# Searching for Sustainable Development and Its Purpose

# Searching for Sustainable Development and Its Purpose:

## *The Human Story*

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# CHAPTER ONE

# INTRODUCTION

From the beginning of time, people have always liked to tell stories. Even in the times of hunters and gatherers they gathered around the fire and talked, exchanging experiences and forming a community. Today, we also tell stories, although it is thanks to modern information technologies that we suffer more from an excess rather than a deficit. It is then that these stories are often fragmented and flustered. Let us try to avoid this trap and say something about the "great human story," from the birth of our universe, the creation and development of life on Earth, to the ultimate outcome of human history as we see it today.

God once spoke to us through the prophets, if we believe what is written in the Old Testament. Then it is as if He broke off. It is quite possible that He just changed His way of communicating and now speaks to us through science, and one day, we hope, He will speak directly to us.

Many people have tried to tell the "great story"—that is, the search for answers to questions about who we are, where we come from, and where we are headed. It is here that we will try to present a holistic, synthetic view while knowing that it is not in our power to capture everything that is important and significant. We will look into the past, which we can interpret in different ways, but cannot change. We will examine current events and challenges in greater detail because they predict future events. And we will attempt to look into possible future scenarios. If the future is not predetermined or predicted, it can evolve in different directions, which we can affect with our actions. Therefore, we can never fully come to know the future, but we can form it to a certain extent.

Along this journey we will rely on the two main sources of our knowledge: science (things understood) and faith (things revealed). Even at the time of writing this story is outdated. New events happen, which are unknown to us today and will fundamentally affect our view of the world around us. But that is our destiny. As long as we are pilgrims on this Earth our knowledge is not perfect, as it changes and develops. Yet, at least for

some, this story will be an inspiration in searching for the meaning of our sojourn in this material universe, bounded by space and time.

This story is loosely linked to the *Sustainable Development* work (Nováček 2011). It was more extensive and factual, and focused mainly on the desirable scenario of the future development of human society—long-term sustainable development. The data from 2011 are already outdated, so I have attempted to update them. At the same time, I have focused on the "human story" and what I consider to be the most important, most inspiring, and more-or-less constant over the years.

# CHAPTER TWO

# PAST

## 2.1. Beginning

*Before the world was created,*
*the Word already existed;*
*he was with God, and he was the same as God.*
*From the very beginning the Word was with God.*
*Through him God made all things;*
*not one thing in all creation was made without him.*
*The Word was the source of life,*
*and this life brought light to mankind.*
*The light shines in the darkness,*
*and the darkness has never put it out.* (J. 1: 1–5)

This is how the creation of the universe is told to us by the Bible. We can understand the "Word" (*Dabar* in Hebrew) to be a creative act ("the act of doing"). The reference to light is interesting. In the word (the creative act) was life, and life was light to the people. Light may perhaps link the natural world (our universe) with the supernatural world. According to Einstein's theory of relativity, nothing can achieve the speed of light except for light itself. The nature of light is a mystery to us. We only know how light is transmitted by the flow of particles or photons. According to the theory of relativity, light has unique properties. Logically, we would expect that the faster we travel through space, the relative speed of light with respect to us should be smaller. But that is not the way it works. Whether we are travelling towards light or away from it, the observed speed of light remains constant.

> Let´s imagine a disembodied observer traveling at the speed of light. Einstein´s equations would then predict that, from light´s own point of view, it travels no distance and takes zero time to do so. This points towards something very strange indeed about the light. Whatever light is, it seems to be in a realm where there is no duration; no before, and no after. There is only "Now" (Russell 2003).

Today, the theory of relativity and quantum theory consider the phenomenon of light out of space and time. Light may thus be the key to the mysteries of the universe, and to breaking the barrier of time and space. However, time and space are two different manifestations of a deeper reality—a time-space continuum, something past space and time, but with the potential to manifest itself as space and time. In physics, light turns out to be absolute. Space, time, mass, and energy are not as fixed. Light may be the first manifestation of the underlying grounds of all existence, the subtlest level of creation, the closest we can come to that which lies behind the countless forms (Russell 2003).

People who have undergone clinical death have come very close to the border separating the natural and supernatural worlds. They often talk about meeting a spiritual being, who they perceive as an intense, bright, yet not-blinding light. Mystics are called "enlightened" people.

Albert Einstein once stated that he would like to spend the rest of his life studying only light. He perhaps may have had the right idea that light connects the natural world with what lies beyond this world—the supernatural world.

The Book of Genesis talks about the origin of our natural world:

> *In the beginning, when God created the universe,*
> *the Earth was formless and desolate.*
> *The raging ocean that covered everything was engulfed in total darkness,*
> *and the power of God was moving over the water.*
> *Then God commanded, "Let there be light"—and light appeared.*
> *God saw that the light was good, so God separated the light from the darkness.*
> (Gen. 1: 1–4)

What does our current scientific knowledge, which we have gained through our reason, tell us about the origin of the world? In 1929, Edwin Hubble made an important observation that, wherever you look, the distant galaxies are moving away from us at great speed. That means the universe is expanding, which indicates that at some time in the past an event called the Big Bang took place when the universe was infinitely small, and therefore infinitely dense and hot. Mathematicians have named such a state to be singularity.

