot be adequately explained by something that is *in us* or originates *from us*. The observation of lawful behavior always presupposes that also the *things-in-themselves* behave lawfully, that is, that their lawfulness lies *within them* and is not something *we* impose upon them.

So we end up back at Hume's problem of justification, and it remains again unclear why the observed laws should also apply in general.

What Kant believes he has proven is, let's be honest, simply nonsense. The certainty with which he concludes that the natural laws we recognize ***must*** be true, because they come from *us ourselves* and reflect only the laws of our own perception and thought, is a chimera – as was, after all, shown some time later.

It is also somewhat absurd that Kant compares this transfer of causality from external reality into ourselves with the "Copernican Revolution." It is the opposite: human beings are not *expelled* from the center of the universe, but rather *placed there* by being granted power over the laws of nature. (In Prolegomena § 36, Kant states: "With respect to the pure and universal natural laws, nature and *possible* experience are entirely one and the same" (italic in the original).

3.2. Why Does Causality Exist?

Many of the old arguments against the existence of causality in reality have now become meaningless, such as Leibniz's "absolutely certain" argument that "accidents cannot separate themselves from their substances."

The so-called "problem of induction" has also lost weight, since there are physical laws that are not merely generalizations of individual cases, but are also derived from general considerations, such as Einstein's law of gravitation. The individual case then no longer serves as a basis, but merely as a test. But even in GR, the question still remains unanswered: "*Why does mass curve the space-time continuum?*", or in Newton's theory, the question: "*Why does mass attract other mass?*"

So the fundamental problems remain unsolved. They are the following

questions about the laws of nature:

1. ***Why*** *do they exist?*
2. ***Where*** *do they come from?*
3. ***Where*** *are they?*
4. ***How*** *do they determine the behavior of objects?*
5. ***Why*** *are they the way they are?*

In my construction of reality, all five questions are answered in the scenario in which the *origin of reality* is analyzed.

In the second chapter, I already presented a brief outline of this scenario (under point 7). Now follows a more detailed version that contains the answers we are looking for.

What produces reality I call ***Substance***.

The crucial question is:

Based on the assumption that reality arises from Substance, can statements about Substance be deduced from which the description of reality can be derived?

The answer is ***yes***. As follows:

If one wants to ***establish*** existence, one cannot begin with something that already exists.

Substance must therefore – in an ontological sense – ***precede*** all existence.

It is therefore *not an object*. From this follows that we cannot think it as what it "is," since our thinking cannot leave the network of relationships between objects.

But even if we cannot think it **as** *it itself*, it is still possible to say something **about** *it*:

(1) Substance produces reality. Therefore, we must attribute ***activity*** to it.

(2) Without comparison, there is no distinction. Therefore, distinction presupposes existence. Thus, Substance – *before* it produces reality – must be in itself ***indistinguishable***.

(3) That Substance is *active* means that it abolishes its indistinguishability: Substance is ***That-Which-Changes***. By ***changing***, Substance produces differences and thus ascends to existence.

Now we bring these statements about Substance into a mathematical form.

To this end, we now shift from the ***origin of reality*** to the ***origin of the description of reality*** – or, to put it philosophically: we shift from what the Substance is *in itself* to what it is *for us*.

Our task, therefore, is to determine what has the same status for a *description of reality* as Substance has for *the reality itself*.

What is Substance? *The logical and ontological presupposition of reality.*

What are the logical and ontological presuppositions of the description of reality?

Space and time.

This means: *For us*, Substance **is** *space and time*.

According to (1) and (3), Substance creates reality by *changing* itself. So we begin building our description of reality with the description of a change.

The first question is: ***What*** is changing?

That, what Substance is for us: space and time. (Since we are still *before* all existence, it *can* only be space or time.)

The second question is: ***How*** do we represent this change?

According to (2), Substance is *in itself indistinguishabl*e. So there is *no structure* and *no memory.*

This means that each change in time can only refer to the respective previous moment, and each change in space can only refer to an immediately adjacent position.

Therefore, changes must be represented as *differential quotients*.

Let us start with a change of space. How can space be altered in a description? Only by changing its ***measure of length*** or its ***measure of angle***.

So we define σ, the ***metric density of the length***, as follows:

Let r be a spatial coordinate. Then

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

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

So we set for the first change:

$$\text{Change 1} = \frac{d\sigma}{dr}$$

However, it is clear that *one* change is not sufficient to establish a description. Since without change, there would be *Nothing*, something must follow from the first change, and this consequence must again be a change of the Substance, i.e. of space or time.

Our first change was a change of space. As second change, we need another change, different from the first, that is, a change of time.

Therefore we set for the second change:

$$\text{Change 2} \;=\; \frac{d\zeta}{d(ct)}$$

– where ζ denotes the ***metric Density of the time t***.

For dimension reasons – which will become clear below – ct must be set instead of t, where c is a constant that has the dimension of a velocity. ζ is dimensionless.

