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CONCEPT RELATIVITY PART 1. INFORMATION UNIVERSE

A new theory of the universe

What is our universe? Concept Relativity merges philosophy, physics, and information theory. Concept Relativity is a philosophy on reality and the human mind and it is a physical theory that unifies Quantum Mechanics and General Relativity. Mind and reality are unified by the concept of information and quantized by information of the concept. The conceptual framework of Concept Relativity is described in two parts.

Concepts are relative

Information is metaphysics

A black hole and a universe refer to the same informational object

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Our universe has concept symmetry between macro and micro kosmos

HET MENSELIJK VERMOGEN

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This issue of “The Human Capacity” - magazine for the imagination – describes a new theory on the universe. I will pursue a new direction of theoretical research named Concept Relativity merging philosophy, physics, and information theory. Concept Relativity is a philosophy on reality and the human mind and it is a physical theory that unifies Quantum Mechanics and General Relativity. Mind and reality are unified by the concept of information and quantized by information of the concept. The conceptual framework of Concept Relativity is described in two parts.

This first part focusses on a physical theory – the unification of Quantum mechanics, General Relativity by introducing the object of an Information Universe. The second article presents a general information theory resulting in a systems cosmology. The starting point of part 1 will be the Information Universe Hypothesis: a black hole interior and a universe are two conceptual representations of the same informational object, called an Information Universe. In other words, an Information Universe is a concept symmetric entity and can be conceptualized in two ways, relative to some thinker-observer. I will present the philosophical basis of the Information Universe Hypothesis and define the Horizon Concept Transformation that expresses the concept symmetry of an Information Universe.

Next, I will explore a second concept transformation, the Human Concept Transformation, which is derived from a symmetry study of physical concepts of Classical Mechanics, Quantum mechanics, General Relativity and Thermodynamics. It unifies Quantum mechanics and General Relativity by mapping microscopic and macroscopic object-concepts onto each other. The theory of Concept Relativity can give new answers to a number of burning questions in physics, like the origin of dark matter, the source of quantum mechanic entanglement and the mass of the neutrino.

Keywords: Conceptuality; Reality, Relativity; Quantum mechanics; Information; Cosmology; Multiverse; Black Hole

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Concept Relativity Part 1: The Information Universe

1. Introduction

How can Quantum mechanics (QM) and General Relativity (GR) be unified? This was the main question in physics, in the 1970s and 1980s when I was a student in physics and philosophy[i]. And it still is 40 years later. Despite all efforts, there has not been a breakthrough. A lot of theoretical work has been done. Grand Unified Theories (GUT) have been developed to unify strong, weak and EM force. Theories of everything (TOE) try adding gravity to this unification. But there is yet no consensus upon one theory. 40 years ago, as a student, I pursued a completely different route adding the dimension of metaphysics to theoretical research. The main ideas of this article are originated from this period. I am not a professional, practicing scientist and have not had access to the scientific community for decades. Still, these old ideas haunted me since. I think they are worthwhile to be examined by the physics community. So recently, I decided to reexamine, update, and refine these 40 year old ideas as far as I could. This article is the result of that exercise.

2. Concept Relativity (CoR)

Since Darwin, many scientists consider metaphysics obsolete. I will re-introduce metaphysics based on the concept of information. John Wheeler wrote in 1970 a famous article [1] on the strategy how a unified theory should be developed. I fully agree with Wheeler's assumption, that unification will be found by 'It from bit'. The cause of all matter must be found in information. But it is not enough to affirm that all things are informational. We also have to change the 'bit' into a 'metaphysical it'. Information must be substantialized metaphysically.

Trespassing the border between physics and metaphysics is controversial because it embraces a non-empirical world which excludes any form of scientific verification. Metaphysic is behind physics. It is not testable. Metaphysics is a believe. It is no science. Nevertheless, CoR will postulate a metaphysics of information 'behind physics', which will be tightly connected to reality by the relational interpretation of QM [2] that will be used to verify the theory. CoR will extend the relational interpretation of QM to *all conceptualization*, stating that - not only QM measurement is observer dependent -, all universal conceptualization of reality is observer/thinker-dependent. Concepts like time, space, mass, charge, and objects like protons, electrons, or the universal metric, depend on the thinkers that 'thinks' them. They are all relative.

My starting point, 40 years ago, was the ever-exiting object of the black hole. Some have explored the idea that a black hole could be the source of a new universe[ii]. These explorations are based on the Einstein-Rosen bridge. My explorations were quite different. I embraced from the start the possibility of *conceptual discontinuity*. The idea was released by the fact that within the interior of a black hole, the radial space coordinate becomes 'time like', and time becomes 'space-like'. As a physics student I took this conceptual hybrid for granted and just 'did the math'. As a philosophy student the concept puzzled me deeply. How can something look like time, but not being time? Should we not skip this conceptual hybrid and think of time-like as just being time? What would be the consequences of this 'conceptual flipping'? My first assumption was that there should exist something that stays invariant under flipping concepts. My second assumption was, the conceptual flipping image must result in something we could understand, something like our universe. Therefore, my starting hypothesis was that the black hole interior must also have a *conceptual appearance* of a universe. Because the black hole and the universe appearances must be *consistent* with each other, there must exist a mapping of concepts. There has to exist a concept transformation (CoTrans). This process of concept flipping is not just a mind-game, it is real. The stuff that stays invariant under swapping concepts is a real thing that I will call an 'Information Universe'. So, generalizing this basic idea, the *Information Universe Hypothesis* (IUH) sounds:

A black hole interior and a universe are two *concept representations* (CoRep's) of the same entity: an information universe. It implies, *all* universes are black holes. *All* black holes are universes.

If we observe the IU "from the outside" conceptual continuity predicts a black hole interior with a singularity in the middle that will destroy all matter. Another kind of thinker situated "inside the interior of that *same* Black Hole" sees a completely different thing, the thinker sees a universe. The second thinker does not see the universe of the first observer,

which lays *before* the Big Bang. Both concept representations (CoRep's) should be completely equivalent, interchangeable, and equally valid because they are representations of one and the same 'thing'. This hypothesis is the starting premises of Concept Relativity.

2.1. The mathematical nature of metaphysics

The philosophy of Concept Relativity concerns the nature of reality and the relationship between reality and the human thinker. In a Appendix I explore the general implications on the relation of mind to universe. Here I will focus on the implications to physics. As a physical theory CoR fits in a tradition of physical theories of 'increasing' relativities, starting with the relativity of Newton's Cartesian coordinate system to Einstein's theory of Special relativity and General Relativity. The main difference between the physical theories of relativity and the theory of Concept Relativity is that in the first case concepts themselves, although they become 'more relative', they do not change, - Length remains length, time remains time, they can be bent in Einstein's relativity (length can even become time-like), but they remain the same concept -, while in Concept Relativity concepts *transform* into other concepts. This kind of transformation can only be meaningful if there exists something *behind* these concepts that remains unchangeable and invariant. That is where philosophy is needed. CoR is a non-physical theory that describes a metaphysics (what is behind things?) and a cognitive theory (how can we know something?). The 'thing' that stays invariant cannot be a physical concept because *all* conceptuality belongs to a representation thought by a thinker. Concepts are the 'things' that *change* in a concept transformation (CoTrans). So, what can stay unchanged in a concept transformation? The obvious candidate is bare mathematics. The 'unchangeable thing' is a meta-world of pure abstract mathematical objects and relations which is not directly visible or accessible but will only take shape through conceptual representations by intelligent beings which add 'conceptuality' to mathematics. These conceptual representations are, as in Plato's cave parable, a kind of reflection of a true, purely mathematical reality. The conceptual representations represent a specific physical interpretation of a mathematical 'reality' which is created by interaction of thinker and its reality.

Mathematical variables or structures have no physical dimension. The meta world is *without* physics. I will therefore call it a metaphysics, in de direct sense of the word 'meta' (= behind) physics. Mathematics becomes metaphysics. There are physicists that will probably consider the idea that mathematics is metaphysics, an extra reality 'too much', philosophers will find it 'too less' because mathematics is almost empty of conceptuality. But is it quite logic. Numbers are fundamentally empty of conceptual content. Mathematics counts emptiness. A metaphysics that serves CoR must be empty.

2.2. The Information Universe

There is yet another modern concept that is without physical dimension: information. There cannot be two *different* substances without a physical dimension, because there is no means to differentiate. And if there is, it cannot be metaphysics. Therefore, they are the same. The pure abstract mathematical world is informational in nature. Math tells us about pure information. What information is hidden, what information is present and how information flows. This information only becomes 'visible' in a conceptualized form, stored within the data of an entity, or activated in a force or interaction. That is why I called the invariant object behind all Concept Transformations an ***Information Universe*** (IU).

The metaphysical conception of information does not match the common conception of information, which is often perceived as knowledge or meaning we extract from data[iii]. In this common conception we do not distinct between the informational representation (knowledge) and the content of information itself. It also does not match Shannon's definition of information, which is used in physics. Shannon's information is a sum of possible states (degrees of freedom). Although both are numerical 'in nature', Shannon's definition lacks a metaphysical interpretation which is needed to manage information within an IU on a theoretical level. My metaphysical interpretation does not interpret information as a mathematical 'addition'. In my view 'number' is being an entity, an object[iv]. Mathematics is metaphysics. The information we 'count' or calculate, is never the number-object itself, - the metaphysical object, - because that object has no physical dimension. This metaphysical reality is *not real* in the physical sense, i.e., we can never contact directly that informational object. We need an interaction or communication within a physical process, we need a 'hook', to retrieve information. The perception we use to communicate information is always (concept)relative.