At this moment, Einstein's general theory of relativity no longer applies and cannot be used to explain how the universe began (what its origin is), but only how it later developed (Hawking and Mlodinow 2010).

Astronomers believe that the Big Bang took place 13.7 billion years ago and lasted only a fraction of a second—precisely $10^{-43}$ of a second. Then space, matter, radiation, and time came to exist. We do not know what came before the point of the universe's creation, and we may never find out because the place where our natural laws do not apply is outside of our natural world.

Afterwards, the universe expanded extremely quickly. According to mathematical calculations, the dimensions of the universe increased $10^{30}$ times in just $10^{-35}$ seconds during this inflationary period. This is completely beyond our understanding and imagination. It would be as if we had a coin with a diameter of one centimetre, and it suddenly grew to the size of ten million galaxies (Hawking and Mlodinow 2010).

There are approximately 100–140 billion galaxies in the known universe, our galaxy being one of them, and each of the galaxies contains about 100 billion stars. The Earth and seven other planets orbit the Sun, which is an ordinary star of average size.

As the universe started to expand after the Big Bang, the temperature of its matter decreased. One second after the Big Bang it dropped to approximately ten thousand million degrees—about a thousand times higher than the level of the temperature at the Sun's core. At this moment, the universe contained mainly photons, electrons, and neutrinos and their antiparticles, together with a small amount of protons and neutrons.

About one hundred seconds after the Big Bang, the temperature dropped to one thousand million degrees. At this temperature, protons and neutrons no longer had enough energy to escape the attraction of the strong nuclear interaction. They started to coalesce and form the nuclei of deuterium atoms, also called heavy hydrogen. Afterwards, the deuterium nuclei fused with more protons and neutrons and formed the nuclei of helium.

For the following one million years, the universe as a whole kept expanding and cooling. Hydrogen and helium clouds started to coalesce due to gravitational attraction and formed huge primeval galaxies (protogalaxies). The process of coalescence also continued inside the galaxies. The formation of the first protostars began, their size being a million times greater than that of today's observable stars.

Later, gas in the galaxies separated into smaller clouds which collapsed due to their own gravity. As the cloud shrank, the gas temperature

increased to the point where it was high enough to initiate nuclear reactions. These again converted hydrogen into helium.

The more massive stars had to produce more heat to balance their stronger gravity. As a consequence, the thermonuclear fusion inside them happened faster so these stars exhausted their hydrogen in only a few hundred million years. Then they shrank a little and, as they heated up again, started converting helium into heavier elements like carbon or oxygen. Then the core region of the star probably collapsed into a state of great density, like, for example, a neutron star or a black hole. The outer layers of the star may have been blown away in a massive explosion called a supernova which outshone all the other stars in the galaxy. Some heavier elements produced in the final stage of a star's lifespan were blown back into galactic gas and became building material for the next generation of stars.

The Sun contains approximately two percent of these heavier elements because it is a second or third generation star. It was formed some five billion years ago from a rotating gas cloud composed of the remnants of previous supernovae. However, a small amount of heavier elements gathered and formed some of the bodies which today orbit the Sun, such as the planets, including the Earth.

The Big Bang model is an elegant and breath-taking theory. Nevertheless, as Josef Svoboda points out (Svoboda and Nováček 2002), we should keep in mind that everything could have happened in a different way from what we imagine and what cosmologists and astrophysicists still find in mathematical equations today.

Our understanding of the universe is not definite. Rather, we can say that our understanding of the universe is "infinite"—it is never-ending. Einstein completely changed our understanding of mass and energy. Quantum mechanics goes even further when speaking about the dual manifestation of the existing reality. The most recently discovered elementary particle of the physical world is the one-dimensional "string," an almost infinitely small quantum of vibrating energy. Pioneers of String Theory have already come up with the new concept of "branes," which are multidimensional and can better explain the structure of the universe and its matter, as well as space and time, and reconcile the discrepancies between relativity and quantum mechanics. But again, it is questionable as to whether the indications of mathematical equations must necessarily be the reality.

## 2.2. The origin and evolution of life

Natural laws make up a system which is very finely tuned. These laws apply throughout the entire universe. Natural forces we know about can be divided into four groups (Hawking and Mlodinow 2010):

(1) Gravity. This is the weakest force, but has a great reach and uses attraction to affect everything in nature
(2) Electromagnetism. This affects objects which carry an electrical charge. It is a major factor for all of chemistry and biology
(3) Weak nuclear interactions. These cause radioactivity, and we do not encounter them in everyday life
(4) Strong nuclear interactions. These forces keep protons and neutrons inside atomic nuclei, and also hold the protons and neutrons themselves together. They are the source of solar energy and nuclear energy

Most of the physical constants in theories explaining the universe are also very finely tuned. If we were to change them only slightly, the universe would be different and probably incompatible with life. Stephen Hawking (Hawking and Mlodinow 2010) gives the following examples:

