

The Theoretical Foundation of Physical Reality

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This paper deals with different postulates and their consequences for the theoretical foundation of physical reality.

If a theory is complete, it is required that “*Every element of the physical reality must have a counterpart in the physical theory*”¹. However, this requirement is biased by the word *element* which has to be replaced by the word *everything*. The requirement for a complete theory will then be the following: *everything in the physical reality must have a counterpart in the physical theory*. An element can be understood as limited to mass or matter only. In the search for the foundation we need an open mind, so we must look in all directions; that’s why *element* has to be changed to *everything*, or the theory will not be complete.

Karl Popper formulated one of the most important criteria for safe knowledge, i.e. “A scientific statement is one that could possibly be proven wrong.” A theory is scientific if, and only if, it is falsifiable. Then, applied to physics, how can the Higgs Boson theory be proven wrong and how can the statement be falsifiable? The same can be said about $E=mc^2$, i.e. how can it be proven wrong and how can the statement be falsifiable? Even though Karl Popper has been widely criticized, we can keep his criterion in mind, since it strengthens our mind, in a time where we need to find new ways for physics.

Einstein stated something quite similar to Popper in this final sentence in his paper “Does the Inertia of a Body Depend upon its Energy-content?” i.e. “*If the theory corresponds to the facts, radiation conveys inertia between the emitting and absorbing bodies*”, which then could be said to be falsifiable. The same can be said about Einstein’s paper directed to Bohr, i.e. “*Every element of the physical reality must have a counterpart in the physical theory*.”

The very important issue and question concerning if the Universe is based on determinism or random properties has to be asked. Then one criterion could be if a theory can predict the behaviour of masses or not. Heisenberg showed that it is only possible to measure within probabilities, i.e. we do not know, while Einstein claims that the deterministic point of view is a prerequisite for any general theoretical basis for physics.

Even if the Universe is fundamentally based on the deterministic view, it can be very difficult to prove it, since Universe and Nature are in continuous change, most of all at the levels of elementary particles and cosmos entities; and there can also be parts of the Universe which are inaccessible to humans.

In order to develop a theoretical foundation for the reality of physics we need to find a new angle and we need to question some basic concepts of the physics of today, e.g. energy, gravitation, force and interaction. We must also question the

existing postulates of some theories of physics, i.e. the theory of relativity and the theory of quantum physics.

The starting point is a new postulate and the aim and objective is to find a minimum of concepts and fundamental relationships to create an alternative theoretical foundation for the reality of physics. Furthermore, *every concept has to represent the physical reality directly* and not via abstract concepts, e.g. via concepts such as energy and gravitation.

The Paradigm of Physics 2021, P_P , is based on these statements:

- 1) The language of Nature is mathematics.
- 2) P_P is based on P_L , where P_L stands for the established logic and mathematics.
- 3) Man stands outside Nature.
- 4) Man is master of Nature, where Nature is the object.
- 5) Nature is a non-organic system.
- 6) P_P is based on few concepts:
 - Forces or interaction (gravitation, attraction and repulsion).
 - Masses (the leptons $e, \mu, \tau, \nu_e, \nu_\mu, \nu_\tau$ and the quarks u, c, t, d, s, b and galaxies, suns, planets, moons).
 - The forces/interaction act between masses.
 - Exchange particles (the bosons $\gamma, W^+/W^-, z, g$ and G for the graviton) mediate the interaction.
 - Space-time.
 - Field.
 - Energy (E).
 - Gravitation (G).

These statements are now being questioned.

Since Aristotle and through history, philosophers and natural scientists, such as Leibniz, Frege, Russell, Wittgenstein, Newton and Einstein, have used the analogy that nature is a house, built up by parts. Once formulated, it is easy to accept this basic logic. The belief that nature consists of some small pieces, elementary-particles, and all alike², with rules of connection, will enable the creation of any structure and any conclusions of the Universe. From axioms theorems can be deduced: atoms with bindings create molecules; elementary-particles create atoms with bosons; and planets are connected by attraction. Furthermore, these elements and conclusions are either true or false. All models of science through history and up till now were based on this model, as are the Standard Model, the theory of relativity and the theory of quantum.