But (flipping the perspective) we could as well say that this metaphysical reality is the *only real thing*. All CoRep's are just reflections, images, pictures, expressions of a real, unreachable world. Information, the essence of that reality, is present in *every* physical interaction, and hidden in many possible states precisely because it has no properties other than number. Nevertheless, we cannot *reduce* reality to just mathematics. I am not a mathematist like Max Tegmark [3]. His *Mathematical Universe Hypothesis* (MUH) states that our physical world is an abstract mathematical structure. I do not (fully) agree. This reality of Tegmark is pure abstract conceptualization. The essential problem of this approach is that it *reduces* all conceptualization to abstract concepts. It loses contact both with the human mind *and* reality. In my view the reality can only be 'seen' (i.e., interacted with) by representing concepts. We need both. Math and conceptuality. We need metaphysics and physics.

2.3. The Horizon Concept Transformation

According to the IU-hypothesis a black hole interior and a universe CoRep are two different conceptual frameworks of the same unchangeable IU. Such an IU can only be consistent if there exist a specific conceptual symmetry. We must search for a mapping between both representations. I have called this mapping a Concept Transformation (CoTrans)[v]. If we consider the Schwarzschild metric[vi], describing the spacetime of a black hole, a potential candidate of the Concept Transformation is easily defined from the observation that $g_{00} = -1/g_{11}$. The *Black Hole Horizon Concept Transformation* (CT_{ho}) is therefore:

$$\underline{t} \Rightarrow 1/\underline{r}' \qquad (1.1a)$$

$$\underline{r} \Rightarrow 1/\underline{t}' \qquad (1.1b)$$

or simply

$$CT_{ho}: (\underline{t},\underline{r}) \Leftrightarrow (\underline{r}'^{-1},\underline{t}'^{-1}) \qquad (1.2)$$

in which $\underline{t}$ and $\underline{r}$ are *informational concepts* defined by $\underline{t} \equiv t/t_P$ and $\underline{r} \equiv r/r_P$ where t_P and r_P are Planck-time and Planck-length. I introduce here the convention that a physical concept *underlined* is the informational variable derived from the physical concept by a process of deconceptualization: the concept is divided by its corresponding universal constant. This Horizon CoTrans interchanges and inverts time and one space dimension. The radial axis originating in the center of the black hole becomes inverted time. The event horizon of the black hole acts as a *mirror* plane, hence the name 'Black Hole Horizon CoTrans'. The universe concept representation of the black hole interior starts at time $t' = 0$ located on the Schwarzschild horizon 'flowing' inwards. The Big Bang origin of our universe CoRep is situated at the horizon of a black hole. The center of the black hole (the singularity) is mapped on $t' = \infty$. Time itself will flow according to inverted space (1/r). In short, the Black Hole Horizon CoTrans turns the black hole 'inside out' , 'backwards forward' and is 'conceptually twisted'.

Further on, I will extent the definition of the CoTrans CT_{ho} for reasons of consistency, for now I want to focus on the fundamentals of CoR. To understand the idea of a concept transformation we must dig more deeply into the nature of our conceptuality. We, intelligent beings, believe concepts are very fixed irreconcilable things. It is hard to imagine that physical dimensions like time or space can transform. Concepts are the basis of our rationality. Transforming concepts is transforming our rationality. How is that possible? The solution involves a process of *deconceptualization* and *reconceptualization*. And the key to these two processes is the concept of a universal constant.

2.4. What is an universal constant?

A *universal constant* is a strange concept. It is a constant and it is universal. But something that is a constant of reality must be of the same nature as mathematical number (which is a 'universal' constant of the mind). But a mathematical number has no physical dimension, a universal constant like c, the velocity of light, has. What consequences does this have? What is a universal constant? In general, the concept of speed has multiple characteristics. In physics the concept is stripped to a physical quantity that has only three characteristics: a numerical value, a physical unit, and a physical dimension. The physical dimension is the rational constant. *All* intelligent beings in a universe have an understanding of speed that enables mutual communication. All languages have a word for the concept 'speed'. Reality is based on these rational constants. They do not change. Speed cannot suddenly turn into space

or a block of cheese. The numerical value and the physical unit on the other hand *can* change. But there is always a mapping between systems of measurement because a rational constant is at the basis of both systems of measurement. For example, 1 m/s = 86.4 km/h. Speed is a property of objects. It is a variable. I.e., the speed can change. The numerical value can change. Without variation, there is no differential power. And without differential power there exist no concept. A universal constant 'misses' variation. A universal constant therefore reduces the conceptual richness. If a photon could think, it would not understand speed. A photon does not experience a change in speed. The photon's 'mental world' has one dimension less than that of man. There is a conceptual reduction.

This existence of a universal constant of speed makes it possible to *eliminate* the physical dimension of speed. By dividing the variable by its corresponding universal constant, we create an *informational concept*. Universal constants are by their nature also the most logical physical units to express a variable. Every intelligent being in our universe knows what speed is meant when you say v = 0.00393c. Physicists use the dimensionless quantity $\beta = v/c$ to simplify the calculation. But deconceptualization is much more than just nondimensionalization. It is more than just a rule of convenience. Dividing the concept by its universal constant is the way to make a physical dimension disappear and let a new metaphysical dimension 'appear'. By dividing speed by its universal constant, the property speed is deconceptualized into an information object and a pure mathematical value that has a 'reality of its own'. The universal constant connects physics of concepts with the metaphysics of number.

2.5. Postulates of Concept Relativity

> ***Postulate* 1 *of CoR.*** *Mathematical, informational structures build an Information Universe. They constitute the metaphysics of our reality.*

The universal constant can be used as an instrument of deconceptualization but also as an instrument of reconceptualization. The retrieved concept created from an informational dimension does *not* have to be the same physical dimension as the original concept. Our conceptualization is always relative to the thinker that conceptualizes. An 'other thinker' can conceptualize an IU in a different form. This kind of idealism will be a difficult hurdle to take for realists. Yet it is the heart of CoR. If we want to understand the world, we cannot ignore our thinking. We are no invisible observers. We *make* reality with our concepts. And universal constants are nothing more than expressions of those rational constants. From this we derive our second postulate of CoR.

> ***Postulate* 2 *of CoR.*** *All concepts in physics have a corresponding universal constant.*

For instance, speed has the speed of light, mass the Planck mass, time the Planck time, and length the Planck length as universal constants. A universe is a frame within human conceptuality creates a physical reality. I.e.

> ***Postulate* 3 *of CoR.*** *A universe is constituted by a set of universal constants that are direct expressions of the concepts we use to represent reality.*

I should add a remark that universal constants are constants of the universe, but they are no constants of reality (only numbers are). As their name correctly suggests, they are constants relative to a universe. And they express fully our conceptuality of the universe. They connect thinker and universe. Each CoRep of an IU has its *own* set of *constituent* universal constants and corresponding thinkers. The IU hypothesis says that the CoRep's are isomorph. Because the *informational structure* of the deconceptualized concepts is fixed. Therefore, the values of the set of universal constants can differ per CoRep, but there will be a clear mathematical relation between the values of them. In the definition of CT_{ho} $\underline{t'} \equiv t/t_{P'}$ and $\underline{r'} \equiv r/r_{P'}$ where $t_{P'}$ and $r_{P'}$ are Planck-time and Planck-length of *another* conceptual representation of the IU that theoretically do not have the same values as 'our' Planck-time and Planck-length.

Concept Relativity causes a remarkable shift of our perception of the universe. Until now physicists believe that the discovery of the constant of Planck (h) and the constant of Einstein (c) are scientific additions to understand the reality of the microscopic and macroscopic world. To me, it is just the other way around, Planck-length, Planck-time, the Planck-mass, and the speed of light are universal constants of length, time, mass, and velocity and are the

sole reason we are capable to use concepts of length, time, and mass at all. They *define* conceptuality. They are therefore deeply related to the realm of thought and our conceptual representation of the universe.

The universe CoRep of the interior of a black hole is as real as our universe but it involves a different thinker (of concepts). I.e., to this thinker the interior black hole looks like a full-blown universe that has evolved, build layers of complexity, and eventually produced the thinker self. These intelligent beings can *never* communicate with us (thinkers) that are 'outside' that universe, or vice versa. When *we* would 'enter' a black hole universe by falling into the black hole there cannot be any communication. We will dye and end up into the singularity inside the black hole. Still, both representations are equally real because we share the same IU. Intelligent beings inside and those coming from outside a black hole live intelligibly in different universes.

3. Exploring the Horizon CoTrans

Let me now explore on a conceptual level, some consequences of the IU-hypothesis.

The IU-hypothesis introduces a new type of black hole: a universe black hole. And it introduces new types of universes: black holes created by collapsing stars, supermassive black hole at the center of galaxies and even theoretical primordial black holes, all have a universe CoRep. Can we calculate the Schwarzschild radius of our own universe black hole? It has been noted that the Schwarzschild radius of a black hole with a mass equal to the mass of our *visible* universe is equal to the cosmological horizon of our universe, (13.7 billon lightyears), suggesting that our universe could be a black hole. The idea is mostly rejected[vii] reasoning that our universe has no outside like a black hole. But according to Concept Relativity our universe has an 'outside' which is (flipping the CoRep) 'located' *before* the Big Bang. Others objected that the radius of the universe is much bigger that the visible universe because of the initial universal inflation of spacetime. But CoR predicts lesser inflation (see below). According to CoR universe and black hole 'meet' at the horizon. It is highly improbable this numerological equivalence is a pure coincidence. But we do not have yet any idea of the actual numerological relationship between image spacetime and source spacetime.