- If weak nuclear interaction were to be weaker than it is, all hydrogen would convert to helium in the early stages of the universe, and therefore not allow regular stars to form
- If weak nuclear interaction were to be significantly stronger, exploding supernovas would not force their outer regions into interstellar space, and therefore there would be no heavier elements that are vital for the emergence of life on planets
- If protons were to be only two-tenths heavier, they would decompose into neutrons, which would mean the end of atoms
- If the sum of the weights of the proton-forming quarks changed by ten percent, there would be a much lower number of stable atomic nuclei, from which we are created. On the contrary, the sum of the quark weights is optimised so that the greatest number of stable atoms would exist
- In order for life to develop, it is imperative for a planet to spend millions of years in a stable orbit. This is determined by the number of spatial dimensions (three dimensions) within which we exist. With respect to the law of gravity, stable elliptical orbits exist in three dimensions only. Circular orbits are possible in other

> dimensions, but are unstable. In a larger number of dimensions, a sun cannot exist in a stable state

These ideas would be hard to understand for a person from the Old Testament, living several millennia ago. And the laws of physics and mathematical equations from which the above-mentioned findings are derived would be absolutely incomprehensible.

So what does the Bible, or the Book of Genesis, say about the creation of Earth and life?

On the first day, God created light. God saw that the light was good, so God separated the light from the darkness.

On the second day, God created the heavens: “Let there be an expanse in the midst of the waters and let it separate water from water!”

On the third day, God gathered the waters under the heavens in one place to show land. And so the seas and land were created. Then, God created green plants with fruits and seeds.

On the fourth day, God created lights in the expanse of the sky (stars). God made two great lights: the greater light to rule over the day and the lesser light to rule over the night (the Sun and the Moon).

On the fifth day, God created creatures living in the sea and birds flying across the vault of the sky. He also created great monsters and various species of all kinds of winged flyers. God blessed them and said: “Be fruitful and multiply and fill the water in the seas, and let the birds multiply on the Earth.”

On the sixth day, God created various species of animals, livestock, and reptiles. And then God created a human:

> God created humankind in his own image,
> in the image of God he created them,
> male and female he created them.
> God blessed them and said to them:
> “Be fruitful and multiply. Fill the Earth
> and subdue it! Rule over the fish of the sea
> and the birds of the air and every creature
> that moves on the ground.”

Then God said: “I now give you every seed-bearing plant on the face of the entire Earth and every tree that has fruit with seed in it. They will be yours for food. And to all the animals of the Earth, and to every bird of the air, and to all the creatures that move on the ground—everything that has the breath of life in it—I give every green plant for food.”

God saw all that he had made—and it was very good! By the seventh day God finished the work that he had been doing, and he ceased on the seventh day all the work that he had been doing. God blessed the seventh day and made it holy because on it he ceased all the work that he had been doing in creation. (Gen. 1: 3–31; Gen. 2: 1–3)

Let us highlight several points that follow this account from the Book of Genesis:

(1) God created humans in his own image
(2) He created humans as a man and a woman; only then do they together form a whole human being
(3) People are to be the caretakers of this planet (“fill the Earth and subdue it”)
(4) Humans and animals, who have a living soul, receive plants and their fruit as food. Humans and animals were thus originally created by the creator as herbivores, not carnivores or omnivores
(5) God sees that all He has done is very good. On the seventh day, He rests and also institutes this day for humans as a day for recreation in the sense of restoring creative power

What does our current knowledge on the origins of life, based on logic, look like? As we mentioned earlier, in order for the universe and life to exist, a whole series of physical constants must be finely tuned. There is also a multi-universe hypothesis according to which an infinite number of universes can exist (up to $10^{500}$ based on mathematical calculations), which emerge either alongside ours or in some kind of sequence with different values of physical constants, and maybe even different laws of physics. So, our universe is not a miracle; it is just a random result, including the existence of such physical properties that enable life and consciousness to emerge (Collins 2006). However, we are not able to observe or prove the existence of these universes, and that is why we will not deal with them.

In order for life to flourish on our planet it must be exactly “tuned,” that is, it is necessary for a number of conditions to be met (Bryson 2003):

(1) Excellent location
- Had our Sun been ten times bigger, it would have exhausted itself in ten million years instead of ten billion, and we would not be here today (the bigger the star orbited by a planet, the faster it burns up)
- If the distance of the Earth from the Sun was fifteen percent further, the oceans would freeze
- If it was five percent closer, water would vaporise

(2) The right kind of planet
- Liquid magma caused the gases that formed our atmosphere to escape from the Earth's interior to the surface
- Further, liquid magma together with the planet's metallic interior create a magnetic field around the Earth which protects us from cosmic radiation
- The tectonic plates also move thanks to the magma and thus continually sculpt the Earth's surface. If the Earth was levelled (because of erosion processes) it would be covered with water at a depth four kilometres
- We also have the right chemical elements on Earth in the correct proportions

(3) We are a twin planet
- A celestial body the size of today's Mars is believed to have hit the Earth 4.5 billion years ago and the blown-out material to have formed our companion, the Moon (the diameter of our Moon equates to one-quarter of the Earth's diameter)
- The Moon's gravity keeps the Earth rotating at the right speed and angle, which provides the necessary stable environment for the long-term evolution of life

(4) The right timing
- Had the dinosaurs not become extinct sixty-five million years ago after a collision with an asteroid (with diameter of about fifteen kilometres), human beings would not be here and mammals could not have evolved into their present form

Evolution needs both long-lasting periods of stability and short "catastrophic" events of moderate intensity. This is called the theory of punctuated equilibria (Eldredge and Gould 1972).

