

In the Beginning Was... (the Word?)— A Geoscientific Excursus on Planet Earth Framed by Historical Statements of Poets and Thinkers about Spirit, Matter, Natural Laws, Chance, Work and Eternity

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Abstract

That humankind has grappled with the origins of its existence since early times is evident in the Bronze Age creation story found in the Old Testament. Today, our understanding of the evolution of planet Earth and life on its surface is scientifically more robust, thanks in part to insights from the petroleum industry drawn from the geoscientific archives of Earth and its Moon. These insights include evidence of sea-level fluctuations, multi-cyclic deposits of sedimentary rocks, including those of petroleum source rocks, which have developed across all climate zones of the Earth, among other things, through algal blooms in the world's oceans after the (periodic, perhaps cosmic?) input of fertilizing phosphorus, magmatic events (e.g. as volcanic hotspots) with accompanying thermal metamorphism of the lower crust and the occasionally delayed subsequent subsidence of oil- and gas-generating and accumulating sedimentary basins above, tectonic movements with generating subsurface structures and combined with earthquakes (e.g. the epochal earthquake and the subsequent tsunami in Lisbon in 1755), asteroid impacts, and dice game affine lognormal field size distributions of oil and gas in the subsurface as well as of other natural multiplicative systems on the Earth's surface. The purely material development governed by natural laws and its likely dependence on astronomical conditions in the Milky Way certainly allows for the justified assumption that Earth, in its diversity, appears to be quite isolated in its galaxy. How this came about can be discussed primarily from a geoscientific perspec-

tive, starting with the New Testament statement “In the beginning was the Word,” and drawing on quotations from, among others, Goethe (“in the beginning was the deed”), Leibniz, Voltaire, Einstein, Jung, and Eigen (“the game and its rules are a natural phenomenon that has guided the course of the world from the very beginning”). At the beginning, and in the time that followed until today, there must have been a multipolar interplay of word (spirit), matter, natural laws, chance, and work (energy) around the planet Earth, transcending the bipolarity of spirit and matter. The developments of the Earth’s core and the Earth’s magnetic field, which offers protection against cosmic radiation, and the increase in catastrophic (periodic?) asteroid impacts documented in lunar rocks, coinciding with the beginning of the Phanerozoic (the eon of “visible life” since approximately 541 million years ago) with its high, unstable atmospheric oxygen levels produced and maintained by biota through photosynthesis, and formative geodynamic cycles encompassing climate history and influenced by lunar motions, testify to sensitive, previously unseen (random?) dependencies.

Keywords

Planet Earth, Asteroid Impacts, Earth’s Magnetic Field, Milky Way, Universe

1. Introduction

At the beginning of their exploration of the natural world around them, the interpretation of cause and effect was a central concern for Bronze Age man. How did the world around them come into being and where is it leading? Spatial understanding was predominantly limited to restricted three dimensions, including the sky with the sun, moon, and stars, as well as the (volcanic) hell in the depths of the Earth, and the Earth itself, conceived of as a two-dimensional, flat disk. The progression of time would be another dimension.

The Old Testament (OT) recorded the idea of a divine creation, which contained many facets of myths handed down in Asia and the eastern Mediterranean. It states, loosely formulated and abbreviated for less informed readers: In the beginning, God created heaven and earth out of a pre-existing chaos. He began with the light, which he separated from the darkness, and called the light Day and the darkness Night (Day 1). Then he separated the water from the sky (Day 2), then the sea from the earth (Day 3). Then the sun, moon, and stars followed (Day 4), as well as fish in the water and birds in the air (Day 5). Finally, he created the animals on the dry earth, humans, and plants for food (Day 6). This creation story, written down by priests in difficult times when the people of Israel were in exile and captivity at the mercy of the Babylonians with their very different beliefs in many gods, incorporates the scientific findings of the time. Around the same time, but lasting only a few centuries, the idea of the successful battle of the gods under Zeus—from the heavens of Olympus—against the giants of the earth goddess Gaia, who gave birth to them, developed in the polytheistic world of Greek my-