Of fundamental importance is the prediction of CoR that our universe is an *open* entity[viii]. The big bang of our universe *co-exists* with a creation of a black hole within our parent universe. And all black holes within our universe are (proto) universes which are fundamentally *open* entities. There exists a *permanent flow of mass/energy/information from outside to inside*, from the parent-universe to the child-universes.

We can develop a new theory on the origin of dark matter and dark energy when we relate dark matter/energy to the parent-universe, i.e. relate them to different phases of the 'life' of the corresponding black hole. Dark energy may be energy added 'later' to our own universe from our parent universe. The black hole horizon will increase, which has a corresponding effect in the universe CoRep of an increase of its expansion rate. *The acceleration of the universe expansion rate is caused by the flux of energy from our parent universe*. Moreover, the size of this flux is dependent of the unknown energy-density or matter-distribution of the parent-universe around its child-universe. There must be a clear relation between the rate of acceleration of universal expansion and the surface of the horizon of the corresponding black hole in the parent universe. It is likely that dark matter was created in a earlier phase of the black hole creation, just after the initial collapse while all baryonic, visible mass, was created in the collapse itself. So, this new theory predicts the initial mass of our universe was much lesser than it is today and it has to re-evaluate the present data (5% visible mass, 26% dark matter, 68% dark energy).

As we must assume there is no fundamental difference between the matter that was created in the Big Bang, and the matter that falls into the black hole/Universe later on, we must assume normal mass and dark mass should be fundamentally equal. But they are not, otherwise we would have detected dark mass or dark energy somewhere. The only differentiating fact, theoretically, is the size of the horizon. In the initial universe/black hole creation the horizon increases extremely fast. Whereas, if mass falls into a black hole, later on, the horizon increment will be small, compared to the size it already has. A temperature threshold could possibly prohibit baryon creation within the universe CoRep[ix]. But additional mass and energy does increase the horizon and accelerates the universal expansion. It will create spacetime structure, without creating elementary particles. Dark matter/energy could be a space-time distortion due the extra 'fuel' expansion gets by the parent universe. It could be considered *emergent gravity* [4]. Although Erik Verlinde, who proposed the idea that

gravity is a entropic force, does not define information metaphysically, CoR supports his idea that information is more fundamental than gravity[x].

CoR also has a direct impact on the (universe) inflation theory. Do we need less inflation to realize the present homogeneity? According to Concept Relativity *any* model of the beginning of the universe should have a corresponding black hole representation of a collapsing spacetime. So any Inflation must be conceptually entangled with the collapsing process of a black hole. If inflation theory is right, we should see an 'inflationary' effect in the expansion of the Schwarzschild horizon during the first moments of a black hole creation process. By studying how and when exactly the horizon of a Black hole was created (point-like? Disk-like? Sphere-like?) and how fast the horizon is 'expanding' we can learn about the beginning of our universe and the amount of inflation.

The two representations of an IU are complementary. This *CoR complementarity* is an extension to Black Hole complementarity [5]. When a proton falls into a black hole, we have two representations that describe the same process. To the observer traveling with the proton, the force of gravity becomes dominant. The proton/observer cannot escape destruction. After crossing the horizon there is no way to escape the singularity and disappear into nothing. But an observer far away sees something quite different. The proton gets 'frozen 'and gets scattered onto the horizon by QM Brownian movement. Time seems to stop. Information is added to the black hole by an increment of the Schwarzschild radius. CoR complementarity extents this Black Hole Complementarity. *Inside* the black hole, we flip over to our universe CoRep of an IU. Due to the mass added to the black hole, the horizon surface increases. The total information increases. The dark matter of the universe CoRep increases and cause an acceleration of the expansion. The universe CoRep evolves. The immanent destruction of all matter fallen into the black hole (black hole CoRep) has a complementary description of an expanding universe (universe CoRep). They are two representations of the same IU.

As our universe is a black hole, the far end future of our universe, becomes conceptually entangled with the far end future of black holes. Hawking showed that black holes can evaporate when the background temperature of the universe drops below the temperature of a black hole. Exceedingly small black holes (with higher temperature) evaporate more 'quickly'. This kind of evaporation must have a universal equivalent, for example a Big Crunch. Because information is 'invariant' under our CoTrans, the information of the universe CoRep and the black hole CoRep should be equal. According to the holographic principle the information inside a black hole cannot be 'more' then the information stored on the black hole horizon, which is equal to the surface of the horizon measured in square plank-units. But there exists a paradox: A Big Bang starts off with *minimal* entropy. A black hole ends with *maximal* entropy. Does CoR violates the conservation of information? How does CoR solve this paradox? I have to postpone the answer. I will return to it in part 2 in which I discuss the relation between entropy and information.

Does Concept Relativity satisfy the principle of *general invariance*? The reference frame you choose should not influence the laws of physics. What happens to laws if we apply the Horizon CoTrans? Laws of physics are relations between concepts. A concept transformation maps different concepts onto others leaving the informational structure of the conceptual frame intact. If we take the law to be part of the informational structure, the law changes into a law between image concepts. According to CoR that image law should also be a law of physics, because universe and black hole CoRep are concept symmetric. We could also 're-estate' the physical law using the right image concepts. This law will stay the same but again not quite the same. The concept transformations concern normalized concepts. They have no physical dimension. To recreate the law, we must reconceptualize the parts of the law by 'multiplying' each concept with its corresponding universal constant. These constants are universal but *relative* to this representation we use. So, to 'restore' the laws of physics, we will find universal constants that are recalibrated to the new representation. Changing our frame of reference from black hole to universe representation will leave the laws of physics invariant, but the constants of the universe which are (in general) the 'startup parameters' of a universe are different in each representation.

According to mainstream cosmology black holes are part of our universe. Our universe is thought to be a closed super-entity of reality. CoR does not share this assumption. The IU-hypothesis, - all black holes are universes, - *reduces* the 'area' that can be denoted by the concept of a 'universe.' What is inside a black hole belongs to another universe and is no longer part of our universe. Our parent-universe is not equal to our universe. New cosmological questions arise. Can there be an indefinite hierarchy of parent-child universes? What kind of conceptuality can be applied to different IU's? Because all IU's are

informational, pure mathematics, they can be compared. What will be the fabric of this 'mathematical superstructure,' going beyond universes?

4. Concept Mechanics(CoM)

4.1. The Human Concept Transformation

The IU hypothesis must also apply to our own universe. Our universe CoRep has a black hole CoRep, implicating that we are 'living' in a black hole, present in a parent universe. But because we cannot escape the conceptual bound of our thought, we will never experience our own universe as a black hole interior. Can we ever proof the existence of a parent-universe or the existence of baby-universes? Although we are not able to ever 'go there', proof may be found in the predictions the concept symmetry of an IU produces. Therefore, we will have to investigate the concept symmetry of an IU more deeply.

My first step is to switch perspective. The Horizon CoTrans uses the event horizon of a black hole as mirror-plane, mapping 'end' and beginning of a universe onto each other. We, human thinkers, do not stand at the 'edge' of a universe. We stand 'in the middle' of our universe. I.e., from the viewpoint of humans, we see microscopic levels of complexity below us, and macroscopic levels of complexity above us. According to CoR our IU must be concept symmetric under CT_{ho}. If we switch perspective *concepts may change but symmetry should be conserved*. Let me define the *Human Concept Transformation* (CT_{hu}) being the Horizon Concept Transformation applied from the human perspective. What are the concepts transforming by the Human CoTrans? The Horizon CoTrans involves flipping space and time by inverted time and space. The inversion part maps the microworld on the macroworld and vice versa. For this reason I took a big jump and assumed that the symmetry condition of our IU from Human perspective, must imply that the Human CoTrans, standing in the 'middle' of the universe, must reproduce the *exact same universe* as an image. Therefore, our conceptual framework we - human thinkers - use to describe our own universe should have a *mathematical structure* that stays intact by the transformation of the concepts. Subsequently, my route of research into the theory of CoR does not involve 'doing experiments' but uses a philosophical route which challenges our imagination deeply: I will research the (physical) concepts physics uses to explain reality and investigate how they are related and what kinds of symmetry are present. I have called this kind of research 'Concept Mechanics' (CoM).

I chose to investigate four main areas of physics conceptuality: the Classical (Newtonian) Mechanics (CM)), Quantum mechanics (QM), General Relativity Theory (GR), and Thermodynamics (TD). In his "Physics and Philosophy" [6] Heisenberg describes the relation between Quantum mechanics (QM), Relativity Theory (GR) and Classical (Newtonian) Mechanics (CM)). The relation is called 'the classical limit'. The concepts of QM describe reality on a micro scale (the small), GR on a macro scale (the big) and CM for a normal scale. QM becomes CM when h -> 0. GR becomes CM when c -> ∞. I added a fourth area of physics to this picture: Thermodynamics (TD). TD becomes CM when N -> 1 (where N = number of elements of a system). The relation between those four areas is shown in figure 1.

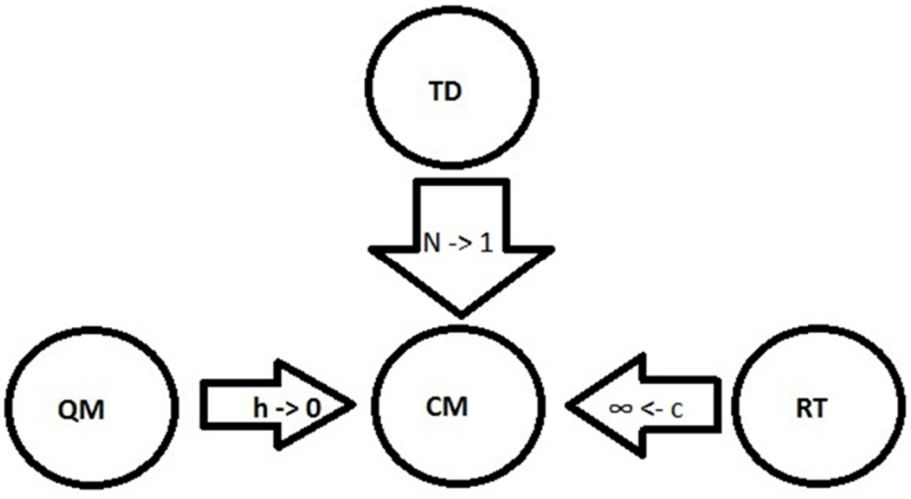


Figure 1. The classical limit. Extended Heisenberg picture of physics showing the relations between four main concept fields of physics.