Based on the statements about Substance, we have now determined two changes, assuming that the second change follows from the first.

But since it still holds that without change there would be *Nothing*, we are now forced to continue the chain of changes.

In our scenario only space and time can change, and both we have already used. This means that the chain of changes, in which each subsequent change follows from the respective previous one, can only become perpetual if from the second change in turn follows again the first one.

We thus obtain

$$(\text{change 1} \Rightarrow \text{change 2}) \;\; \textit{and} \;\; (\text{change 2} \Rightarrow \text{change 1})$$

It follows

$$\text{change 1} \;=\; \text{change 2}$$

So the equation we have arrived at is

$$\boxed{\frac{d\sigma}{dr} \;=\; \pm\,\frac{d\zeta}{dct}} \qquad \text{or} \qquad \boxed{\frac{d\sigma}{dr} \;=\; \pm\,\frac{1}{c}\,\frac{d\zeta}{dt}} \qquad (0)$$

In Words:

The spatial change of the metric density of length is proportional to the temporal change of the metric density of time. Proportionality factor is the velocity c.

Mathematically, this is just an equation. Ontologically, however, it is what the process of generating reality is *for us:* ***the law from which reality is woven***, or, to put it another way, ***the fundamental equation***, where "fundamental" means that everything that can be derived at all must be derivable from it.

Since the metric density σ in equation (0) has two interpretations: as ***length density*** and as ***angle density***, what was just done for the change in the length measure must be applied analogously to the change in the angle measure. For this, I refer you to my book Structure, where the entire derivation is presented, beginning on page 20.

But now back to the questions about the laws of nature. To answer the questions posed at the beginning of this section, the part of the derivation of equation (0) just performed is sufficient.

The derivation begins with the three statements about that from which reality arises – about *Substance*. All three assertions are general and *a priori* valid. They state that Substance *changes*, and, furthermore, the *mathematical form* of these changes follows from them.

The fundamental prerequisite for the further course of the derivation is the fact that *without change*, *there would be Nothing*. Therefore, every change must result in another change, so that the chain of changes becomes endless.

Since the number of different possible changes is limited, the chain must be closed, i.e. also the first change must be the result of another change. The shortest possible and thus *simplest* variant of this procedure then leads directly to the fundamental equation (0).

Therefore, the following applies:

Equation (0) is derived exclusively from general, *a priori* valid hypotheses. It therefore establishes a ***fundamental causal relationship*** between temporal and spatial density.

However, initially it appears as if all the prerequisites included in the proof – recognized as necessary – would already be met if the fact presented in (0) only applies to certain values of the two differential quotients, in certain places and at certain times.

This can be ruled out in the following way:

Equation (0) describes how reality arises from a state that *precedes* all existence: however, *before* all existence, Substance is in itself *indistinguishable* – thus, there is *no structure, no memory, and no size*.

These properties must be applied to what Substance is *for us*, that is, to space and time prior to all existence. It follows that, in this state, there is a) no way to specify a position, b) no way to distinguish a point in time, and c) no way to define units of length and time. The claim that equation (0) applies only at a specific position, or only at a specific point in time, or only for a specific quantity would therefore be nonsensical.

This means that – in this state – it is impossible to distinguish whether equation (0) describes an individual case or a general law.

With regard to a) and b), this conclusion is self-evident. For c), it can be demonstrated by a simple example: Let P be a point in a plane with coordinates x_0 and y_0 . Let be $x_0 = y_0$. Then P is a point on the 45° line through the origin. However, if there is no unit of length, then the position of the point on the line becomes arbitrary: without specifying a unit, the point and the line are *indistinguishable*.

In other words: *Without specifying units, the general and the individual are equivalent*.

This is exactly what applies to equation (0).

Therefore, from what has been said so far, it follows:

The statement, consisting of two parts:

(0) applies to **one** point in spacetime with a **specific** value of the two differential quotients
(and)
there is no way to determine position, time, and size

is equivalent to the statement:

(0) applies to **all** points in spacetime with **any** value of the two differential quotients

Thus, the fact expressed by (0) is both individual and general. Here, individual and general are indistinguishable.

Just as for the *justification of existence*, also for the *justification of causality and the possibility of natural laws* it is therefore necessary to go back to the state *before* all existence.

I***n fact, this is <u>the only possibility</u> to explain the existence of the general.***

Substance creates reality by *changing* and thus abolishing its indistinguishability. *For us*, the abolition of indistinguishability takes place in *space and time*.

The differential relationship represented by equation (0), which creates the fabric of reality, has no memory and knows no size. By producing reality, it creates, at the same time, a memory and size relations.

In this way, what was previously *individual* – abstract singular fact – and at the same time *general* – fundamental law – becomes *what is the case:* the *individual.* – But only *for us; in itself*, what is the case at a certain time and position: the *individual*, always carries the *general* within itself.