These are all human constructions, by analogy of how a house is built, i. e. block by block connected by bonding.

Now, we will focus on these three basic concepts below, which are behind a new theoretical foundation of the reality of physics. They are:

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- 1) Mass
- 2) Wave
- 3) Relation

Based on these three concepts we will find the new foundation of physics. The concepts 1 and 2 are based on Newton's, Planck's, Einstein's and de Broglie's theories, while the concept 3 is new and has been added based on the theory and the principle of relations³. We are familiar with the concept of mass and the concept of wave; but the concept of relation has to be explained.

First, however, these are the most important equations to penetrate and to analyze:

- 1) $F = Gm_1m_2/r^2$, i.e. Newton's interpretation of gravitation.
- 2) $G_{\mu\nu} = T_{\mu\nu}$, i.e. Einstein's interpretation of gravitation.
- 3) $E = hf$, i.e. Planck's – Einstein's interpretation of energy, i.e. quanta have energy.
- 4) $E = mc^2$, i.e. Einstein's interpretation of energy, i.e. mass has energy.
- 5) $\Psi(t, x)$ is the wave function, said to be valid for all systems and for all types of matter, e.g. de Broglie's thesis $\lambda = h/p$.
- 6) $X = aRb$, i.e. the Principle of Relations' interpretation of both energy and gravitation, i.e. energy and gravitation are flows (waves), R , between two masses a and b . $X = E$ and G , where E stands for Energy and G stands for Gravitation.

These equations have all the factors needed, i.e. mass, wave and relation, for the theoretical foundation of the reality of physics. Based on the concept **relation, R**, in combination with the concepts mass and wave, it is possible to unite the realities of the elementary particles and the masses of the Universe in one equation, i.e. $X = aRb$. Any abstract concept, e.g. energy, gravitation, force, interaction, dark energy and dark matter, can be explained by *the concrete content of aRb*.

Then, there are no equations needed, since we will have a complete and direct representation and description of the reality of physics via aRb .

Now we have to turn to the postulates of the theories of relativity, quantum and relation.

The postulates used for the theory of relativity:

1. The laws of physics are the same in all inertial frames of reference, i.e. the principle of relativity. What does an inertial frame of reference mean? It is a body at rest and there are no causes external to that system of physics, or a body moving at constant speed in a straight line.
This postulate is false, since there are no existing inertial frames of reference, i.e. there is no body at rest anywhere, since all bodies move continuously and all bodies have relations with the external environment, as will be shown later; but by intuition we can already understand this.

2. The speed of light is constant and the fastest speed in the Universe, i.e. the invariance of c , which is independent of the state of motion of the emitting body. We can easily take the position that light is not the fastest in universe.
3. The principle of equivalence, i.e. $G_{\mu\nu} = T_{\mu\nu}$. What does this equivalence mean? Physical equivalence means that a gravitational field corresponds to an inertial moving body in acceleration.

Equivalence is, as we will see, not valid.⁴ Equivalence will be replaced by the concept description, since both describe the phenomena of movement and gravitation to be basically the same, i.e. $G_{\mu\nu}T_{\mu\nu}$. We need to find a more fundamental explanation of both phenomena.

The postulate of quantum theory says that any system can be described by a wave function: $\psi(x, t)$; where t is a parameter representing time and x represents the coordinates x, y and z of the system.

However the postulate of quantum theory is not, by definition, a postulate, since a postulate is a statement that is hold to be true without any proof, that is taken to be true *a priori*; but this is not the fact: it is an *a posteriori* statement, since it is based on experimental statistics⁵, but we need postulates that are deterministic.

It is simply a function. Furthermore, the concept time, t , can be questioned as to whether it is a property of the physical reality itself, as it seems to be a human invention. Then time is not a direct representation as is required.

The new concept **relation** is based on this postulate:

Nothing exists in isolation, i.e. everything exists in relations.

The postulate is valid for all things and all beings –for scientific objects as well as for human sciences - at the most fundamental level before we even think of science and humans.

The conclusion is then that there is only one valid postulate and it is the postulate of relation. All other postulates are not valid. The postulate of relation, however, cannot be seen as *a priori*, it is an *a posteriori* concept, which all concepts are.