4.2. Concept Space and configurations

Before I present my findings, let me first elaborate a bit more on Concept Mechanics. CoM considers all concepts to be informational *objects* that can be studied, just like normal physical objects which are positioned in a physical space. It defines an abstract *concept space* and creates a coordinate-system using a basic set of universal concepts (for instance, the concepts associated with the Planck Unit system) and plot all normalized concepts (concepts with no physical dimension) into this concept space. The unit of measurement of our ordination-system corresponds to the exponential value of the concept that is used as basis. Normally, we express c, h, and G in SI units. But we could also use the normalized universal constants $\underline{c}$, $\underline{h}$, $\underline{G}$ as unit-system. In that case $\underline{t}$ (normalized time) will have coordinates (-5/2,-3/2,-1/2) ($t_P = c^{-5/2}\ h^{-3/2}\ G^{-1/2}$). By plotting a group of concepts in concept space we create a concept configuration that can be studied. CoM investigates the symmetries of the configuration, using group theory. By defining a symmetry-group, a group of Concept Transformations (CoTrans) is presented which ultimately expresses the idea of Concept Relativity. A Concept Transformation always defines a transformation of a set or configuration of concepts. In the case of our Horizon Cotrans (1.2) not just time and space transform, but all related concept transform accordingly.

4.3. Concept Trinity

Using Group theory on conceptuality simplifies concepts extremely. In general, concepts are not 'easy things' to transform. They have meaning. They are rational constants, static and fixed. It is difficult to imagine that time *becomes* space. Plotting concepts in a concept space and applying group theory reduces conceptual richness and creates transformable concepts. A basic building brick of CoM is called a concept *trinity*, which is an abstract concept based on the definition of a (mathematical) group itself. By definition, a group must be closed under an operation, there must be a unit-element, each element must have an inverse, and the operation is associative. The smallest, non-trivial group has three elements. One must be the unit element, and the other two are opposites of each other. The 'operation' that unites the three concepts is called a perspective in CoM. Which concept is the unit-element depends on the perspective. In a concept trinity *multiple perspectives* appear because each of the three concepts can be considered unit-element of the group. A trinity concept group creates transformational concepts. It therefore reflects the concept of the concept transformation itself. A trinity concept group can be considered a superposition of three perspectives. It is like a quantum wave, where each concept is a quantum of our ratio. Choosing a perspective is 'destroying the wave' into a quantum state. Effectively choosing a perspective also defines an operation: a Concept Transformation between the 'opposite' elements within the trinity concept group.

Our mind is full of trinities. But mostly we assign meaning to each concept of the trinity and we do not recognize the transformational power of them. In concept mechanics we focus on that power. For example, the three concepts 'universe', 'black hole' and 'IU' are a trinity, which places the trinity at the heart of CoR. Another trinity concerns the relational perspective of reality I mentioned earlier. According to CoR *all* reality is thinker-observer dependent. Reality can only be understood from a relational perspective. What does this mean? Is reality build out of relations? No, relations cannot be without a subject and an object: those 'things' that become related by a relation. Does a 'relational perspective' imply that objects and subjects are secondary? Are they 'produced' by relations? No, we humans have a concept called I that is used to denote a subjective unity. Objects seem to be 'out there' even if we do not relate to them. So, what is fundamental? Relations? Objects? Or Subjects? They all three are. These three concepts form a trinity group, which I have named the Existential Trinity. Each element of this trinity represents a perspective. None of the three is fundamental. They all three are fundamental. And they are one. And we cannot say much more!

A trinity of concepts is without structure. It has no further decomposition. All trinity groups have three properties. *Symmetry*: all elements are potentially equal because all three can be unit-element (unity). *Correspondence*: Every two elements correspond 1-1 as being opposites (duality), like black and white, north, and south. *Complementarity*: due to the chosen perspective every opposite pair is 'completed' by an operation, resulting in the (third) unit element. The third unit element 'transcends' the duality creating a unit of three (a three-ty). A trinity is self-defined by unity, duality and three-ty. These three properties are, of course, linked to the definition of a group: closedness contains symmetry. Inversion correspondence, and the unit-element, complementarity. These group-properties characterize the transformation between CoRep's or a change of perspective and will be often used in Concept

Mechanic thinking. And of course these three properties are concepts and form also trinity concept group, called the methodological trinity.

4.4. Basic concepts

Let me now apply all this on the extended Heisenberg picture of physics. QM, CM and GR, study the universe by taking the object of study to be *elementary constants* of being of which we try to understand the 'outer' movement. TD on the other hand, considers objects to be a *system* build out of a huge number of smaller elements of which we try to understand the inner movement. Even GR uses an elementary approach, only the 'elementary object' is excessively big: it is a universe. A theoretical physicist positions himself or herself outside the universe' as a neutral observer. For this fundamental equivalence QM, CM and GR are drawn on the same horizontal line, while TD is positioned above this line. The vertical 'line' in this picture represents the duality between those two fundamental perspectives: to study an object as an element or as a system. QM, CM and GR are disciplines belonging to Element Physics. TD belongs to the area of System Physics. In this first part I will concentrate on the three concept fields of Element Physics. In part 2 of CoR I will discuss the system-perspective of TD. Figure 1 suggests furthermore that QM, GR, and TD are characterized by a universal constant and when these universal constants are 'eliminated' by changing the values of the constants to its classical limit $(0,1,\infty)$, these disciplines of physics will merge into one. These three mathematical concepts[xi] $(0,1,\infty)$[xii] form a mathematical trinity and are a particularly useful tool in analyzing concepts. Within any trinity 'pushing the concepts to its max' we will find this mathematical trinity.

By definition, the Human CoTrans is equal to the Horizon CoTrans applied from a human perspective. It, too, must have two parts. The first part is an inversion that maps 'big' onto 'small' and 'small' onto 'big'. Objects of the macro world are transformed into objects of the micro world. Applying the Human CoTrans on the extended Heisenberg picture of physics we must expect symmetry between the concept field of QM and GR because the small scale (QM) must be mapped on the big scale (GR) and vice versa. This inversion part of the Human CoTrans involves a micro-macro correspondence (*MM-correspondence*).

In figure 1 I have presented the result of my concept mechanical study into the basic concepts of the four fields of physical concepts.

Main Area	Element Physics			System Physics
Concept field	CM/SR/Bohr	QM	GR	TD
Basic concepts	*Classic element properties*	*Micro objects*	*Macro objects*	*System properties*
2a	x_i (position in space)	u (up quark)	g_{ii} (space part of covariant metric tensor)	V (volume)
2b	t (moment of time)	d (down quark)	g_{00} (time part of covariant metric tensor)	θ (Inverse absolute temperature)
2c	p_i (momentum)	e^- (electron)	T_{ii} (energy-impulse stress tensor)	pθ (pressure/ Temperature)
2d	H (external, Hamiltonian energy)	ν_e (neutrino)	T_{00}	U (internal energy of system)

Figure 2. Pattern sheet of four concept fields of physics: basic concepts

This pattern sheet establishes basic structural symmetry of the concept fields of GR, QM, CM and TD. The mathematical calculus differs, the concepts are different but the pattern sheet seems to show a *structural* isomorphy. Although the pattern sheet raises a lot of questions and objections can be easily made, I will use this pattern sheet to define the CoTrans $T_{hu.}$

$$CT_{hu}: (u, d, e^-, \nu_e) \Leftrightarrow (g_{\alpha\beta}, T_{\alpha\beta}) \qquad (1.3)$$

4.5. Dual concepts

Due to the associative property of a concept transformation, the definition of CT_{hu} automatically involves a mapping of related concepts in all concepts fields. The first group of concepts of interest are *dual* concepts (2a to 2d in figure 3) associated with the basic concepts (1a to 1d).

Obviously, the duals of contravariant spacetime/energy momentum concepts are covariant concepts and the duals of baryon/lepton matter are antimatter concept. But what are de dual concepts of the basic concepts of CM? We have to analyze the effect of the second part of CT_{ho}, interchanging the time dimension with one space dimension. This is more difficult to grasp Just like CT_{ho}, CT_{hu} predicts besides an MM-correspondenc another qualitative change of concepts. What will this change look like from a human perspective? An indication is given by the image of the concept of force (F) by CT_{ho}. Force has physical dimension $\mathbf{M\ L\ T^{-2}}$ (in SI base units: kg m s^{-2}) and will be mapped on the concept angular momentum (J) with physical dimension $\mathbf{M\ L^2\ T^{-1}}$ (in SI base units: kg m^2 s^{-1}) normalized by the Planck Constant, the quantum of angular momentum. Vice versa Angular momentum becomes Force. Rectilinear motion due to a force is transformed into rotational movement and vice versa. Rotations are inner movements of objects whereas forced movements our outer movements. Rotations do not change the location. A rectilinear force changes the location. So, we are looking for a correspondence between concepts of locality and non-locality. My working assumption is that the famous QM object-wave correspondence is an expression of this local / non-local correspondence or local / global correspondence (*LG-correspondence*) i.e., the well known QM object-wave duality is an effect of the IU symmetry.