Regarding equation (0) – the *fundamental* law of nature – we have thus answered the questions 1, 2, 3, and 4, posed at the beginning:

1. ***Why*** *does the fundamental law of nature exist?*

It follows from the statements about that what produces reality – about the Substance.

2. ***Where*** *does it come from?*

The same answer as for 1.

3. ***Where*** *is it?*

It is ***in everything that exists***. Every individual case carries the general within itself. It is never merely an individual case, but always also an embodiment of the law.

4. ***How*** *does it determine the behavior of objects?*

The same answer as for 3.

So, finally, to question

5. ***Why*** *is the fundamental law of nature the way it is?*

The answer is:

Each component of equation (0) represents the ***simplest*** possibility of fulfilling the condition from which its occurrence follows.

This means that everything that could be changed or added to equation (0), would be *unfounded* or *superfluous*, and thus *inadmissible*, for the following reason:

Equation (0) represents the necessary and sufficient conditions for the ***emergence of reality***.

Therefore, it has to contain only what is necessary and sufficient for the ***description of the emergence of reality***.

In short, the answer to the question

5. ***Why*** *is the fundamental law of nature as it is?*

– is this:

Equation (0) is as it is because only in this form it corresponds ***for us*** exactly to how the reality ***itself*** emerges.

Now that all questions about the *fundamental* law of nature have been answered, we are faced with the question of what follows from this with regard to *other* laws of nature. The answer is:

Everything that can be derived from equation (0) and other general metric assumptions, inherits from this equation not only the causality itself, but also all the corresponding answers – the answer to the question "*5. **Why** is the law as it is?*", however, only if the principle of *necessity* is again observed in the respective derivation and everything *superfluous* is avoided.

If equation (0) truly represents the process of creating reality, then this applies to the entire description of reality, insofar as it is derivable.

However, there is an important limitation:

What has just been said only applies as long as the description system remains *purely metric*. If the "normal" mass (in kilograms) is defined and integrated into the system (as described in the second chapter in the note on page 20), then the general validity of the derived laws is again downgraded to that of a working hypothesis: since the definition is based only on a *measured value*, i.e. on an *experience*, its general validity cannot be proven.

By adding the mass in kilograms, one is therefore once again confronted with the *unsolvable* problem that has prevented the establishment of causality in the history of physics and philosophy to this day: the fact that in the realm of experience, one only encounters *individual cases* and never *universals*.

This leads to the question:

Can the physical description system be constructed without the mass in kilograms?

The rule for such a reconstruction is quite simple: In all physical equations, the normal mass in kilograms is exchanged for the geometric mass in meters – and by this, I mean a *direct* exchange, without introducing the dimension-dependent factor G/c^2. [kilogram] is thus *removed* from the description system – it is replaced by [meter]. Since electric charge is also defined as length, [meter] and [second] are the only base units.

In my two books, I simply posed this question and offered some hints of the consequences (Structure, page 226 ff.). I made no attempt to actually reconstruct the system without the mass in kg. However, I am convinced that – assuming equation (0) – such a conversion to a purely metric system is feasible.

Note:

The fact that my account of the process of the origin of reality can justify the existence of the universal and thus, at the same time, the lawfulness of nature is, for me, one of the most important arguments that at least the assumptions necessary for this account are correct.

The correctness of the derivation itself is supported by the simplicity of the path to gravity, the wealth of consequences for the rest of physics, and – what seems significant to me – the gradually revealing consistency and coherence of all results.

The principle of local causality:

Just as the blade of grass does not calculate where to move but simply follows the wind that touches it, also the reality does not calculate its next step but simply follows everywhere and anytime the differentially adjacent spacetime changes.

Chapter 4: What else should be said

At the age of 12, I attempted my first steps toward understanding reality, and even then, two ideals had formed within me.

The first was: *One Reality – One Book!*

The other: *For every truth, there is only one correct formulation, and only when you have found it you may write it down*.

Therefore, for a long time, I remained a philosopher without works, and when I finally wrote my first book – "The Concept of Reality" – I was very troubled because so much remained unsaid and so much had not been correctly formulated.

I tried to mitigate this deficiency by adding "unsystematic remarks" intended to complete and clarify things.

The same happened to me with my second book, "The Structure of Reality", at the end of which, for exactly the same reasons, I added a postscript.

And that brings us to this book. The ideals of that time still drive me; The first remained almost unchanged, but the second has significantly weakened, because while writing my books, it has become painfully clear to me that it is actually *never* possible – for any argument or train of thought – to find the "one correct" formulation for what one believes to be true already the first time.

And that is why I am now writing this "unsystematic" chapter.

The most recent example of how long it can take to finally discover the "correct" formulation for an argument can be found on page 4 of this text.

The argument is directed against the claim that the universe is variable in size.

It is one of my oldest arguments. When I was 14 years old, it appeared in my mind as an image:

A physicist, standing in the void, holds a meter ruler in his hand and observes the universe, which is in the final stages of its shrinking and then disappears.