thology. The myth stood for the triumph of order and civilization over chaos and brute force (Pergamon Museum, Berlin, Germany) and demonstrates the deep roots of flourishing Bronze Age and subsequent ancient cultures in questions of good and evil. Because there had to be an idea behind all visible things, and this convinced conscious and searching people in the long term, centuries later in the New Testament (NT) in John 1:1-18, among other things, it says about the “battle” between the divine word and darkness: “In the beginning was the Word. The Word was with God, and the Word was God himself. From the beginning it was with God. Everything was created through the Word; nothing was created without the Word. In him was life, and this life was the light for all people. It shines in the darkness, and the darkness has not been able to extinguish it.” These ideas certainly helped to facilitate further questions and answers about the beginning of the world at that time. The idea of a (divine?) plan also occasionally reappears in modern science fiction literature. In the Perry Rhodan novels, reference is made to the superintelligence ES operating in the background as a spiritual collective being at a higher cosmic level of evolution.

The target audience of this article is, on the one hand, humanities philosophers, theologians, and literature scholars (Goethe enthusiasts), in order to bring them closer to some of the current scientific findings about the Earth as a habitat that affect them intensively as documented by related thoughts of important poets and thinkers, and, on the other hand, natural scientists, including all geoscientists, with the hope of providing them with philosophical access to the deeper origins of their endeavors. Furthermore, the links between the two scientific trends are pointed out. The most recent reason for the preparation of the manuscript was the observation that the development of the Earth’s magnetic field, which protects life, appears to be linked to the deadly consequences of large asteroid impacts throughout the entire history of the Earth. Both are obviously positively correlated, using data from lunar rocks, and thus the entire article, even including the repeatedly mentioned Lisbon earthquake of 1755, is a geoscientific excursus. The order of the chapters is deliberately chosen. The reader will forgive me for this choice. It begins with concise, brief descriptions of the evolution of the Earth and that of life on it, then turns to causal matter, switches to its biblical counterpart, word, and then, via chance and natural law with their equally important properties, comes to the topic of humanity and the significance of work as an universal entity, and concludes with the limited eternity and finally a summary. A bipolar world process with an interaction of spirit and matter (or even of word and darkness) becomes a multipolar one through the addition of chance, natural law, and work (energy), which as the aim of this paper significantly expands the scope for deeper philosophical and theological thoughts. However, if one wants to maintain a bipolar world process, chance and natural law would have to be assigned to the spirit, which would then allow it to intervene in chaos and before the “almighty” word, and the work (energy) of matter, which thus becomes changeable. Humanity would still be impossible to classify.

To introduce at least one important law of nature with an approach to ordering the Earth as a celestial body, let us refer to the planetary orbits around the sun. Kepler's first law states that every planet moves kinematically on an ellipse, with the sun at one focus. With this, Kepler (1571-1630) refuted the view—prevalent since antiquity up to Copernicus (1473-1543) and Galileo (1564-1642)—that the planets move in very complex or simple circular orbits. According to the geocentric worldview, which, according to Aristotle (384 BC-322 BC) and Ptolemy (c. 100-160 AD), among others, consists of a circle (epicycle or upcircle) orbiting on a circle (deferent or carrier circle), or, according to the more realistic heliocentric worldview of the late Middle Ages, on purely circular orbits. With Newton (1643-1727), another law of nature was added through the discovery of gravity as the dynamic cause of planetary motion.

