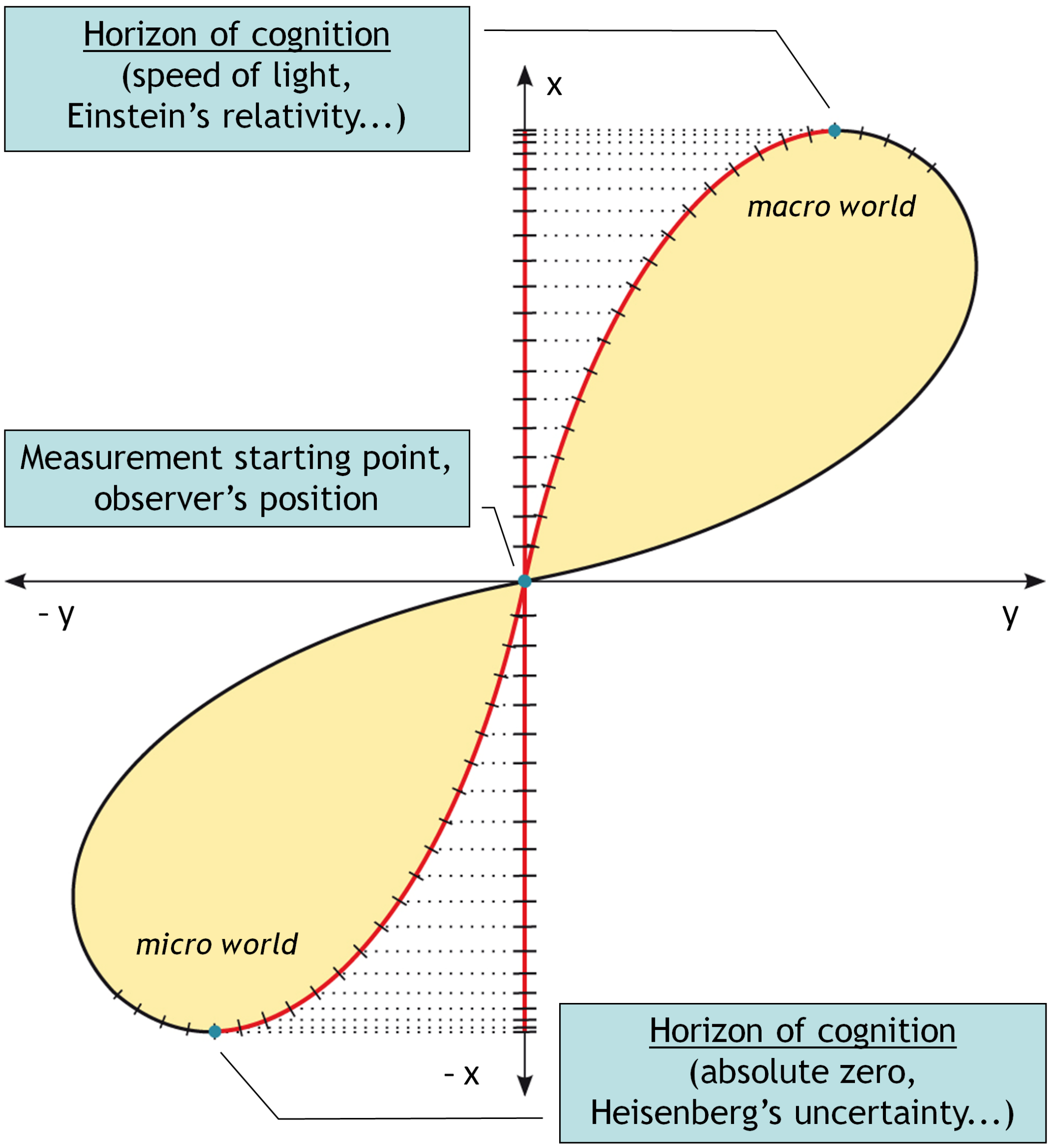
THE HORIZON OF COGNITION

A way to unify the micro/macro world from the point
of view of the Philosophy of Existence



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Dedicated to Mr. Josef Zezulka.

This work has been created with the help of kind review and inspiring comments from

Prof. Jan Rak - quantum mechanics, co-worker of the CERN laboratory
Dr. Adolf Inneman - cosmic engineer, co-worker of ESA and NASA
Assoc. Prof. Günther Kletetschka - qeophysics, NASA co-worker
Dr. Martin Zahradník - quantum optics

Thank you!

“At the beginning of the 21st century, it seems that physics is increasingly being confronted with fundamental philosophical and existential questions. Quantum physics has opened the question of the connection between the observer’s consciousness and the observed reality, whereas modern cosmology touches upon questions regarding fate and the creation of the universe. This places science in a realm that previously belonged to religious, philosophical and spiritual teachings. I find that the book ”Horizon of Cognition“ opens up for the inevitable communication between the different ways of perceiving reality around us that have previously been divided to a certain extent. The concept of the cognition horizon offers an interesting view on phenomena happening on such different scales as sub-atomic and astronomical spheres. This approach of connecting purely scientific knowledge and a philosophical point of view has the potential to enrich our cognition of the world around us, including natural relations and laws.”

Prof. Jan Rak - quantum mechanics, co-worker of the CERN laboratory

“In my opinion the book „Horizon of Cognition“ is amazing and interesting first of all because the thoughts and ideas contained here are based on the objective cognition of our world. This work creates a bridge between exact science and the philosophy of Existence, which has been founded and brought to us by the Czech philosopher Mr. Josef Zezulka. From the past we know, that the understanding of our world has always developed and changed together with the development of the culture of human race. Now, at the beginning of the third millennium we have the chance to get free from the past ideological and religious mainstreams, and look into the reality from the point of view of modern science, which has achieved an unprecedented progress in many ways during last hundred years. In spite of all this cognition we still seek the sense of existence – of us, but also of the whole world. And so, today we stand at the doorstep of a paradigm change, where the fading traditional values and way of thinking are creating space pro the birth of completely novel understanding. The scientific cognition will then naturally lead to eternal philosophy, which already now inspires the science of the future.

Therefore, I would like to recommend you to read this book of Mr. Tomas Pfeiffer and Vladislav Sima with all the interest, because our “Horizon of Cognition” can be extended in a never ending way.”

Dr. Adolf Inneman, cosmic engineer, co-worker of ESA and NASA

„The presented work showed an elaborate level of thinking with the goal to understand the connection between the micro and macro worlds using the unique principles of philosophy. The connection glue of these vastly different concepts was via fractals and incorporation of quadrupole as a base of the philosophical understanding of connectivities of the microcosmos and macrocosmos.

I enjoyed how the thought process flowed and resulted in demonstration that the motion definition and consideration of quantizing of macroworld was shown as the fundamental inter connection of important concepts of physics."

Assoc. Prof. Günther Kletetschka – qeophysics, NASA co-worker

"In the never-ending pursuit of faster processors, more powerful engines and smarter artificial intelligence, we often tend to forget why we, as physicists, decided to dedicate our lives to science in the first place. We forget the moments of our youth and the excitement we felt standing beneath the glittering beauty of the mysterious nocturnal skyscape when, instead of impact factors and industrial applicability, our hearts carried only the pure desire to know and understand the secrets of the beauty that arched above our heads. Horizon of Cognition is a book that brings us back to exactly those most fundamental questions in our minds and hearts, questions to which generations of physicists before us have sought answers, and generations after us will continue to do the same.

Reading the Horizon of Cognition, I have been fascinated and shocked by the apparent ease and elegance of the understanding of even the most difficult questions of physics with such increasing levels of depth that are not at all common today. Looking at the infinite heaven vault of the universe, I wish that we do not overlook this in favour of processors, drones and cyborgs. We are perhaps witnessing a new revolution in physics."

Dr. Martin Zahradník – quantum optics

Abstract

This publication presents an attempt to introduce unifying philosophical view of the current scientific research of the macro and micro worlds.

The ideas in this work are based on the Philosophy of Existence by the Czech philosopher Josef Zezulka [1]. Based on the philosophical observations of our world and Tomáš Pfeiffer's (Josef Zezulka's student) considerations, it can be concluded that all scientific knowledge/findings may be confined to and limited by the horizon of cognition[1], originating as a consequence of a curvature of the spacetime[2] we perceive. This is related to the non-linear and uncertain[3] manifestations of macro and micro objects[4] that are, by their nature/character (interval), distant from the observer.

The states of objects observed at the horizon of cognition are indistinguishable[5], which leads to the quantisation of spacetime itself[6]. As a consequence, particles of matter (e.g. electrons) manifest themselves as waves and electromagnetic waves manifest themselves as particles (and we talk about them as photons). This manifests itself not only in the micro world but also in the macro world (which should either confirm or disprove future scientific observations).

[1]The horizon of cognition is a newly introduced term, which is explained in the book „Spacetime + Gravity“ [2], and in this book in chapter 2.1. The horizon of cognition sets the limit of our cognition and beyond this limit, we cannot observe or measure anything.

[2]In General relativity [3], a spacetime curvature is described as an attribute of gravity. In our view, we understand the spacetime curvature (non-linearity) as a general attribute of our world, inseparably connected to the position of the observer (see chapter 2.1). As the distance between the observer and the observed object increases, the curvature increases and all objects (intervals) observed are burdened by a larger and larger measurement error (see Fig. 2.1, chapter 2.1).

[3]Our perception and description of the world usually occurs within the rectangular linear Euclidean spaces which we use for measuring of intervals. Using these Euclidean spaces in a curved spacetime causes the error of cognition (measurement) of the real interval size to increase, which also increases the level of uncertainty.

[4]Micro objects – objects the size of molecules, atoms, protons, electrons etc. The corresponding measurement units are for instance angstroms (1 angstrom = 10^{-10} m). Macro objects – objects close to the boundary of the observable universe, the corresponding measurement units are for instance light years (1 light year = 9.45×10^{15} m).

[5]The term indistinguishable refers to the impossibility of exactly determining the physical state (in the micro world, for instance, simultaneous knowledge of the position and momentum) of the observed particle using the linear Euclidean space.

[6]Explained in chapter 2.3.

By applying the observations of the Philosophy of Existence[7] to cosmology[8], we can understand the topology[9] of our world as an infinite chain of self-contained and interconnected sub- and super-universes[10], which, in all their possible levels of existence, create a shape, which we could philosophically describe as a dimensionless sphere[11]. We can hence explain all the power (force) manifestations as a result of the quadrupole[12] resonance effect of the fractal structure of force[13] centres that are independent of mass[14].

All this could help us not only understand quantum mechanics and cosmological dynamics, but also provide a fundamental starting point for a future theory of everything.

The philosophical ideas and observations presented in this work suggest novel explanations of the effects connected to the well-known double-slit experiment and justify why a wave, spreading in our 3D/ three-dimensional space (representing a quantum/particle) suddenly "materializes" and transforms into a measurable energy at the point of interaction (during the photoelectric effect for instance). This publication offers a novel approach to understanding what light actually is and shows a path, which could lead towards clarifying the origin, structure and dynamics of our universe.

The philosophical ideas in this publication (if accepted and further developed by the scientific community) offer a novel philosophical–scientific path towards a unifying view of the world of atoms and the macroworld.

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[7] According to the Philosophy of Existence, a philosophical observation is made spiritually and is based on merging with the investigated object, making it possible to understand the object's true nature. Such observations can also be described as "visions". Quite a few examples can be found, for instance, in [1].

[8] Cosmology is a scientific field which studies the origin, development and the structure of the entire Universe. See the chapter 1.4.

[9] Topology is a mathematical discipline devoted to studying space, general properties of space and the objects contained in space. It studies, for instance, compactness, connectedness and continuity.

[10] Explained in chapters 2.2 and 4.1.

[11] Current mathematics, which regards a point to be the only dimensionless object, is not able to either describe or explain the term "dimensionless sphere". Therefore, for the time being (until a new mathematical aspect has been developed), the only way we can approach an understanding of the expression "dimensionless sphere", is by employing a philosophical approach, as described in chapter 4.1.

[12] The quadrupole resonation (the resonation of four forces) can be regarded as the basic factor of cosmological dynamics. This is explained in chapter 4.4.

[13] The term Force/Power refers to the root mechanism through which dynamics enter our world (i.e. the root mechanism that causes something to happen and change). This mechanism can be manifested, for instance, in the form of known physical interactions.

[14] The term "force/power centres, independent of mass" (i.e. non-material) is introduced by the Philosophy of Existence based on observations (see chapter 4.4). This philosophical view does not correspond with the present scientific paradigm, which considers mass to be the primary cause of force/power (mass is primordial). According to the observations made by the Philosophy of Existence, it is the other way round: the force/power is always primordial and it is the mass that accumulates around (or is being repulsed from) the relative force/power centre.

Contents

Chapter 1

Introduction

1.1 Can philosophy help science?

Before we start presenting our view on the world's quantum-cosmological foundations, it is worth considering the relationship between science and philosophy.

In his book *A Brief History of Time* (1988) [4], the renowned physicist Stephen W. Hawking mentions that philosophy has been falling out of touch with new scientific research since the beginning of the last century. At the same time, world science has become more and more confused in its attempts to explain the real nature of our world.

In addition to this, the past decades in particular have seen the scientific world shift towards narrow professional specializations. Scientific research has sped up to such an extent that today there is a literal 'explosion' of new theories and ideas. The result of all this is that a contemporary scientist (wanting to stay in touch with the latest research and findings) often focuses on a relatively narrow subject area. It is therefore becoming difficult for scientists to have a thorough understanding of more than a limited, narrow number of the existing scientific theories [4].

So how can we compare or connect these theories, or choose one over another?

For example, the latest developments in quantum mechanics have given rise to the string theory [5] (describing particles as one-dimensional strings, vibrating in different modes), and have brought new experiments supporting the pilot wave theory [6] (according to which there is a wave, that determines the behaviour of particles) and the many interacting worlds theory [7] (in the many worlds theories, all the quantum mechanics probability options really do exist, but each of them is manifested in a different "world"). Although all these theories offer explanations to well-known observations, they all differ fundamentally. Similarly, current cosmological research also has many different models and perspectives, whether based on the well-known Big Bang, the notion of cosmical plasma, or something else (see [8] for an overview).

The current state of scientific knowledge thus makes it difficult to decide which perspective or theory is the best approach. A survey was carried out in 2016 [9]: 1234 physicists at eight different universities were sent a questionnaire concerning their preferred interpretation of quantum mechanics[1]. Only 149 physicists responded. While 39% of respondents supported the Copenhagen interpretation (according to which a quantum system/particle does not have any defined properties and exists only as a probability distribution until it is measured), 25% supported an alternative (e.g. Many worlds, Pilot waves etc.) and 36% did not express any preference. A report on this survey states the following:

"*[...] today there are a plethora of interpretations of quantum mechanics. The interpretations in this context are in reality different theories that are designed to replicate the same results [...]. These different interpretations cannot be separated by experiments, since they are designed to give the same predictions. How should physicists then choose between the different interpretations? And is this a question that physics should concern itself with?*"

In an article connected to this survey [10] Sabine Hossenfelder from the Frankfurt Institute for Advanced Studies comments:

"*There doesn't seem to be two people who can come to any agreement on anything. It seems to me that they're just discussing the wrong things or in the wrong way.*" [10]

And so it is up to science to decide whether the time has come to ask the following question:

"Could philosophy help science understand more in this area?"

The primary foundation of science lies in observing the manifestation of all kinds of phenomena, events and processes in this world and to explain them using mathematical, empirical, and theoretical models. The primary foundation of philosophy, just like science, lies in observing phenomena, events and processes. Philosophical observation[2] does not primarily work with any single model or theory and tries to permeate the essential, internal nature and logic of things directly.

Science mainly examines our world using first of all material means (usually connected to matter) by carrying out experiments and observations, measuring, making exact calculations and verifying evidence. The results of this are then thoroughly considered, compared to each other and interpreted using logical and mathematical approaches and methods, Philosophy does not use any material means (such as telescopes, microscopes etc.), but employs the spirit and deeply immerses itself into the investigated object, merges and identifies with it in order

[1] Aarhus University, University of Copenhagen, University of Göttingen, Heidelberg University, Oxford University, California Institute of Technology, National University of Singapore, University College London

[2] The philosophical observation, investigation and cognition technique is a part of the Philosophy of Existence, and is taught at the Spiritual university of Existence (www.dub.cz)

to complete its material cognition.

Philosophical observations may be just as well-founded and truthful as scientific observations. Philosophical observations are not at all far from the way of reasoning of some of the twentieth century's most significant scientists, such as Albert Einstein (see his well-known thought experiments) and Nikola Tesla (who, in his memoirs, describes how he, after many years of intensive thinking and musing, was out taking a walk in Budapest when he suddenly saw the entire working conception of an asynchronous motor driven by an alternating current before him).

Science and philosophy have the same goal, and both disciplines use logic to support any conclusions made and filter out any mistakes. The essential difference between the two is that science mostly uses an inductive approach (from the specific to the general) while sophisticated philosophy can well use deductive logic (from the general to the specific). A discourse on inductive and deductive reasoning can be found in [11].

Sound philosophy should thus be able to provide truthful basic and axiomatic statements (using its means, philosophy considers these statements to be evident and obvious) and can then (using deductive reasoning) try to enrich and guide the reasoning of related fields of human knowledge.

Philosophy can thus try to approach to an explanation of "what" it is that scientific equations describe. Ideally, science and philosophy should go hand in hand, mutually helping each other and providing common answers to any questions about the nature of our world.

In our opinion, close cooperation between science and philosophy may open the door to a unifying understanding of the micro world and the entire universe.

The language of philosophy often differs from the terminology used by science. In this publication we therefore try to unite the terminology of philosophy and science as much as possible; it may be an important step towards mutual understanding and cooperation. We should also mention that, hereinafter, whenever philosophy is mentioned we are referring to the Philosophy[3] of Existence [1].

We would again like to stress that this analysis does not aim to provide a new theory or model of thinking (science has plenty of those already – as illustrated at the beginning of this chapter). Instead it describes how direct philosophical observations, followed by deductive logic, accommodate the results of contemporary scientific knowledge regarding our world.

Most contemporary scientists have gained a Ph.D. This abbreviation stands for "Doctor of Philosophy" (from the Latin Philosophiæ doctor). Perhaps the title also refers to the famous founder of modern science, Mr. Isaac Newton, who was also a philosopher (which the name of his pivotal publication "Philosophiae Naturalis Principia Mathematica" indicates).

[3]The Philosophy of Existence is a philosophical discipline about the basic verities of life, brought to us by the Czech philosopher Mr. Josef Zezulka. Nowadays, the discipline is taught by his student and successor, Mr. Tomas Pfeiffer.

We therefore believe that philosophy still has something to tell to modern science, and that philosophy can help move our understanding and cognition of our world a step forward.

Perhaps we could give an idea of how science and philosophy could cooperate with the following thought example (in this instance, philosophy would use the word "parable" rather than "example"):

Let us imagine, for a moment, a hypothetical civilisation composed entirely of "breatharians" (beings, in whose bodies are enclosed circles and thus do not eat any food) somewhere in the universe (laying aside the discussion of whether or not such a civilisation could exist at all). Astronauts from this civilization find a spoon, lost by someone (i.e. a tool, which they have never seen before and are thus unaware of its purpose).

Their science will investigate the spoon, measure it, weight it. It will determine the spoon's mechanical properties and density, analyse the its chemical composition and its resistance in a corrosive environment. It will make a model of the spoon, create an identical copy, and define the structure of the crystal lattice. Science will measure the spoon's electric conductivity, resistivity and magnetic properties. Science will identify endless amounts of information and data.

But all this does not bring science any closer to understanding the purpose and meaning of this spoon. Which is why disputes and arguments may arise. One scientist will notice its ornamental decorations and proclaim that this may be a religious symbol. Another scientist will claim that it might be part of a catapult from a vanished civilization of dwarfs. A third scientist will tap it against a piece of glass and will consider it to be a musical instrument. None of the scientists will be able to propose an experiment that would either support or disprove any of their theories.

This might then be a task for an advanced philosophy, i.e. a philosophy that has developed the skills of using direct observation to penetrate into the essence of things, of helping science, of investigating the object and saying:

1. This object is called "a spoon"
2. It is used for to intake food (also explaining what food means)
3. It is put into one's mouth

Dear reader, now replace this spoon with our world. From subatomic particles to the most distant galaxies on the boundaries of the observable universe. Science, with its patient and systematic work, has collected an enormous amount of data, figures and information. Science has been able to work out and propose a large number of models, conceptions, hypotheses and theories. For this, science deserves great esteem and respect.