Even then, it was clear to me that this is nonsense, and the logical structure that the argument has in its new, recently developed form was already present, but unfortunately not explicitly.

Now the argument is as follows (I repeat it from page 4):

> The universe, *by definition*, is everything that exists.
>
> Therefore, it cannot be compared to anything *else*, but only to a *part of itself*. So let's consider any such part – an arbitrarily chosen object that exists in the universe. Its size bears a certain ratio to the size of the universe.
>
> Now, what does it mean if this ratio changes over time – or if it even tends toward zero or infinity?
>
> Can I then claim that the universe is becoming infinitely large or that it is disappearing?
>
> No, of course I can't claim that. It would mean setting the size of a *part* of the universe ***absolute***, which would be nonsensical: The universe is not only everything that exists, it also ***creates*** everything that exists within it.

Setting such a thing created by it *absolute* and using it to demonstrate the disappearance of that ***by which*** it was created – that is, the universe – is obviously **contradictory**: if the size of the universe is assumed to be ***variable***, then no part of it – no object that it created – can be attributed an ***absolute*** size.

Here, the logical and ontological primacy of the universe over every part of it when comparing size, is sufficiently clearly emphasized, and it follows that a change in the size relationship between the universe and the scale must always be at the expense of the scale, because otherwise one would commit a logical error.

There is only one thing that would contradict this: the postulate of the *complete ontological separation* of space and matter: only under this assumption could space change its size, while the size of matter would remain absolutely unchanged – until it is compressed by its own gravity.

However, this ontological separation has long been abolished even in standard physics: in GR, matter curves space-time, in quantum field theory, there essentially no longer exists any boundary between matter and space. Thus, even in standard physics, the postulate of the absolute size of matter appears more and more to be pure arbitrariness, a suggestion that stems from everyday experience with objects, then solidifies and is retained without reflecting it.

However, I think that my argument – quite independently of what is going on in standard physics – excludes this absolutization anyway, because the statement *"something whose size is assumed to be variable cannot produce anything whose size is absolute"* is obviously true: there can be no ontological separation between the *producing whole* and any *part produced by it*, and therefore also not between the parts among themselves. [17]

Moreover, in my physics, two further arguments support this conclusion:

1. From the analysis of the process that generates the relationships of locally valid times, it follows clearly (see page 27):

There is only the speed of light.

– and this naturally means that also matter itself must be a ***state of spacetime***.

2. Reality unfolds from a purely metric basis. Therefore, there is only space and time, and from this follows again the same.

In this way, the proof that the absolutization of the scale is a logical contradiction is strengthened by two independent arguments.

Thus the following applies:

It is not the universe that changes its size, but our scale.

(Further related explanations can be found on pages 3 to 6.)

In the first chapter I have already reported, in sufficient detail and clearly enough, which errors and mishaps have prevented the interpretation of the quantum mechanical measurement process.

17 There are physicists who believe that one could embed the entire scenario just presented in *another* coordinate system and thereby justify the changing size of the universe. This is absurd: without reference to being, it is neither possible to define a unit nor to determine its temporal evolution – the assertion of its (absolute) constancy would be an unjustifiable postulate.

But I want to return once again to the central point:

In the double-slit experiment, ***interference*** occurs. The amplitude of the waves causing this interference is considered the *square root of the probability that an electron appears* at the corresponding position.

Based on the calculated and verified result, this is undoubtedly correct.

But it is equally clear that ***square roots of probabilities cannot interfere:*** only something that **exists** can interfere.

But square roots of probabilities are ***purely formal quantities*** that cannot be acknowledged to ***exist*** under any circumstances.

This is so obvious that it is completely incomprehensible why it was ignored. The only sensible reaction would obviously have been to ***admit ignorance*** and begin searching for ***which truly existing waves*** are involved – or, simply put, ***what is actually oscillating***.

This is also the reason why I am bringing this topic up again. It remains an insoluble mystery to me – from the very beginning and to this day – how it could happen that this clear failure of interpretation, this fundamental ignorance, could give rise to a series of completely abstruse concepts that are still considered *interpretations* today.

While in standard physics there is absolutely no idea what is actually going on, instead of finally correcting this ignorance it is used as a license for further fantastic speculations. No end of the nonsense is in sight.

In the field of physics, anger and grief over so much petrified limitation in the fundamentals can at least be appeased by the magnificence of the technologies that physics has produced.

In philosophy, however, there is no such consolation. In its statements about the elements and structures of reality – matter, mind, natural laws, determinism, freedom, consciousness, etc. – it has remained helpless for millennia regarding the fundamental questions. (The two examples presented at the beginning of Chapter 3 demonstrate this with impressive clarity.)

However, this involves not only philosophers, but also natural scientists, insofar they comment on these questions, and, more recently, also experts in artificial intelligence, who believe they are on the path to creating a superintelligence and are therefore directly affected by questions of mind, freedom, and consciousness.