Secondly, notice that basic concepts of wave mechanics are wavelength (λ), vibration time (T) or frequency (ν) and wave velocity (V). They have the *same* physical dimension as the basic concepts of classical (object) mechanics: space, time, and velocity, but they are very different: An object is a localized entity. A wave is non-localized. It is everywhere. We find two sets of concepts but we have only one universal constant for each physical dimension. This conceptual doubling is inherent to the concept of a universal constant. A universal constant does not create one, it creates a *pair of dual concepts*. If C is a universal constant of concept x, then dual pair is defined by $xX = C^2$. Or $X = C^2 / x$. For example, $vV = c^2$ where v = velocity, V = phase velocity and c = speed of light. Because all concepts have a universal constant, *all* concepts have a dual (inverse) concept. This duality is characterized by LG-correspondence.

Figure 3 shows the pattern sheet of our dual concepts.

Main Area	Element Physics			System Physics
Concept field	CM/SR/Bohr	QM	GR	TD
Dual concepts (D-symmetry)	*Wave properties*	*Anti particles*	*Contravariant tensors*	
3a	λ (wavelength)	$\bar{u}$ (anti up quark)	g^{ij} (contravariant metric tensor)	
3b	T (vibration time)	$\bar{d}$ (anti down-quark)	g^{00}	
3c	P (impulse = EV)	e^+ (positron)	T^{ij} (contravariant energy-impulse stress tensor)	
3d	-L (Lagrangian = H - pv)	$\bar{\nu}_e$ (anti neutrino)	T^{00}	

Figure 3. Pattern sheet of four concept fields of physics: dual basic concepts

Basic objects and dual concepts are related by a unit relation. Figure 3 complements the pattern sheet of basic en dual concepts of the concept fields of Element Physics.

Main Area	Element Physics			System Physics
Concept Field	CM/SR/Bohr	QM	GR	TD
Unit relation of dual concepts				
4a	$\underline{r\lambda} = 1$; $r\lambda = r_P^2 = s^2$	$\underline{u\bar{u}} \leftrightarrow$ one; $\bar{u}u \leftrightarrow 2m_uc^2$	$g_{ij}\,\underline{g^{ii}} = 1$;	
4b	$\underline{Tt} = 1$; $Tt = t_P^2 = \tau^2$	$\nu_e\bar{\nu}_e \leftrightarrow 1$;	$\underline{g_{00}}\underline{g^{00}} = 1$;	
4c	$\underline{\mathbf{pP}} = 1$;	$\underline{\bar{d}\,d} \leftrightarrow 1$; $\bar{d}\,d \leftrightarrow 2m_dc^2$	$\underline{T_{ij}}\underline{T^{ij}} = 1$;	
4d	$-\underline{HL} = 1$;	$e^+e^- \leftrightarrow 1$; 2 photons	$\underline{T_{00}}\underline{T^{00}} = 1$;	
4e	$\underline{vV} = 1$; $vV = c^2$	$W^-W^+ \leftrightarrow 1$;		

Figure 4. Pattern sheet of four concept fields of physics: unit relatiions of dual concepts

4.6. Intermediate concepts

Next, we should consider the role of intermediate concepts. Intermediate concepts are (unit) concepts that *define* a relation or interaction between two *other* concepts (objects or properties). In QM bosons are carriers of these relations, the forces of nature. The carriers of the weak force relate to quarks and leptons. In GR the intermediate concepts are the concepts that relate the base entities of space and time.

Main Area	Element Physics			System Physics
Area of physics	CM/SR/Bohr	QM	GR	TD

Intermediate concepts	*Movement*	*Vector Bosons*	*Richi curvature Tensor*	
5a	v_i (velocity)	W^+ (boson)	R	
5b	V_i (phase velocity)	W^- (boson)		

Figure 5. Pattern sheet of four concept fields of physics: intermediate concepts

Figure 5 shows the patten sheet of the *intermediate concepts* both within the concept fields. According to CT_{hu} we have:

CT_{hu}: $W\text{-}W^+ \Leftrightarrow vV$ (1.6)

Space and time are 'íntermediated' by velocity (v = x/t) . Velocity intermediates also the concepts of energy and momentum (E = **pv**). An intermediate concept does not exist on its own. It is tightly connected to the concepts it relates. Intermediates represent the relation perspective within a conceptual trinity: (v,x,t), (v,E,p), (W,u,d) and (W,e,v) are trinities. These trinities are congruential to the Existential Trinity (object, subject, relation), so we can apply all the perspectives of the Existential Trinity to these base trinities of QM and GR.

In GR, this *relational* perspective between GR-objects is unusual: we normally do not say that speed intermediates space-time positions or energy-momentum changes. Speed seldom gets objectified as a perspective. But it is. All movement - intermediates changes of space and time. But we cannot isolate it. If you try to understand het concept of 'speed' without space and time, you will fail.

These intermediate concept form together with concepts they are relating concept trinities. These fundamental equations are basic laws in each concept field. The structural symmetry of these concept fields implies that these laws should be mapped. I will discuss them in the next section.

Main Area	Element Physics			System Physics
Concept Field	CM/SR/Bohr	QM	GR	TD
Trinity perspectives	*Classical movement*	*Feynman diagram of weak interaction*	*Einstein field equation*	*gas law*
6a (1 dimension)	$p_i = mv_i = H x_i/t$ $t = xV = x\ p^{-1}\ H$	$d \leftrightarrow u\ W^- \leftrightarrow u\ e^-\ \bar{\nu}_e$		
6b (3 dimensions)	Vector represention $\mathbf{x} = \mathbf{v}t = (-L)\mathbf{p}t$	Particle representation ν_e uud$\leftrightarrow\nu_e W^-$ dud$\leftrightarrow e^-\ \nu_e$ dud Beta minus decay		

figure 6. Pattern sheet of four concept fields of physics: trinities

Finally, universal constants also create borders and boundaries in relations to the concept they bear. Variables (of concepts) are related to the constants (of concept) by a rule of *inequality*. Two inequalities shape the field of QM and GR: $v < c$ and $px > h$. To obtain the symmetry condition we pursue, I expect these specific constraints must be mapped onto each other. Each inequality defines an asymmetric relation. Reversing the asymmetry is also a kind of correspondence, but it concerns no objects or properties but relations.

Main Area	Element Physics			System Physics
Concept Field	CM/SR/Bohr	QM	GR	TD
Characteristic universal constant	G constant of Newton: gravitational constant	h constant of Planck	c constant of Einstein: velocity of light	K_B constant of Boltzmann

Characteristic mathematical calculus	Functions (p.e. time is parameter)	Operator-calculus (time is eigenvalue)	Tensor calculus (time is coordinate)	Statistic calculus (temperature variations)
Characteristic barrier for creating directional asymmetry		px >= h	v <= c	dS >= 0

Figure 7. Pattern sheet of four concept fields of physics: characteristics

4.7. Object – Property symmetry

The perspective switch from horizon tot human concept transformation changes the nature of the concepts that are mapped. Because we have shifted our perspective to the human 'middle', the concepts presented in the QM and GR column of the pattern-sheet are *objects*, while the Horizon CoTrans concerns *properties* (concept field CM/SR/Bohr). The QM objects are elements of the standard model; the GR-objects are the metric and Energy-momentum stress tensor objects. The tensor *object* describes a 'potential' field that defines the object of spacetime structured by mass and energy. The Human CoTrans maps objects that are exceedingly small (QM) onto objects that are excessively big (GR) (MM symmetry) and it also changes, besides size, some fundamental characteristics.

In my study I used the group of *property* concepts of CM, as an *intermediate* to map the basic objects of GR and QM (1a to 1d) onto each other. More precisely, I have introduced an enlarged CM concept field (enlarged CM/SR/Bohr) of physical properties that can link to both 'sides' (micro and macro level). These concepts are 'referential concepts' of our horizon CoTrans. I have added concepts of Special Relativity (SR) (universal constant of speed) to connect space/time and energy/momentum and the Bohr complementarity, - an electron can appear as a wave and a particle – to combine classical wave mechanics and object mechanics into a unified picture.

Enlarged CM property concept group	t	r	T	λ	v	V	H	p	-L	P
QM object concept group (first generation)	d	u	đ	ū	W^-	W^+	ν_e	e^+	$\bar{\nu}_e$	e^-

Figure 8. Pattern equality between two groups of concepts of CM/SR and QM

I expanded this pattern sheet with corresponding concepts of GR:

GR tensor concept object-group	g_{00}	g_{ii}	g^{00}	g^{ii}	R	R	T^{00}	T^{ii}	T_{00}	T_{ii}
Enlarged CM property-group	t	r_i	T	λ_i	v_i	V_i	H	p_i	-L	P_i
QM standard model object group	$\bar{\nu}_e$	u	ν_e	ū	W^-	W^+	e^+	d	e^-	đ

Figure 9. Pattern equality between two groups of concepts of CM/SR and QM

Of course, properties and objects are different classes of concepts. Properties have a physical dimension. Objects have not. Concept Transformations of physical properties involve three components: deconceptualization (normalizing the property by dividing it by its corresponding universal constant), transformation and reconceptualization. But we cannot 'normalize' concepts of objects in this manner. Philosophically objects have no physical dimension other than the 'property' of 'being'. I quoted the word 'property' because it is not a real, physical property, it is a metaphysical or ontological property.