The creation of life on Earth is still a mystery today. We still do not know how this development took place, and we know even less about where life

is headed and its meaning. We know, however, that whatever caused life to appear happened only once, and did so very early on, about 3.85 billion years ago. Even 3.9 billion years ago there was no solid surface and Earth was hot. Therefore, life appeared as soon as it was able to do so. The idea of whether it was somehow "predestined" comes from way that the non-living substance, under favourable conditions, was "inherently" directed to creating lifeforms.

All things that have ever lived on Earth—microorganisms, plants, and animals—date back to one common beginning. All of us, who enjoy life on some level, have a common ancestry.

Francis S. Collins (2006) presents four possible explanations for the emergence of life: atheism, creationism, intelligent design, and theistic evolution.

(1) Atheism

Atheism was almost unknown to humankind until the eighteenth century at the time of Enlightenment and the rise of materialism. It was actually a rebellion against tyranny from the government and church. When the revolutionaries identified the church with God, they realised it would be better to do away with both. Sigmund Freud later claimed that God belongs to the category of desires and dreams.

Atheism has one major problem—it must assume the emergence and evolution of a highly organised matter from chaos. More precisely, the behaviour and evolution of matter are governed by natural laws, but where did the natural laws originate? Were the laws "spontaneously" created by chaos?

Bill Bryson (2003) states how the spontaneous evolution of proteins, which are vital for our existence, is astronomically unlikely:

> There are about one million types of different proteins in the human body. By the laws of probability, proteins should not exist at all. For instance, to create collagen, a common protein, 1,055 amino acids must be arranged in the exact sequence. Most proteins are composed of fewer amino acids, at approximately two hundred. The odds that two hundred amino acids will arrange themselves in the exactly given sequence is $1{:}10^{260}$. This number is greater than the number of atoms in the universe.

Let us pause and consider DNA, the bearer of inheritance. James Watson and Francis Crick revealed its structure in 1953. The DNA molecule has

the shape of a double helix, a kind of twisted ladder. A sequence of chemical compounds, making up the rungs of the ladder, provides the ability to transfer information.

The ladder rungs are made up of combinations of four chemical compounds called "bases," namely A, C, G, and T. Each of these chemical bases has a specific shape.

Shape A fits only on the rung beside shape T, and shape G fits beside shape C; therefore, there are four possible "ladder rungs": A-T, T-A, C-G, and G-C.

The double helix ("twisted ladder") is an elegant tool for copying itself because each element can be used as a sample for the creation of a new one. If we were to split all the pairs in half (i.e. splitting the ladder down the middle), both halves would contain all the information needed to create a copy of the original.

We can think of DNA as a software programme located in the nucleus of each cell. The specific instruction manual, known as the gene, is created by hundreds of thousands of letters of code. All the complex cell functions must follow the order of the letters in the code.

For a long time we did not know how the programme "worked." This was solved by the identification of the RNA mediator. Information from the DNA, which is created by a specific gene, is copied into a single strand of a mediator RNA molecule resembling half a ladder, whose rungs hang loosely to one side. This half-ladder moves from the cell's nucleus to the cytoplasm, where it enters the ribosome protein factory. This is where a group of complex translators read the bases hanging from the RNA mediator in order to transform the information into a specific protein created by amino acids. Three RNA "rungs" of information create one amino acid. Proteins perform the cell's job and provide it with structural integrity (Collins 2006).

Thus, DNA, RNA, and proteins are very elegant. Could have they arisen spontaneously, out of chaos? And if their creation and evolution took place under certain rules (laws), where and how were these rules established?

Let us add that atheism approaches agnosticism. An agnostic claims that it is not possible to ascertain whether God exists or not.

(2) Creationism

A creationist is one who claims that there is a God who is directly responsible for the creation of the universe. Creationists believe that God created the world in six days and that these days were twenty-four hours long. The planet is at most ten thousand years old. Advocates of creationism admit to small changes within a certain species through alterations in the environment and natural selection (microevolution), but completely reject that one species could evolve into another (macroevolution).

They believe that the geological layers and fossils found within were formed over several weeks during a global flood. Also according to this theory, dinosaurs and the first humans lived together on Earth for some time.

The advocates of creationism are mainly found in North America, and approximately forty-five percent of Americans believe this theory (Collins 2006).

(3) Intelligent design

This is the concept of "irreducible complexity" in nature. The origin and evolution of life without an "intelligent plan" are statistically extremely unlikely. The concept is based on three basic theses:

(a) Evolution supports the atheistic worldview and that is why believers must stand against it
(b) Evolution is ultimately wrong because it fails to explain the intricate complexity of nature. The cell is not the only thing that brings a sense of wonder. Organs consisting of billions or trillions of cells are structured in a way that evokes a holy reverence. Considering the eye, for example, it is hard to imagine that it could arise as a result of natural selection. Various kinds of bacteria have flagellums, which work like "outboard motors," driving the cells in different directions. The construction of a flagellum, made from approximately thirty different proteins, is very intelligent. It includes a miniature version of a basic anchor, drive shaft and universal joint. They control the fibre-like drive. The whole arrangement is a miracle of nanotechnological engineering. This kind of complex device would never arise from the basis of Darwin's processes only
(c) If evolution cannot explain irreducible complexity, then an intelligent designer must exist

According to Francis Collins (2006), the problem is that intelligent design has not been qualified as a scientific theory. A scientific theory offers the possibility to predict further discoveries and procedures on how to prove it on the basis of experiments.