For some unsolved problems – as with the quantum mechanical measurement process – the solution is obstructed by an initial blindness that makes it difficult or even impossible to *recognize* the problem at all.

Here's an example.

In our universe, the following seems to apply:

Everything that exists consists of elementary objects that interact with each other. How these objects behave ***is completely regulated by physical laws***.

Thus, the entire future development follows from so-called "initial conditions" – the totality of the attributes of all objects at any point in time – and physical laws.

If this assumption is correct, then there is only physics.

Causality is then always "below," in the elementary layer of reality. All other, more complex layers have lost their independence. We still need descriptions that refer to such layers – for example, neural or psychological descriptions of our mental activity – but only because it would be unfeasible to represent this activity in a physical way.

But that doesn't change the fact that ***it is actually of physical nature***.

This brings us to the aforementioned "initial blindness": the inability to recognize the problem, which makes its solution difficult or even impossible.

In the present case, the problem is this:

The above assumption implies that we cannot argue or reason.

Because it is evident that:

Every argument or reasoning presupposes that one thought follows from another thought.

But that is the very **definition of intellectual causality**.

In other words: precisely *what cannot exist* according to the basic assumption of natural science quoted above, *is constantly* ***presupposed*** by philosophers, natural scientists, and AI experts: it is the basis of their existence.

I consider it a *grotesque* of our intellectual history that this fact is not taken into account in due measure – indeed often not even noticed – by philosophy, natural science and AI research. From the first French materialists in the 18th century to the present day, physicalists and determinists have doubted the existence of *morality*, but *thought* always retains its independence – otherwise they would not be able to argue at all – although it is quite obvious that it dissolves into physics just as morality does, if it is not *itself* understood as causal.

Just as deductive thought disappears, also ***free will*** ceases to exist.

This consequence, however, seems more intuitively accessible and is therefore perceived much more often. The reason for this is probably that *willing* – in contrast to thinking – is centered on a *motive*, so that willing is more closely linked to the person and therefore its dissolution into physics is also more strongly perceived as a loss.

But even here, only a few succeed in exposing themselves for any length of time to the harsh realization that with the consistent adoption of the physical worldview, the will, the mind, indeed the entire person – ***the self*** – actually disappears.

In most cases, a soft focus called compatibilism is immediately applied.

There is a simple proof against this disappearance of thought and will – which would ultimately mean the dissolution of *ourselves*. I will not elaborate on it here, but refer to my work "The Substantiation of Free Will", in which it is contained.

My next (and final) example concerns AI research, which, as I said, believes itself to be on the path to creating a superintelligence – and I say "believes" because a necessary prerequisite for carrying out this project – indeed, the *fundamental* ingredient – is missing, for reasons *of principle*, so that this deficiency is irreparable.

The proof that AI systems can never become a new, superintelligent species lies beyond the scope of current natural science. Here, I want to at least present an outline of the proof method:

Every mental state is a combination of two dissimilar elements: **information *and* sensation**.

Its information content is what it represents or means: ***Information is definable***.

Sensation stands for everything in a mental state that goes ***beyond information***, that is, for that which ***cannot be defined*** but can only be ***felt*** and ***experienced***.

Two examples: the frequency of the color red can be defined, but the sensation *red* cannot; the intensity of a pressure can be defined, but the sensation *pain* cannot.

The essential starting point of the proof is the fact that ***everything*** *that exists* consists of a ***definable*** part **and** an ***indefinable*** part.

In the physical realm of reality – or better said, in the realm of matter – these conditions are familiar to us. We know that *mass* causes gravity and that *electric charge* causes electromagnetic interaction. So we know that there must be ***something*** that is the ***cause*** of what is going on and we name it, but we don't know what it "**is**."

We cannot *define* it; we can only determine its *effects* – just as with sensation.

With this, the problem of why sensation exists fundamentally changes. As follows:

From a scientific perspective, ***mind is nothing but information processing***.

However, the following applies:

Everything that ***can be defined*** is accessible through information processing; *everything that* ***can not be defined*** is *fundamentally* inaccessible to information processing: no matter what function is applied to information – the result is always merely information and nothing else; the information "red" never becomes the sensation *red*, the information "pressure" never becomes the sensation *pain*.

This means: From a scientific perspective, there is fundamentally ***no answer*** *to the question of why sensation arises in our minds*.[18]

In the view presented here, however, mind is ***not just information processing***, but ***information processing and sensation***.

So we don't ask, like everyone else:

"Why does something indefinable, like 'color' or 'pain,' exist only in the mind, and nowhere else?"

Instead, our question is:

"Why does the indefinable, which exists everywhere in reality, change its character when it appears in the mind?"

So we are no longer asking about the reason for the ***existence*** of this indefinable, but rather about the reason for its ***change***. In the first version, the question cannot be answered. In this (false) form, it leads to strange hypotheses, such as qualia eliminativism or panpsychism.