We are still able to use the enlarged CM *property* group as a referential (intermediate) concept group between two groups of *object* concepts because, according to CoM properties and objects are dual concepts. Objects are normally defined by (a set of) properties, O = O(P). Since Frege [7] properties can also be defined in set theoretical terms: A property is defined by the set of objects that have property P: P = P(O). So, we have two dual perspectives of the universe. Both objects and properties are concepts of the mind and CoM will treat them

equally as informational dimensions. It expresses the fundamental assumption of CoR: Ontologically, 'being' becomes 'being information'! Object and property concepts are dual representations because they are, metaphysically seen, made of the same stuff: information.[xiii]

In QM the correspondence between object/entity and property is well known. In QM the charm-quark entity is an entity with a property called charm-number which has a value of 1. Quantum numbers define complete entities, and entities are that simple we can denote them by one property. In this situation we often neglect the distinction between object and property.

Our perspective switch form Horizon to Human CoTrans reveals and important corollary of CoR: the representations O(P) and P(O) of a universal CoRep must have an identical (mathematical) structure. I will call this equation *OP-correspondence* or OP-duality. Notice that the OP-correspondence is an implicit perspective of the Existential Trinity we discussed earlier. *A property is the carrier of a relation*. The relation between subject and object, between us-thinkers and the universe is realized in a process of objectification, i.e., labeling objects by their properties. The Existential trinity (subject, object, relation) reappears in a subtle new way.

5. Exploring the Human CoTrans

5.1. Concept Entanglement of GR and QM

The concept fields describing the micro cosmos and macro cosmos have a remarkable symmetry in *historical* development. By analyzing cosmos (literally: by taken it apart) within three centuries science has found four elementary objects that are intertwined with each other (u, e^-, d, ν_e). Parallel to this historical process science unified absolute concepts of time, space, momentum, and energy into one unified manifold of the universe. There were distinct steps in this historical process. To Descartes' space was still an empty, absolute space. Newton added a neutral (absolute) flow of time. Newtonian Mechanics started off with a fundamental distinction between (absolute) space/time and movement. But the role of space and time can also be replaced by action and energy, which is the Hamilton/Lagrange formalism. Special Relativity intertwines the concepts of space and time (and momentum and energy). In GR the spacetime metric and energy-impulse tensor are united in the Einstein field equation.

QM and GR are 'defined' by two fundamental universal constants (h and c). These constants represent this historical process of conceptual entanglement. in GR time and space are entangled by the universal constant of the speed of light, while on a QM-level space and momentum become entangled on a microscopic level by the uncertainty relations of Heisenberg. Likewise, entanglement of concepts time and energy (QM) differ form the GR entanglement between momentum and energy.

Furthermore, both QM and GR tell us, there is no vacuum. Spacetime is always materialized and energized. Most people, when asked, visualize space as a void (an empty space with a system of coordinates) and then we put some object in it to describe its movements within that void. According to GR and to CoR too, this dichotomy is an illusion. And it is proven easily by a simple thought experiment. Try to imagine a *complete empty* space? You cannot. It is impossible. You may imagine an empty container. You may imagine you can look in all directions and see nothing. But both are not empty spaces. The first has a border. The second has an observer. Complete emptiness is unthinkable. There must be something in it, which is an observer that needs to create an interaction with movement and energy in space. GR confirms the unification of spacetime and momentum-energy by telling us that massive body is curved spacetime. All spacetime is filled, energized spacetime. QM confirms the non-existence of a void by telling us that even a vacuum is full of elementary particles.

My assumption is that this historical development is just an expression of the IU-hypothesis. Moreover, this symmetry should also affect specific characteristics of QM and GR. QM entanglement between particles is one of most fundamental characteristics of QM. Let me first notice that due to OP-correspondence entanglement of objects must have a correspondent principle in the entanglement of properties caused by universal constants. But that is not all. The fundamental nature of all kinds of entanglement must be based on the symmetry of the IU. Locality or non-locality, particle or wave, are just two representations of the same informational thing. We can swap perspective without changing the IU. This symmetry must, in some sense, be a hidden variable, which would imply a rejection of the Copenhagen interpretation of QM. But that hidden variable is a pure informational dimension. It is metaphysics. It is not detectable. Only by measurement, which is creating a

conceptualization of the experiment, we can know things of reality, which asserts the Copenhagen interpretation of QM. CoR states both are true.

5.2. Hydrogen and SpaceTime

CT_{hu} states that an IU has a conceptual symmetry between sets of objective concepts of QM and GR. The Standard Model of QM consist of fermions and bosons. the four basic objects (1a t/m 1d) are fermions that create all matter in the universe. These objects are no independent, isolated free-floating objects. They are strongly connected. The weak forces relate all for objects. In GR, the concepts of space, time, momentum, and energy are the basic 'objects' of energized spacetime. The Einstein field equation connects them. So, I will assume the Human CoTrans maps the weak force onto Einstein field equations and vice versa (in a way yet to discover).

A *subset* of the Human CoTrans asserts the equivalence between the objective concepts of a baryon and space:

$$CT_{hu}: b\,(qqq) \Leftrightarrow g_{ii}\ (i= 1,2,3) \quad (1.4)$$

A baryon is the Human CoTrans QM-image of 3-dimensional space (g_{ii}) and vice versa. Baryons, e.g a proton, are build out of three quarks. Space has three dimensions. The three spatial dimensions represent the omnipresence of the universal object called 'space'. This global object is transformed by the Human CoTrans into three quarks building the localized object of a proton which is confined within a specific area. The inversion part of the Human CoTrans 'compactifies' dimensions of space. Both concepts, proton and space, are trinities and obey the characteristics of a trinity. The three are one. We cannot isolate one quark from a baryon, nor can we isolate one dimension from space. The three elements are equal (symmetry) and complement each other. They are fundamental. There is no decomposition possible (I will discuss QCD shortly).

But if we look closer, we find the symmetry is partially broken. A proton is built out of two up-quarks and one down quark, whereas space has three *identical* dimensions. Using spherical coordinates (r, θ,φ) and noticing that according to CT_{ho} radial space dimension (r) is reciprocally converted to time, I assumed that de conceptual difference between up and down quark will be, in a way related to the time-space interchange of CT_{ho}. But it is impossible to retrieve a transformation that involves the concept of charge (the charge difference between up and down quark is e) by just using time-space interchanging. Therefore, I concluded the Horizon CoTrans is not complete. There must exist an additional component to CT_{ho}. I will propose it later.

The second *subset* maps the electron onto the (radial) component of the 3-dimensional linear momentum within de the energy-momentum stress tensor.

$$CT_{hu}: e^- \Leftrightarrow T_{11} \quad (1.5)$$

Again, we define impulse in spherical coordinates (r, θ,φ) and noticing that according to CT_{ho} one space dimension (r, θ,φ) is reciprocally converted to time, and again we suspect the same additional component to $T_{\alpha\beta}$ that involves the conceptual appearance of charge.

According to CoR our universe is, as John Wheeler already proposed[xiv] in1940, a one-electron Universe. The origin of this QM statement is found in the conceptual equivalence between a microscopic concepts and macroscopic concepts. And because all electrons are one, they are as QM-objects indistinguishable**.** CoR applies the same reasoning onto quarks. We live in a one three-quark universe. All baryons are images of one macroscopic entity called space. They are on QM-level indistinguishable particles: many and one.

Combining 1.4 and 1.5, CT_{hu} is mapping the *composite* QM object of the H-atom, including all interactions within the atom, onto the *composite* GR object of energized spacetime. The resemblance of micro- and macro-structures has always intrigued scientists. e.g., the Bohr planetary model. The Human Concept Transformation adds a new dimension to this symmetry. It states that the protonElectron model (qqqe) of the H-atom, is deeply related to spacetime (xyzt) object being our universe.

5.3. Weak Force and Einstein Field Eqations

What effect has Concept Relativity on the four fundamental forces of nature? The basic concepts of the microworld (QM) all take part in the *weak force* interaction whereas the basic concept of GR take part in the Einstein Field equations. CT_{hu} maps objects of QM onto GR and

vice versa. In doing so, it is also mapping the weak force interaction on the GR 'relation' between space, time, energy, and momentum.

The CM formalism of Lagrange and Hamilton that describe movement in space and time has the same conceptual structure as transmutation of proton into neutron and vice versa, 'velocity' in GR has the same intermediate 'function' as W-bosons in the concept-field of QM. Mapping them the concepts of velocity/W-bosons become intermediates between spacetime/baryons and momentum-Energy/leptons. The weak interaction is a QM is congruent wit the conceptual relations of the mechanics of movement in GR: the Einstein field equations. I suspect the Ricci tensor in GR plays the same role as the weak interaction boson in QM.

It must be noted that our mapping CT_{hu} is just a *first-order* model. It describes the basic 'movement' between the basic elements of matter and the basis cosmic structures and evolution. The standard model does have six flavors of quarks and leptons. The Human CoTrans only concerns the first generation of quarks and leptons. It does not account for second and third generation, nor does it concern other elementary particles like mesons. Still, this should be good approximation because this model incorporates all *stable* QM particles (electron and proton), and all *stable* concepts in GR (time and space). Precisely, the degree of universal conceptual stability strongly suggests that the concepts of proton and space originates from same informational object(s). Nevertheless, the wide range of elementary particles, and the transmutation of them should have a GR-counterpart, assuming our IU is symmetrical under CT_{ho} and CT_{hu}. Additionally, flipping to our perspective, we also find omissions in the CoTrans concerning GR. The Horizon CoTrans neglects angular momentum and charge of black holes. I will discuss this topic soon.