(4) Theistic evolution

Theistic evolution is accepted by many believers of different religions (e.g. Christianity, Judaism, Islam, Hinduism). It is based on the following assumptions:

(1) The universe originated from empty space about fourteen billion years ago
(2) Although it seems very unlikely, the properties of the universe were set exactly for the creation of life
(3) Although the mechanism of the origin of life is still unknown, we know that life on Earth emerged, began to grow through the process of evolution and natural selection, and after a long period of time has arrived at a state of great biological diversity and complexity
(4) Once evolution began, there was no need for a supernatural miracle
(5) Humans are a part of this process and share a common ancestor with great apes
(6) At the same time, humans are extraordinary in many ways, which stands in the way of evolutionary explanations and points to our spiritual nature. This includes the existence of a moral law (the knowledge of what is right and wrong) and the search for God, which characterises all cultures and civilisations throughout human history.

According to Collins (2006), these premises lead us to a credible and logically consistent synthesis:

> God, who is not limited by time or space, created the universe and established natural laws governing everything in the universe. In order to populate an otherwise empty universe with living entities, He chose the elegant mechanism of evolution, resulting in microbes, plants and animals of all kinds. God also chose the same mechanism for the creation of special creatures, characterised by their intelligence, knowledge of what is right and wrong, free will and desire for a relationship with Him. He also knew that these entities would stop following the moral law.

We can suspect how life was created, but we do not know how exactly it happened and who its designer was, and we may not find out over the course of our earthly lives. If God is found outside of nature, then science can neither prove nor reject His existence.

Stephen Jay Gould (1999) emphasises this point: “Science cannot simply decide by its valid methods about God’s possible control over nature. We do not deny it, but we do not confirm it either. As scientists, we are unable to express ourselves on this issue. Science can only explain natural phenomena.”

For more than three billion years, the oceans were inhabited by bacteria and primitive algae only. Three and a half billion years ago, single-celled organisms (anaerobic prokaryotes) appeared. At this time, the first photosynthetic systems developed, not yet producing oxygen. It was only two billion years ago that cyanobacteria could use photosynthesis and release oxygen. Oxygen production and photosynthesis were key for the further evolution of life on Earth. Under photosynthesis, light energy changes to energy in chemical bonds. In combination with solar radiation, water and carbon dioxide create energy-rich chemical compounds called sugars (with oxygen as a by-product). Photosynthesis is the most important metabolic innovation in the history of life on this planet.

DNA (nucleic acid), the simple carrier of heredity, evolved 1.7 billion years ago. The beginning of the Cambrian Period (about six hundred million years ago) marks a sudden boom in evolution when numerous groups of morphologically differentiated organisms appeared. They have been classified into more than one hundred phyla. Many of them have disappeared, but since the Ordovician (450 to 500 million years ago), this number has stabilised to thirty-two tribes, which are the ones that overcame all the later disasters.

It has not yet been clarified why this evolutionary “Big Bang” occurred. The emergence of multicellular organisms, however, was probably preceded by an interesting event—a time when the Earth was a “snowball” (the Snowball Earth hypothesis). The Ice Age, which occurred 2.2 billion years ago, was followed by a billion years or so of warmth, following which further cooling may have ensued. Because of a six percent fall in solar radiation and a drop in the concentration of greenhouse gases, Earth essentially lost its ability to maintain its heat. Growing evidence shows that some seven hundred million years ago Earth went through a Snowball Earth stage (during which it was completely covered in snow and ice,

including the equator). If Earth really was a "snowball" then how did it ever warm up again? The idea is that volcanoes pushed through the ice-covered surface of the Earth, spurting out lots of heat, gases, dust, and ash that melted the snow and ice and changed the composition of the atmosphere. This caused a "restart" of the greenhouse effect and a subsequent warming. It is remarkable that the end of this super-cold period coincided with the so-called "Cambrian explosion" and the ensuing accelerated evolution of more sophisticated lifeforms.

About 570 million years ago, various body shapes, including reinforced parts (shells and skeletons), developed. Four hundred million years ago plants "invaded" the land. Insects and amphibians followed 370 million years ago. The age of the reptiles, especially ceteosaurs, began 225 million years ago. There were mammals at the time, but ceteosaurs were dominant. The Earth collided with an asteroid sixty-five million years ago, which likely caused the ceteosaurs to disappear. An ecological niche (a living space formerly occupied by the ceteosaurs) was made available for mammals to become the dominant animal group.

The asteroid which collided with Earth was a similar size to Mount Everest (being ten to fifteen kilometres in diameter). The place of the impact is located on the coast of the Yucatan Peninsula in Mexico. The asteroid was moving through space at a speed of about ten km/sec and thus struck the Earth with the force of about seven billion times the atomic bomb dropped on Hiroshima.