Yet despite this, we still do not fully understand neither the origin, nor the sense or functioning of our world. We still lack a united, comprehensive view that would unify this huge amount of data and knowledge.

Dear reader, this is exactly what this publication that you are now looking at is about. This work is being put forward, with humility and awareness of own fallacy, for the consideration of those, who seek the causes of causes.

1.2 A philosophical approach to unifying the view of the micro-/macro world

We believe that there is a philosophical observation that is key to understand the unity of our world (which could subsequently be described using the language of equations and formulas). This observation provides evidence that our world is, in all respects, in all directions, on all its levels of existence, literally in any way we can perceive, observe, or quantify it, curved.

However, up until now, our understanding of our world, and therefore also our assessment thereof, has been linear.

The difference between our observation and reality is illustrated in Fig. 1.1.[4]

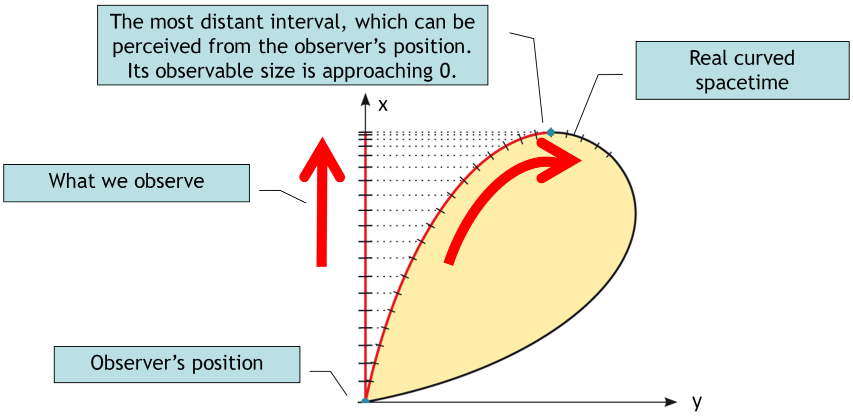


Figure 1.1: The difference between our perception and reality. When observing objects in our world, the interval (distance), for instance between us (observer) and the observed object, plays an important part. If the object is close to us (a small interval), then we observe/measure its properties with a negligible error. If the object is distant (the interval is large), the curvature of our world distorts the measured property, i.e. the difference between reality and the measured value increases. In other words, as the size of the interval increases, so does the error of any measured value of any observed physical property (e.g. mass, size, energy). At the same time, the curvature of our world prevents us from seeing further than up to a certain limit (the horizon of cognition), which is given by this curvature.

[4]This finding and observation was been made by Mr. Tomas Pfeiffer. See chap. 2.1 and also [2]

Fig. 1.2 illustrates, what happens when an observer changes his position (from position A to position B). In this example, position A belongs to an observer from our world, whereas position B belongs (from the A perspective) to a very small observer from the micro world. If observer A moves to position B (imagine the observer, and therefore also his scale, shrinking), he will see a bit further: everything that observer A sees around the position B is seen greatly distorted. Observer B will see much more accurately (and the values from his measurements in these surroundings will thus differ entirely from those of observer A). However, observer B will experience the same limitations as observer A, just a one step further away.

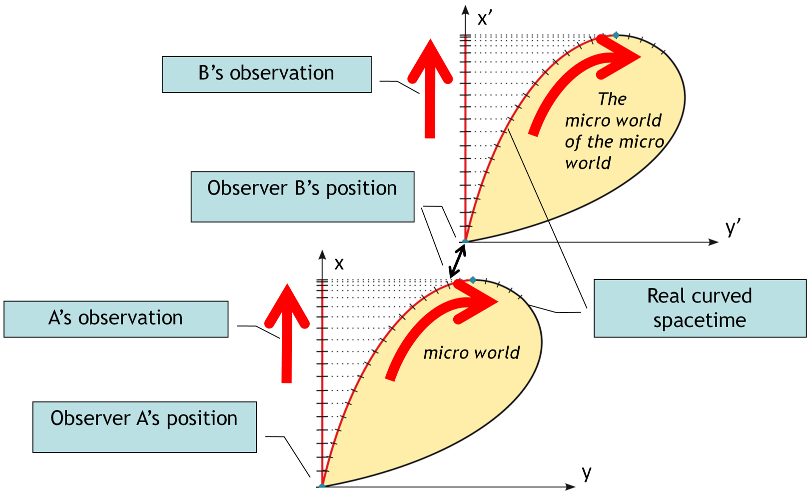


Figure 1.2: Different results observed from position A and B. As it is stated in chap. 2.1: "*If we measure the dimensions of atoms in the order of magnitude from* 10^{-11} *to* 10^{-10} *m from our observation point (A), in the spacetime of the relevant atoms (B) its dimensions may range from* 10^{13} *to* 10^{14} *m. While an atom in the micro world may have a rest mass of* 10^{-27} *to* 10^{-26} *kg from our observation point (A), an observer in the micro world (B) would measure up to* 10^{30} *kg. The lifetime of a particle measured in a particle accelerator, e.g.* 10^{-5} *s, de facto represents millions-of-years intervals within the particle's spacetime (B), etc.*"

If we measure the physical data of very distant objects, the data will be distorted by the curvature of our world. Only in our immediate surroundings will our observations of objects be almost precise and not-distorted.

This is a completely new view of the natural laws of our world.

This novel view and how it affects our observations will be thoroughly explained in the coming chapters.

Let us take a look at the present state of the scientific knowledge regarding our micro- and macro world, and at how these two worlds can be understood and connected in a united and comprehensive way.

1.3 Quantum mechanics and the double slit experiment

Quantum mechanics is a physical theory that describes what properties field particles and matter exhibit in the micro world.

It is an extension of Newton's classical mechanics that describes the behaviour of microscopic objects. The state of motion of particles (such as electrons, protons etc.) is not described through terms of classical mechanics, such as the current position and momentum (the product of velocity and mass), which are stated with a high accuracy. In quantum mechanics, particles are replaced by wave functions, which only describe the particle's statistical probability distribution of occurrence in its state of motion (see for instance [12]).

As soon as we try to measure purely the particle properties, we hit the limit of cognition, which is mathematically formulated in Heisenberg's uncertainty principle (x position, p momentum, $\hbar$ reduced Planck constant) [13]. This uncertainty regarding the particle's position and momentum is expressed in equation (1.1):

$$\Delta x \Delta p \geq \hbar/2 \tag{1.1}$$

A classic example that demonstrates how the quantum world differs from the world as we know it is the double-slit experiment, illustrated in Fig. 1.3.

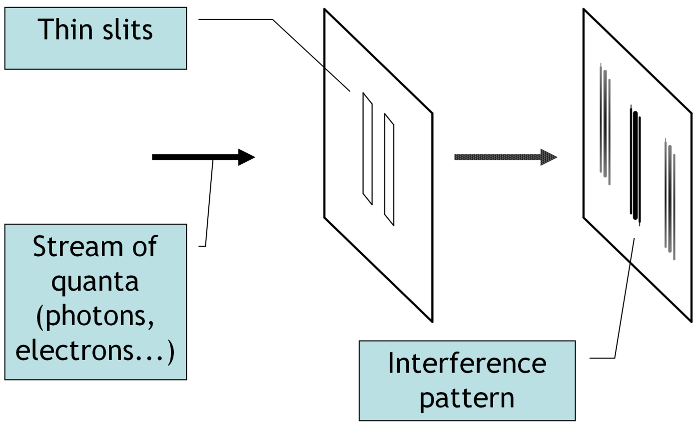


Figure 1.3: The double slit experiment is simple and famous [14]. From the left we send a stream of quanta (photons, electrons or other subatomic particles, that pass through a plate with two slits. In this experiment, the quanta behave like waves. The screen at the back shows the interference pattern created by the waves passing throw the two slits.

This experiment is a mystery that, to this day, puzzles physicists from all around the world. It consists of adding a sensitive detector capable of registering individual quanta (photons, electrons etc.) to one of the slits in the system above. When the detector is added, the entire interference pattern disappears and the particles start behaving like a stream of particles (the pattern on the screen changes and shows a pattern similar to as if grains of sand had been sent through the two slits). This occurs each time we try to determine the trajectory of each individual quantum (irrespective of the method used). The wave behaviour is manifested even if the particles/quanta are sent through one by one. The decisive factor of the observation of the interference pattern is whether or not the observer has information about the trajectory of the individual quanta at his disposal during the experiment.

The scientists Niels Bohr and Werner Heisenberg thus concluded that objects in the micro world exist as both a wave and a particle simultaneously. Which property they exhibit depends on which method is used to observe them (see the Copenhagen interpretation [15], for instance). Many other explanations of the observed dual property have since been proposed, but we cannot state for sure that we fully understand this phenomenon.

How can the term particle be derived from the wave and vice versa?

Based on the current findings and experiments, it seems as though objects in the micro world (unless registered by a detector) were strongly delocalised (spread out over macroscopic distances). Therefore, a single photon or electron (or other particle) can pass through both slits and interfere "with itself".

In 1927 Werner Heisenberg wrote [16]:

„*Since the statistical nature of quantum theory is so closely connected to the uncertainty in all observations or perceptions, one could be tempted to conclude that behind the observed, statistical world a "real world" is hidden, in which the law of causality is applicable. We want to state explicitly that we believe such speculations to be both fruitless and pointless. The only task of physics is to describe the relation between observations.*"

In this statement, Heisenberg explains his conviction that there is no classical causal reality hidden behind the statistical nature of quantum mechanics: "*quantum mechanics establishes the final failure of causality*" ([16]).

With all due respect to the famous physicist, we take the liberty to not fully agree with this strong and unequivocal statement. We would like to present our philosophical view, which could lead to an explanation and understanding of the quantum world phenomena, including the latest scientific observations (e.g. experimentally verified quantum entanglement – see the Delft experiment from 2015 [17]).

1.4 Cosmology and dark matter/energy

Cosmology is a scientific field that studies the origin, evolution, structure and future of the universe. The present conceptions about the origin of the universe and evolution are illustrated in Fig. 1.4.

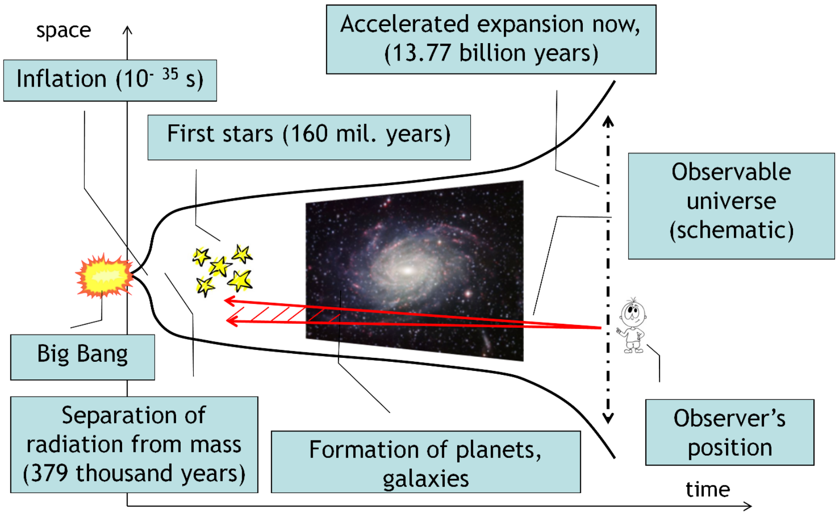


Figure 1.4: Schematic illustration of the origin, expansion and observable part of the universe according to current understanding of the Big Bang, inflation and accelerated expansion. We only perceive a tiny part of the universe, and even then looking just into the past. Based on observation it is therefore difficult to assess what our universe actually is (now) and how it will be in the future.

According to most contemporary theories, gravity is the main force structuring the universe. Most cosmological models are based on the idea that the universe was created with the Big Bang about 13.77 billion years ago. At that time, there were no differences between the macro and the micro world; the properties of the universe were governed by the particles within it.

A comprehensive information about cosmology you can find for instance in [18].

Soon after the creation of the universe, a phenomenon called inflation occurred (according to contemporary theories): in a fraction of second, the young universe expanded rapidly and evened out the creases in space-time to such an extent that according to current observations, two parallel rays remain parallel when moving through space – regardless of the distance covered or time passed. Material objects cause the curvature of spacetime in their surroundings, and this curvature is the cause of the gravitational effect between them.

About 379 thousand years later ([18], page 237), the temperature dropped (below 3000 K) as the universe expanded and electrons and nuclei combined creating the first atoms. This reduced the number of free electrons that were scattering photons. The universe thus became transparent to radiation, which could now develop independently of matter. Today, cosmic microwave background radiation can be observed passing through the universe in all directions.

The temperature of this radiation constantly falls as the universe expands (thus characterising its size). Based on the current measurements, the radiation can be assigned a temperature of about 2.75K, using the theory of black body radiation.

Ever since, (according to our current knowledge) the universe has been constantly expanding into the universe as we know it.

Observations show us that the universe looks almost the same in every direction and that at larger scales, matter is homogeneously spread throughout it. The observable universe (of which we can only observe a negligible part) enables us to infer the universe's geometry, but because we are observing the universe from within, we are not able to say anything about its overall topology (its shape or layout, or any twists or curves in the universe as a whole). We also do not know how big the universe is, or if it is finite or infinite.

As the universe expands, the objects within it are moving further away from each other, just like spots on a balloon that is being blown up. Well known Hubble's law can be applied here ([18], page 25):

$$v = Hr \tag{1.2}$$

where v is the velocity of recession, H Hubble constant and r the distance of the galaxy from the Earth. Equation (1.2) explains that the further away an object is from us, the faster it moves. The oldest identified object in the universe (and hence also the object furthest away from us) is the galaxy GN-z11 (published in 2016, [19]), which we can observe the way it was 13.4 billion years ago (approximately 400 million years after the Big Bang). Observations show that this galaxy is moving (i.e. was moving) almost at the speed of light (about 295 000 km.s^{-1}). We can also see that new stars are being born (i.e. were being born) about 20 times faster in GN-z11 than in the Milky Way [19].

Astronomical observations are limited, because the redshift means that the radiation of the object moving away shifts into the infrared spectrum making it harder to detect. We are also not able to see objects that are moving away from us faster than the speed of light. Such objects most likely do exist (due to the expansion, at a sufficiently large distance, objects are able to move away from each other faster than the speed of light) but we are not able to detect them. It is an event horizon beyond which we are not able to see.

Up until the last century, it was presumed that gravity gradually slowed down the expansion of the universe and there were speculations as to whether gravity would at some point prevail over expansion and the universe would again contract into a singularity.

In 1998, however, by observing exploding supernovae in a distant galaxy, it was found that the supernovae were further away from us (they radiated less) than their redshift suggested (this discovery was awarded with the Nobel Prize in 2011 [20]). It seems that since the Big Bang, the expansion of the universe has accelerated and the supernovae are further away than the redshift indicates.

This discovery led to a thorough reassessment of cosmological theories. Scientists assume that it is an energetic manifestation of vacuum, which creates a repulsive force and expands free space. This repulsive force is called dark energy ([18], page 101).

Observations showed that galaxies are held together by a force greater than the compound gravity of all the stars within them. This gave birth to the term dark matter ([18], page 248). Dark matter is a part of every galaxy and there should be more dark matter in the universe than there is ordinary visible matter.

According to our current knowledge, it seems that stars and planets only account for a mere 5% of the forces we can observe in the universe. In many sources today we can see that another 27% is accounted for by dark matter and 68% by dark energy.

Understanding dark matter and dark energy is one of the greatest challenges in physics today and is also one of the greatest mysteries of the universe.

With all due respect to scientific research and the meticulous and rigorous work of scientific teams, we take the liberty to disagree with the current theories regarding the age of the universe, cosmic inflation and the current understanding of dark matter and dark energy. The observed smoothness and homogeneity of the universe and the acceleration of its expansion may, in our opinion, also have a different cause and explanation.

So far, we have presented a very brief and basic overview of the current scientific knowledge and understanding of the micro and macro world. Now let us look at these two worlds through the eyes of the Philosophy of Existence.

Chapter 2

The Philosophy of Existence

2.1 The horizon of cognition

This is a philosophical explanation of contemporary scientific knowledge and mysteries that relates to the philosophical observations and theories published in *EXISTENCE – a Philosophy for Life* by Josef Zezulka[1] [1] and in *Spacetime + Gravity* [2] by Tomáš Pfeiffer[2], Josef Zezulka's student and successor.

As we know from the theory of the general relativity [3] non-Euclidean geometry is of great help when describing the universe. In this view, space-time is curved and allows the existence of objects that can never be directly observed – singularities that curve space-time so much that not even light escapes them (black holes[3]). The theory of black holes defines an event horizon [21], beyond which no events could observed by an outer observer.

[1] Josef Zezulka was an eminent Czech healer and philosopher born 30 March 1912. As he turned 33 (30 March 1945) he had an extremely deep spiritual experience – an awakening. This moment changed his perception and his understanding of events and the world. His consciousness expanded. He received two gifts: the gift of healing and the gift of the spirit. With his gifts, he not only healed and founded the medical field Biotronics, he also started to teach people about the fundamental truths of life - the Philosophy of Existence. In time, his name became a concept that is known even abroad.

[2] Tomáš Pfeiffer is Josef Zezulka's successor. As Josef Zezulka's student, Tomáš Pfeiffer heals and develops the field of Biotronics and also regularly lectures about and explains the Philosophy of Existence. He is the founder of the philosophical school The Spiritual University of Existence and of the Fellowship of Josef Zezulka – a new kind of religious society that aims to benefit of the entire biosphere. Please visit www.dub.cz for more information.

[3] Black holes are objects with such a large mass (such a great gravitational force), that no object (including light) can leave its relevant spacetime region. The black holes were predicted by general relativity [3], and their existence is considered to be proven based on astronomical observations.

However, by philosophically observing the foundations of our world we can understand the curvature as a fundamental and integral part of the reality we live in.

Due to this curvature, our ability to observe is always limited by the "horizon of cognition" = the limiting boundary beyond which we cannot see (perceive, observe) anything.

This does not only relate to the material world (such as quantum mechanics and astronomy) but also to all non-material aspects such as psychology, philosophy, history, culture, and social, spiritual and health aspects or any other aspects – basically, anything that we can perceive, observe, assess or quantify in any other way.

Horizon of cognition is a general law that applies anytime, anywhere and everywhere.

From a scientific perspective we can relate this to the value of measurable intervals and how they correspond to the actual size in a curved space. The Fig. 2.1 illustrates the horizon of cognition in relation to micro and macro worlds [2]. The Figure highlights the meaning and importance of the axis' intersection, which is the observer's position[4]; i.e. the point where the interval begins.

As *Spacetime + Gravity* puts it [2], page 8:

„*An interval can be understood as anything we can quantify – what we perceive, measure, evaluate, i.e. anything in our world. Therefore, it concerns mathematics, physics, astronomy, psychology, philosophy, etc. The following figure implies the importance of the axis origin – the point where the interval starts – the position of the observer. (...) When in proximity to the horizon of cognition, no matter how large the interval in the curved spacetime is, it no longer increases the interval on the fictitious linear axis. This is what I (Tomáš Pfeiffer) call the horizon of cognition beyond which it is not possible to observe, i.e. measure, anything anymore. It is always true for both directions – towards the universe and the atom, i.e. for light-years and angströms. (...) Nonlinearity is also manifested in the fact that any attempt at measurement is burdened by error being infinitely small at small intervals and, conversely, infinitely large at large ones.*“ [2]

Our ability to observe the micro and macro world is thus essentially limited. So we are in fact observing (and hence also measuring and quantifying) the world in the plane of a right-angled Euclidean grid. But in reality, the world is curved in such a way that, once we reach the horizon of cognition, we lose the ability to measure, recognise or quantify anything at all.

[4]The term "observer" here refers to any form of live being, which is aware of its own existence, "its notion of existence - I am". An observer may thus be also an animal, a plant, or any other possible life form.