The concept relation relates to reality by showing that there are relations between all parts in the Universe and nature. Between all systems and between all parts of any system there are continuous flows of packages, i.e. R .

Then the useful concepts for this new theoretical foundation of the reality of physics are mass, wave and relation.

These are the consequences for the equations:

- 1) $F = Gm_1m_2/r^2$ is Newton's interpretation of gravitation.
 F means force, G is the gravitational constant, m_1 and m_2 are masses and r is the distance between the masses centers.
Based on aRb , we can calculate the size and amount of the masses in flows between different bodies in any

system, e.g. flows between the solar system and the Milky Way, between the Sun and the Earth. These flows are what make gravitation.

- 2) $G_{\mu\nu} = T_{\mu\nu}$ is Einstein's interpretation of gravitation, where $G_{\mu\nu}$ stands for space-time-curvature and $T_{\mu\nu}$ stands for energy-momentum.

Based on aRb, we can calculate the size and amount of the masses in flows between different bodies, which explain the content of gravitational fields and the movement of bodies in the Universe.

Equivalence does not exist in Nature, only inhuman thinking.

- 3) $E = hf$ is Planck's – Einstein's interpretation of energy, i.e. quanta have energy.

h is Planck's constant and f is the frequency of the photon. What does E stand for? E stands for the energy of the photon, but since quantum is mass and mass has energy, what, fundamentally, is energy? Is energy only a human construction of the phenomenon, i.e. an abstract concept, however much based on this concrete observation?

By aRb we have another explanation and interpretation of energy, as partly shown; but this will be shown completely later.

- 4) $E = mc^2$ is Einstein's interpretation of energy, i.e. mass has energy. The speed of light is c , which means that c^2 is pure mathematics since it does not have any direct representation in reality, which is needed due to the stipulation that *every concept has to represent the physical reality directly*. So c^2 is not valid in reality. The same goes for the concept E . Furthermore, in Nature there is no rest energy E_0 . In Nature there is no rest mass m_0 . The equation $E_0 = m_0 c^2$ is as a consequence not valid. We can also notice that none of the concepts E , m_0 and c^2 fulfils the criterion stipulated by Einstein, namely that "every element of the physical reality must have a counterpart in the physical theory".

E is energy in existing theories. Now a , b , $c \dots$ are units and R is the relation between a , b , $c \dots$. The consequence is that R will replace E : $E = R$, $E = aRb$, $E = m_1 R m_2$, $E_{1-n} = R_{1-n}(a, b)$; $E_{1-n} = R_{1-n}$; So, based on aRb, we understand that the formula $E = mc^2$ has many difficulties, for this reason: the concept of energy is not a direct representation of reality and is therefore not a valid scientific concept. To use the concept energy as representation seems to be a detour, while the concept of package goes straight to the point, which is in likeness with the stipulation "every concept has to represent the physical reality directly".

- 5) $\Psi(t, x)$ is the wave function valid for all systems and for all types of matter.

First we must ask what a system is. Can a system only be time and the three coordinates x , y and z ? No, it is not a system; it is only a single particle or packages of particles at a certain point of time. We can call it a hypothesis, valid for some parts of reality, e.g. de Broglie's hypothesis. The wave function is limited to any wave, but the wave function is now expanded by aRb, i.e. we need to find out the systems of a and b to understand.

- 6) $X = aRb$ is the Principle of Relations' interpretation of energy and gravitation, i.e. energy and gravitation are flows (waves), R , between two masses a and b .

$X = E$ and G , where E stands for Energy and G stands for Gravitation. aRb is the missing link between mass and wave, which is demanded in order to have a complete theory of the Universe, where *every concept represents the physical reality directly*.

The concept relation relates to reality by showing that there are relations between all parts in the Universe, aRb, where:

- 1) a , b , $c \dots$ are any system, subsystem, unit or part in any field of the Universe, e.g. suns, planets, moons, galaxies, leptons, hadrons, mesons, baryons, nuclei, atoms and molecules.
- 2) The relation R is a flow (wave) of packages, p_{1-n} , between a , b , $c \dots$ in any field of the Universe.