It took a split second to turn an area of seafloor the size of Belgium into aerosols of sulfuric acid that were blown into the atmosphere. For months afterwards, Earth was subjected to rains acidic enough to burn the skin (Bryson 2003).

Another consequence of the asteroid impact was a sharp drop in temperature, as the blowing dust and ash from fires darkened the sky. For months, the lack of light significantly inhibited photosynthesis. When, after several months, the dust cloud settled, only small reptiles, some of the birds, and primary mammal representatives of the abundant higher fauna of the Mesozoic era survived. Dinosaurs, after almost two hundred million years of absolute dominance, disappeared, as well as seventy to seventy-five percent of all plant and animal species.

However, if Earth and the asteroid had not collided, we humans would not be here today, and the planet would probably still be dominated by dinosaurs.

This was the last major "catastrophe," during which double-digit percentages of plant and animal species became extinct, but it was not the only one. So far, palaeontologists have been able to identify four other major extinctions:

- in the Ordovician period (440 million years ago) eighty to eighty-five percent of species became extinct
- in the Devonian period (365 million years ago) eighty to eighty-five percent of species became extinct
- in the Permian period (225 million years ago) ninety-five percent of species became extinct
- in the Triassic period (210 million years ago) seventy to seventy-five percent of species became extinct

After every such "catastrophe," however, life has developed over several million years into rich, more diverse, and advanced forms. We do not know why. It was as if the saying "through adversity to the stars" applied here.

According to Fritjof Capra (1996), there is perhaps a link between natural selection and the ability of living matter to organise itself (again, we do not know where this ability to organise originated). The process of organising began with the Big Bang, when pure energy first began "materialising" into subatomic particles, then simple hydrogen atoms, and then an open line of ninety-four elements, which appear in the universe that we know. The birth of organic life, which gave rise to the biosphere, now appears as the logical continuation of the evolution of the universal minerosphere. In such a case, evolution should be a process of law: a physical continuation of the hierarchical structuring of material reality.

However, evolution is not a smooth or fluid process. It takes place in sudden periods of post-catastrophic booms in which rapid and rich species branching occurs. Nevertheless, after some time the vacant ecological niches are filled and the process of speciation slows down. Organisms of terrestrial biomes and their component ecosystems settle down into a new dynamic equilibrium.

Therefore, evolution is not governed only by the "natural selection of more capable populations," as Darwin imagined. Charles Darwin did not know about Gregor Johann Mendel, his contemporary, who discovered the laws of inheritance, and neither could he know anything about genes and DNA in his time, or even about mutations. Natural selection is a powerful means of evolution, but not all-powerful. Spontaneous mutations filtered by natural selection are limited by the same process they originated in.

Despite all the great "catastrophes" (extinctions), we do not know why life is directed towards ever more complex and perfect forms. In fact, we do not even know what caused these extinctions (except for the last, fifth, extinction, where it seems to be clear that the cause was a collision with an asteroid). It could have been sudden changes in solar radiation, global warming, global cooling, sea level changes, depletion of oxygen in the oceans, epidemics, huge methane seepage from the seafloor, collisions with cosmic matter, massive hurricanes, volcanic activity, and other factors. It is very likely that these factors worked in combination and had a cumulative effect.

## 2.3. Cultural Evolution

When, sixty-five million years ago, the dominant dinosaurs disappeared from the scene (and with them seventy to seventy-five percent of other species of flora and fauna), a small animal similar to the shrew called Purgatorius survived among the evolutionary young mammals. This is the earliest example of a primate.

Some fifty million years ago, a suborder of the anthropoid primate was established. Thirty million years ago, advanced primates such as monkeys and apes appeared. Fifteen million years ago, the first hominids came onto the scene. Five million years ago, these hominids walked upright on two hind legs. The *Homo habilis*, a species that used tools, emerged, and so a new form of evolution was discovered—the use of technology. Two million years ago, *Homo erectus* controlled fire, developed language, and used weapons.

Approximately five hundred thousand years ago, *Homo sapiens* appeared. This species differed from the other animals on the basis of its ability to create and improve tools (technologies). About 130 thousand years ago, *Homo sapiens neanderthalensis* (Neanderthals) appeared, and then, forty-five thousand years ago, the current *Homo sapiens sapiens* (wise man) evolved.

Neanderthals and modern humans coexisted for thousands of years before the former, for some reason, disappeared. Neanderthals hardly ever lived over thirty years of age, but as a species they were magnificently resilient. They had brains larger than those of modern humans—1.8 litres for Neanderthals versus 1.4 litres for modern people. So why then did the *Homo sapiens sapiens* survive and not the Neanderthal? Had there been some divine intervention—the "creation of the human"—as the Bible's Book of Genesis describes? Or were we perhaps genetically modified and "bred" through the intervention of some extra-terrestrial civilisation, as Erich von Däniken (1969) and a series of other "mysticologists" believe? Or were we just lucky?

Modern humans show remarkably little genetic variability. The reason for this is that we are the descendants of a small founding population. According to geneticist Spencer Wells (2002), modern humans came from Africa sixty thousand years ago. (*Homo erectus* had arisen in the first wave of migration, the remains of which have been found in Indonesia and China, but was later replaced by the much more advanced *Homo sapiens* in the second wave of migration.) Wells monitored the genetic code of the Y chromosome (the male chromosome) which guided him back to the African "Adam."