5.4. Strong force

How does CoR evaluates the *strong force*? As I first learned of QCD I was disappointed. In QCD quarks have a color charge, red, bleu, or green. There are nine types of gluons that carry the strong force between the quarks. It contradicted my personal intuition, based on the 'rule of reducing complexity': the smaller we get, the lesser complex, constituents will be (finishing finally into just one bit-constituent!). But QCD needs, paradoxically, a multiplicity of particles, gluons of distinct color, to explain the few. Concept Relativity can help us to solve this paradox. According to CoR the confinement of quarks within a boson corresponds to the *dimensional entanglement* of the spatial universe. We should therefore interpret the color property as an expression of this dimensional entanglement. Each color corresponds to a spatial dimension. QCD describes a *microscopic mirror image of the macroworld*. An analogy will help us understand this idea. Theoretical physicists want to describe the universe they see. It motivates them most strongly. So, what will happen if they are looking into a mirror and they do not recognize the image they see is a mirror-image? They will build a theory that embraces both 'worlds' (real and image world) into one representation of the world. That is what QCD does. The color-property of gluons (red, green, blue) is a mirror-property of space (height, length, width). It reflects the structure of space. So according to Concept Relativity *QCD should be reinterpreted as a mirror theory*. The spatial structure that co-exists with baryons is mirrored into a smaller scale structure that composes the baryon. Let me clear. QCD is not illusionary. It describes reality. But to me, it is not fundamental any longer. Reality just fools us. On the other hand, if we are aware of this mirror-nature, a re-interpretation of QCD could produce new predictions that could be verified.

An interesting thought experiment is to map current QCD onto GR conceptuality. Let us visualize the unity of three-dimensional space by proposing some kind of 'glue' that sticks spatial dimensions together. It is not as strange as it sounds. Everyone experiences this 'glue' directly in a natural way, because our three-dimensional image of space is a basic category of thought. We cannot eliminate or isolate a space dimension. Space is a trinity (length, width, height). Just try to think of a flat space in two dimensions without thinking of three dimensions. It is impossible. You will *always* visualize the flat space as a plane in three-dimensional space. You cannot strip the third dimension. Of course, it is possible *mathematically* to do all kinds of calculations on flat spaces, line-spaces or higher dimensional spaces, but these do not match the reality we, thinkers, experience. It cannot be used in an IU thought by an intelligent being. All CoRep's are thinker dependent. If visualization in three dimensions is fundamental to thought, any CoRep of our IU will bare that same structure. We cannot get rid of ourselves! Is there some causal relation? Does QCD 'causes' the unity of space? Or does our spatial experience 'causes' QCD? The answer is neither or both: They correspond to each other. They are mirror images.

5.6. EM and gravity

How does CoR evaluates the force concepts of *EM and gravity*? Both forces are inverse square laws. They are opposites in strength. Gravity is very weak; EM is a very strong force. Consequently, the gravity force between fermions does not play any role; the EM forces does. On macroscopic level the situation is reversed. Between stellar objects, EM charge sum up to zero. The EM-forces becomes invisible and gravity becomes the dominant force. Due to the MM-symmetry in the Horizon CoTrans the *image* of the gravity force concept must be strong and the image of EM force must be weak. According to the premises of the Human CoTrans the same universe should re-appear after applying the concept transformation. Therefore my assumption will be that gravity must in some way 'reappear' as EM-force and the EM-force should 'reappear' as gravity. Because both are inverse square law, and the Horizon CoTrans, so far, only concerns space and time, we need therefore an interchange of the concepts of inertial mass and charge. I therefore concluded our Horizon CoTrans is not complete and must be expanded.

The conceptual congruence between inertial mass and charge is not a straightforward mapping. EM is an attractive *and* repulsive force. Charge can be positive or negative. Gravity has no repulsive component because there does not exist negative inertial mass. So, it is not possible to transform the concepts one to one. We have to take another concept into account: Spin. EM is a unified, hybrid concept: it is electricity *and* magnetism. This dual appearance is caused by charge that *rotates* either left- or right-handed. If we pair left/right (spin) to plus/minus (charge) in a new combined concept called *SpinCharge* we can perform The opposite charge 'emerges' when spin is reversed. The Horizon CoTrans becomes a coherent concept transformation by adding the interchange of inertial mass and a new concept called SpinCharge (SQ):

$$CT_{ho} : (\underline{r}, \underline{t}, \underline{m}_0, \underline{SQ}) \Leftrightarrow (\underline{t}^{-1}, \underline{r}^{-1}, (\underline{SQ})^{-1}, \underline{m}_0^{-1}). \quad (1.7)$$

By the expansion of the definition of the Horizon CoTrans inertial mass, spin and charge become deeply connected. Gravity is weak *because* EM is strong and vice versa. The symmetry condition of the IU enforces this duality. As we already know, there do not exist massless charged particles. If they would exist, they should be easily found in collision experiments. Electron and positron would become instable particles because they could decay into these massless charged particles. But CoR tells something more: inertial mass and SpinCharge are fundamentally intertwined concepts. We there is inertia, there is SpinCharge. Where is no inertial mass, there is no SpinCharge. In fact, if we decompose the SpinCharge concept, the tree concepts inertial mass, charge and spin form a conceptual trinity. It is a fundamental property-set for both elementary particles and black holes.

Let me recollect the concept image of force under the limited CT_{ho}. We saw rectilinear force become angular momentum: a non-local force is mapped onto the localized property of rotation. But the restricted CT_{ho} did *not* determine the kind of rotation: Is it righthanded or lefthanded? By expanding the CoTrans we enclose this extra degree of freedom.

I mentioned earlier a partially broken symmetry between the conceptual congruence of the concepts of space and a proton. The broken symmetry was caused by the difference in charge between u and d quark, which is exactly e, the basic unit of charge. By completing the definition of CT_{ho} it becomes consistent with CT_{hu}. *The Human CoTrans of QM an GR objects is identical to a reciprocal inversion and a double interchange of concept pairs of CT_{ho} (space and time, mass, and spincharge).*

This fundamental relationship between inertial mass, charge and spin within an IU could explain a burning question in theoretical physics. Why don't we detect anti-matter in our universe? The answer must be found in the constraints related to this new conceptual symmetry. According to Noethers' theorem symmetry is associated with a law of conservation. I suspect the symmetry between inertial mass and SpinCharge *forbids* an equal amount of matter and anti-matter.

Additionally , the transformation $\underline{m}_0 \Leftrightarrow (\underline{SQ})^{-1}$ implies (from our human point of view) that fundamental *objective* concepts within our universe must fulfill the condition m_0SQ = Constant. Applied to the basic entities of the Standard Model we have:

m_0 SQ (electron) = 0,5 x -1 = -0,5

m_0 SQ (up quark) = 2,2 x 2/3 = 1,4 ~ -3 x m_0 Q (electron)

m_0 SQ (down quark) = 4,7 x -1/3 = -1,6 ~ 3 x m_0 Q (electron)

The significance of the factor three is not clear but could be a multiplicity factor from baryons (3 quarks). The theoretical foundation of this corollary has to be studied extensively.

5.7. Another CPT theorem

The expanded Horizon CoTrans can be considered being 'another' CPT-theorem. The difference is that the Horizon CoTrans *transforms* concepts, where CPT *conjugates* them. The CPT-theorem states that all physical laws and interactions are invariant under CPT transformation. The CPT-transformation, conjugates time (t => -t), parity (**r** => -**r**) and charge (Q => -Q). But the Horizon CoTrans *changes* concepts. All physical laws and interactions are invariant under the Horizon CoTrans, which is a reciprocal inversion of concepts: (t => 1/r), (r => 1/t) (SQ => $1/m_0$). But a conjugation is of course also a transformation. The CPT theorem is a simple CoTrans. A more fundamental difference between the CPT-theorem and the Horizon CoTrans is its existential status. Mainstream physics believe CPT is just a mathematical excursion. But in CoR, flipping concepts has an existential meaning. Both CoRep's are equally real. They exist. They are CoRep's of different thinkers. They both 'live' in the same IU. They use the same informational structure but represent it in different concepts. Conceptual entanglement, conceptual symmetry and laws of conservations are all related to the symmetry of the Information Universe.

According to CoR a chargeless fermion is an object that cannot be decomposed and can not have an inertial mass. A neutrino has no charge and is a fundamental particle without an internal structure. It should not have mass. But from experiments we now believe that the mass of the neutrino is small but not zero (< 2 eV). This mass, although small, has profound impact on the universal evolution, because there are so many neutrinos. Is CoR falsified by the neutrino mass? Or is there another way to explain this discrepancy? Until now we discarded the angular moment of the black hole, our universe has within our parent-universe. This is an omission. All black holes rotate. Angular momentum, mass and charge are the fundamental characteristics of a black hole (No hair theorem)[xv], identical to the fundamental characteristics of fermions. A universal CoRep's must reflect these characteristics because universe and black hole CoRep represent the same IU. Under CT_{ho} angular momentum transforms into the concept of force, so we should expect black hole angular momentum pops up in the universe CoRep as an overall rectilinear force. How do we 'experience' this force? I suspect the force appears as an overall mass-displacement. The mass of *all* fermions in the universe CoRep is slightly increased by Black hole angular momentum. We cannot measure this tiny displacement within protons or electrons because their own rest-mass is millions of times bigger than the displacement. But for the neutrino we can and we did. If we are able to 'do the math' of this concept transformation the mass of the neutrino does not falsify, it could *verify* the IU hypothesis. The fact that we haven't found right-handed neutrino's, could also be a result of a concept symmetry constraint.

5.8. Energy

Lastly, let us examine the concept of energy. Energy is work. It is a quantity measuring the work that must be done to bring things into movement. Energy is a scalar physical quantity. Energy is conserved. It can change its form (kinetic energy, potential energy, heat, electrical energy) but it cannot be created or destroyed. All forces define a form of energy because they define a specific kind of movement. Because energy is such a multiheaded concept it has many physical units of measurement associated with the specific form of energy (MeV, Joule, Calorie, kWh). But according to the second postulate of CoR there can only be one universal constant of Energy.