Based on the postulate - Nothing exists in isolation, i.e. everything exists in relations –in combination with 1 and 2 above, the principle is

$$X = aRb$$

Between all systems and between all parts of any system, S , there is a continuous flow of packages p_{1-n} , i.e. $R = p_{1-n}$. The formula will be this

$$S = ap_{1-n}b$$

Manifestations of the flow of packages are gravitation, energy, interaction, dark energy, dark matter and force.

Based on $X = aRb$ and $S = ap_{1-n}$ any system is and can be described as complex flows. We might call them wave functions, since a wave function is a flow of masses.

A wave consists of masses which stand in relation with systems. From system a the wave of masses moves to system b . This is valid for all masses in the Universe, e.g. galaxies, planets, suns, moons, atoms and elementary particles.

We need to find out how the emission and the absorption of these masses of the systems a and b operate and function.

The equations $F = ma$ and $F = Gm_1m_2/r^2$ have one valid concept – mass. Force, gravitational constant and acceleration are all three not valid, due to the requirement for a complete theory. However, r^2 indicates a relation, distance, between two bodies a and b , i.e. m_1 and m_2 , but what is the content of the relation, since relation stands for a flow of packages, i.e. $ap_{1-n}b$?

Then, by intuition, Gm_1m_2/r^2 can be transformed into the equation $X = aRb$. Let m_1 be a , m_2 be b and r^2 be R , where R stands for flows of packages, i.e. p_{1-n} , between m_1 and m_2 .

When simplified the equation is $F = m_1m_2/r^2$. Hence, $m_1m_2/r^2 = ap_{1-n}b$ and the gravitation is then $a_1p_{1-n}b_1$.

The equations $E = mc^2$ and $E = hv$ can be transformed to the equation $X = aRb$:

- 1) L denotes light
- 2) R is the relation between the bodies a and b .

- 3) R consists of flows of packages and denotes p_{1-n} .
- 4) $\Psi(x, t)$ is a wave.
- 5) $L = \text{radiation} = r = \text{wave} = p_{1-n}$.
- 6) $\Psi(x, t) = p_{1-n}$.
- 7) $E = aRb$.
- 8) $E = ap_{1-n}b$.
- 9) $ap_{1-n}b = hv$.
- 10) Now the equation $E = mc^2$ can be transformed into $X = aRb$; since "radiation conveys inertia between the emitting and absorbing bodies", there is a flow of packages between **a** and **b**; i.e. there is a relation, i.e. $E = aRb$.
- 11) $E = ap_{1-n}b$.
- 12) $E = arb$ equals $E = mc^2 \rightarrow arb = mc^2$
- 13) $E = a(\Psi(x, t) = p_{1-n})b$.

The simplified equation $G_{\mu\nu} = T_{\mu\nu}$ can be transformed to $X = aRb$:

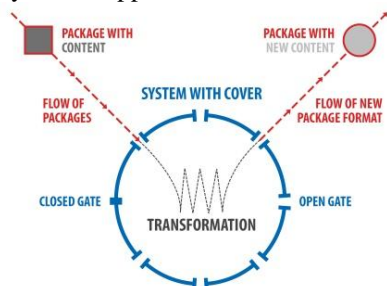
- 1) $G_{\mu\nu} \neq T_{\mu\nu}$, i.e. mass and form are one in co-existing; it should be $G_{\mu\nu}T_{\mu\nu}$.
- 2) aRb results in gravitation by flows of packages, i.e. p_{1-n} , between bodies **a** and **b** in the Universe.
- 3) Form is the system where mass flows. Hence, the concept "system" replaces the concept "form" or any synonyms, e.g. architecture, design, space and shape.
- 4) Left is RS, i.e. Relation and System, which is aRb .
- 5) From the equation $G_{\mu\nu} = T_{\mu\nu}$ there are two valid concepts, i.e. mass, m, and form, f.
- 6) Then $G_{\mu\nu}T_{\mu\nu}$ is equal to mf, where m can stand for $m_1, m_2, m_3 \dots = p_{1-n}$ and f stands for form which is any system $a_1, b_1, c_1 \dots$
- 7) Now we can translate $G_{\mu\nu}T_{\mu\nu}$ into aRb , i.e. $a_1p_{1-n}b_1$.