The very small original ancestral population can be linked with the last eruption of a super volcano, which occurred in the Sumatra region seventy-five thousand years ago. The Greenland ice samples show that the eruption was followed by at least six years of "volcanic winter." This probably pushed mankind to the edge of extinction, reducing the population to no more than a few thousand individuals (Bryson 2003).

This is quite possibly the cause of the very low genetic variability. Despite our racial origins, we all come from one ancestor (i.e. a small group of ancestors) from approximately sixty to seventy-five thousand years ago. This is also where the story of the modern human begins.

Approximately forty-five thousand years ago, the young *Homo sapiens sapiens*, or Cro-Magnon, appeared on the scene. Biologically, this species was practically identical to the modern human. It was a hunter and gatherer and lived in caves, but also built simple shelters. It created the first works of art, including jewellery, various figurines, and cave paintings (e.g. in the Sahara, which was a steppe rather than a desert, in Spain and France). It created tools from stones and bones and mastered the art of speech, which further stimulated brain development. Its artistic

expressions show that it was capable of abstract thinking. It probably believed in an afterlife, i.e. it was able to think about some form of life after death. It was also able to contemplate the future, an ability no other species on the planet appears to have.

Somewhere along this journey, the human has crossed the threshold from unconsciousness to consciousness. Minds meet and communicate, and the feedback begins, the mind affecting the body. Biological evolution is transformed in human beings into cultural evolution, which proceeds at least a hundred times faster (Svoboda 1997).

But what does it mean to "cross the threshold from unconsciousness to consciousness"? When and how does the human begin to fundamentally differ from the other animals? Did it happen thanks to divine intervention or independent evolution, or perhaps the intervention of an extra-terrestrial civilisation?

The Bible places the creation of the human some six to ten thousand years ago. According to the Jewish calendar, the year 2000 marked 5,760 years from the creation of the world. So, when God says: "Let us make mankind in our image, in our likeness" (Gen. 1: 26), it most likely means that He made the beings with a spiritual dimension (i.e. with the possibility to develop on a spiritual level), thus qualitatively distinguishing the being from other animals. And this may have happened relatively recently, in the time following the last glaciation.

What, then, fundamentally distinguishes, in the qualitative sense, humans from other living creatures? Is it a conscience? Or intelligence or intellect? Or a soul and spirit? These terms are not very clear to us. We manoeuvre on the border between reality and fantasy, or even on the border between reality and fiction.

People from various cultural and civilisational circles, adhering to various religions, have believed in the existence of a soul from the beginning of time (at least for several millennia), but its existence has not yet been proven. Billions of people believe in reincarnation (the transmigration of souls), while billions also do not believe in it. Where does the truth stand?

Let's start with consciousness because we, as people, without any doubt have consciousness. Still, consciousness is a bigger mystery than we usually like to admit. Peter Russell (2003) points to a paradox that science has been facing for a long time:

> Science has had remarkable success in explaining the structure and functioning of the material world, but when it comes to the inner world of the mind—to our thoughts, feelings, sensations, intuitions, and dreams—science has very little to say. And when it comes to consciousness itself, science falls curiously silent. There is nothing in physics, chemistry, biology, or any other science that can account for our having an interior world. Nothing in Western science indicates that any living creature should be conscious. Consciousness is not composed of matter. And matter, we assume, does not possess consciousness. This is the paradox of consciousness.

A deeper relationship may actually exist between the world of physics (our natural world) and consciousness. God's first command in the Book of Genesis was: "Let there be light!" (Gen. 1: 3). All of creation came from this light. The theory of relativity and quantum theory consider the phenomenon of light out of space and time.

People who have undergone profound mystical experiences, who we call "enlightened," usually describe their experiences in terms of light. "Do physical reality and the reality of the mind share the same common ground—a ground whose essence is light?" Russel (2003) asks.

Today, we know that consciousness affects reality. For example, in medicine a person's state of mind can have significant effects on the body's ability to heal itself. Also, quantum physics suggests that, at the atomic level, the act of observation affects the reality observed.

The underlying assumption of the current paradigm of science is that matter is insentient. Let us attempt to recognise that the faculty of consciousness is a fundamental quality of nature, and that a certain form of consciousness is present everywhere and in everything. In this case, according to Russell, rather than creators of consciousness, the nervous systems of animals may have served more as an amplifier of consciousness, increasing the richness and quality of experiences.

> If the faculty of consciousness is universal, then what emerged over the course of evolution was not the faculty of consciousness, but the various qualities and dimensions of conscious experience—the contents of consciousness. Human beings developed the capacity of speech. And with this, the evolution of consciousness took a huge leap forward … Then came the most important leap of all. We became self-aware—aware of our own awareness. This opened the door to a whole new arena of development. We could begin to explore the inner world of the mind and, ultimately, delve into the nature of consciousness itself (Russell 2008).

Consciousness may possibly be evolving and is the basic component of reality, just like matter, energy, light, space, and time. In this sense, we could also understand Christ's statement as he entered Jerusalem when the Pharisees urged him to restrain his disciples in proclaiming glory: "I tell you, if they keep silent, the very stones will cry out!" (Lk. 19: 40). If consciousness is a basic attribute of nature, all living and inanimate elements of nature have a certain form of consciousness.