2. The Evolution of the Earth

The world was thought to have been created in 6 days and then evolved. After less than 4,000 years, we know more today, but certainly not everything. It's not 6 days, but approximately 13.8 billion years. The sequence is also different from what was assumed in the Old Testament. At the beginning of the current era—we don't know whether there were other days before that—according to current models, the expansion of the universe followed from a Big Bang, with the development of galaxies, stars, and planets. Our Milky Way with its four spiral arms (**Figure 1**) formed somewhat later, approximately 13.6 billion years ago; our sun only approximately 4.57 billion years ago from cosmic dust within a spiral arm, which was then followed shortly thereafter by the planets (Earth 4.543 billion years).

This dust was the product of a Big Bang fusion and fission caused by cosmic radiation, as well as countless previous stellar explosions of various types (dying low-mass stars, exploding massive stars, exploding so-called white dwarf stars, and the merging of neutron stars), which contributed all chemical elements up to uranium and plutonium to the cosmic dust cloud (**Figure 2**).

This process took approximately 8 billion years until the formation of the solar system. The mixing of the chemical elements in the cloud formed the basis for the diversity of solar planets in size, mass, composition, and distance from the central sun. Fortunately, this sun has a lifespan of approximately 10 - 12 billion years. Smaller stars, which make up the majority in our Milky Way, live even longer, while larger stars die very quickly and contribute further, higher-quality dust to the galaxy through their explosions. Thus, just as in living nature on Earth, birth and death are omnipresent among the stars in the sky. As in star formation, gravity also plays a decisive role in the development of planets. After a collision of the proto-Earth with another Mars-sized planet (Theia) sharing the same orbit around the Sun or coming from further away, and the resulting near-Earth Moon (according to the current theory) [2], a system consisting of a planet and a large moon emerged, a system that is rather rare in the universe (**Figure 3**). This system can keep its rotation axes stable for long periods despite or because of tidal changes in

the rotation rate and prevent wobbling, which was likely crucial for the development of a tolerable “stable” climate and atmospheric and oceanic carbon dioxide-consuming life. The coupled simultaneous retreat of the Moon (Figure 4) from Earth is, among other things, a function of shallow sea development as a result of geological processes and variable sea level [3]. The alternation of high and low tides caused by the (lunar) tides (Figure 5), as also observed in the North Sea, placed strong, short-term (daily) pressure on coastal life to adapt, possibly facilitating the conquest of continents. In Faust II, Goethe (1832) [4] would say:

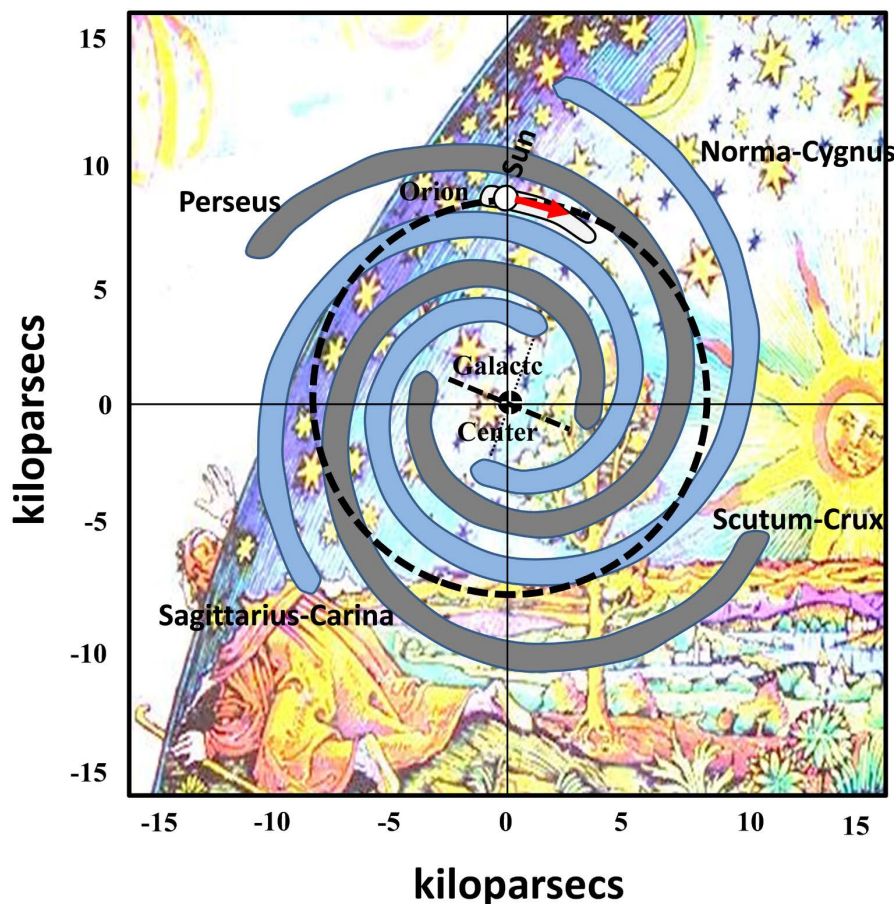


Figure 1. The motion of the solar system relative to the spiral arms of the Milky Way. Perseus and Scutum-Crux (gray) likely have higher gas and dust densities, while Sagittarius-Carina and Norma-Cygnus (light blue) have lower densities. Graphic adapted from [1], Background: Flammarion’s wood engraving, also called “Wanderer at the Edge of the World,” is the work of an unknown artist. The wood engraving first appeared in 1888 as an illustration in the subchapter “La forme du ciel” (“The Form of the Sky”) of the popular science volume “L’atmosphère. Météorologie populaire” (“The Atmosphere. Popular Meteorology”) by Camille Flammarion, the French author, astronomer, and president of the Société astronomique de France, which he founded in 1887. The depiction shows a person standing on the horizon, the edge of his world, with his shoulders in the celestial sphere, glimpsing what lies beyond. In the 20th century, the image was often considered an authentic depiction of a medieval worldview and was often reproduced. Source: https://de.wikipedia.org/wiki/Flammarions_Holzstich.

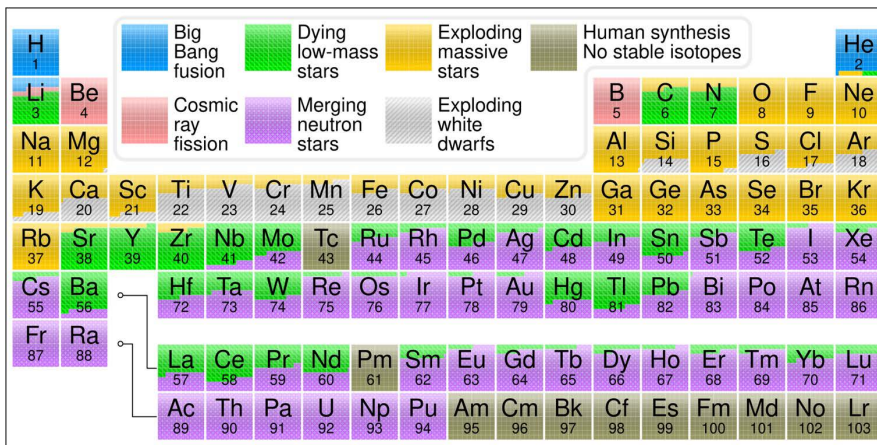


Figure 2. Version of the Periodic Table of Elements showing the most likely primary sources of the chemical elements found on Earth. All elements after plutonium (element 94) are man-made. Reference: Cmglee—Own work, CC BY-SA 3.0, <https://commons.wikimedia.org/w/index.php?curid=31761437>, 2017.