In the second version, however, it can be answered, and this answer also contains proof that sensation – the mental manifestation of this "indefinable" – does not exist in systems that did not arise through ***evolution***, but are ***constructed*** by us.

In systems we *construct*, there is actually ***only information processing***.

18 *David Chalmers* is one of the very few who recognized this. He has since become a panpsychist – out of necessity – which I don't consider a satisfactory solution: the idea of a "sentient electron" is hardly justifiable, even if it is merely a "proto-sensation".

Since the proof is somewhat too complex – it requires some ontological assumptions – I'll stop here and instead refer to my paper "Why free will exists and why robots are not sentient", in which it is fully developed. (Since the proof is based on the argument about free will, this argument is also included.)

There is also a longer version that analyzes the consequences for AI.

So AI systems are not sentient. Accordingly, we *cannot* create a species superior to us, but only emotionless, will-less zombies – mere automatons that are even incapable of *perceiving* anything. (*Perception* also consists of information *and* sensation.)

And they will never "take control" because they cannot *want* to, since wanting also requires sensation: information without sensation is passive and powerless.

So they will neither like nor tolerate us, neither despise nor destroy us; indeed, it would even be inappropriate to claim that we are *indifferent* to them – there is simply *nothing*.

In summary:

AI systems can never become a new, super-intelligent, dominant species. They are not sentient, feeling, willing beings, but automatons.

But this must not be understood as a sign of disdain or even rejection. On the contrary: I find the capabilities of current AI systems magnificent, and I regret that such powerful systems were not yet available to me when I wrote my books.

However, despite this admiration, I consider it necessary to point out the – according to my proof – *established and insurmountable* limitations, because they fundamentally change our expectations for the future of AI – and thus for our own future.

Note:

Information and ***sensation*** (as defined above) form ***the only pair of concepts*** that makes it possible to draw a clear and definite line between artificial intelligence and human mind and to provide evidence for it.

From this follows that the concept "consciousness", which is often at the center of the discussion, is only suitable for drawing this boundary, if the mental phenomena attributed to it (in its respective definition) are analyzed and classified according to their affiliation with *information* or *sensation:* the part of consciousness that belongs to information processing (e.g. any kind of self-representation) can be *reproduced* – no matter what technical difficulties stand in the way of its simulation, while the part that belongs to sensation remains *inaccessible* to AI.

It would therefore be an unnecessary and misleading complication to base the difference between AI and mind on the concept "consciousness".

The three proofs – the proof for the existence of ***free will***, the proof against the existence of ***sensation*** in constructed systems, and finally the proof for the existence of the ***general***, which was presented in the previous chapter – represent a fundamental change in our view of reality:

Through the argumentation in the proof of free will, ***causality is shifted*** from the physical ***to the mental realm***. Mind then – in this sense – no longer belongs to *physical reality:* mental processes can no longer be viewed as changes of *physical objects* that obey *physical laws*, but must be understood as changes of *mental objects* that obey *mental laws*.

The proof against robot sensation significantly increases this difference in our understanding of reality.

Sensation – according to the above definition "that, which goes *beyond* information" – has the same status here as mass in systems determined by gravity (e.g. solar systems), or as electric charge in electromagnetic systems: Just as mass and charge drive and guide *physical objects*, sensation drives and guides *mental states* by activating and organizing them, and relating them to one another.

Through this change and expansion of the scientific worldview, ***sensation is integrated*** into this worldview. If the proof of the general is included, then this means the ***solution to the*** old ***Substance problem***, i.e. the hitherto unanswered question of *how many* substances there are and *what* they are:

Does only matter exist? Or only mind? Or both? Or is there a third substance in which the general exists – the universals and laws?

The first two proofs unite mind and matter, and then, in the substantiation of causality, it is shown that the general exists in all physical and mental objects: only *for us* they are *nothing but* particular cases, yet *in themselves* they always also carry the general within them, which they owe to their origin from Substance, in which the particular and the general are indistinguishable. (See pages 46 and 47.)

Hence **there is only *one* Substance**. *In itself*, it is the *whole* reality.

For us, it is divided into a *thinkable* and an *unthinkable* part. The thinkable part, I call accidents, the unthinkable part, I still call Substance.

Substance is that which makes the accidents *active*. **Mass, electric charge, and sensation are** thus **manifestations of the Substance**.

In our description of the origin of reality, we have already attributed *activity* to that which produces reality – to the Substance.

In this fundamental layer of reality, Substance is therefore the driving force behind the *metric changes*. In the physical realm, it then becomes what drives physical systems, that is, *mass* and *charge*. In the mental realm, it is what causes the mental activity: *sensation*.

The unthinkable part of existence thus ***changes*** as being ascends to ever more complex forms. But since we can only think of change through accidents, this **change** is inaccessible to our thinking and thus **remains hidden**, until it finally reveals itself *within us ourselves:* as *sensation*, which we still cannot define, but of which we nevertheless know exactly *what* it is because our consciousness is a continuous stream of qualia – of our mental states, which are inseparable units of sensation and information.