So how is a human different from other living creatures? Because it has a soul? A soul is the principle of life; that which characterises a living being. It was Aristotle who attributed a soul to all living beings. He distinguished between a vegetative soul for plants, a sensitive soul for animals, and an intellectual soul for the human. In Christianity, the soul represents a person's unique identity and is also immortal. The spirit (from the word "breathe") is the principle of revival; it is the immaterial and immortal aspect of a human.

The spirit and soul are sometimes used as synonyms. A soul, however, is something individual (almost intimate), whereas the spirit approaches the general, regular, rightful. "Spirit of God" appears in the Old Testament as the Lord's direct action—His "word" in the world and among people partaking in the creation of the world. In the New Testament, the Holy Spirit is one of the persons of God, or more precisely the third part of the Holy Trinity.

However, the existence of a soul and spirit cannot be experimentally proved. We can believe in them and the truths manifested about them or not. The natural and supernatural worlds intermingle here, and partial knowledge of the supernatural world depends on revelations, not on our intellectual effort.

Understanding (intellect) is the ability of the human mind to generalise individual experiences, to work with abstract concepts, and to make conclusions from assumptions. The intellect is therefore a fully human attribute, as opposed to intelligence.

Intelligence is a disposition for thinking, learning, and adaptation. All animals have this feature. The American biologist J. C. Lilly (1964) argues that the lowest possible level of intelligence is represented by a single cell. He calls this the first level of intelligence. At the same level or close to it we could probably include the marine and freshwater sponges.

The second level of intelligence involves less complex invertebrates and virtually all insects. This category can also be extended to the lowest vertebrates, including sharks. The third level of intelligence is that of birds, reptiles, and possibly some fish. The fourth level of intelligence is that of mammals.

We are beginning to anthropomorphize with the animals belonging to the fifth level of intelligence. This level represents the intelligence level of anthropoid apes, which are almost a special group of "superanimals." These include the orangutan, chimpanzee, and gorilla. Many of these animals mimic humans so well that many people see them as almost human beings. Within the meaning of intelligence, though, the status of animals at this level is much lower than the level of humans, and we cannot talk about the intellect yet. Between this level of intelligence and human intelligence with a fully developed, complex language there is still a wide gap where we cannot place any animal species.

John Lilly gives the following level No. 6 on the intelligence scale and No. I on the intellectual capacity scale. He calls this level "proto-humanoid" (pre-human), indicating a very primitive, almost-human level. This level is some sort of threshold for an encounter with intellectual capacity (which may be that of, for instance, a severely mentally disabled person whose intellectual capacity is barely detectable). Animals at the proto-humanoid level might have existed and developed side-by-side with humans, or they could have been the direct ancestors of the primary forms of human being. Australopithecus perhaps belonged to this intelligence level.[1]

Intelligence levels No. 7 and No. II is called the humanoid level. This level can be located between the very beginnings of human speech on the one hand and fully developed speech on the other.

Level No. 8 on the scale of intelligence and level No. III on the scale of intellect is called "iso-human." It is the level of a civilised human being with all the complexity of their social institutions, science, national relations, and international relations, at which the human brain reached its maximum capacity, concerning creative artistic work and scientific research, for example.

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[1] Australopithecus appeared seven million years ago in Africa's tropical forests and began populating savannas. It was the dominant species of hominids on Earth for some five million years (about twenty different species of hominids have been described so far).

Above the eighth level we could place at least one more level—intelligence level No. 9 and intellectual level No. IV. This can be called "super-human." We will not characterise it any further because we are in the situation analogous to a chimpanzee trying to specify what a human being is. We can ask questions, but we cannot receive a response.

What actually makes humans fundamentally different from other living beings? According to the Judeo-Christian conception, humans, like everything else, were created by God, but unlike animals they possess immortal souls. So there is the sequence of God—angels—humans—surrounding creations (in a bottom-up sequence: matter—plants—animals—primates) (Kohák 1998).

Whether humans are created by God and whether they, unlike animals, have souls are, at least for now, questions of faith. Intellectually, we can specify three basic features of humanity[2]:

(1) Speech: the ability to capture the fleeting moment in concepts. This ability, dramatically intensified by the written word, makes the far more effective accumulation of knowledge possible
(2) Reason: because humans can capture immediate experience in words, they can grasp not only immediate spatiotemporal relations of continuity and resemblance, but also those of logical and ideal relations. There is one more thing related to reason: imagination, which is possible only because humans are not only capable of seeing a given state, but also of imagining it in ideas and concepts
(3) Freedom: reason and imagination enable humans to recognise moral responsibility. Between humans and animals there is only one morally relevant difference, and that is freedom. Humans are beings who can imagine that things could be otherwise, and the only ones that do not live within firmly established instinctual parameters

The Book of Genesis describes the creation of the human and its subsequent transformation into a free being, but also a being responsible for one's actions through a well-known story.

[2] There are other characteristics, albeit not as important, which differentiate the human from animals: erect posture, clothing, and a face capable of expressing feelings. The use of tools was also mentioned in the past, but we cannot consider this a differentiating characteristic since some animals also use tools.