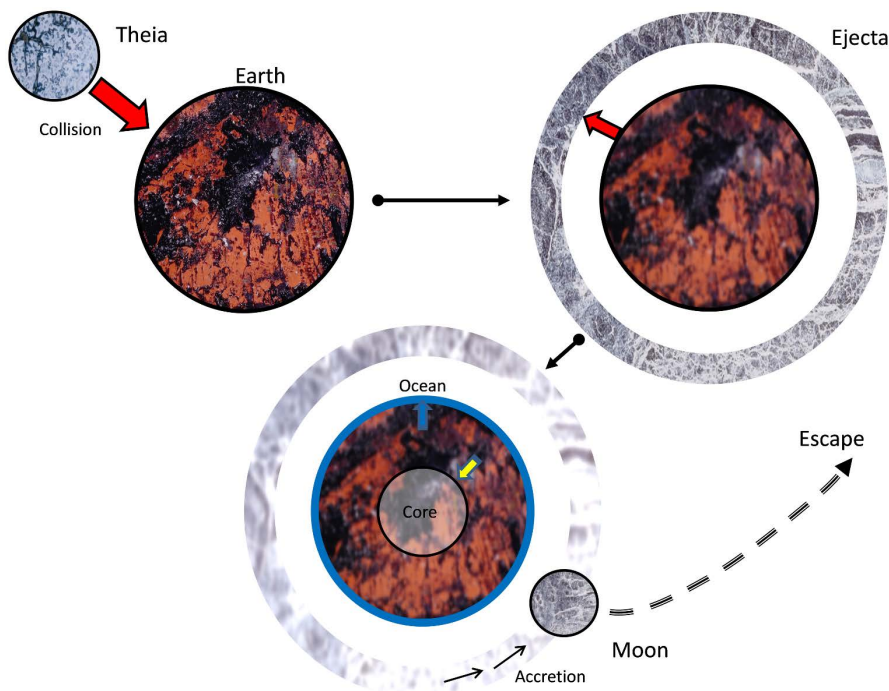


Figure 3. This sketch shows important steps in the very early period of Earth’s history, approximately 4.45 billion years ago. The events include the collision of the proto-Earth with a Mars-like planet (Theia), the development of the impact ejecta belt near Earth, the subsequent accretion to the Moon, its escape from Earth, and the downward and upward segregation to Earth’s core and ocean, taken from [3].

CHORUS:

Sealing the bliss of deepest repose, the moon’s full splendor reigns.

Goethe also incorporated the low and high tides into his literary work at the same point, reflecting on the catastrophic full moon spring tide on the North Sea coast of February 3rd to 4th, 1825, intensified by a powerful northwesterly storm

(according to Dr. Egon Freitag (2009) “The tide rushes outside to the edge”, Eckermann’s relationship to the North Sea and its influence on Goethe’s “Faust”):

“My eye was drawn to the high seas. It swelled, towering inward. Then it subsided and poured forth the waves, storming the flat shore’s breadth.”

“I took it for chance, sharpened my gaze. The wave stood still and then rolled back, moving away from the proudly achieved goal; the hour comes, it repeats the game.”

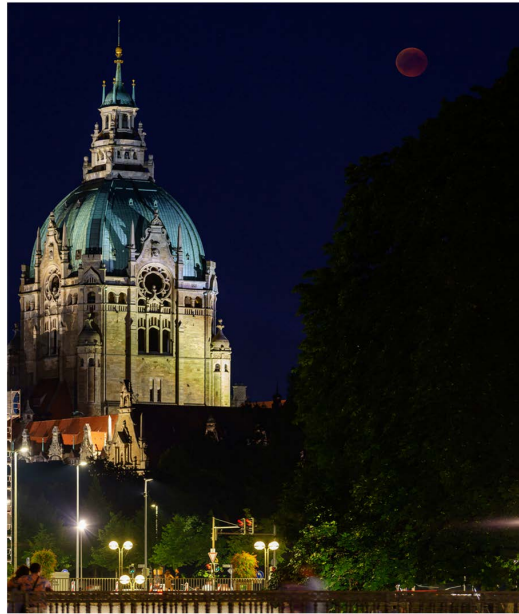


Figure 4. Blood Moon (full moon during a total umbra eclipse) in the night sky above Hannover Town Hall in July 2018, Source: © Patrick Graf, Hemmingen/Hannover.