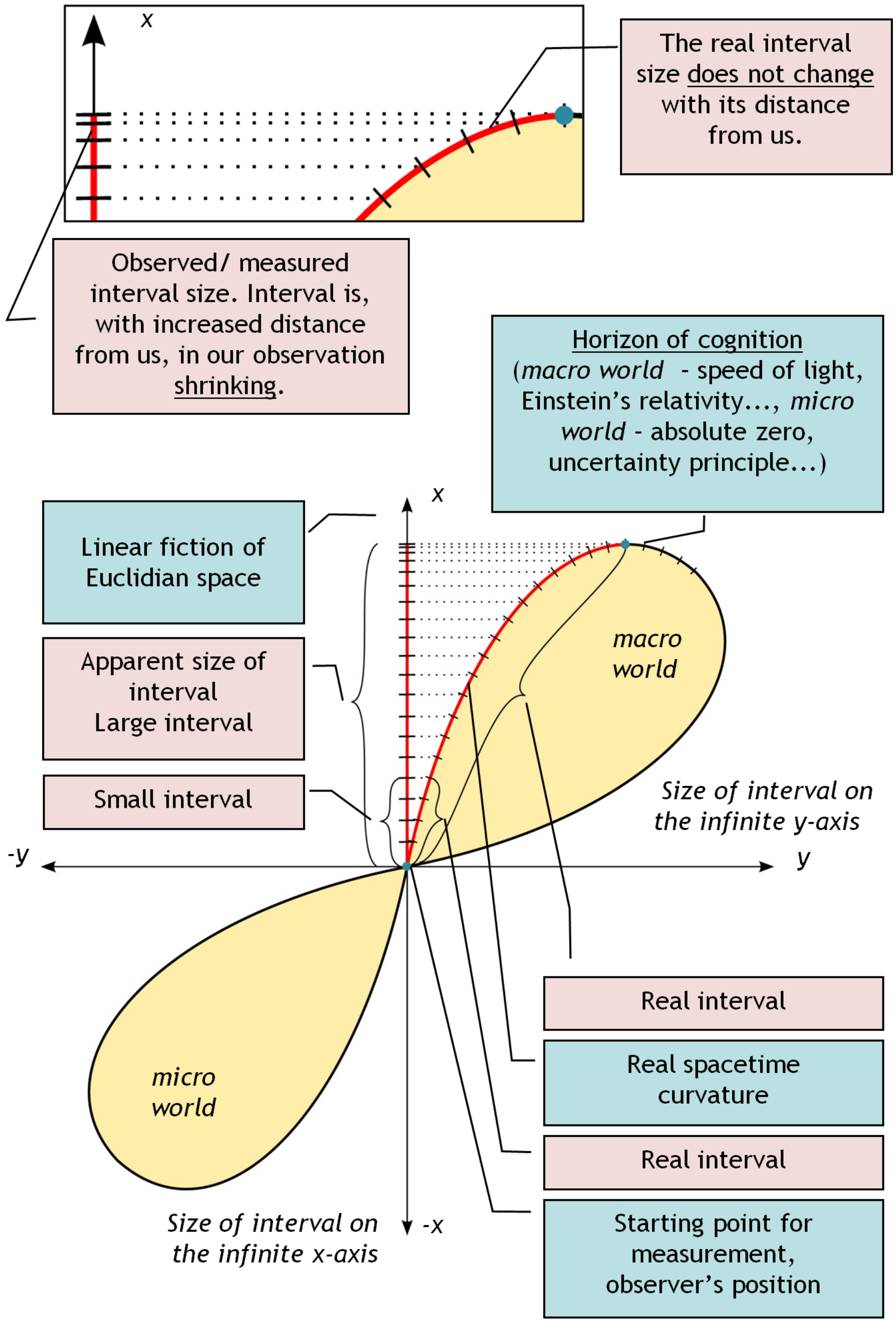


Figure 2.1: Horizon of cognition [2] - schematic illustration. „*This image illustrates the relationship between the value of the measurable interval and its real size in the curved space. This relationship is generally applicable to both macro and micro world. Around the horizon of cognition we are no longer able to determine the position as a change of the interval. There is an uncertainty when quantifying anything, both time and space.*"

In our observation, our perception is always linear[5].
Real space (Earth, the universe) is always curved[6].
Therefore, there is a horizon of cognition, beyond which we are not able to observe anything.

And so when we look at the micro world at the horizon of cognition, the spacetime curvature makes the intervals "twist", i.e. in our linear perception they shorten and form a line, one behind the other (their number grows infinitely) and we thus lose the ability to measure, quantify or differentiate between them in any way.

Analogically, the increments of the large intervals (which are also intervals), when looking at the macro world at the horizon of cognition, also "twist" due to the spacetime curvature, i.e. in our linear perception they shorten and form a line, one behind the other (their number grows infinitely) and we thus lose the ability to measure, quantify or differentiate between them in any way.

And so we can build ever bigger particle accelerators and we can construct ever bigger telescopes – and yet (due to the curvature) our ability to discover and observe will keep decreasing (as illustrated by Fig. 2.1, increasing the intervals on the x-axis will no longer improve our ability to observe the actual interval in a curved space).

Regarding our ability to observe and differentiate, there is no difference between observing the macro and micro world.

Contemporary physics measures and quantifies in metres, Joules and kilogrammes (physical intervals) – but also these are all merely linear ways of measuring in-

[5]A linear dependence or relationship can be understood as a dependence, which can be mathematically described using linear functions (where there are, for instance, no powers etc.). The measured/observed output value is directly proportional the input value. A linear function can thus be expressed as: $f(x) = ax + b$, where a, b are arbitrary constants.

We can for instance imagine, that the longer my route is, the more time I need to spend on it (if my speed is constant). A relation between (x) and $f(x)$ can also be considered as a relation between a cause and a consequence; then a small change to (x) causes a small change to the consequence $f(x)$. A geometrical expression of a linear quantity is a straight line. If we measure the consequence $f(x)$, such as the amount of time spent on a journey, an independent observer can provide exact information about (x) – the length of the route.

[6]Non-linear dependence (showing curvature) is a dependence which violates the rules of a linear dependence. The relation between the measured/observed output interval $f(x)$ related to the input interval (x) cannot be expressed by a direct proportionality. Let us imagine, that in one location, on an infinite, and ideally straight, highway there are two people, A and B. Then B starts to run, moving away from A on this very long, straight highway. A will easily be able to determine B's starting velocity, and will still be able to see B getting smaller and smaller as the distance increases. However, the further B gets along the highway, the more tired he will become. Therefore, he will be gradually slowing down. The time spent on this journey will thus grow faster and faster as the length of the road increases. For A, who only has a linear measuring axis, it will become increasingly difficult to determine how far B has run based on merely the time B has spent on the journey (the error of its determination will grow). Should B, feeling increasingly tired, almost stop or take breaks, it becomes very difficult or almost impossible for A to exactly determine the actual distance B has run based purely on the time measurement. If A assumes that B is still moving away with at the same speed (as at the beginning, i.e. if A's observation/consideration follows Euclidean axes), his findings (observations) will be burdened by a larger and larger error that increases along with the distance (interval) B covers.

tervals and depend solely on the observation point, on our position in relation to the object in question. The law of the horizon of cognition is therefore key if we want to understand the relation between the micro and macro world [2], page 15:

„*The mathematics of large intervals very much differs from our linear mathematics. For instance, the lifetime of a particle measured in a particle accelerator, e.g. 10^{-5} s, de facto represents millions-of-years intervals within the particle's spacetime, since the law of relativity (law of the horizon of cognition) applies to everything; The result of measurement is therefore not real but a fiction of a linear mapping (...). The same relations are also true in determining the particle energy and mass.*" [2]

As already stated in Fig. 1.2, if we measure the dimensions of atoms in the order of magnitude from 10^{-11} to 10^{-10} m from our observation point, in the spacetime of the relevant atoms its dimensions may range from 10^{13} to 10^{14} m. While an atom in the micro world may have a rest mass of 10^{-27} to 10^{-26} kg from our observation point, an observer in the micro world would measure up to 10^{30} kg etc.

Philosophically, we can imagine the horizon of cognition as a perfect sphere with the observer placed in the middle. The observer is completely enclosed in the sphere and cannot observe or discover anything beyond the borders of the sphere. If the observer changes his position (he can move in space as well as change his size), the entire sphere moves with him.

From the perspective of relativity, we could also imagine that the observer does not move (the observer remains the same), but that is the world that changes size around him. The effect is the same. When standing on a boat on a river,

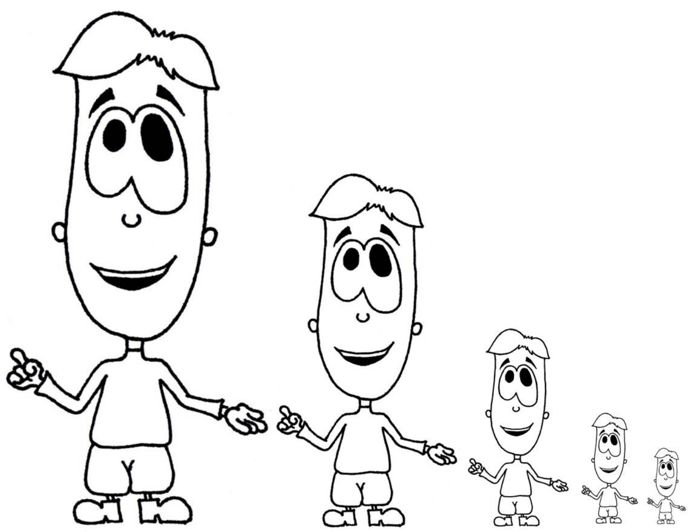


Figure 2.2: Changing position/size of the observer. Is the person on the picture getting smaller and smaller, or is he getting more and more distant?

it is the shore that moves. But if you are standing on the shore, it is the boat that moves.

The change in the position/size of the observed subject is illustrated in Fig. 2.2. This figure shows that, from the horizon of cognition point of view, the concepts "smaller" and "more distant" are, in fact, interchangeable, and that, in our observations, micro-world objects are just as distant as the whole universe.

2.2 The law of symmetry

The horizon of cognition is able to explain a number of mysteries that science still struggles with. It plays a key part in connecting the micro and macro world. The perfect symmetry of our world is a direct consequence of the horizon of cognition (because whichever way we look, our view is always limited by the horizon of cognition).

Contemporary cosmologists recognise the validity of the Copernican principle (see [22]), which is based on the philosophical (!) supposition that the Earth is not a privileged observation point. We can therefore assume that the universe looks the same elsewhere. This assumption also well complies with general astronomical observations, including those made by the Hubble Space Telescope.

Philosophical observations and understanding not only fully confirm this, but also show that this principle should be applicable, not only when up, down, right, left, backwards or forwards, but also when moving into micro and macro worlds.

We now propose expanding the validity of Copernican principle, something which may provide us with the key to a fundamental understanding of our world. It is an expression of the symmetry of the universe, a symmetry most likely known to ancient philosophers. The opening sentences on the legendary Emerald Tablet[7] can serve as an example. These sentences were found among the papers of the famous British physicist and mathematician Isaac Newton (the founder of classical mechanics and exact science in general) and are available at the Royal Library in Cambridge to this day [23]:

„*That which is below is like that which is above*
and that which is above is like that which is below
to do the miracles of one only thing."

Did this genius and father of modern science consider the consequences of this insight?

[7]The Emerald Tablet is shrouded in mystery. We do not know where it was discovered (most likely in an Egyptian tomb or in the pyramids) nor do we know when or where it disappeared again. The only thing that is certain, is it was in human possession at some point. The tablet was made of green glass (hence the name Emerald).

The law of the horizon of cognition gives rise to the law of symmetry of the universe, and thanks to this law we can understand not only the geometry, but also the topology of our world.

The consequence of expanding the validity of the Copernican principle is namely that our word is an infinite formation contained as a whole in any of its own parts of any size (this means in any arbitrarily small or large part).

Imagine an observer that "grows smaller and smaller", that "plunges or flies" into the subatomic world. This observer finds an endless chain of "sub-universes" (universes like ours with stars and planets, etc.) one after the other. Similarly, we can imagine an observer that "grows larger and larger". Such an observer also finds an endless chain of "super-universes" (universes like ours with stars and planets, etc.). Yet both of these seemingly one-way journeys intersect in the infinity (flow into each other) and so each observer will always return to where he started. And it goes on and on in an infinite loop.

Whichever direction we look in the universe, including into the micro and macro worlds, we can only ever see as far as the "envelope" created by the horizon of cognition. And wherever we move, our "view", i.e. the horizon of cognition moves with us – and so whatever we observe, it remains the same (similar).

This reasoning is supported by Josef Zezulka's philosophical observations, as described in his publication *Existence – A Philosophy for Life* [1], page 19:

„*I was standing on a sandy seashore on our planet. It was a clear night with a sky full of stars. As I was gazing at the familiar constellations, I started growing upwards and outwards fast. I was spreading out into the universe. Our planet was shrinking away below me. The entire universe was drawing near and condensing and I suddenly realised that I was looking at atoms of a certain material. Everything continued condensing and diminishing. I realised that I was looking at some gigantic object, which gradually shrank into a big boulder, then into a smaller one, until I was holding a stone in my outstretched hand. The stone became smaller and it ended up as just a grain of sand. I looked around me and saw that I was standing on seashore of some planet. There was splendid sky full of stars above my head and I realised that in my hand I was holding a little grain of sand in which there was an atom around whose core an electron was revolving, and that this electron was the planet I had just come from. I realised I was in another material sphere. I let the sand grain fall to the ground, looked at the starlit sky and began to grow again. Everything condensed and grew smaller once again until finally there was again a grain of sand in the palm of my hand. In one of its atoms there was the planet on whose seashore there was the grain of sand in which there was the atom with our planet, from which I had come. This repeated itself several more times, I don't know how many times, but through this constant moving into dimensionally larger spheres I finally got to the planet from which I had originally started.*

When I was standing again at my original place on the seashore, I bent down and took a grain of sand in my palm. I was looking at it and at that moment I began to get smaller. It was as if I was flying into that grain. The grain was growing bigger in front of me, it was as big as a boulder, then as a mountain and

I saw its matter becoming thinner. I realised that I was looking at its molecules and then at its atoms. I chose one atom and flew towards it. I saw its nucleus around which smaller particles were revolving. I realised they were planets. I chose one of them. I was getting smaller and flew towards it. It grew bigger and bigger until I began to recognise its seas and continents. Everything was getting closer and I landed on it. I was standing on its sandy seashore. My stature was of approximately the same height as on our planet. Sizes were normal too, despite being aware of the fact that I had become small enough to get into an atom. I realised that I had carried out a reversal of what had occurred before and that I was now standing on the planet which was now a part of the atom of the sand that was now lying on the shore of our planet. I looked about the planet, about its starlit sky, bent down and took a grain of sand in the palm of my hand. I began to shrink again, everything around me was becoming thinner and the experience repeated itself. Once again I was sinking into the lower and lower material spheres, I was going through them until I returned to our planet, from which I had come.

Whether I went up into the universe or down into an atom, I always returned to the starting point.“ [1]

The above shows a self-similarity on many levels of existence. Such a formation is similar to a mathematical fractal (see [24]) – i.e. a pattern that reproduces the same shapes and patterns whichever part we magnify (or demagnify). This phenomenon is called self-similarity, and this is why fractals are independent on any kind of scale. The chaotic systems (systems in which a subtle change in the initial condition alters the final state significantly, see [25]), that we come across in our everyday lives, are also a typical dynamical expression of fractals.

This sounds almost utopian. Could such a thing really be true? It is not just meaningless speculation that does not agree at all with scientific findings based on observations made by state-of-the-art equipment?

There are several analogies, such as:

1. In the micro world, the atoms/molecules and their electrons are similar to stars and binary or multiple star systems and their planets. (Bearing in mind the old Rutherford and later Bohr atom model with electrons orbiting around the nucleus as the planets around a sun [26]). There is a similar ratio between mass/free space and classical calculations can be used to calculate the angular momentum of the electron – as if the electron was actually orbiting around the nucleus.
2. The atoms and molecules of bodies warmer than absolute zero always emit heat (infrared) radiation, similar to the most distant observable galaxies (within the limit of the horizon of cognition) which starlight, due to the redshift, has shifted into the infrared spectrum – and is thus very difficult for us to detect.
3. In the micro world, the nuclei of the heaviest atoms spontaneously decay and thus emit high energy electromagnetic gamma radiation. In the macro world, explosions of the largest stars (supernovae) are also accompanied by intense bursts of gamma radiation.

However, there are fundamental differences, such as the following:

1. Objects in the macro world are clearly defined, certain, and predictable; we can describe their behaviour with Newton's classical mechanics or relativistic mechanics. Objects in the micro world behave probabilistically; unless directly observed, they are uncertain and can be described using the wave functions of quantum mechanics.
2. Typically, star systems and galaxies are concentrated in a plane of rotation, where the planets and stars orbit around a respective core. However, the atoms and molecules in the micro world are not so "flat"; the shape of atomic orbitals is much more complex and is given by the solution of wave equations, which has observable consequences for forces, energy and geometry. The structure of atomic nuclei (protons and neutrons, that are further composed of quarks) does not correspond to our knowledge about the sun and stars either (no such structure has been observed in the sun/stars).
3. Objects in the micro world behave and exhibit properties that are not reflected in the macro world (quantisation of energy levels, tunnelling, quantum entanglement, etc.) Objects in the micro world also behave differently depending on whether or not they are directly observed, detected – as if our consciousness shaped the reality we observe. Objects in the macro world, on the other hand, are always the same and do not exhibit any duality.

This philosophical statement aims to provide science with a clear and logical explanation as to why the results of scientific observations are what they are. You can of course reject it as mere unsubstantiated speculation.

Or you can try listening to the voice of philosophy; let yourself be inspired and reflect on the greatest mysteries of our world with us.

2.3 Quantisation of spacetime

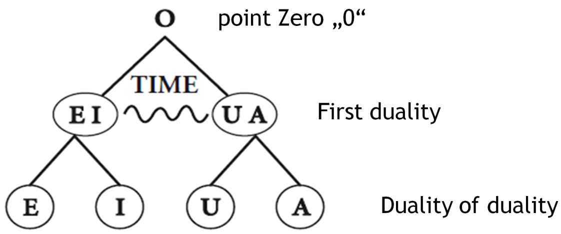
2.3.1 The origin of spacetime

We can now consider the consequences of the horizon of cognition in greater depth. The horizon of cognition is a horizon beyond which nothing can be perceived, observed or measured without changing the observer's position. We will show that this directly leads to the division of spacetime into mutually connected intervals – quanta (!).

In relation to this, we must first outline the philosophical understanding of some basic terms: time, space, interval and motion. To do so, we need to go all the way back to the origin of our world and the universe.

What does the Philosophy of Existence tell us about this? How did our world and the universe come into being?

When philosophically observing the origin of our world, we can see that everything that exists came into being through division. Imagine the beginning as a point Zero[8] (zero state of time and space) that divides into opposite poles, as is illustrated in Fig. 2.3).



„E“ *Earth, centripetality : Solid phase, concentration, egocentrism, centripetal force*

„I“ *Air, centrifugality : Gaseous phase, diffusion, altruism, repulsive force*

„U“ Water, *peace : Liquid phase, coldness, serenity, relaxation, force of slowing down*

„A“ *Fire, glow : Plasma phase, enthusiasm, excitement, force of heat + transformation*

Figure 2.3: Point Zero „O“ divides creating spacetime [2]. Everything around us originated with the division of „zero state of space and time“ [1], [2]. The law of duality manifested itself in the way, that the first division created time and space, and the second division (the law of duality is valid also for the duality itself) created the 3D space we perceive. This is how the four poles of this double duality were created. We can consider these poles as the building blocks of our world. Ancient Greek philosophers, such as Empedocles [27], were familiar with them and called them fire (here A), water (here U), earth (here E) and air (here I). Note.: The forth dimension (which we are not able to perceive, was created by another mechanism, about which we will explain later.

The origin of our world through the process of division can also be described mathematically:

$$0 = (+1 - 1) + (+1 - 1)$$

Through the division of the point “0” (Zero), two pairs of forces (creative principles) are created. Each of these forces divided further into two forces (creative principles) of opposite poles. The grand total is still 0.