The unsystematic structure of this chapter also gives me the opportunity to address the question of why I rarely cite and do not include a bibliography.

The reason for this, however, is quite obvious. I recall my statement at the beginning of this paper:

The catalog that lists everything that is considered correct in standard physics corresponds to the catalog that lists everything that I consider nonsensical, and vice versa.

The purpose of citations is to position one's own point of view within the existing literature and thereby justify and secure it.

However, I have made it more than clear what I think of the achievements of theoretical physics of the past decades. Positioning myself within this structure, which – in my view – is built on completely flawed foundations, would thus be downright absurd.

Therefore I cannot *refer* to anyone, but only list what I am arguing *against*, and that is precisely what I have done here.

I would also like to add that I consider the extreme emphasis placed on citations and the resulting devaluation of arguments to be wrong: An argument does not become better simply because it is supported by others. It doesn't need advocates, it must speak for itself, and if it's new – which is the case with many of my arguments – then that's the only criterion.

And, last but not least: the current, largely fruitless overproduction of papers in the field of theoretical physics is probably considered only by very few scientists as a continuation of physics' success story.

Even though I didn't want to leave this unmentioned, it's essentially of no interest to me. I've already presented my ideal – which stands in almost grotesque contrast to common practice: *One Reality – One Book*.

However, because of my second ideal, it has yet become two and a half books.

Chapter 5: Remarks on Gravity

I call my theory of gravity *metric-dynamic gravitation* theory, MDG for short.

Some aspects of this theory that I consider important do not yet appear in my books in the form I currently see them, because they were not yet sufficiently clear to me.

Since they represent connections between my theory and known facts – connections that reveal new, much simpler paths to these facts – they also provide ideal entry points into my view of gravity. Therefore, the last part of this work will be devoted to them.

5.1. The Relationship Between GR and MDG

First, a brief look at the prerequisites (in the book Structure starting on page 36):

In MDG, mass is defined as *metric compression of length* that causes an *acceleration of the metric flow* in the outer space of the mass, directed toward the mass.

Let m be this metric mass. m has the dimension length. (In standard physics, m is equal to half the Schwarzschild radius and is occasionally referred to as "geometric mass"). M is the "normal" mass, v the velocity of the metric flow, G the gravitational constant, c the speed of light.

Then applies:

$$\frac{dv}{dt} = -c^2 \frac{m}{r^2} \qquad \text{(G1)}$$

With $m = MG/c^2$, this turns into

$$\frac{dv}{dt} = -\frac{MG}{r^2}$$

The acceleration of the metric flow v by the mass m is therefore equal to the acceleration of a test body by the mass M in Newtonian theory – with the difference that in MDG, the gravitational influence propagates at the speed of light and not, as in Newton's theory, without time loss.

This brings us to the announced, surprising connection:

The velocity v of the metric flow can be used to determine the metric conditions at any position in the gravitational field.

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 flow at a velocity of -v*), and let dt' be the time differential of this observer.

Then applies:

$$dr' = dr\,(1 - \frac{v^2}{c^2})^{-1/2} \qquad \text{(G2)}$$

$$dt' = dt\,(1 - \frac{v^2}{c^2})^{1/2} \qquad \text{(G3)}$$

The length differentials orthogonal to the flow direction remain unchanged.

Since the velocity of the metric flow is calculated using the same method as that for the Newtonian velocity of fall from infinity (except for the difference due to the finite propagation velocity), this calculation is considerably simpler than the calculation based on the GR.

In the stationary case – such as in the Earth's gravitational field or, more generally, in the Schwarzschild solution – almost nothing needs to be calculated at all. Here, the velocity of the metric flow v

$$v(r) = -c\sqrt{\frac{2m}{r}} \qquad \text{(G4)}$$

is *exactly* equal to Newton's falling speed (for the fall from infinity).[19] Based on this equation and the two equations G2 and G3 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 calculations required for this (Structure page 43 ff.) are therefore much shorter and simpler than those of the GR.

Even the rotation of the Mercury ellipse – the most accurate test of the GR at the time – can be calculated in just a few lines.

19 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.

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

This situation can be summarized as follows:[20]

In solar systems and in the gravitational field of planets, the formalism of GR can be dispensed with to determine the metric relationships, as there is a much simpler way:

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

Then the radial differential is: $\mathbf{dr' = dr/k}$ (G2)

and the time differential: $\mathbf{dt' = dt\,k}$ (G3)

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.

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

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

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 "approximately" identical.

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 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 G3, 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 sense (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 G3), *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 G3 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.

The "fastest passage of time" – the "maximum proper time" – is, however, the ***definition of rest*** in GR, and if this definition is adopted into MDG, it 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.

This 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 of –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 an "outside" view.

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.

However, something very essential can be lost in this view: precisely that what is the *cause* of this relativity. (As briefly outlined in Chapter 2, Section 2.1 on page 27.)[21]

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 very 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 the speed of light, which can be derived from equation 0, 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:

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21 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.