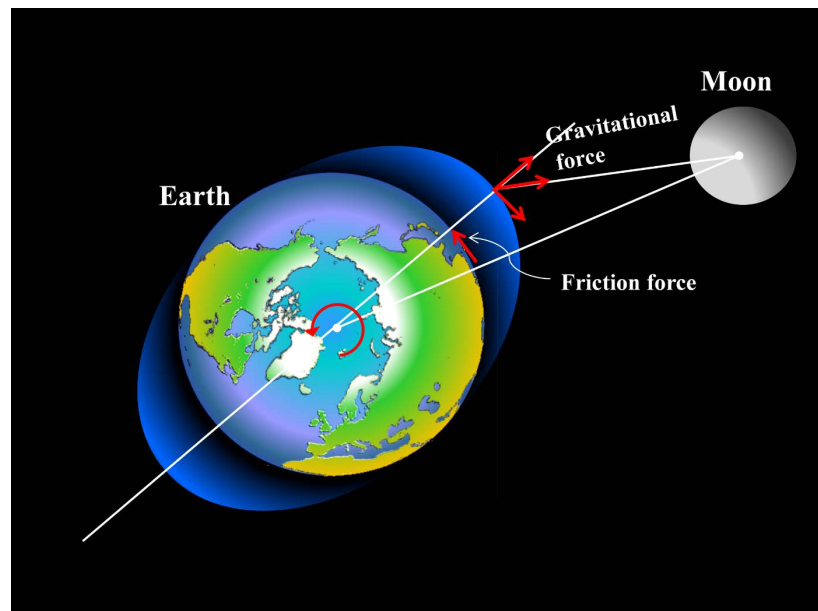


Figure 5. Sketch of the tidal forces of the rotating (gravitational) Earth-Moon system with tidal bulges on both sides of the Earth (low tide regions at a 90° angle) (Collage by the author 2003).

It was one of the first coincidences the Earth was repeatedly exposed to throughout its history. Other significant and less significant ones would follow. In the first approximately 500 million years, iron (and nickel) distributed throughout the Earth's body melted gravitationally to the Earth's core, aided by the radioactive decay of some isotopes as a heat source, among other things, and ensured the creation of a strong, protective magnetic field. At the same time, the Earth's rotation accelerated, but was slowed again by the tidal forces exerted by the Moon on the developing Earth-covering Ocean. During this time, the Moon also rapidly moved away from Earth [3]. Liquid water, due to the suitable distance from the steadily warming Sun, a life-friendly climate (Figure 6), and the protection provided by the magnetic field from cosmic radiation, facilitated the evolution of life and, before cyclical environmental changes in the Phanerozoic (Figure 7), was apparently promoted rather than interrupted by two episodic global glaciations at the beginning and end of the Proterozoic (Figure 6) [5].

Life requires only a select group of chemical elements. The main macromolecules of the cell account for most of the mass of life and are composed almost entirely of six elements (C, H, N, O, P, and S; abbreviated CHNOPS), supplemented by ions (Mg, K, Na, Ca) and a small but variable number of trace elements.

The most important likely sources of chemical elements are processes such as the Big Bang, dying low-mass stars, exploding massive stars, merging neutron stars, fission by cosmic rays, and exploding white dwarfs, each associated with a specific selection of elements from the periodic table, which apparently required 8 billion years to complete (see above). However, there may also be some additional cosmic secondary sources in which chemical elements have been and are generated. The birth and death of stars in the Milky Way are predominantly determined by their position within the spiral arms. Since all chemical elements are