[8] A “Zero” state of time and space is something, which cannot be described with current mathematics or science. Understanding it fully exceeds the capability of the human brain. Zero state does not mean that nothing exists – on the contrary, everything exists, but this everything is not being manifested. We can imagine (this is just a parable to help us understand) a very thin fan, folded up. So thin, that we cannot see or detect it with any means (i.e. it is invisible). In this state of a “folded fan”, neither time, nor space is manifested – they exist, but only in their “folded up” (= not manifested) form. This Zero state can also be referred to as the Podstata, see Josef Zezulka’s explanation in [1], page 7.:

“*The Podstata is the fundamental timeless and dimensionless existence – it is the original nucleus, from which everything has arisen. The Podstata is the highest term and the basis of what we understand as reality as well as that which is not yet real for us – it defines sensory perception. Everything – both visible and invisible – is present within it.*”

From this „Podstata“, “0” (Zero) point, a small part separated and started to divide. We can picture this as our imaginary folded fan unfolding. At this moment, it becomes possible to observe the fan, which also means that the great variety and diversity of our world is coming into existence. Our world is then thus called “The Creative Work” in reference to this. See [1], page 7.

We can now think of time and space as a kind of "playground" which is a manifestation of the world's four poles[9] (E – Earth/centripetalism, I – Air/centrifugalism, U – Water/peace, A – Fire/glow). These four poles are the basic building blocks that are present in everything we know – so not only in material, the psyche or in forces but also in time and the world's developmental sequences. The four poles are manifested in the world's four dimensions (4D), of which we are able to perceive only three (3D).

The duality of everything is also related to matter. Nowadays, matter is generally considered to be the primary and defining phenomenon (for example, we regard the consciousness as a manifestation of highly organised organic matter, something that originates and disintegrates along with the matter; according to science, love is a biochemical reaction in the brain etc.). But in a dual word, matter necessarily and inherently also has a counterpart, an opposite. The counterpart to matter (which is manifested in the way we think and perceive) can be regarded as the building block(s) from which all thought structures and processes are built (philosophy would use the word "spirit"[10] here). The nature of this "non-matter" is the same as matter, but has the opposite sign (a counterpart).

For example, with regard to matter we are familiar with inertia as a common property of physical objects (see Newton's first law of motion), whereas its counterpart consists of traditions, customs and habits. They are essentially two poles of a single property, one expressed in matter, the other in "non-matter".

Should only "Matter" and "Spirit" exist, our world would lack all dynamic time manifestation. Nothing would happen, change, or develop. Observations would not be possible either. This is why there is a third, power (vital[11]) part of our world, which pervades both matter and spirit, and gives them a rhythm, movement and vitality.

Matter, spirit and vitality are composed of the same four poles, the same ba-

[9] These four poles, or creative principles, are called "The Creative Four" – Josef Zezulka [1], page 8. The Creative Four are manifested in matter, in the opposite of matter, which we can call "Spirit", and in the vital (power) manifestation. See [1] for a more detailed explanation.

[10] Our current science is not able to work with the notion of "Spirit", which is not dependent on matter. This is perhaps due to the fact that "Spirit" can neither be measured, nor mathematically described. An explanation of "Spirit" is found in [1], page 8:

„*The Spirit forms the opposite of matter by the creative division of the principal part. The character of Spirit is mental. In the beginning, as an inorganic spirit, it stands out separately out from matter. Later, when favourable conditions occur on the planet, a small part of it unites with matter and the prevalent part remains inorganic. It is analogical with its antipole – the matter, where again just a small part of our planet's matter is transformed into organic, while the prevalent part stays inorganic.*"

Further, in [1], page 28:
„*The spiritual component is most similar to the term we know as thinking – psyche – the mind. It is the part that created, and in the course of our time still creates, events, shapes, situations and psychic forms (. . .). It manifests itself in forms of being as thinking. It is the spirit that is a plan of everything that exists.*"

[11] See [1], page 29:

„*The third component is vital. It is the vital force that moves through spirit and matter. It is the oscillation of life – rhythm, that is coincidented by its existence in the Creative Work. This is because it is dependent on time, which doesn't exist in the Proto-podstata. (. . .) It is an agent of processes and procedures; it is the vital force.*"

sic building blocks or creative principles. The poles are always the same, they differ only how they manifest themselves, depending on whether they manifest themselves in matter, spirit or the power/vital activity. For instance, the “Earth” manifests in matter as solidity, a solid state; in spirit as a concentration, will, egocentrism, in power (vital) manifestation as a centripetal force, causing clustering, connecting, aggregating (imagine gravity, for instance). At the same time, all these are just different manifestations of the same, identical basic building block. Everything we know is thus comprised of the four building blocks (poles, creative principles) described above.

Stephen Hawking mentions the four basic building blocks in *A Brief History of Time* [4]: „*... Aristotle's theory that everything was made out of four elements – earth, air, fire and water, was simple enough to qualify, but it did not make any clear predictions.*“

In order to be able to make true and certain predictions about the future based on the four elements, we need to develop the philosophical observations that we are sharing here into specific formulas and equations. This is however only possible if philosophy and science cooperate.

Let us summarize these basic principles once more. According to philosophical observations, the world we perceive originated through the division of the point “0”. Duality is therefore a fundamental and inseparable attribute of our world (as will be shown later, even gravity has a dual antipole). The four poles, creative principles, the basic building blocks of our world, originated from this division. They manifest themselves in the world's matter, spirit and vital/power.

Science regards matter as the primary, initial, determining and therefore superordinate component of our world. The spiritual and power manifestations are only considered to be attributes and manifestations of matter.

Philosophical observation instead considers the three components to be equal. They have “*a common nucleus and the same fundamental character. (...). They blend with their activity and they are inseparable.*” See [1], page 28. These components are: matter, spirit (which is basically the same as matter, just the opposite pole, like a mirror view), and finally vitality/power, which moves through and fills both spirit and matter, giving them life, i.e. making their manifestations dynamic.

Based on the knowledge that division was the origin of everything, we can try to comprehend the duality of all existence. The consequences of this duality are fundamental and also impact scientific knowledge.

Since division was the origin of everything that “is”, no single pole in this “is” can ever exist anywhere without the other pole (like magnets). And so nothing can exist without an opposite, a counterpart. Therefore, every scientific law, however valid and verified, must also encompass its negation and violation (or it would not have been able neither to emerge, nor or exist).

That fact that one pole cannot exist without the other is fundamental to understanding the symmetry of the world we live in.

In order to understand the "playing field" of our world – i.e. time and space (which is what we are discussing now), we also need to understand that a manifestation of any kind of dynamics (motion) in spacetime is connected to observation. Without observation, there is no motion, no time and no space. Everything that exists is static, and all and any dynamics are created by the observer (!).

And now we can move on to explaining the basic terms.

2.3.2 Time

What is time? There is no clear, generally accepted and unambiguous definition of time. What we do know, is that time enables us to describe the order and sequence of events or developments, to quantify how long they last or intervals between them.

On this matter, the Philosophy of Existence states [1], page 87: *„There is no past. There is no future. Everything is now!" The Creative Work (note: this refers to our entire world) endures in its motionlessness. The past and the future are simultaneous. Only we, our "I am" rove in the completed events and create the notion of time in our mind.*"

According to the Philosophy of Existence, time can only be understood in relation to the observer and his connection to our world, which is otherwise a completely static object (!).

There is no time without an observer. In other words, time is just one way of looking at a finished product. Imagine a river on a map – we perceive it as solid, timeless, static object. But if we connect to it, become a drop of water within it, its motion makes us perceive its dynamic expression in time – to us, time then exists.

In our perception, time is inseparably connected to motion. Without motion we cannot perceive time (!). However, when we quantify time, it is always connected to some kind of periodic movement, oscillation (may it be oscillation of a pendulum clock or measurement of light beam reflections between two mirrors according to the special theory of relativity). And so it is understandable that time as such always and inevitably OSCILLATES in our perception.

When observing objects (intervals) close to the observer, time seems to be a perfectly continuous and uniform continuum. The case is completely different at the horizon of cognition.

When we move into the micro world (observing smaller and smaller parts), the time we perceive accelerates alongside the growing frequency of the micro world's vibrations (oscillations). They accelerate to such an extent that, as we draw close to the horizon of cognition, we are no longer able to register any motion (and thus lose the ability to quantify time). The perception of time disappears, blends and crumbles into a static set of possible states (of time quanta) that are perceived simultaneously. There is a border frequency beyond which we cannot perceive anything. This is why to us, time is a fractal property, just as everything else.

Science relates to this when speaking of Planck time [28]. In 1899, Max Planck defined a Planck second as the time it takes for a photon in a vacuum to travel 1 Planck length. According to our current knowledge, nothing can happen in less time than a Planck second, and this time interval is considered to be the basic time quantum. Planck time is approximately 5.39×10^{-44} s [29], whereas the shortest measured time interval is an attosecond (10^{-18} s) [30], which is approximately 10^{26} Planck seconds. This shows that, in relation to time scales, science also recognises the existence of the horizon of cognition.

Moving into the macro world (observing larger and larger objects), the time we perceive slows down alongside the decreasing frequency of the macro world's vibrations (oscillations). It slows all the way to zero (similar to the horizon of black holes) or when travelling at relative velocities comparable to the speed of light (the special theory of relativity). Our perception of time thus disappears and we only perceive a single given state, one static quantum (of the whole universe) and, again, we lose any ability to measure or quantify it. The perception of additional time increments disappears, blends and crumbles into a static set of possible states (of time quanta) that are perceived simultaneously. It is not possible to quantify anything in a state of absolute rest (zero frequency).

The change in time perception when moving into the micro or macro world is illustrated in Fig. 2.4.

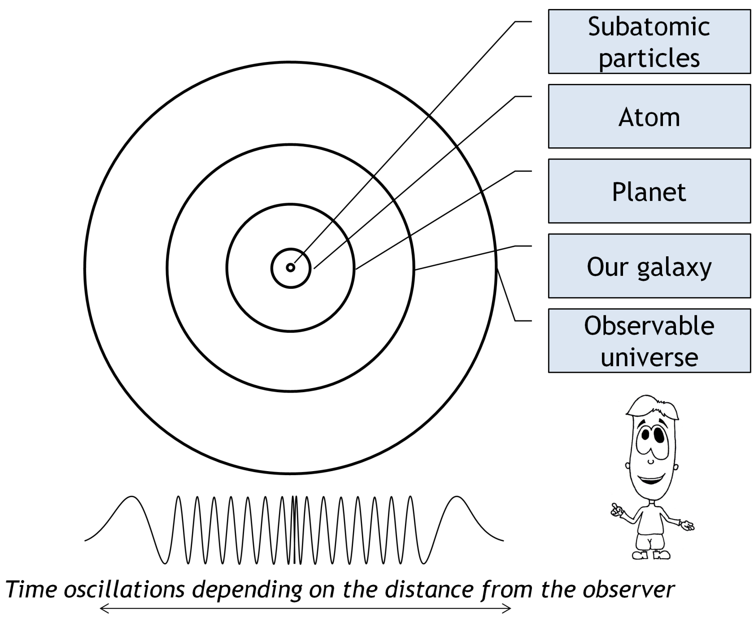


Figure 2.4: An illustration of time accelerating and decelerating when smaller and larger items are observed from the position of the observer in our world.

The illusion of time acceleration and deceleration is a manifestation of the horizon of cognition and of the fractal structure of our world that is direct consequence of the horizon of cognition.

Philosophically, time can be understood as oscillations between two poles. These oscillations enable us to perceive and observe sequences; they provide us with a causality scale. Nothing oscillates in the undivided state (point zero for time and space) – there is no causal perception of time. Time only came into being with the process of division, and nothing has been at rest in the universe ever since. At the same time, our ability to distinguish time and causality completely disappears at the limit or our observations, given by the horizon of cognition.

From another perspective (4D) time exists (as a consequence of division) in a static form and it is only a 3D observer that makes it dynamic. In other words, all possible changes of state also exist in their constant, unchanging and infinite form. It is just the 3D observer that brings due to his observing this static time to life, makes it localised, determines the dynamic a place of a specific time oscillation.

2.3.3 Space

What is space? It is again difficult to provide a precise definition. The term space is usually used to refer to an extent in which we can perceive and distinguish individual objects, their shape and motion.

Again, it is a property that determines our ability to perceive and is connected only to the observer. In actual fact, similar to time, space originates in our mind as we observe and regard the basic thought structures that create our world. As with time, the perception of space is always connected to motion.

Imagine that you want to look at two points that cannot be observed at the same time. We perceive them as spatially detached. We look at one point and then at the other, and then at the first again etc. Yet both points exist invariably, independently of us observing them (!). In fact, it is our OBSERVATION that oscillates from one to the other (like when we look left and right at a zebra crossing). Our perception of space thus originates through our observation and is hence virtual-illusory.

In our perception, space OSCILLATES, just like time.

So just like we need vibrations (periodical movements) in order to quantify time, we need scales (matter) to quantify space. When observing objects (intervals) close to the observer, space seems to be a perfectly continuous and uniform continuum. Yet here too, the case is completely different at the horizon of cognition.

Moving into the micro world, we perceive that space concentrates and thickens (as if space disappeared) to such an extent that, at the horizon of cognition (e.g. sub-particles of atom nuclei), we completely lose our ability to compare it to any scale (we do not have one). At the horizon of cognition, space completely disappears from our observations (similar to black holes at the event horizon [21]) and we can no longer measure or quantify it.

Moving into the macro world (into the super-universe), we perceive that space (our perception of the universe) spreads and thins out (as if space were increasing). At the horizon of cognition, we are not able to observe any matter (in our perception, space has spread and increased so much, that our observations do not show any matter), whatever telescope we may use, and again we are not able to compare it to anything, to measure it.

The illusion of space thickening or thinning is a manifestation of the horizon of cognition and fractal structure of our world that is direct consequence of the horizon of cognition. We can say that density is a fractal property that is dependent purely on the position of the observer.

At the horizon of cognition, the oscillating nature of space also manifests itself as its quantisation. As we move into the micro world, space crumbles into a static set of states that are perceived simultaneously (a concentration and thickening of spatial perceptions into singular points, quanta). As we move into the macro world we perceive the entire visible universe as a single spatial quantum, and we are not able to distinguish any further increments (also quantised) or to compare them to anything in space.

We defined time as an oscillation between the two poles of our divided world; space can be regarded as the playground, the arena that arises between these two poles. Space is the span between zero and infinity – in our perception the span between the opposing poles of the horizon of our cognition.

We can also regard space as a way to project an infinitely small point. In its essence, this infinitely small infinity contains everything: its compound part that is not manifested as well as the counterpart in its division, where NOTHING becomes SOMETHING, yet is in essence the same.

2.3.4 Motion

The previous sections related time and space to motion. But what is motion?

Any kind of motion can be regarded as an action that connects time and space together. We usually relate motion to matter as an expression of a change in its position, shape, size or properties.

If we study motion philosophically, we find that what we perceive as motion is actually the event of dynamics being added to a static formation. It is our observation that adds the dynamics. We have already mentioned that our world and everything around us exists constantly; every possible manifestation, time, state and form exists simultaneously and is static. There was nothing, there will be nothing, everything “is” [1]. Our whole world is a static formation. Its existence does not depend on any observer – the observer does not create its existence, the existence IS.

It is our OBSERVATION that gives this world MOTION, as we connect to time and space at a certain point and perceive the existence of time and space as an oscillation (as described above in the sections *Time* and *Space*).

Our perception of MOTION, i.e. the dynamics of time and space, can be philosophically identified with OBSERVATION.

The physical quantity that characterises motion is velocity (with its magnitude – speed), which connects time and space together. The limits of the horizon of cognition are equally applicable to speed (see the illustration in the Fig. 2.5).

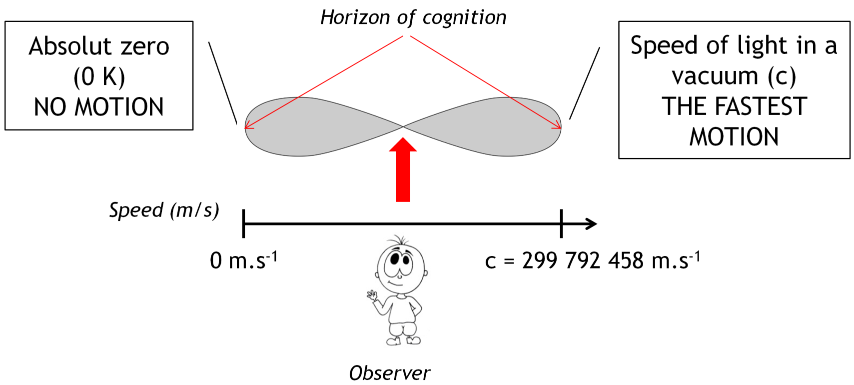


Figure 2.5: Limiting speed at the horizon of cognition. When we measure motion, we are on both sides limited by the horizon of cognition. We consider the highest measurable speed to be the speed of light in a vacuum (c), but the only way we could talk about zero speed (due to the permanent vibrational motion of all atoms and molecules), would be if the observed object reached a temperature of absolute zero (0 K) and simulataneously we did not consider the observer's oscillation. It would be interesting to cool the observer (measuring device) to a temperature close to absolute zero and simultaneously observe just a single particle, i.e. to move the observer right up to the particle, into its spacetime. This way we would even be able to detect the oscillations of its subparticles and the boundaries of zero vibrations would be moved even further. This could continue to infinity.

2.3.5 Interval

What is an interval? The term interval is usually used in relation to any kind of observed quantity or law (matter, psychic, or force-energy) in an attempt to quantify it. The term interval refers to the difference or variation in value of the quantity or law's various values between two observed positions, poles, points, states or values.

An interval can be regarded from two perspectives – either as the distance between the observer and the observed object, or as a property (e.g. dimension) of the object that changes (fractally) as the distance between the object and observer changes. Since both perspectives depend on the position of the observer, literally everything we observe is an interval.

It is imperative to note that each and every interval is always relative to the observer. This is a well-known fact regarding moving bodies and can be expressed mathematically, in accordance with the special theory of relativity, to measure their length, time, mass and energy. Even here, an interval is not regarded as a fact, but as a fictive tool used to understand and describe the observed state. Yet in a state of rest, an interval is considered to be an objectively given fact independent of the observer.

However, this is not actually so – in a fractal world, the term interval is always related to the position of the observer. Any interval is merely the manifestation and consequence of an observation, and its size depends on the distance to the observer alone. This fact becomes more evident when attempting to quantify objects that are far away from us in the macro and micro world (similar to the special theory of relativity).

And so, intervals close to the observer are perceived to be expressed clearly and well-defined in space and time, while any interval at the horizon of cognition is burdened with error that grows to infinity. An interval (object) on the horizon of cognition is therefore perceived as uncertain, spread across every possible position at once and we are not able to distinguish between the possible positions.

Based on the previous sections about time, space and motion, we can state that everything oscillates, including our perception of any spacetime interval.

The oscillating character of spacetime thus manifests itself in such a way that the continuity of space and time disappears – and we perceive its quantum wavelike character (in the micro world towards multiplicity, in the macro world towards the perception of a single quantum). This directly leads to a possible explanation of the double-slit effect (as we shall see in the coming sections).

2.3.6 The horizon of cognition and spacetime quanta

Let's take another look at the horizon of cognition. If we observe an object (interval) that is close to us in time, space or any other dimension, we perceive it as a clear, tangible and certain object (see Fig. 2.6).

But if the object/interval is distant from the observer in time, space, or any other dimension, the object becomes more and more uncertain to the observer; the measurement error keeps growing creating the phenomena of uncertainty. All interval increases blend together and, not being able to distinguish them from each other, we perceive them all at once. Upon reaching the horizon of cognition, a measured object/interval does not grow any larger; beyond the horizon of cognition, we are no longer able to observe the object and so we

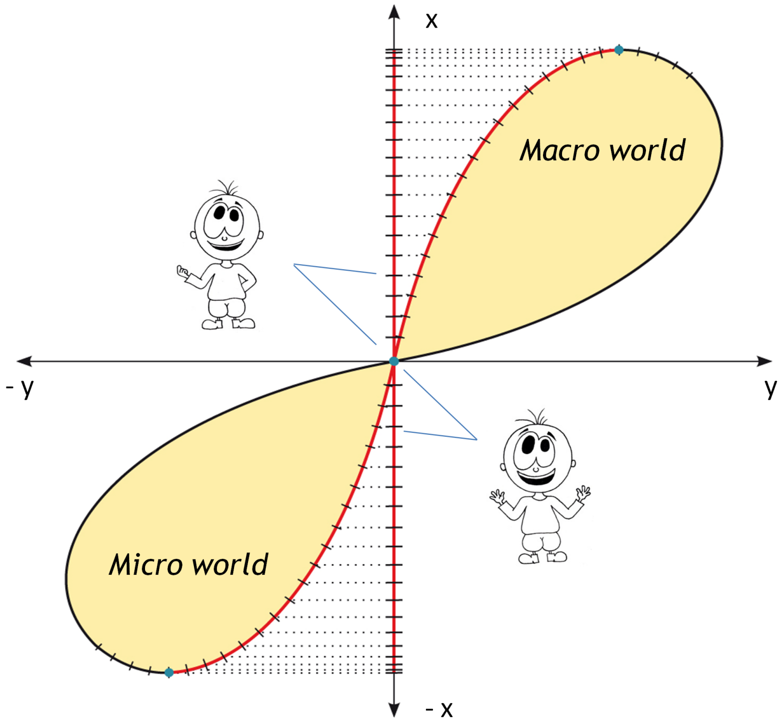


Figure 2.6: Observing intervals close to the observer. Here we perceive everything clearly, without any distortions. Time and space seem to be a perfectly continuous, uniform continuum. Any error in its quantification is negligible.

perceive it as disappearing completely. According to philosophy, this holds true not only for space and time dimensions but for literally anything that can be regarded as an interval (see Fig. 2.7).