The concept of energy has characteristics that are equal to those of information. It is omnipresent, it can appear in different forms and it is conserved. But energy is no information. Energy is a physical quantity. Information is a mathematical quantity. The image of the concept of energy in the reduced Horizon CoTrans (1.1), is again 'energy'. The image of speed is speed. Because $E \sim c^2$ the image of energy will be energy. Do things change looking out the extended Horizon CoTrans, involving also inertial mass and charge? No. Energy stays energy but the *form* of energy changes. Gravitational energy becomes EM energy. Kinetic energy becomes rotational energy. The Horizon CoTrans transforms types of energy into other types of energy. Within the Human CoTrans the QM neutrino object is associated with the energy component of the GR impulse-energy stress tensor (T_{00}). We can perceive our universe as a one-neutrino universe, because it corresponds to just one (unique) energy state of the energized space-time object we call 'universe'. Secondly since the neutrino particles are (almost) massless and chargeless they do scarcely interact with other particles. They are abundant, invisible, and inert. It is complementary to the idea of energy. All is energy; all is

'active' (work in progress). These characteristics deepens our insight in the nature of the Human CoTrans.

5.9. String Theory

Finally, how does CoR evaluates TOEs like string theory? String theory the most promising theory of unification of GR and QM, is diagnosed by CoR in the same manner as QCD: string theory is a second order mirror-theory. Because string theory tries to unify relativistic gravity with QM its mirror image is more complex. As it does not recognize the concept symmetry, all unification effort will create a *multiplicity* of geometrical dimensions, which feels to experimental scientists a little bit 'too much'. String theory needs hidden, compactified dimensions which are disguised copies of concepts of a gravitational spacetime. Lacking the idea of concept relativity string theory reduces all conceptualization into pure geometrical, mathematical concepts. This kind of mathematization is 'in line' with CoR's metaphysics, but in the process string theory loses contact with conceptualization. The additional (hidden) dimensions string theory 'needs' to define unification have no conceptual basis anymore. CoR states there does not exist a deeper reality 'below' that of elementary particles, or 'above' the universe. They are conceptually connected by the Human CoTrans. According to CoR string theory should therefore be re-interpreted as a mirror theory.

After the second string revolution, initiated by Maldacena's AdS/CFT correspondence, string theory focused on the holographic duality. I think the famous AdS/CFT correspondence can be considered a first step in this reinterpretation, as it defines a correspondence between a cosmological model (AdS) and a quantum field theory on elementary particles. I expect COR will eventually become a conceptual representation of this new mathematical research.

6. Conclusions

The Information universe hypothesis states that a black hole and a universe are two different concept-representations of one entity called an Information Universe. The hypothesis combines a metaphysical interpretation of information with concept relativity, stating that there exist multiple conceptualizations of one IU. I proposed two possible Concept Transformations that define this particular concept symmetry of the IU:

CT_{ho} ($\underline{r}$, $\underline{t}$, $\underline{m}_0$, $S\underline{Q}$) ⇔ ($\underline{t}^{-1}$, $\underline{r}^{-1}$, $S\underline{Q}^{-1}$, $\underline{m}_0^{-1}$) (the property symmetry of an IU) (1.8a)

CT_{hu}: (u, d, e^-,ν_e) ⇔ ($g_{\alpha\beta}$, $T_{\alpha\beta}$) (the object symmetry of an IU) (1.8b)

I have sketched an overview touching many fundamental theories of physics and cosmology without performing in-depth analysis of specific statements. The philosophy of CoR and the physical theory is far from complete. Let alone, a scientific 'proof' of the theory. In part 2 I will extent the philosophical framework of Concept Relativity and create generate a General Information Theory resulting into a systems cosmology. The physical theory of Concept Relativity needs a lot of theoretical research. The technique of concept mechanics, the symmetry study of concepts, must be further developed. Physics will need a detailed *mathematical* representation of a Concept Transformation. And many ideas I have put forward need further development or must be 'tested'. I am in no position to contribute to this and I hope this article will stimulate others to explore this new line of thinking.

Appendix. Connecting universe and mind

CoR re-establishes the importance of conceptuality. I strongly believe mathematics (metaphysics) should always be represented in a conceptual form, because concepts connect the universe and the thinking subject. When (theoretical) physicists do not accept the *additional* reality of metaphysics, all physics becomes in the end just mathematics. But reality is communicative, it is relational. You cannot understand the universe by eliminating the conceptuality of an understanding mind. On the contrary, CoR states, - this is the new route – understanding the universe is understanding the *relation* of human mind to reality. To CoR this relation is a relative one. There are multiple concept representations of the same IU thought by different minds/thinkers.

The intrinsic relation between concept and universe is a quite natural thing. When a baby is born, what is its relation to the universe? The baby has no concepts, has no words, does not speak. The mind is almost 'clear', united by undefined, chaotic sensory incentives. What does it do? Its mind starts working. Using its senses, the baby distinguishes forms, feelings, colors, substances, it associates incentives with each other, build rational constants which become eventually concepts, properties, and objects. By building concepts, it is building the objective

universe, including meta-concepts like I , the cosmos, life, and death. The final meta-concept of all though is information, which closes the circle: the source of chaos and order[xvi]. It is a completely natural process. When the baby becomes a grownup, it forgets this original building process. It forgets the objective world is a conceptualized world. CoR gives us back that unity. It connects the conceptuality we develop with the representation of our universe.

Although the relation of the human species to the universe is a religious and philosophical topic, theoretical physicists too have thought a lot about it. John Wheeler introduced in 1977 a strong, participatory anthropic principle [8]. It says that universes that can exist, must be universes in which (intelligent) observers are observing. This condition restricts the number of possible universes severely. Others objected and proposed a many-world theory: all possible worlds, also universes without intelligent beings, can be real universes. The wavefunction of QM created another multiverse, in which all possible states are considered actual universes. This debate on weak and strong anthropic principle never stopped since. It has different forms but it always starts off with the same question: what is the position of (thinking) man in the universe? CoR mingles in this debate. It does not take sides: both sides are right. Obviously, the IU hypothesis is a design for a multiverse theory. Concept Relativity tells us, like the many-world theory, that there are many universes, but they are, in contrast to many-world theory, not independent worlds in a superposition of a multiverse wave but connected to each other by concept transformations. Our universe creates black holes, which are universes that create black holes, which are universes that create black holes, etc. etc. Reality is a foam of imploding and exploding universes all with different universal startup parameters, exploring all the potential of reality. But reality is also 'man-inclusive'. Parent and child universe have concept symmetry according to human/horizon CoTrans. We humans, live in a multiverse but they are not parallel potential words. They are all connected and are therefore all intelligible and made for men.

Finally, CoR is not only a multiverse theory; it is also a theory of *multiple realities*. The IU-hypotheses relates the multiverse explicitly to thinkers. But *all* things relate to their world. A bacterium does not think, but it does, just like thinkers, relate to its environment. It exchanges information. It relates differently to its reality, but the basic informational scheme is not different then that of human beings. This bacterium 'experiences' its own reality. In the second part of CoR, I will show that we can distinguish between several types of reality that are 'build' by emergent properties. Intelligence is just one of them.

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Notes

1. I studied physics (1976-1981) and philosophy (1983-1987) at the Radboud University Nijmegen, The Netherlands
2. https://en.wikipedia.org/wiki/Black_hole_cosmology
3. https://en.wikipedia.org/wiki/information
4. This idea may resemble number mysticism of ancient Pythagoreans, but there is no mystics involved here. The number-reality is well attached to our conceptual world by the concept of information. In part 2 I will discuss the metaphysical 'dynamics' of information. In this part I just like to emphasize the metaphysical nature of number denoting quantities of information.

5. Note, my definition of Concept Transformation, does not use the word 'concepts' (plural), which seem to be more appropriate because a Concept Transformation includes a complete set of concepts that are transformed simultaneously. But in my definition, the word 'concept' refers to the category (singular) of all concepts. Although there is a risk of misunderstanding the idea of Concept Transformation (it does not concern *one* particular concept) I decided to use the singular word for reasons of convenience. Consequently also the word 'concept' in 'Concept Relativity', Concept Mechanics' and 'Concept Representation' refer to the category 'concept'.
6. Because all black holes rotate, the Kerr metric should be considered. But the Schwarzschild metric will give a good first approximation.
7. See for instance: https://www.preposterousuniverse.com/blog/2010/04/28/the-universe-is-not-a-black-hole/
8. When cosmologists speak of the universe as being "open" or "closed", they most commonly are referring to whether the curvature is negative or positive. Which is not the case here. Openness means there is an unknown outside, which is in contact with our universe.
9. In my definition of the Human CoTrans I did not consider dark matter.
10. In part 2 I will discuss the relation between entropy and information in depth and will state that *all* physical interactions are entropic/informational in nature.
11. I should point out the paradox in using the word 'concept' in this context. All mathematical objects are of course also a kind of concepts. They are abstract concepts, without physical dimensions. They are concepts that cannot be observed. They are concepts that paradoxically denote something non-conceptual. Because it is not possible to think without concepts, we simply need words/concepts to denote 'mathematical entities' or any other metaphysical category. But those words are in some sense 'wrong'. Pure metaphysics is speechless.
12. The number 1 of the mathematical trinity stands for any finite number.
13. In part 2 I will show this congruence goes much further: I will theorize that besides universal property constants (like the velocity of light) there exist universal *object* constants as well.
14. https://en.wikipedia.org/wiki/One-electron_universe
15. https://en.wikipedia.org/wiki/No-hair_theorem
16. Order and chaos and the relation to information will be extensively discussed in part 2.