The Principle of Relations demonstrates the most fundamental properties of physical reality. In physical reality continuous flows of packages moves in "tubes" between all systems, resulting in gravitation, force and energy.

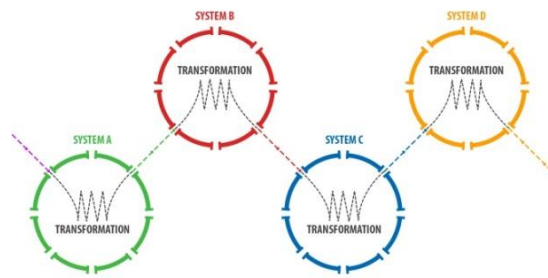
These flows contain all mass in the Universe, including dark matter and dark energy.

The key concepts are flows of packages, gates, transformers and systems.

When any flow of packages arrives at any system there are gates transforming the content to fit into the system; i.e. the content will change appearance. There are continuous flows in and between all systems. The two models below show schematically how it appears:

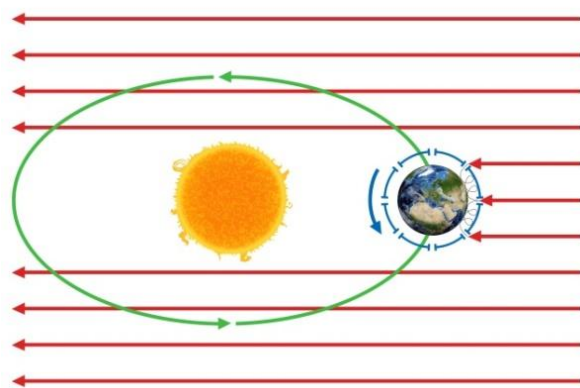


The second model shows how flows are present throughout physical reality:

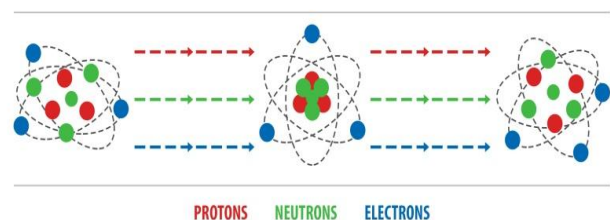


The systems A, B, C, and D represent planets, suns and galaxies; or molecules forming a transport system between cells in the human body; or flows of elementary particles between atoms; or proton flows between molecules; etc.

When we apply these models to the Earth, the appearance might look like the model below:



When we apply these models to elementary particles, the appearance might look like the model below:



One consequence, among many, is that reality is coherent: i.e. the extreme split of disciplines damages our understanding of physical reality, since it all hangs together.

Using the formula $X = aRb$

We can transform the most important equations of force, relativity and quantum physics into the equation below, which unites force, relativity, quantum and energy with dark matter and dark energy, i.e.

$$X = a(\Psi(x, t) = p_{1-n})b$$

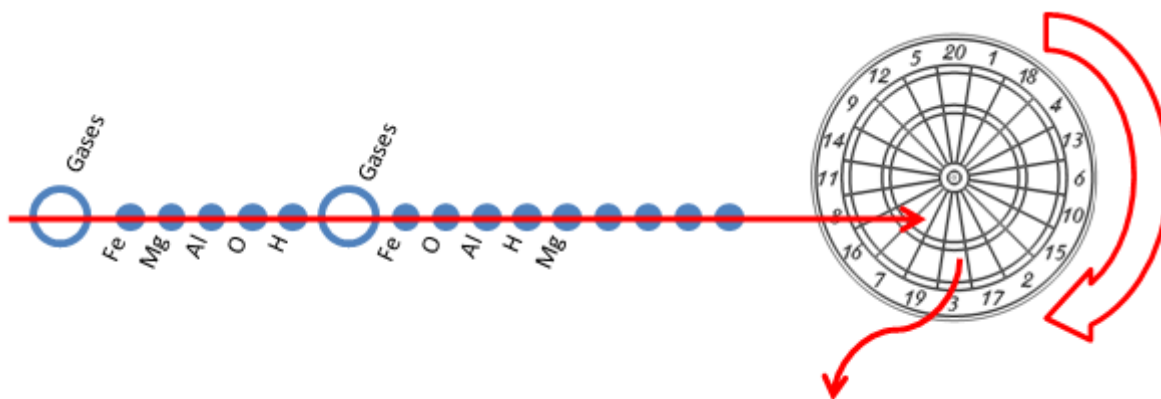
Where X stands for force, gravitation and energy, **a** and **b** are systems and p_{1-n} is a flow of packages.