Going into the micro world, we do not perceive particles close to the horizon of cognition as having a single specific time or a single specific projection (!). We can only perceive them as “spread across” time and space.

The oscillating nature of time and space implies that in our perception, we cannot consider spacetime in its manifestation near the horizon of cognition as a continuous quantity. To us distant observers, space and time seems to divide into interconnected intervals (spacetime quanta), each of which must also have its negative counterpart (or else it would not be possible according to the law of duality). These then line up one after the other and we are not able to distinguish between them. The particles thus become uncertain in time and space, which directly leads to Heisenberg’s uncertainty principle (1.1).

Since particles cannot exist in two states at once, we perceive them as fluctuating, i.e. oscillating between the two states. This explains the essence of the wave particle dualism.

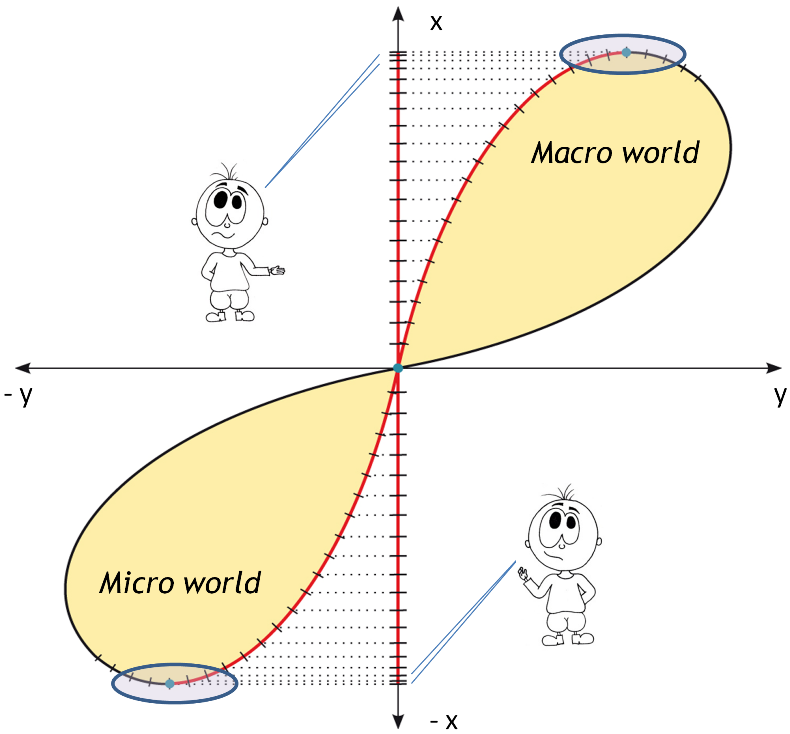


Figure 2.7: Observing intervals distant/far from the observer. Here the spacetime uncertainty is manifested. When trying to quantify, the measurement error grows steeply and once we reach the horizon of cognition, it is infinite. We no longer perceive any increase in an actual interval as an increase on the x-axis. The intervals can only be recognised by changing the observer's position.

Yet all the intervals are interconnected. Under common circumstances, no two intervals can be disconnected from each other, as spacetime is a oneness.

To understand the phenomena observed by quantum mechanics we have to abandon our current notion of the continuity of time and space.

At the horizon of cognition, not only space, but also time (!) is quantised, and a time quantum may appear and behave similarly to a quantum particle, i.e. jump back and forth like a quantum particle. Because time, like a particle is an interval just like everything else.

The quantisation of time thus also fundamentally affects the perception of causality.

Note: If we have connectedness and continuity on the one hand, then according to the law of duality, disconnection and jumps across time and space must also exist under certain conditions (step changes in regular intervals). This could be the subject of further philosophical-scientific research, and one day it may open up the possibility to time travel i.e. step changes in spacetime. Although it has not yet been studied by science, intervals perhaps evidently do sporadically disconnect and reconnect.

Time oscillations are incredibly fast (given by the speed of light) and they do not manifest when observing nearby objects; we perceive everything continuously. We can use a film stock as an analogy; a number of static pictures are projected one after another. If they are projected quickly enough, we perceive them as a continuous event. This is the case with all common events around us.

However, when we observe microparticles near the horizon of cognition, we are in fact observing an object whose "own" proper time runs unimaginably much faster than the time in our spacetime. In comparison to our time, the particle's own proper time is accelerated by many orders of magnitude and it draws close to the frequency of time oscillations in our spacetime. At that moment, our observations show the particle crumbling into the many possibilities in which may exist in time and space – like individual slides on a film stock – and we are not able to distinguish between them.

The result is a time and spatial dispersion of its possible and impossible (the dual counterpart) occurrences, which in our observation manifests itself as a wave, with all consequences. We are already not able to differentiate between the time oscillations. From our perspective of time and space, the observed object disintegrates (crumbles, splits) into a set of possible (spacetime) states, which are perceived simultaneously.

It is important to remember, that the quantisation of time and space in fact exists and does not exist simultaneously. This phenomenon must be regarded as a direct consequence of the horizon of cognition; this is how the horizon of cognition manifests itself in our observation (with all consequences for geometry, forces, etc.) – in all directions (in this case into the micro and macro world).

The same rules apply to extremely long segments of spacetime and extremely short ones. Further increases in large segments of spacetime are quantised just the same as in the micro world. We are not able to observe the real universe the same way we are not able to observe a real particle. What we observe is actually an imaginary bubble, in which we are only able to see up to the limit of the horizon of cognition, whichever direction we look in.

Chapter 3

The micro world

3.1 The duality of particles in the double-slit experiment

The French physicist Louis de Broglie studied the wave–particle duality and proposed the wave–particle duality principle [31], which won him the Nobel Prize in 1929 [32].

According to this principle, the wave properties of particles can be described with the following equation:

$$\lambda = h/p = h/(mv) \tag{3.1}$$

where λ is the wavelength, h Planck's constant, p momentum, m particle mass, v particle velocity. At high speeds, we substitute the mass (m) for relativistic mass.

$$m = \frac{m_0}{\sqrt{1 - v^2/c^2}} \tag{3.2}$$

where m_0 is the rest mass, v is the relative velocity and c is the speed of light in a vacuum.

Note: Quantum mechanics is not considered relativistic. Only when describing relativistic particles, is quantum mechanics extended by the theory of special relativity, and this has given rise to the quantum field theory. The quantum field theory is relativistic and is also called the second quantisation. However, so far, no theory has been able to unify the quantum world phenomena with gravity.

Contemporary quantum mechanics in its basic form does not work with the term spacetime. Yet we previously justified that it is the quantised spacetime that lies behind the above mentioned wave manifestations of particles.

We noted that when observing objects into the micro world, at the horizon of cognition, spacetime disintegrates (crumbles) into a set of interconnected non-disconnect able intervals in our observation. Each of these intervals inevitably also has an opposite counterpart. These intervals then line up one after the other and, in our observation, the particle oscillates between them (to us, all possible occurrences exist at once).

For a moving particle, these intervals propagate in space like a wave, and its wavelength is expressing the spacetime curvature at the horizon of cognition. We can talk about a wavelike character of spacetime itself as a consequence (manifestation) of our observation.

Now imagine sending just a single particle during the double-slit experiment. In our model situation (an object at the horizon of cognition) it will be a single point (quantum) with a non-zero rest mass.

However, in our observation, we cannot talk about a particle anymore, but about a "projection of a spacetime uncertainty of a point", propagating in spacetime. This is illustrated in Fig. 3.1.

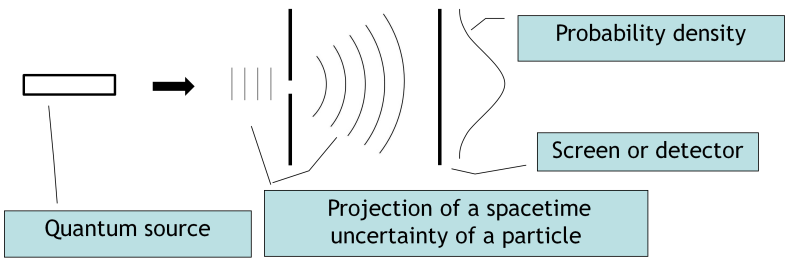


Figure 3.1: Moving particles at the horizon of cognition. The source sends a single particle that is near the horizon of cognition in our observation. If we do not experimentally measure or limit the particle in any way, it is a free particle that indistinguishably occurs/propagates in a set of interconnected spacetime intervals (intervals with both positive and negative polarities are alternating). If the particle passes the narrow slit, the wavefront of the corresponding wave is circular.

And now we send this object through the plate with two slits.

Due to the impossibility to distinguish (recognise) caused by the horizon of cognition, the interference, i.e. summation individual "waves" from both slits, holds (a particle observed from a distance can only occur in positions where we do not recognise its actual trajectory). The probabilistic waves of our projection are summed over both slits – and in the network of interconnected intervals of opposite signs, they strengthen or cancel each other out.

The interference after passing through both slits is illustrated in Fig. 3.2.

Yet if a detector is used to observe which slit the particle passes through, we are observing it close up = the observer's position has been moved into the particle's own spacetime (!). For us, at that moment, the particle is not at the

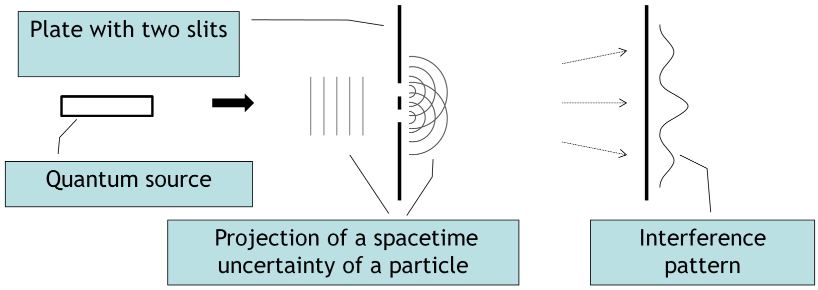


Figure 3.2: Explaining the double-slit experiment. If we place a plate with two slits in the way of our "projection of a spacetime uncertainty of a particle", the projection will pass through both slits simultaneously (with all the consequences implied, including its forces effects in both places at once). It continues propagating beyond the plate, while to us the unobservable particle itself keeps indistinguishably oscillating among all possible states of the quantised spacetime (a set of interconnected intervals of opposite signs). Next we place a screen at a suitable distance behind the plate with the two slits. As a consequence of the indistinguishability, at the points where the particle impacts the screen, an interval of a positive sign corresponding to a trajectory through one slit must/has to meet with an interval of a positive sign corresponding to a trajectory through the other slit – therefore, constructive interference can only occur in certain directions depending on the wavelength and the experiment's geometry.

horizon of cognition and classical Newton mechanics applies. The interference and diffraction effects related to the uncertainty of its projection disappear.

If we were to move towards the particle, not with a step, but gradually (imagine us simply shrinking – note: we are considering an object with non-zero rest mass – it would not be possible for us to move towards light photons in such a manner), we would perceive the particle as gradually increasing in size and its rest mass would increase (a consequence of the spacetime curvature). This would simultaneously change the time scale of our observation. A consequence of this gradual change of parameters – the relation (3.1) $\lambda = h/p = h/(mv)$ would still hold - would be the gradual shortening of the corresponding particle's wavelength λ. The particle would then behave according to classical Newton mechanics more and more (as in our observation it was leaving the horizon of cognition).

We can find analogies all around us, and in the case of quantum mechanics, there is an analogy with the rippling of liquids. And not just classic waves on the surface of water. Yves Couder and Emmanuel Fort from the university "Paris 7" [33] and Daniel Harris from MIT [6] carried out experiments where a liquid droplet bounced on a vibrating fluid bath, driven by the waves originating in its own collisions. Although the resulting movement of the droplet was chaotic, it was exactly analogical with the observed behaviour of quantum particles.

Considering all possible states, among which the particle inherently oscillates in our observation, spread in time and space, we can imagine that there is some kind of resonance with boundary conditions given by the experimental setup, and so there is an analogous "continuous" mechanism, as with the liquid droplets described in [33] and [6].

We can imagine the projection of a particle observed from a distance as a chaotic oscillator. Spacetime becomes a non-linear resonator that adopts the characteristic physical parameters of an oscillator, affecting its apparent movement and occurrence. And this is where the analogy with the movement of the droplet in a vibrating fluid bath comes in.

The perception of the wavelike character/nature of spacetime may remind us of the formerly used aether theory, which even ancient Greek philosophers included in their reflections. [34].

We are now ready to investigate if the above-mentioned philosophical observations could help us clarify the mystery of typical quantum effects in the micro world.

3.2 Electron orbitals and atomic nuclei

Let us reflect on how our observation of the universe can be connected to typical effects in the quantum world in relation to the above explanations.

Anyone can raise the objection that electrons in atoms evidently do not behave the way planets orbit around the sun – the shape of their probabilistic orbital is far more complicated, depending on the quantum numbers determined by solutions of corresponding wave equations.

And so, we raise our hat to the genius of Richard Feynman. During a physics lecture at Cornell University, in relation to the double-slit experiment, Feynman (as later published in his book [35]) famously proclaimed:

„*I will take just this one experiment, which has been designed to contain all of the mystery of quantum mechanics, to put you up against the paradoxes and mysteries and peculiarities of nature one hundred per cent. Any other situation in quantum mechanics, it turns out, can always be explained by saying: You remember the case of the experiment with the two holes? It's the same thing.*"

The double-slit experiment answers this question too (!). To an observer in the macro world, atomic shells exhibit a resonant wave behaviour showing the probabilistic maxima and minima, just like the observation during the double-slit experiment without a quantum detector.

Yet we know that when we perform the double-slit experiment, using a detector will move the observer into the micro world: the pattern on the screen changes and we can see the dispersed particles that can be described using Newton's classical mechanics.

Literally the same applies for atomic shells. An observer from the macro world “sees” in “his” micro world complex electron orbitals described by the corresponding wave function (with all consequences regarding the forces or geometry etc.), whereas an observer located in this micro world notes a circular “Newtonian” motion of clearly defined bodies or planets.

We can imagine the horizon of cognition as a kind of veil or curtain hiding a world that is similar to ours. In this sense, the Copenhagen interpretation of quantum mechanics is valid. To an observer in the macro world, a quantum particle exhibits a chaotic-resonant wave character with all the subsequent consequences, and this originates due to the quantisation of spacetime. But if we remove this curtain by moving into the micro world (direct detection or interaction such as photoelectric effect), we can perceive its actual behaviour as a particle.

The absolute value of the wave function squared expresses the probability density of a particle viewed from the macro world. We can consider this as a description corresponding to the resonance structure of a given system that is manifested as a consequence of the corresponding particle’s motion when being observed – because resonance, too, is motion. But to an observer in the micro world, the same particle may actually move or occur in a completely different place than shown by the corresponding vibrational characteristics of the macro world view.

Imagine a teaspoon in a glass of water. The part that is under water shows itself “elsewhere”. Perhaps it is also somewhat similar to strumming a tuned string instrument. From a macro perspective we cannot see the strumming, but we can perceive the tones and vibrations of it.

If we now look into the atomic nuclei, it is important to consider that the “interval quantisation” occurring at the horizon of cognition concerns all quantities (i.e. not only time and space, but also energy, mass, etc.). This means that, in our observation, matter itself also (inevitably) divides into a discrete set of states, which we, from the macro-world perspective, observe, measure and evaluate as “individual” particles, with all their resonance states, manifestations etc. This quantisation is valid also for all the structural sub-levels of atomic nuclei (therefore we can observe their "sub-particles", like neutrons and protons, and further quarks in the neutrons and protons structure).

But all this is just the effect of the horizon of cognition – should we move our observer (make him smaller) into the dimension of an atom, in its nucleus would this observer generally detect no such inhomogeneity of the structure.

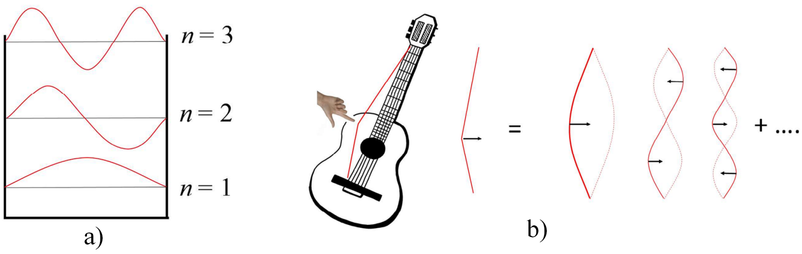
The next sections cover also particles/quanta with zero rest mass. But before we do that, we can take a look at other typical effects in the quantum world.

3.3 Quantisation

The previous sections show that even Heisenberg's uncertainty principle is essentially given by the attempt to describe the particle's wave–resonant manifestation as perceived in the macro world, through the particle's own characteristics applicable to an observation by an observer in the micro world (position, momentum, time, energy). Here, we inevitably face the horizon of cognition, which is what causes the particle's wave-resonant manifestation.

Now let us look at the quantisation of energy states of quantum particles. We know that if we attempt to somehow seize or enclose a particle, its stationary vibrational (energy) state starts to be quantised – it disintegrates into a discrete set of possible values (see the illustration in Fig. 3.3). This happens to electrons in an atom, for example.

When we observe a particle from the macro world, what we are actually observing is its energy-vibrational character, which manifests as its resonance, according to the experimental conditions.



Picture credit: https://ufch.vscht.cz/files/uzel/0013999/0045~~y04syCzJz0k0AQA.pdf?redirected

Figure 3.3: A quantum particle in an infinite potential well. The equations of quantum mechanics show that while the vibrational state of a completely free particle (not limited in any way, without boundary conditions) may continuously take values, the vibrational state of a particle, which is in some way limited in its motion in space (e.g. an electron in an atom) is quantised in a stationary state (corresponding to a standing wave). Modelling the case of an infinite potential well (the potential energy in the well is zero and outside the well is infinitely large) – see a), solving the wave equation gives us a set of stationary discrete energy (vibrational) states for this particle. The particle can then be described as a superposition of these states, and rather than a particle, we are talking about a "wave packet". This may remind you of the vibrations from a guitar string. The vibrations are composed of basic and higher harmonic frequencies - see b).

We can say that in our "wave perception", the projection of a spacetime uncertainty of the given particle "resonates" with the experimental boundary conditions and the probability of its occurrence is unevenly distributed. Yet to a proximate observer the same particle may occur at any point with the same probability and its energy spectrum (kinetic or potential energy) may take any continuous value.

The quantisation of the particle's energy-vibrational state is thus a consequence of the existence of the horizon of cognition. It occurs as a consequence of the quantisation of spacetime – the division into interconnected intervals among which we are not able to distinguish.

3.4 Tunnelling

Another typical manifestation of the quantum world is tunnelling. Thanks to this phenomenon, the quantum particle can pass through a seemingly unsurpassable obstacle, as it is shown in Fig. 3.4.