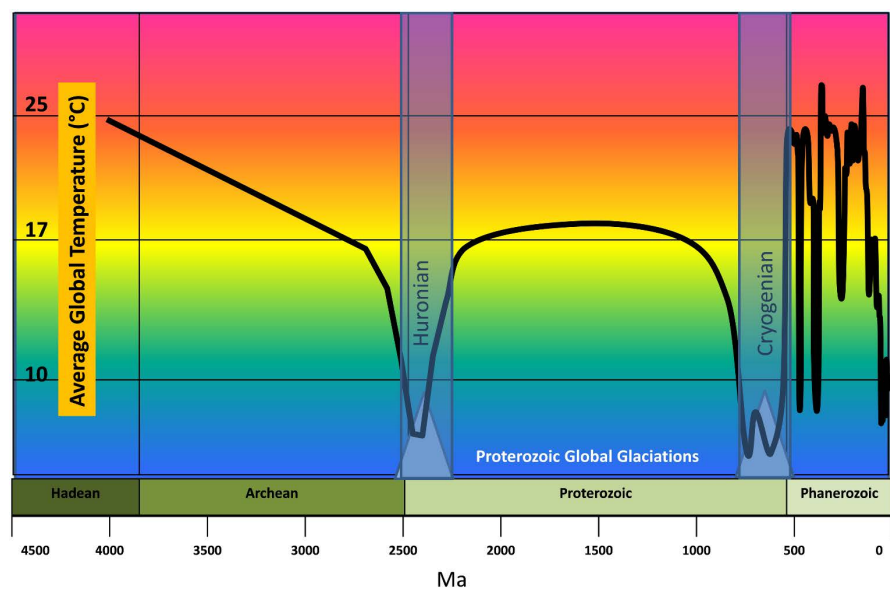


Figure 6. Earth's temperature history for the last 4000 Ma (million years), modified from [5]-[9].

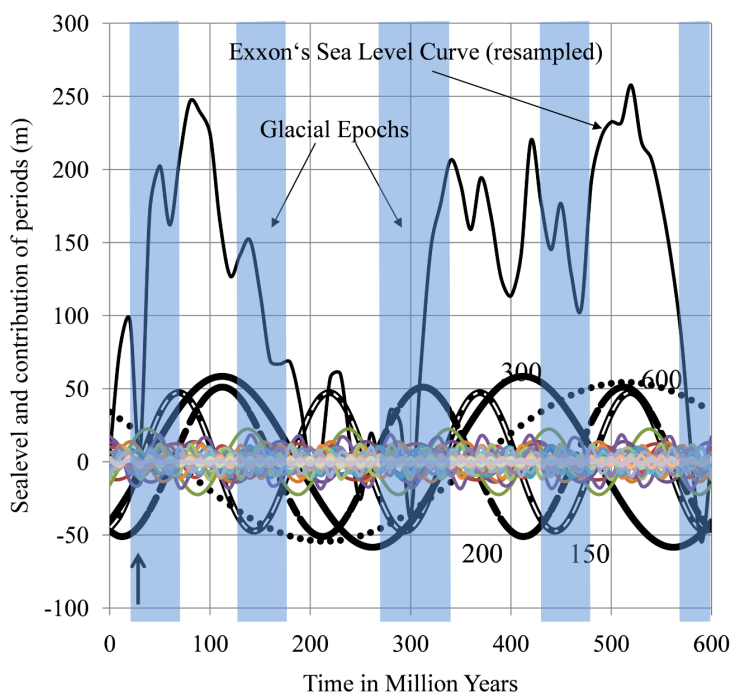


Figure 7. Glacial epochs in the Phanerozoic and analysis of Exxon's sea level curve using the Fast Fourier Transformation (FFT) with resolution of the dominant periods, their amplitudes and phases (modified after [10]).

available on Earth, all types of stellar extinction contributed to the composition of the interstellar cloud as a source for Earth's planetary body. Later cosmic dust injections following explosions of nearby young stars provided further contributions of chemical elements to the atmosphere, oceans, and continents in a Milky Way-bound manner during the Phanerozoic. This could also apply to vital phosphorus, whose potential input contributed to marine and lacustrine algal blooms and continental plant growth, with their importance for the generation of hydrocarbons as energy sources for humanity.