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.[22]

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.

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22 I recall what was said in section 2.1. (on page 27) about the ***generation*** of relationships between local times. In comparison with the flow system, the following holds: 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. (In the book Structure, pages 162-168, a detailed, illustrative justification of SR *based on an absolute rest syste*m is provided.)

This means:

From the perspective of the MDG, the entire three-dimensional continuum, which in standard physics is considered "resting" space[23], 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*.

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.

<u>Note:</u>

On page 17, I stated:

If a metric flow leads from an area X to an area Y, then *nothing* changes: Y does not increase, and X does not decrease. It's like the number line: if you compress the range between 0 and 100 to the length of the range between 0 and 1, then nothing has changed: there are neither *more* numbers nor

23 In the usual view, space also expands, but this is not the case in my construction of reality (see page 4).

are they *closer* together than before. In other words: *metric density itself* doesn't exist, but only its *change in time:* the density itself causes *nothing*; the change in density causes *acceleration*.

The same could be said for the respective consequences: a change in density results in acceleration, and thus, the density itself ***should*** actually result in velocity – but if density doesn't exist, velocity doesn't exist either.

I mention this not to present an absurdity, but to point out that abstract concepts or images, just like mathematical concepts, can never fully correspond to reality.[24]

This is intended as a warning: it would be wrong to consider abstract elements of descriptions, such as "metric flow", simply as "real". If contradictions appear to arise in the associated ideas when they are conceived as *actually existing* – as would be the case with the two opposing flows – then this is no argument against their use in a description.[25]

In the present case, we are confronted with the consequences of a fundamental, irreducible difference between what anything that exists is *in itself* and what it is *for us:*

*In itsel*f, there is not *existence*, but only *change*.

This means: There is nothing which merely ***exists***, only that which also ***changes***. ***Existence*** and ***change*** are ***inseparable***.

Our thinking, however, is unsuited to grasp this inseparability. We *know* about it, we can *assert* it, but we cannot *think* it.

For us, reality is divided into *subject* **and** *predicate*, and that means: in *existence* **and** *change*. But existence itself **is** already change, not **something that** changes. Subject and predicate coincide.

From this follows:

In itself, only space (the continuum) exists: It itself **is** already change. Time exists only *for us:* we need it to *describe* and *think* change.[26]

In physics, the knowledge of this fact is nonexistent. This is primarily due to the almost complete lack of distinction between reality and description, and also between reality and mathematics, and in this case there is the added problem that only a *part* of mathematics is suitable for the description of reality.

Therefore, in contemporary physics, almost all statements about time are completely nonsensical. The most important, most widespread nonsense is the belief that reality **is** a four-dimensional structure composed of three spatial coordinates and the time coordinate (ict). This is false: this structure – and also the coordinate ict – exist *only in the description*.

Reality itself does not apply mathematics. ***It does not calculate.***

I fear that most physicists are not aware of this.

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24 I recall the statement made on page 22: Mathematics is necessary for the description of reality, and in this process, mathematical structures (four-dimensional space-time, configuration space, Hilbert space, etc.) and concepts (such as "imaginary unit") can arise to which no existence "in nature" can be attributed.

25 In the case of opposing flows, there is also a connection to quantum theory: from a metric-dynamic perspective, *spin* is also a metric flow. It results from the change in *angular density*, and here, too, there are always two opposing directions.

26 One might ask why I have given time such a fundamental role through equation (0). The reason is simply that with mathematics, we are *always* on the side of the description, that is, in the realm of what is true *for us*.

5.2. 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 $m = M\,G/c^2$ (m is the geometric mass, M is the "normal" mass), in my theory of gravity the equation takes the form:

$$\mathbf{R_U = m_U}$$

– and this identity follows directly from the

definition of the geometric mass:

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.

In MDG, this is derived from the definition of metric density. (See Structure starting on page 43)

This means:

The universe must 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 at the beginning of this paper, 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.

5.3. 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 ***radius*** becomes 0. [27]

The ***geometric Charge*** ± μ, however, causes a change in the *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.* [28] (See page 25)

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

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.

The question is:

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

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27 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.

28 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.

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 a 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*.

We 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.[29])

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.

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*. (We can ignore factors such as π or 2.)[30]

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29 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)

30 On page 24 we found: 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.

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*. [31]

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, the sum of $(10^{40})^2 = 10^{80}$ elementary charges.

(3) because a fact finally comes into our field of vision that is capable of explaining the almost unbelievable ratio of $1:10^{40}$ 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.

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

The ratio of the strengths of electromagnetism and gravity must be at least as large as the square root of the number of positive elementary charges.

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

I'll leave it to you to verify this.

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31 However, 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.

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:

- Every reality is *purely metric*, because only then is causality possible.
- Thus, every reality consists *exclusively* of metric changes.
- 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.

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