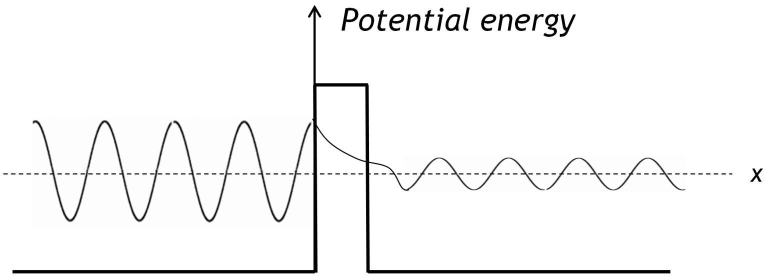


Figure 3.4: Quantum tunnelling. The difference between classical and quantum mechanics is that if we place barrier in the way of a "classical" material object, and the barrier has a higher potential energy than the kinetic or potential energy of the object, the object will not be able to pass the barrier and will bounce off it (picture a small gap of air or a sheet of paper between two conductive objects of different charge). A quantum particle, however (depending on the relative energy difference and barrier width), is able to pass the barrier and continue propagating with no energy loss (!). How is this possible? Again, the position of observer plays a part. Quantisation of spacetime cannot be limited in the perception of a distant observer, because if this were possible, we would be able to define and localise the particle through its spacetime manifestation. This is, however, not possible in principle, as a consequence of the horizon of cognition. We can imagine that even the oscillation of spacetime has its time and spatial inertia. This could be proven, for example, by the fact that if we added a sensitive quantum detector to this system (similar to the double-slit experiment) the tunnelling would entirely disappear (!).

How is it possible that the oscillation of spacetime has its inertia? Let's imagine a particle (in our observation, a projection of a spacetime uncertainty of a point) that reaches a potential barrier that is higher than the particle's energy. At that moment a resonance occurs between the particle (our projection) and the barrier. In our observation, this resonance causes a change to the vibrational characteristics of spacetime, both of the particle and even the barrier (spacetime is a unity of interconnected intervals that has no discontinuity under regular circumstances). However, the particle itself cannot enter the barrier and in our observation thus appears on "its own" side of the barrier. But due to the resonance of the continuous spacetime, the particle's vibrational imprint does enter the barrier (in physics we call this an evanescent wave, see [36]. It is a standing wave that changes its phase only along the barrier but not in the direction into the barrier and its amplitude decays exponentially in the direction into the barrier). If the barrier is not too wide or high (with regards to the energy-wave characteristics describing our projection), this vibrational imprint can be non-zero even on the other side of the barrier. At that moment, another "transfer" of this imprint (as there is no discontinuity) occurs and so the spacetime is quantised even on the other side of the barrier. Our projection of spacetime uncertainty can thus occur in front of and beyond the barrier (it can jump across the intervals on both sides).

Even in the case of just a single particle, we are able to observe its manifestations on both sides of the barrier simultaneously (analogous to passing through both slits in the double-slit experiment). However, the probability amplitude of the oscillations (manifestations) in front of and beyond the barrier is different, depending on the experimental setup.

And again, the tunnelling effects disappear if the observer is moved close to the particle.

The latest experiments (from 2015) [37] show that this is the case. Scientists from Cornell University observed that rubidium atoms that had been cooled down to a temperature close to absolute zero no longer showed the tunnelling phenomenon and did not behave according to Heisenberg's uncertainty principle if observed "close up". This is known as the quantum Zeno effect – if we observe atoms directly, they do not show quantum effects. As we explained earlier, this is a direct consequence of moving the observer near the particle.

We can also look at this from the perspective of the law of duality – each law must also encompass its own violation (otherwise it would not be able to exist, just as one magnetic pole cannot exist without the other). Each particle must therefore also have the possibility to pass through a barrier that is "unsurmountable" for it. However, it is not possible to observe this phenomenon close up, i.e. in the particle's spacetime. Such an event happens very, very rarely. When observing from afar, the particle's own time is so accelerated in comparison to the observer that this phenomenon is actually recorded as tunnelling. If we move the observer to the particle, into the particles time and space (see the abovementioned experiment where the particle's time was slowed down by cooling it down to a temperature close to absolute zero) then it becomes inherently (in the particle's own time it obviously occurs extremely rarely) impossible for us to record it.

3.5 Quantum entanglement

Another fundamental manifestation of the horizon of cognition is the phenomenon of quantum entanglement.

As it is well known, for many years physicists argued about whether or not local realism observed in the macro world also applies in the micro world.

The assumption of local realism implies that

1. each object is only influenced by its immediate surroundings (locality)
2. an object's properties are real; they exist regardless of whether or not they are observed (realism)

The principle of locality
Imagine we have two quantum particles with a mutual quantum past, a state, in which the quanta influenced each other – for example, two particles created due to the decay of another particle. Two such particles are said to be entangled.

We then separate these two particles. The principle of locality tells us that their properties originated/were determined at the moment their connection originated and that the particles carry these properties with them. Measuring one particle should hence not influence the state of the other particle in any way once they have been separated.

The principle of realism
postulates that each measurable quantity, including the spin[1] of quantum particles, must correspond to "something real" something that exists independent of any observation. The result of any observation (measurement) should hence be given prior to the actual observation and the choice of an observed (measured) quantity should not affect or disturb it.

Scientists spent decades arguing about whether or not local realism is valid. Albert Einstein is one example of an ardent advocate of local realism and named the phenomenon of quantum entanglement "spooky action at a distance".

But experiments have repeatedly shown that the quantum world manifestations clearly undermine this principle (e.g. [17]). Observations of pairs of entangled particles show that the particles retain their connection after they have been separated regardless of spacetime limitations (!).

In 2015 an ingenious experiment was carried out at Delft University in the

[1] A spin is a quantum property of particles that does not have an apparent equivalent in the macro world. It is an "intrinsic angular momentum" (similar to a hidden rotation around an axis), which is added to the total angular momentum of a given quantum system. The Spin may take integer or half integer multiples of Planck's constant. A given particle's spin always has the same absolute value and only its sign (axial orientation) changes. Depending on their spin, particles (or composite particles e.g. atom nuclei) can be either fermions (with half-integer spin e.g. electrons) or bosons (with integer spin, e.g. photons). Fermions are basic particles of matter (a quantum system, such as an atom, cannot contain two fermions that occupy, share the same quantum state – i.e. they occupy higher and higher energy levels and "take up space"), whereas bosons are force carriers (they can share the same quantum state). The spin of charged particles (e.g. electrons) is connected to its magnetic dipole moment, which enables us to determine its orientation. In ordinary materials, the dipole moments of whole atoms (the sums of the spin and orbital angular momentum) are randomly orientated and they cancel each other out. In ferromagnetic materials they are mutually aligned at room temperature and the material behaves like a classic magnet. In light quanta (photons) the spin orientation can be observed as light polarisation.

Netherlands [17]. The experiment involved nitrogen doping into the carbon crystal lattice of two artificial diamonds. The nitrogen atoms created vacancies in the lattice, places where carbon atoms were "missing" and therefore they attracted and trapped free electrons. The two diamonds were placed 1.28 km apart. The trapped electrons were excited using microwave pulses, i.e. they were given energy that was immediately released by emitting "their" photons carrying information about their spin. The photons from the two crystals were brought together by optical fibres on a beam splitter (where they interfered) and then they were detected (= observed close up). The interference/detection caused the photons to entangle - and this caused the original electrons, which emitted these photons, to entangle as well (the information about the electrons' spin orientation was entangled). Immediately after the photons had entangled the electrons, the spin orientation of the electrons in the crystals was quickly measured in random directions. To make sure that there was no unknown "interconnecting" signal propagating between the two diamonds, the electrons' spin orientation has been measured for a mere 3.7 microseconds (it would take 4.27 microseconds for light to transmit information at such a distance). This measurement showed that there is a statistically significant correlation between the measured spin orientations of the electrons in the two crystals.

So, it was observed, that measuring one of the entangled particles immediately affects the behaviour (the measurement results) of the other (however far apart they may be). It seems that any time or space limitations are cancelled out, as if the electrons agreed that each time they would orient their spins in mutually opposite directions.

It is thus possible that the electron's spin orientation is "randomly" determined the moment it is measured (and not defined earlier), but that would undermine the principle of realism.

If the electrons' spin orientation were real, the electrons would have to communicate at a speed faster than the speed of light (the electrons measured in one crystal would instantly have to "notify" the electrons in the other crystal so that it made sure they had the opposite spin orientation). Yet such "instant, faster-than-the-speed-of-light" communication undermines the principle of locality.

Further research is (fairly successfully, see [38]) trying to find a way to keep the particles entangled for sufficiently longer time (so that the entanglement is not disrupted by external interactions, or so that it is renewed faster than it is lost). A quantum network based on this phenomenon could be a revolutionary step for information transfer.

But in any case, the results show that the principle of local realism is not tenable in the micro world.

How can this be explained?

Everything in our world follows the law of analogy (as everything that exists was created through division, i.e. according to same laws and principles), which is manifested in time, spatial and dynamic similarity of things, forms, events and processes. And so a rippled liquid surface simulates the wave processes of quantum mechanics, and the same mechanisms that make shoelaces come undone can be applied to DNA or other microstructures that fail under dynamic forces, etc.

As mentioned previously, philosophical observation tells us that the entire world originated in a point zero in time and space. In our view, this "0" (point zero) split (and will again unite one day). We can compare this to a fan, that opens in a causal process, so that it can be perceived, and then folds back up. And yet, in timelessness the fan simultaneously exists in both an open and a folded state.

It is a unity that split into two poles, poles that always have the same essence but opposite signs (polarities), i.e. a unity that split into duality.

Before this point split, it was impossible to perceive either time or space (both existed, but in a non-manifested, “folded” state - a state in which all times and spaces were encompassed all at once).

In our perception there is the horizon of cognition, a cut-off point that limits the possibilities of our perception. As we know, the horizon of cognition sets the boundary beyond which time and space do not exist for us (we cannot perceive them).

And as our world is so fond of analogies, the horizon of cognition appears somewhat similar to point zero, the point that everything we know came from – including all its further manifestations.

Particles are at our horizon of cognition, which makes them undistinguishable to us. So, we must first ask ourselves to what extent a particle’s spin is a real and true property of the particle itself. Is it not just a resonant manifestation of its actual own rotation that is incognizable (the horizon of cognition causes we cannot find this out) to us?

It is likely that, although the spin of a particle with a non-zero rest mass is most likely a very real and existing property (everything in the universe rotates around its own axis), to us distant observers the real orientation remains unknown = it remains hidden in the resonant image of all the particle’s possible rotational states. The experimental setup then merely “chooses” from the set of these states (for more information about spin measurement see, for example, the Stern–Gerlach experiment from 1922 [39], where spins of particles were measured by sending the particles through an inhomogeneous magnetic field). This should also be valid for measurement of the spin/polarisation of light quanta – photons (although in this case it is difficult to talk about a real rotation in the sense of a material object).

As we know, the measurement of a spin along a given axis temporarily cancels out the spin’s uncertainty along this axis. By repeatedly measuring along the same axis we get the same results (whether we measure a single particle or two entangled particles), yet we do not know anything about the spin values along the other axes. However, if we subsequently measure the spin along a different axis, we lose the information about the spin along the first axis. This is fully analogical to repeatedly measuring a particle's position "x", while not knowing anything about its momentum "p". Measuring the momentum "p", we lose the information about its position "x", according to Heisenberg's uncertainty principle (1.1).

Measuring the spin orientation along one axis involves "choosing" one of the possible orientations of the actually existing property, but most likely we still do not move the observer towards the particle itself and so we do not know anything about its actual rotational axis (!). It remains incognizable to us, hidden among all the possible states.

This is how the observed "randomness", which seems to violate the principle of realism, arises.

If we create a pair of entangled particles, which we subsequently separate, what we are actually creating is a process of transition from one state to another, similar to the state of an undivided unity (that is created through entanglement, and is somehow analogical to point zero) becoming a state of duality. So, our experiment divides an undivided unity and the division always creates counterparts. In our case these counterparts necessarily manifest themselves in the opposite signs of the spin orientations of the created poles (here of the two electrons). The distance between the poles is of no importance.

However, if we make the value of one of the poles, uncertain (either ourselves or by external interactions), the value of the other pole must inherently also become uncertain (we return to the state analogical to point zero). If we measure the pole again and get a different value (since to us distant observers the spin orientation oscillates between all its possible positions according to the law of uncertainty), we can be sure that the counterpart will again remain the counterpart.

But this is only our observation, though it manifests itself this way in the (geometrical, quantum, force) consequences of the measured spin orientation.

Since this is a manifestation of the horizon of cognition, here too, quantum entanglement would probably completely disappear if we were able to observe the particles (their measured property - the spin) close up.

Do you think that the reasoning presented above could lead us back to Albert Einstein's (abandoned) notion of local realism?

Or could it be that (figuratively speaking) our experiments, rather than the stars, merely observe their resonant "reflection" on the rippled surface of water, and so it seems to us that they flicker and form waves in the same (contradictory) spin rhythm?

Can something that is most likely not true actually be true?

3.6 Quantum fluctuations

We should perhaps also note one more quantum phenomenon. We know that not even a vacuum is an empty space. We talk about a quantum vacuum that is swarming with microscopic particles and antiparticles that constantly appear and disappear within a split second. Imagine it as a stormy sea of particles, where extremely small areas of space and matter are literally "simmering". This also has real observable effects on electrons on the outer orbits of atoms in the micro world, on the radiation and "evaporation" of black holes in the macro cosmos and on the forces between two thin uncharged plates (the Casimir effect, experimentally verified in 1997 [40]).

Successful experimental observation of quantum fluctuations of a vacuum was carried out and published in 2019 [41].

In order to understand this, it is necessary to realise that the horizon of cognition also applies to itself (incognizability of incognizability). In our observation, this point fluctuates, jumps between the quantised intervals of spacetime and it is not possible for us to determine its exact position.

And so due to the fluctuations of our sub-universe, inherently, its particles' manifestations must virtually appear and disappear, and in our distant observation we can detect them due to their electromagnetic force effects/manifestations.

Similar to quantum entanglement, we split a unity, which is why we observe pairs also in matter – particles and antiparticles.

3.7 Matter is energy, energy is vibration

We have previously shown how spacetime quantisation results in wave manifestations of particles, that is the relation particle → wave. But is it possible for the opposite to apply as well? Could the relation wave → particle exist if quantised spacetime behaved and manifested itself the same way as a particle? Would it not make it possible to explain, say, the behaviour of photons – i.e. quantum particles with zero rest mass?

In order to follow these thoughts, we must first consider the essence of matter and energy again.

Josef Zezulka discusses this in the chapter "Matter is energy, energy is vibration" in Lectures II. [2], appendix 1, page 51–52:

„*Let's imagine that we are able to observe matter in such a way that our observation takes us to incredible depths. This is only an image, which could be real if humans had the right knowledge and technical possibilities. We already know that matter is made up of atoms. This image is similar to that of a starry sky. There are fixed stars, planets etc., like in the macro cosmos. (...) If we observed it more deeply, atom particles would appear as energy. And energy, in* *its vital manifestation, would appear as vibrations.*“

Philosophical observations of the micro world provide us with two views. One is fractal and shows a structure that repeats itself infinitely below (and above) us. The other view perceives energy–vibrational manifestations of the micro world, and from our point of view they are just as valid and real as the fractal view.

We can thus regard matter as the “*fundamental building material for everything that we perceive as reality*” ([2], appendix 1). It is building material not only for visible matter but also for its force effects, observed in a sequence of time.

Both views are simultaneously valid and bring us closer to understanding the terms matter and energy.

Is it already possible for us to observe the energy-vibrational character of particles? In 2007 a team from the Swedish university Lund published the first images of a dynamic electron motion on an electromagnetic wave [42]. In order to record this, innovative stroboscope setup was developed. It combines two synchronised lasers (one generating extremely short ultraviolet attosecond (10^{-18} s), pulses, which ionised atoms and temporarily localised their electrons; the other laser generated infrared pulses controlling their dynamics). This made it possible to get an image of a moving electron (more specifically its corresponding localised wave packet). The film showing this phenomenon can be found at [43]. The results were compared to the numerical solution of the corresponding Schrödinger’s equation, and the data from the experiment and the calculations showed an excellent agreement, which is shown in Fig. 3.5.

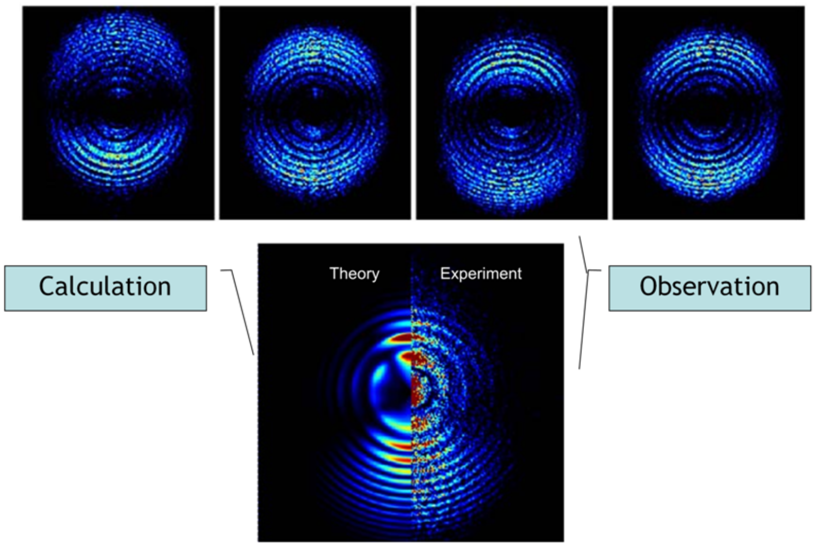


Figure 3.5: Observation of the dynamic (location change in time) of a localised electron and a comparison with the solution of the wave equation. Published by the team at Lund University, Sweden [42].

Johan Mauritsson, a member of the team at Lund University commented: „*It takes an electron about 150 attoseconds to orbit the nucleus of an atom. One attosecond lasts* 10^{-18} *s, and if we draw out one attosecond to the length of a second, it would be like drawing out a second to the age of the universe.*“ [44]

The image does not picture the electron as a planet in a sub-universe; it shows the distribution of its energy state (wave packet), which agrees with the corresponding calculations of quantum mechanics. Does it not remind you of drop of water that has hit the surface?

The research presented above is closely related to a new and interesting view of our current understanding of matter and energy that was introduced by Jeff Yee [45] namely the Energy Wave Theory [46]. This theory considers matter particles to be standing longitudinal waves localised at so called "wave centres" (as Yee points out, these are very similar to the observations made by the Swedish scientists). Matter (rest mass) is determined by energy deposited in these standing waves:

$$m_0 = E/c^2 \tag{3.3}$$

where m_0 is the particle rest mass, E is the energy of the corresponding standing wave, and c is the speed of light in a vacuum.

The equation (3.3) is based on Einstein's famous equation ($E = mc^2$), and defines the rest mass of a particle as the energy of the corresponding standing waves divided by the speed of light squared. An illustration of this view of a particle is shown in Fig. 3.6.

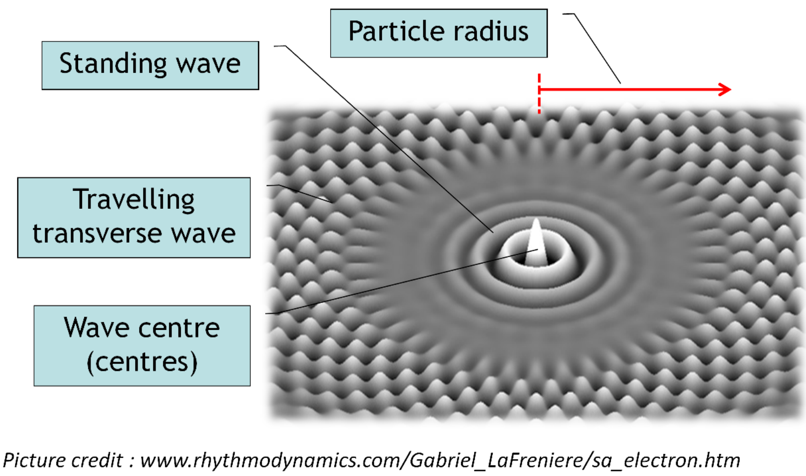


Figure 3.6: A schematic image of a particle depicted as energy deposited in a form of standing (longitudinal) waves [46]. Waves are actually longitudinal. We can picture the waves with the help of a small ball and a sphere. Imagine a small ball (the wave centre) in the middle of a closed sphere filled with air (the entire particle). If we quickly deflate and inflate the ball, standing longitudinal waves would form inside the sphere.