The absorption of any flow of packages is guided by a Transformer, which is the mechanism that directs and leads packages, e.g. protons, electrons, photons and nutrient molecules, as shown below in the example of Black Holes,

i.e. Black Holes are Transformers creating new galaxies, suns and planets.

Black Holes: Let us first take the position that the main content of gas (X) in the Universe is hydrogen (H), then in

combination with the elements of iron (Fe), aluminium (Al), magnesium (Mg) and oxygen (O), we can illustrate the Transformer:



The Sun, the Earth and Planets

The so-called Black Holes are Transformers between galaxies using packages of the so-called dark matter and dark energy. The conclusion is that Black Holes do exist, but they do not function as we thought. The function of Black Holes based on contemporary science is only imaginary, since they are based on invalid postulates and theories of physics.

Throughout reality *The Principle of Relations* applies to the mechanisms of a Transformer's functions, e.g. the Earth, the Sun, the Moon, the human body, galaxies, atoms, organs and cells in the Human Body.

Notes

1. Physical Review, May 15, 1935, Volume 47, page 777: Can Quantum-Mechanical Description of Physical Reality be Considered Complete? By A. Einstein, B. Podolsky and N. Rosen, *Institute for Advanced Study, Princeton, New Jersey.*
2. Rene' Descartes: Discourse on method and meditations, Penguin Books, 1968, page 41: "The third, to conduct my thoughts in an orderly way, beginning with the simplest objects and the easiest to know, in order to climb gradually, as by degrees, as far as the knowledge of the most complex, and even supposing some order among those objects which do not precede each other naturally."
3. The postulate was introduced in the book *The Principle of Relations: Paradigma Principia Relationum*, by Thomas Nordström, Published at Cambridge Scholars Publishing, 2018.
4. The mysterious concepts sameness, identity and equivalence. Let us listen to Gottlob Frege's reflections concerning the concept of sameness, which is related to the concept of equivalence, in his paper *On Sense and Nominatum*, where he notes the use, and I quote: "I use this word in the sense of identity and understand "a = b" in the sense of "a is the same as b" or "a and b coincide". Page 228. Frege argues further: "Is Sameness a relation? A relation between objects? Or between names or signs of objects? I assumed the latter alternative in my *Begriffsschrift*. The reasons that speak

- in its favour are the following: "a = a" and "a = b" are sentences of obviously different cognitive significance: "a=a" is valid a priori and according to Kant is to be called analytic, whereas sentences of the form "a=b" often contain very valuable extensions of our knowledge and cannot always be justified in an a priori manner." Page 217. The pages are from the book: *The Philosophy of Language*, by A. P. Martinich, pages 217 – 229. Synonyms for "sameness" are the following: oneness, selfsameness, homogeneity, homogeneousness, homology, equality, equivalence, accordance, agreement, conformity, congruity, correspondence, likeness, resemblance and similarity. Through the history of science the concept of equivalence has played a crucial role, e.g. in Einstein's equations of gravity. Since this must be of the most extreme importance for science in general and especially for the theory of gravitation as told by Einstein, it can, dependent on interpretation falsify or not Einstein's equations. My conclusion is that Frege's interpretation of the concept Sameness supports this books interpretation of equivalence; i.e. equivalence cannot be used the way Einstein uses the concept, since he confuses the analytic meaning of the concept with its meaning of being an extension of knowledge.
5. Ibid. page 116. "The De Broglie-Schrödinger wave fields were not to be interpreted as a mathematical description of how an event actually takes place in time and space, though, of course, they have reference to such an event. Rather they are a mathematical description of what we can actually know about the system."