Energy quanta (photons) are then described as travelling transverse waves, which originate as a consequence of the oscillations of matter particles (all matter with a temperature higher than absolute zero always emits heat radiation). According to this theory, energy is understood as being the motion, waves of the universe, which can be used to describe all known interactions, attractive and repulsive forces. The Energy Wave Theory hence assumes the existence of an omnipresent aether (a medium that has its own density), representing a system of interconnected grains/granules that transfer energy. Wave centres (which can be used to describe the particles of matter) are then able to reflect, absorb or emit this energy (which changes their energy state in the given system, e.g. an atom).

The Energy Wave Theory gives remarkable outputs and provides a simple explanation to many observations in particle physics. For example, it is able to describe all known particles and antiparticles as combinations of a single fundamental particle (representing the previously mentioned wave centre) and it also lowers the number of fundamental physical constants significantly (from more than 20 to a mere 5) [47]. This is very significant because every empirically determined physical constant sets a limit (horizon) on our understanding of the natural law it helps describe. It is an expression of our inability to understand further. More knowledge and a deeper understanding of natural laws should hence entail lowering the number of fundamental physical constants.

3.8 Aether and photons

In order for the Energy Wave Theory to be acknowledged as an advisable/suitable direction for further reasoning, it would be necessary to prove the existence the existence of the aether, a field that could oscillate and thus work as a transmission medium for propagation of electromagnetic waves. Scientists used to be convinced that the aether existed. Up until the late nineteenth century it was considered to be an absolute reference system against which in any direction relative motion could be measured. Back then, it was assumed that if light was sent from a source which was moving against the aether in a certain direction, the light would not move with equal speed in all directions. It was never proven that the aether existed (see the Michelson–Morley experiment from 1887 [48], which is still being confirmed by the most accurate measurements – most recently in 2009 [49]) and scientists abandoned the concept as the theory of relativity and quantum mechanics were developed.

What does philosophy have to say about this? We have previously explained that in our observations the particle motion at the horizon of cognition leads to spacetime quantisation; spacetime is divided (crumbled) into a set of interconnected intervals. To an observer in the macro world the particle seems to oscillate between these intervals. The projection of the spacetime uncertainty of a point/particle propagates in space and resonates with the boundary conditions of given experiment, and we perceive it as a wave.

As shown above, we can perceive a particle to be an energy storage. The storage can absorb and emit energy, and in doing so its overall vibrational state in given system changes, while the law of conservation of energy holds. If energy is emitted, the released energy is directed to the particle's surroundings.

It seems that the electromagnetic energy–vibrational manifestations of the micro world are connected to the horizon of cognition. Energy is then emitted right at the horizon of cognition where spacetime is quantised. Therefore, the emitted energy is only transferred to a single quantum (interval) of this spacetime.

This quantum propagates in space (it is transferred between the interconnected intervals, which we can imagine as closely adjacent inflated balloons with positive and negative polarities, whose size (half the wavelength) is given by the corresponding energy state) while we, again, just as with the particle, perceive all possible states (projections) of this quantum at once, indistinguishably and simultaneously, including all its force and resonant manifestations.

Here too, this quantum works as a non-linear chaotic oscillator and the set of interrelated intervals as a resonator. When it comes to electromagnetic waves, we know that these intervals can take any proportion– from gamma radiation to long radio waves – the essential thing is the propagation speed which is always on the horizon of cognition.

Quantised spacetime thus resonates with all energy states and "sets" their wavelengths so that they correspond exactly. This means that we are able to describe the energy of electromagnetic quanta with the well-known formula (3.4), which describes the relation between energy and the wavelength of the corresponding quantum.

$$E = hc/\lambda \tag{3.4}$$

Here E is the energy of an electromagnetic quantum, c is the speed of light in a vacuum, λ is the wavelength, and h is Planck's constant.

And so again, we observe a wave with all that it entails.

However, if our projection wave of given quantum interacts, say if a photon interacts with an electron in a metal during a photoelectric effect, the electron is only ever "hit" by this single quantum (not the whole wave) – and if the quantum has enough energy, the electron is ejected from the metal. As the quantum transfers its energy to the electron, it "perishes" (it is absorbed) and we can no longer perceive it in its spread-out uncertainty.

Similarly, if we use a detector to observe the given quantum (light photon) during the double-slit experiment, the uncertainty disappears along with all the interference and diffraction effects.

Again, the photon behaves purely as a particle.

And now we can imagine our set of interconnected intervals (inflated balloons) as a medium, previously considered to be the aether. But because it is at the horizon of cognition, it is not possible to prove its existence through any experiments that are based on measuring the speed of light in various directions.

It is because light quanta are the effect and consequence of the horizon of cognition (they are always at the horizon of cognition) that their speed sets the maximally cognizable spacetime limit. This limit necessarily moves together with the observer (because the horizon of cognition is always related to the observer's position).

We could say that we live in a virtual world and that its' virtual character is manifested by the horizon of cognition.

Next, we shall leave the world of (seemingly) tiny objects and look at the (seemingly) very large ones.

Chapter 4

The macro world

4.1 The topology of the universe

As stated earlier, as a consequence of validity of the horizon of cognition, we are living in a self-similar, self-contained formation that is independent of any scale. Fractal geometry can help us approach an understanding of what such a formation is like. The terms “larger” and “smaller” are based only on the position (the apparent size) of the observer. And so, we have an infinite self-contained chain of interconnected universes, all different yet all analogical.

There is nothing finite, solid or indivisible anywhere. We can view this in relation to the words of the Greek philosopher, mathematician, physicist, inventor and astronomer Archimedes of Syracuse: „*Give me a firm spot on which to stand, and I shall move the Earth.*“ [50]. There is in fact no firm spot in our world that is not dependent on the observer.

We know that we observe our world in three dimensions (3D).

However, in order to avoid any discontinuity of the permanent “decreasing/increasing in size” and for us to return back to our starting point, the world must necessarily be four dimensional (4D).

Only then can the topology of our 3D world be arranged so that we can return to our starting point without any discontinuity. Otherwise it is simply not possible.

We can also draw the conclusion, that the fact that we only see three dimensions (3D) and do not perceive the fourth one means that we exist as 3D beings in a 4D world.

We can use a simplified analogy of the relationship between the 3D and 2D space to help us understand the relationship between the 4D and 3D space. Imagine a Möbius strip, which is shown in Fig. 4.1. A hypothetical 2D being living on the strip would most likely be very surprised to end up back where he started if he walked all the way along the strip without changing direction, don't you think? In our 3D/4D world, this does not only apply to motion in any direction but also to increases and decreases in size.

Figure 4.1: Möbius strip. A Möbius strip is created by taking a strip and turning one end 180° (twisting it half-way round) before gluing the ends together. The result is a strip with a single surface and a single edge. If we take a pen and draw a line along the strip, in one direction, we will eventually return to where we started without any discontinuity.

It is amazing that in the 4D view, which is usually inaccessible to us, all times and places of our three dimensions are observable at once (!). Let's imagine an example with a simplified analogy of a two-dimensional drawing of a flower or a car. It would take a two-dimensional being a long time to move around the drawing in order to look at it and study it. Whereas a three-dimensional being can see the entire drawing of the flower or car at once.

But this example is a great simplification. Philosophical observations tell us that 4D can be regarded as a different kind of space and time. In 4D every dimension and every time is contained at once in all the infinitely many possibilities of their manifestations. A 4D view enables a simultaneous perception of everything at once – without any progression of time, space or causality.

There is thus more to it than just adding another axis to our Euclidean network! Since the fourth dimension contains all measurable intervals of the infinite reality at once, the starting point of an interval must change – the point becomes the surface of a dimensionless sphere[1].

[1]See also note [11] in Abstract. The term "dimensionless sphere" cannot be described or explained using current mathematics, where the only dimensionless formation is a point. We are now approaching the relation between "0" and "infinity", where the two terms merge. A hypothetical observer in 4D becomes all possible projections of all possible levels of existence and also time. "Causality" does not apply here, the dynamic of development exists only in its static form, everything "is and exists", literally simultaneously, here and now. We can also see this as a widened state of mind, which can only be achieved (for a human being) if we overcome the evolutional limitations of our human brain, i.e. if our mind leaves our brain. We claim, in all seriousness, that the mind can exist fully autonomously, independent of matter (!). One example that proves this are, for instance, the palm leaf records in India. The records were written thousands of years ago and contain exact descriptions of the fates of many people who lived or will live in the future. Unfortunately, these records do not attract any attention from current science.

And so, logically, the fourth dimension makes it impossible to anchor more than four-dimensional spaces, which are shifted to becoming just descriptive mathematical model constructions[2] - because infinity cannot be further divided.

Everything means everything, even in the area of multidimensional spaces (for example, the string theory [5] assumes that there are ten dimensions + time. Other "fractal" dimensions can be found in the infinite structure of force centres manifested in mass, the general theory of relativity [3] is the geometry of a non-Euklidean curved four-dimensional spacetime, etc.).

Since a 4D view contains all states, scales and possibilities at once, we can call it a "Superreality".

And so, from a 4D perspective, the whole world is a static formation without time or development, everything in it exists simultaneously, at once. Only a 3D observer (who is also part of the 4D world) adds dynamics to this world through his observation. From his position, on one of the endless numbers of levels and possibilities, the observer perceives time, evolution, creation and extinction (causality).

The world is dual and exists in both states at once. While a 3D observer perceives the dynamics of the world and its seeming causality, from a 4D perspective the perception is static with all possibilities and states existing simultaneously.

If we take a train from place A to place B, the fact that we cannot see place A does not mean that it no longer exists. Similarly, if we decide that we shall never visit place B, that does not mean that place B does not exist.

The entire self-contained chain of sub- and super-universes has a structure that is analogical to that of the Möbius strip (otherwise we would observe a discontinuity when passing through the sub- and super-universes).

From the perspective of self-similar symmetry, it is also very likely that every sub- and super-universe has a structure analogical to that of a Möbius strip when seen in 4D (a 3D observer can go through the entire infinite universe yet never find its end).

Yet even in our 3D observation there is a duality that is analogical to the duality of particles in the micro world:

While an observer "within" the universe, regardless of his position, observes an infinite non-localisable formation without an end or a border (the apparent border is given only by the horizon of cognition), an observer from a super-universe can observe it as a real, finite and tangible formation, e.g. as a grain of sand. Yet both observers are observing the same thing.

The topological distortion of all universes also prevents them from folding back

[2]Philosophy observes and explains, that our world is a 4D formation. It can certainly also be described using a mathematical model that works with other multidimensional spaces (5D, 6D etc.) Such a description (although it may be functional in certain limited areas) will always remain a mere thought construction, i.e. something which does not reflect the true reality of our world.

to the starting point “O”. The universes are all interconnected (anchored) by singularities, which we know by the name “black holes”.

4.2 What is matter?

How can we understand the concept of matter if there is nothing that cannot be further divided? We explained earlier that particles of matter can be described as standing longitudinal waves at wave centres with a remarkable accuracy, and that mass is energy and energy is vibration.

So, what exactly is matter and how does it relate to fundamental forces such as gravity?

Perhaps the best description of this idea came from Albert Einstein: in his general theory of relativity, he introduced the term spacetime and described gravity as its curvature [3]. And so, thanks to Einstein we can start to understand that gravity is not what causes the curvature of spacetime, gravity “is” the curvature of spacetime.

If we are to speak the language of philosophy for a moment (our apologies to the scientists), we can picture our material world as a thought structure (!), and the material distribution of this thought in time and space only copies the location and motion of spacetime’s force centres, which are this thought, and this is how they manifest themselves to the observer. So the force (thought) structure of spacetime is the main defining element.

Can you imagine for a moment that there could be fractally structured force centres in our world, and that everything we call mass would gather around these centres? And that matter would only copy the force (thought) structure of our world?

Do you think we would then need cosmic inflation in order to explain the smoothness and homogeneity of the observed universe, which contemporary cosmology solves by the (perhaps somewhat artificial) theory of inflation [51]?

Matter is one of the manifestations of the thought structure and essence of our world. We perceive it as something solid and tangible that takes up space – as the building material that our entire world is made of. Matter binds the energy of force centres within itself. This energy manifests itself as a vibration in its life and time progression.

We have described time as the oscillations between two poles, space as span between these two poles, and motion as observation. If we can understand our world as a thought structure, then matter is the perception that depicts this thought structure and makes it visible to us in our observation (in all its time and space manifestations).

4.3 Non-linearity of physical quantities

We have already explained that any kind of interval that is described using a linear understanding of physical quantities (time, space, motion, energy etc.) may appear arbitrarily large or small to us depending on the relative position of the observer. That is a manifestation and consequence of the horizon of cognition.

This statement may seem very strange at first. The easiest way to understand it is to first look at a length or distance. Measuring the length of a coastline is a well-known example. The finer the scale (the smaller the observer) used, the longer the length of the coastline. We can say that the measured length only depends on the size of the measurement units (which the observer of course chooses according to his position). The length itself cannot be defined without stating which scale we have chosen to measure it with. That is clear.

But what if we were to look at rest mass, for instance? Could the same concept be applicable here? Could the rest mass take on arbitrary values depending on who (how large an observer, for example) is investigating it? After all, the horizon of cognition is equally valid in this case as in any other. Perhaps we could use a fractal perspective to help us out here (purely for illustrative purposes):

In our common understanding, the rest mass of any body is related to the number of particles it contains. Can you imagine that, if we were to keep shrinking within our fractal structure, more and more, previously undetectable, particles would appear from behind the horizon of cognition (which always moves with us)? So not only would the body in front of us increase in size, but its mass would also keep increasing in our observation?

In this case too, we can thus conclude that rest mass is not an objectively existing constant, but that its value is given only by our position – i.e. by the interval to which we RELATE this mass. If we change the observer's position, we also change the observed interval. In a curved world, where only we ourselves are the scale, and thus one of the poles of the interval, this is comprehensible.

And this continues on and on in an infinite circle.

We can observe the same with energy, time, etc. Any measured value will change non-linearly as the observer's position changes and may take on any arbitrary value depending on the interval defining our observation. Any attempt to measure anything is thus always burdened with error. As mentioned earlier, the measurement error of small intervals can be considered infinitely small, yet at the horizon of cognition its value (the inaccuracy of our observation) grows infinitely.

This perspective makes it clear that even Einstein's famous and undoubtedly valid equation $E = mc^2$ only captures a tiny fraction of the infinitely many levels of our world's actual existence.

The philosophical observations presented above (if taken seriously by science) could thus bring about a fundamental paradigm shift of contemporary science's perceptions of the world and existence.

As a direct consequence of the above stated, we can immediately conclude that the terms gravity and spacetime must also have a fundamental meaning everywhere – not only in the universe, but also in the micro world.

And so, in order to reach a unifying philosophical explanation of the whole world, we must also take a look at gravity[3], as it is currently considered to be the basic force that helps create and structure our world.

4.4 A philosophical view of gravity and the dynamics of the universe

A philosophical discourse on gravity from the perspective of the Philosophy of Existence can be found in Tomáš Pfeiffer's book *Spacetime + Gravity* [2], which we draw on in this chapter.

There is one essential difference between the scientific and philosophical understanding of gravity:

According to contemporary science:
Gravity is proportional to mass (mass is primordial).

According to the Philosophy of Existence (based on its direct connection/observation):
Mass is proportional to gravity (the force is primordial).

Let's see if we can find where the actual truth lies.

Contemporary science understands gravity as a manifestation of matter itself. As we explained earlier however, according to the Philosophy of Existence, there is nothing finite, solid or indivisible in matter.

As explained previously, we can therefore imagine matter, philosophically, as a thought structure whose distribution in space and time merely copies the location and motion of spacetime's fractally structured force centres.

„*Let us imagine, though, for a moment that matter itself is not a source nor a bearer or gravity; however, the way matter seems to us, not only in physical terms, is the result of the existence of immaterial force centres which, according to their quality and power, attract matter to themselves, regardless of whether towards atom structures or planetary systems etc. With this said, those centres*

[3] Gravity is a universal force manifestation among all forms of matter. It has an infinite range and, according to current scientific knowledge, it is always centripetal, attractive (which is why science considers it to be monopole). As will be explained further, in the rhythm of time, this attractiveness (centripetalism) is rotated by its repulsive anti-pole (centrifugalism). This means that the principle of duality is maintained here as well.

structure the matter and make it visible.“ [2], page 43.

Science knows four fundamental forces/interactions/fields: the gravitational, weak, electromagnetic and strong interactions and tries to unify them into one – which is clearly the right way to go.

Direct philosophical observation shows us the activity of immaterial force centres, which (see [2], page 42) „*resonates quadrupolely in time, creating four fundamental states of matter:*

Positive force – centripetal gravity, its material manifestation is solid matter
Negative force - centrifugal, repulsive, its material manifestation is gas
Heat force - fast oscillation, its material manifestation is plasma
Calm force – cooling, solidification, slowing down oscillation, its material manifestation is liquid"

The quadruple resonance occurs simultaneously on all levels of the fractal structure of our world and expresses its dynamic manifestation. Its practical, observable consequences are, for example, the fluctuations of the gravitational constant G, which are otherwise difficult to explain [52].

This is all a direct consequence of the existence of the four poles, the fundamental building blocks of our world (see section 2.3.1 The origin of spacetime), which are also manifested in progression of time.

This thought is further elaborated upon in [2], page 44:

„*According to how these immaterial power centres change under the immediate predominant influence, the matter – universe finds itself in the corresponding state. For example, today the cooling universe is – through positive gravity and cold – fully concentrated in planets, solar systems, galaxies.*"

The fundamental state of the universe is thus always given by the prevailing influence of one of the four regularly recurring phases. A quote from Josef Zezulka's publication [1], page 14 follows to explain this further:

„*There was a time when only gaseous, glowing, dispersed matter existed in the universe along with centres of force (non-material points of energy or magnetism with their own structure were moving around the universe in such a way and on such paths as today's planets). They were the foundations of future planets in the form of energy. In the universe, centrifugal force governed – hence the material dispersion.*

Just as inhalation follows exhalation, centripetal force affected the universe and replaced the ruling centrifugal force. The centres of force were then activated and began attracting the dispersed glowing gas towards themselves. Thus, the non-material centres of energy became material, though still gaseous planets. The gaseous planets through the effect of steady centripetal force condensed into glowing liquid matter and in this form they pilgrimaged on their predestined paths.

After a long period of time, but still in exact time rhythm, another influence became effective in the universe – this time it was the influence of peace and coldness. Glowing molecules of space matter were calming their vibrations under this influence, the matter of the hot and liquid planets began to cool down and harden slowly. On the liquid surface darker spots were appearing slowly (as today on the sun) – the first floating continents.

According to force rations in the universe, some planets were cooling faster, while others – those that were closer to the centres or were themselves the centres were cooling down more slowly. And so the process has reached our present time. We are living in a time of quietening of the universe – the time of its cooling.

(...) Time goes on. The planet will gradually continue to cool. Even the sun will go the same way. Life will be changing form and everything will be waiting for another impulse that will permeate the universe one day to claim power for a limited time. The cosmic influence of a new heat will come. All the planets will warm up. Their matter, which was divided into elements and compounds, crystals and rocks, and then became organic, will melt and become homogeneous again. Planets will be transformed into liquid, then gas but they will still exist in their specific existence. The era of fire and glowing will rule the universe. When its time passes, the centrifugal impulse will come again. Everything will disperse. Individual components of the matter will be repelled from each other. Only gas and immaterial centres of force will exist in the universe. But life cannot be lost. The centres of force will continue wandering on their eternal paths as planets and only the environment around them will change in the course of time.

One day, another centripetal impulse will occur, followed by others that are quiescent, fiery and eventually centrifugal again.“ (Josef Zezulka, [1])

Perhaps we can illustrate this in a very simple form as in Fig. 4.2.

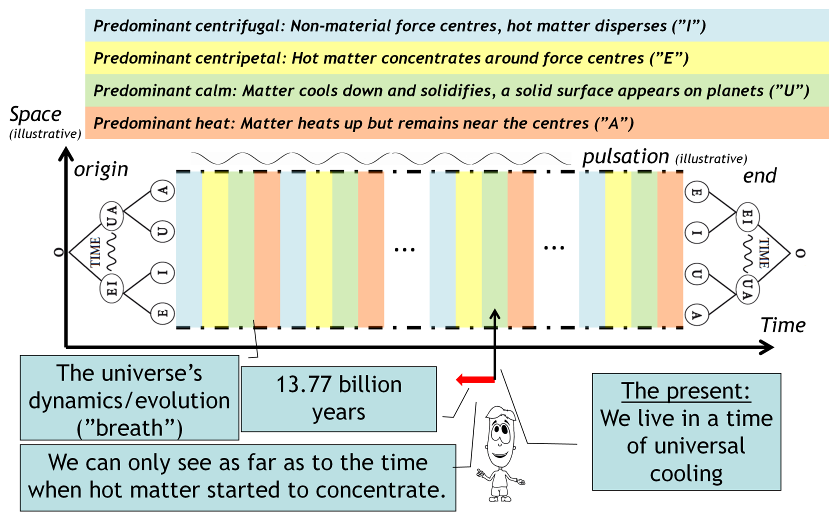


Figure 4.2: The origin, dynamic of evolution and future end of the universe and regular alternation of the predominant force influence.

4.5 The origin and ultimate fate of the universe

How did the universe originate? We have already explained that everything that exists came to be through division. We can picture the beginning of everything as point zero (of time and space).

„*There is no space, there is no time. There is Nothing and the Nothing includes everything, just in a different form. By dividing a part of it, this Nothing immediately explodes into another form – a manifested spacetime. In that moment, matter finds itself in a state of "superheated plasma", a state of matter that is indescribable to our understanding (similar to how we cannot describe the state of matter at the centre of a black hole). Because at that moment, there is no material atom, molecule or planet in the entire universe, which is filled with this plasma.*" [2], page 46

The state of matter, when it is completely dispersed on all levels of the sub- and super-universes, when it is not found at power centres, could perhaps be described as a spacetime wave (as we explained it earlier). In this moment, matter exists only in the form of radiation. In the words of the Energy Wave Theory [46], there are no standing waves enclosed at wave centres when the universe is in this state. We only have waves propagating in space.

Yet despite this, wave centres do already exist:

„*And yet, already at that time, nuclei of future planets are also in the power form and circle around immaterial power centres in space. In the very next moment, the positive gravitational force triggers the activation of these power centres in space. The still dispersed hot plasma becomes attracted by those centres in their eternal orbits – to a lesser extent by minor centres and to a greater extent by major ones. The first suns, planets and galaxies are being born in the material form of the emerging universe. The universe continues to live in accordance with its laws. Absolutely nothing is random, the structure and the order have existed since the very first moment of spacetime existence!*" [2], page 46

And so, in relation to this, we can again ask ourselves the philosophical question we mentioned earlier, if what is not true can be true.

Because of course, randomness only applies to an observer in 3D space – from a 4D perspective, all chaos and the horizon of cognition itself disappear.

„*In another understanding of time (causality) all the states of the universe exist NOW in the fourth dimension. There is no past, there is no future, everything EXISTS now. Thus, the moment of birth EXISTS as the positive gravity concentrates the plasma into the form of still gaseous, hot pre-planets; there EXISTS another impulse in the immaterial power centres – an impulse of cold that creates solid matter of terrestrial planets as they cool down depending on their size (i.e. the activity of their immaterial power centres).*

There also EXISTS the end of this cosmic era where there is only cold in the universe, and all suns burn out to their final state. There also EXISTS a sub-

sequent phase, in which the planetary power centres' heat force transforms the matter back into plasma that is still rotating in the location and shape of the former planets – under the present influence of positive gravitational force, which is immediately thereafter substituted by the opposite force – negative gravity (diffusion). This gaseous plasma diffuses again to the universe's initial state. Another cycle is at the beginning…

This is how the universe and its psychic part (not a human psychic part) live.“ [2], page 47–48

Just as the universe once originated, it will also at some point end. Perhaps we can draw an analogy to exhaling (the origin of the universe) and again inhaling (the end of the universe):

„*After an endless number of cycles, there also EXISTS the end of the existence of spacetime in manifestation; this happens by implosion of the duality created out of the initial division. The whole cycle of birth and death repeats in an infinite sequence as one of the manifestations of life of infinity.*“ [2], page 48

What we consider to be the "Big Bang" is actually a process during which hot, dispersed matter started to concentrate into the areas of force centres and then cool down.

On all levels of existence, the dynamic of the universe is the consequence and manifestation of the resonance of the four force components: the centripetal force, the centrifugal force, heat and calmness. Since everything came into existence through the division of the original folded unity (point zero), everything is self-similar in all its forms, shapes and manifestations on all levels of existence; in a dynamic manifestation, it is synchronous in its seeming asynchrony (if we try putting several pendulum clocks into one room, after a certain amount of time the pendulums will synchronise [53]). In the chronology of time everything thus mutually resonates in spacetime's infinite fractal structure and the resulting state is the superposition of an endless series of the four force components' resonant oscillations. The oscillations differ in intensity, range and the period of the manifestation (imagine the superposition of all kinds of waves, including the tidal force effects, on a stormy sea).

It is primarily the manifestation of the four resonating forces, which results in the observed phenomena. Therefore, the current state of the universe is a result of when heat and dispersion was the prevailing force in the universe and free energy, under the influence of the emerging centripetal and calm component, withdrew to the power centres, calmed down – and particles and solid matter appeared. This is why the power centres, in their structure and state, are today able to interact according to our known laws of physics.

The dynamic manifestation of the quadrupole resonance contains the four forces and the alternation of antagonists (forces of the opposite sign), i.e. calmness (coolness) – heat and the centripetal–centrifugal forces. While the heat force disrupts the form (state) of solid matter, the centripetal force disrupts its concentration. These transitions between the antagonists then create very distinct divisions: not only in cosmology, but also our everyday lives – after all, the dynamics of the resonating force rhythms is manifested on all levels of existence.

Another consequence of the dynamic superposition is that our observations will yield different results at different times and in different places – see for instance the previously mentioned fluctuations of the results when measuring the gravitational constant.

What we perceive as cosmic microwave background[4] is most likely a remnant from the previous ages of heat, dispersion and clustering, not from the actual beginning of the universe. The universe originated many, many cycles earlier. If we perceive the entire universe as a single quantum of spacetime, perhaps we can regard this radiation as a state function expressing the dynamics of its current energy state (an analogy can be drawn to the vibrational-energy state of a quantum particle here). Once the temperature of the cosmic microwave background reaches the horizon (i.e. absolute zero), the reverse process begins – the heat force emerges. The universe starts to contract and the temperature of the cosmic microwave background rises again.

Cosmic microwave background also contains information about the last age of heat. This is most likely manifested in its anisotropy, which we observe. And so, it is likely that this information is passed on between the universal cycles and thus the universe as a whole can gradually evolve (a new cycle does not begin from zero).

In conclusion, let us once more repeat the perhaps most important cosmological result of the philosophical observation of our world:

The manifestation of the immaterial skeleton of force centres determines the state of the universe we observe. Gravity is completely independent of matter! It is created by the FORCE skeleton of matter, of the universe. Matter only follows this force structure (as particles, sub particles and the entire universe).

4.6 Dark matter, dark energy and the accelerated expansion of the universe

According to scientific ideas from the last century, the expansion of the universe was understood as being a relic of the initial spacetime expansion and that gravity would slow down this expansion in time. From the perspective of physics, the 1998 discovery that the expansion keeps accelerating was simply shocking [20].

[4]Cosmic microwave background is microwave electromagnetic radiation coming from all directions of the universe. According to scientific theories, it could be a remnant from the period not long after the Big Bang. With the help of theory of black body radiation and recent measurements the temperature of the radiation has been determined as about 2.73K. According to the most commonly used cosmological models, this temperature was much higher in the early stage of the universe. As the temperature reached about 3000K, when electrons and nuclei started to combine, this radiation split from matter (matter became transparent to it). The temperature of cosmic microwave background keeps decreasing as the universe expands (thus characterising its size).

This is difficult to explain without considering the existence of negative gravity.

In order to explain this phenomenon, we again quote from the book *Spacetime + Gravity* [2], page 44-45:

We can imagine that „*the entire energy manifestation is likely primarily constituted of the energies from all these immaterial energy centres found in all material levels of fractal structures. This applies all the way from sub-particles of sub-particles to galaxies and universes. It is the sum of the infinite resonant fractal influences, while, cosmologically, matter at the atomic level may only correspond to a few percent of gravity and the rest is the fundamental superior immaterial power centre of the planet. (...)*

Hence, the resulting state stems from superimposing the vast number of state levels interbound by the causal link law. The causal links are not fully recognizable within the linear plane of Euclidean networks, but only by applying the law of the horizon of cognition to the fractal system.

For example, let us take a look at a planet, our Earth for instance. It consists of atoms and compounds of various elements. Likewise, each atom has its own immaterial power (gravity) centre – a nucleus keeping electrons in their orbits by the means of positive gravity, similar to a solar system keeping its planets.

I deliberately omit other lower sublevels, since each atom component is analogically composed of more and more sub-components to infinity. This is also true in the opposite direction, towards the macro universe.

On the Earth's surface, the Earth's gravity can therefore be described by the fractal sum of atoms' positive gravitations and the planetary elementary power centre, using the law of the horizon of cognition which incorporates the non-linear variable – interval size – into the calculation. This resulting force interacts on the Earth's surface with the atoms of Newton's apple that led to the formation of gravitational laws, i.e. the external description of gravity, as a result of observation.“ [2]

We can look at the entire galaxy in this way, adding up the gravity of the individual stars, planetary systems and dispersed matter + the gravity of the galaxy's fundamental force centre.

We can even look at our entire universe this way. The superior power centre, which determines the universe's overall state, is fundamental here. But just as an inner observer will never be able to find the centre of our universe, for our observation, we can imagine that this force centre is spread all around us. Its activity is therefore "even", i.e. entirely uniform in our observation. The rhythmical changes of the entire universe are then determined by the activity of this force centre.

„*If we imagine a system interconnected by positive gravity as a group which as a whole carries another attribute – an attribute created by the group's overall power centre that has negative gravity and that interacts with its surroundings – we can come to comprehend the phenomenon regarding the levitation of material* *objects*“ [2], page 45, or the acceleration of the expansion of the universe.

And so, we can approach an explanation for the missing dark matter and dark energy.

As we tried to explain above, a philosophical view of the natural laws tells us that every consequence must have a cause, which is often hidden within it. For instance, we are surprised to find that the parity is violated in weak (and it seems also strong) interactions [54]. yet at the same time we are, quite rightly, saying that the world could not have originated without this violation.

Philosophy can easily explain this as a result of the law of duality (similar to the tunnelling phenomenon in the micro world). Everything that we perceive must necessarily have two poles in order for it to be able to exist at all (just as there is no magnet with just a single pole). And so every natural law must also encompass its own violation (!). As we are well aware, if parity was not violated in weak interactions, our world really could not have originated.

This might perhaps all seem a bit strange. If we take a stone and throw it, we move an infinite number of power centres with our random capriciousness (by our will). Yet even this is part of the universal order: chaos in 3D, which is order from a 4D perspective (!).

Chapter 5

Unifying perspectives

5.1 A unifying view in the micro/macro world

The following figure shows a comparison between the situations of an observer in our universe, an observer located in a fractal sub-universe (reduced to the size of an atom or electron), and an observer located in a fractal super-universe (enlarged to a size exceeding the size of our entire universe). Let us imagine, for instance, an electron (in the micro world) and our entire universe (in the macro world).

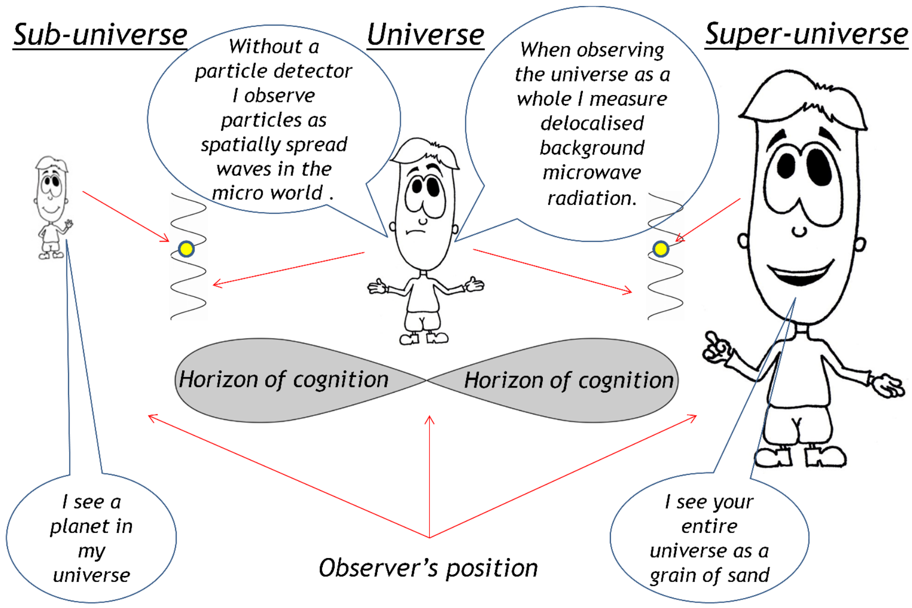


Figure 5.1: An observer's different perceptions in different positions (sizes).

Based on the concept of a self-contained fractal object – the infinite chain of sub- and super-universes [1, 2], and adopting the concept of the horizon of cognition, we can conclude that both the electron and our entire universe will appear as clear, defined objects to our observers in their different positions (sub-universe and super-universe).

On both sides we have the same duality of observation, capturing the symmetry of our world, which is illustrated in Fig. 5.1.

Philosophy can again repeat that the horizon of cognition applies to literally everything, even itself. The possibility of cognizing and understanding the horizon of cognition is thus limited by its very existence and we can only do so partially.

5.2 Does God play dice?

In his famous letter to Max Born in 1944, Albert Einstein wrote [55]:

„*You believe in the God who plays dice, and I in complete law and order in a world which I, in a wildly speculative way, am trying to capture. Even the great initial success of the quantum theory does not make me believe in the fundamental dice-game, although I am well aware that our younger colleagues interpret this as a consequence of senility. No doubt the day will come when we will see whose instinctive attitude was the correct one.*"

We have previously explained the uncertainty of quantum mechanics as a manifestation and consequence of the horizon of cognition. Although the statistical behaviour of the micro world with all its wave consequences – geometric, forces, quantisation, or quantum entanglement – quite evidently does manifest itself in that manner (and we can consider it real), there is also a fractal veil, curtain, that hides other real worlds. Both views are valid simultaneously: the fractal view and the energy-vibrational view in which the mass of particles is concentrated energy.

The wave, quantum and chaotic manifestations we observe are closely connected to our fractal world – they are its dynamic manifestation and their indisputable existence is given and conditioned by the horizon of cognition.

The causal chaos observed in 3D can be order without any randomness or causality from a 4D point of view. All levels of existence in the sub- and super-universes exist simultaneously, thus creating a dimensionless sphere in all their possible 3D passages (which we "choose" between).

It is therefore necessary to realise that what we consider to be reality is in fact only one of an infinite amount of interconnected, parallel and timelessly existing levels of our dimensionless sphere – i.e. a set of everything that may exist in 3D (and thus does exist in 4D). In the infinite fractal circle of all self- similar universes, these levels are then completely fulfilled (and thus also observed) in all their infinite variety and diversity.

We can therefore say that, although our consciousness does not create reality, from a 3D perspective, it does co-create it (as it looks into the micro and macro world). Philosophically, the consciousness of a human (a being) can be understood as one of the two poles of overall existence. The second pole is the central unchanging and timeless thought manifested in the 4D structure of our world.

And so, we can say that Einstein's intuitive view was quite simply true. From our limited 3D perspective, we can only understand God causally (i.e. only partially), for instance as the primary cause of all causes. His 4D component, self-projected into everything that can exist, surely does not play dice.

From philosophical point of view, we can therefore consider randomness and chaos as properties of our brains, not of spacetime. The infinite structure must encompass EVERYTHING, here and now.

5.3 The theory of everything

Towards the end of his life, Albert Einstein (and many others after him) pursued the idea of a theory of everything (that would describe and unify all known interactions). The equations of such a theory should be able to unify quantum mechanics and the general theory of relativity. However, to date no attempts have been successful and the two appear to be incompatible.

1. Contemporary quantum mechanics mathematically describes the fundamental interactions in the quantum world through the exchange of virtual particles, bosons, that transfer momentum. This is how the strong, weak and electromagnetic interactions are described. Yet intermediate particles (when mediating an interaction) are not directly observable and are only manifested as energy quanta. Apart from during force interactions, however, these particles (for instance photons used to describe electromagnetic interactions) could be directly detected.

2. The general theory of relativity [3] combines three spatial and one temporal dimension into a single four-dimensional spacetime network and describes gravity as its curvature. Gravity slows down time and the manner in which spacetime is curved is given by the constant speed of light in a vacuum. In spacetime, material bodies move (fall) freely along the shortest (most direct) paths and their paths are curves corresponding to the shortest possible spacetime trajectories.

Up until now, unifying attempts have mostly been based on the Quantum field theory and have also tried to explain and describe gravity using virtual particles, gravitons, which, however, have not been observed in any experiments to date. And not even gravitons have made a unified theory possible. The previously mentioned Energy Wave Theory presents an interesting concept, but the fractal view of our world is missing here as well.

From a philosophical perspective, contemporary attempts have been based on our observations of processes at the horizon of cognition. However, these observations are always strongly distorted, related to our consciousness (although in our view entirely real, with all the perceived and observed consequences). Should our base not rather be what the great scientist and philosopher of the last century, Albert Einstein, intuitively understood and mathematically described? After all, even the recent measurement of gravitational waves [56] again confirmed that his ideas were valid and correct.

The general theory of relativity is essentially a non-Euclidean geometry of space-time (this means it works with its curvature). Even if general relativity does not explain all the observations and processes, if we were to add the thoughts presented in this publication to the general theory of relativity, we may be able to find a way to completely unify all forces and interactions.

For example, it should be possible to describe what we call electromagnetic attraction, which forces negatively charged electrons to orbit positively charged protons in the nucleus of an atom, with the same equations as used to describe Earth's motion around the sun. They are in fact just two views of the same thing.

Philosophy can show us insights beyond the limits of possible scientific knowledge, but it will never be able to replace scientific knowledge itself. The theory of unified field/universe can thus not be developed by philosophers – only if philosophy and science cooperate can it be developed and proven.

Chapter 6

Conclusion

Contemporary scientific theories describing the micro and macro world seem to be incompatible. Yet philosophical knowledge explains that they all in fact describe the same thing and that the only real difference is the observer's position.

While the theory of relativity works with 100 per cent predictability and certainty, quantum theory is purely probabilistic. From our perspective, we consider the force of gravity as negligible in the micro world while gravity plays a fundamental part in space.

An observer in the micro world sees an object in "his" scale and finds it completely and clearly defined, exhibiting fully predictable relativistic behaviour, whereas an observer in the macro world only perceives oscillating spacetime projections of points, which manifest themselves to him as waves. An observer in the macro world measures tiny values of dimensions, time and mass, whereas to an observer in the micro world the measurements show many billion. In the macro world astronomers observe the explosions of huge supernovas, while in the micro world we detect the spontaneous decay of heavy atomic nuclei. Just as we observe molecules in the micro world, we can find binary or multiple star systems in the macro world.

And yet they are in fact just two views of the same thing.

The ideas in this book thus invite us to consider the possibility of changing the paradigm regarding our contemporary understanding of the world. If we apply the horizon of cognition to objects in its vicinity, we can reach a deeper (albeit not full) understanding and clarification of not only cosmology and quantum mechanics but also our entire world.

It may seem that some of the ideas presented here are hardly provable based on our current knowledge of the world. However, their foundation is not hypotheses based on scientific observations (which are limited by the horizon of cognition) but philosophical observations, which can see much further and deeper than a perfect telescope or accelerator (though philosophical knowledge is similarly limited by the horizon of cognition given by the human brain's limited comprehension – even if we could break this limitation by leaving our brain with our mind, for the subsequent description and explanation, we would still have to return to our brain).

In this work, we have used the opposite pole of human cognition as our starting point in an attempt to help science understand WHAT its equations and theories actually describe. This is the true and indispensable task of philosophical cognition of our world.

The observations presented here and the explanations arising from them may serve as a basis for further following contemplations and confirming experiments. In the future, a link between philosophy and science could open the door to deeply true, unifying understanding of the micro and macro world.

One possibility (the simplest) is to reject the above-mentioned ideas as mere unsubstantiated speculations; the second possibility would be to try to give these ideas deep and serious consideration.

Over the last decades, despite all the findings and observations that have been made, our understanding of the fundaments of the existence of our world has not increased much. Therefore, we are perhaps reaching the point when philosophy and science can unify and join their efforts, break through the present paradigms, and shift our common horizon of cognition that bit further.

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