3. The Evolution of Life

It began with primitive single-celled organisms about 4 to 3 billion years ago and continued with the innovation of photosynthesis. For the next 1 - 2 billion years, the evolution of multicellular organisms followed slowly and steadily. The atmosphere was replenished with biologically released oxygen, which formed the basis for the higher life forms we know today, which emerged approximately 550 million years ago. These higher life forms evolved according to Darwin's (1809-1882) theory of adaptation to their habitat through variation (mutation) and natural selection. He thus explained the phylogenetic development of all organisms and their splitting into different species, which arise through sudden and inheritable changes. These mutations, which also depend on astrophysical and geological conditions, are directionless and can include beneficial or harmful effects on the organisms. However, the trend toward ever greater order, with humans as the "crown of creation," seems obvious (Figure 8). Important references include [11]-[16].

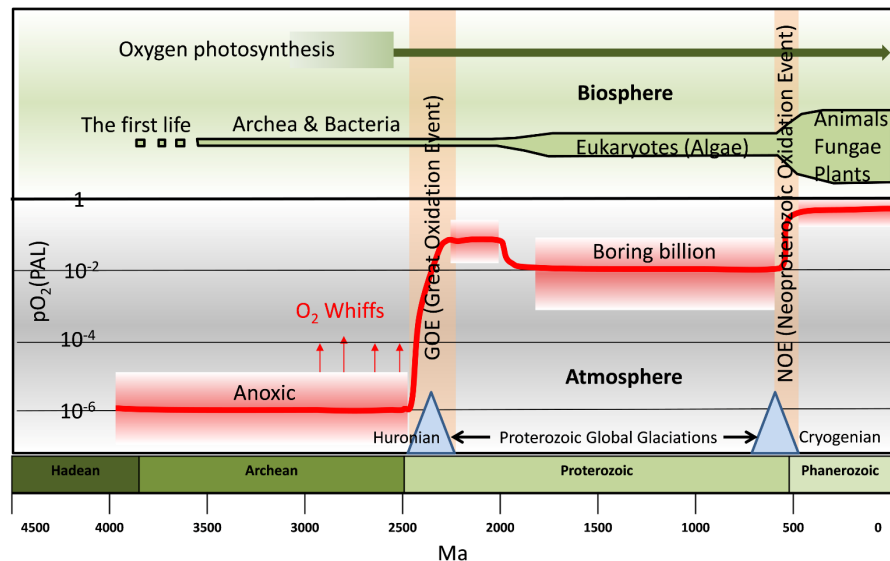


Figure 8. Evolution of life within the biosphere and evolution of the atmospheric oxygen level relative to the present atmospheric level (PAL), Ma = million years, modified from [5] and [13].

It is possible that life itself, through the production and use of oxygen, also contributed to shaping the climate via heat-conserving ozone formation combined with cooling carbon dioxide consumption. Especially during this period of upheaval, the Earth's magnetic field was dangerously weakened, thus enabling a high biological mutation rate between the equator and the poles due to the cosmic radiation now penetrating the Earth's surface extensively. At the same time, the impact rate of asteroids on the Earth-Moon system increased dramatically, as can be seen from the analysis of "spherules" distributed in lunar rocks, the melt products of high-energy impacts (Figure 9(a), Figure 9(b)). This was likely another random or coordinated event. Larger, potentially lethal impacts likely provided supportive stabilization of the magnetic field, and the protection against cosmic radiation was rebuilt, which certainly allowed for further mutations in this regard ([5] [17]-[24]).

That extreme fluctuations in magnetic field intensity may have influenced the later development of humanity is evident in the enigmatic global, extremely short-term paleomagnetic Laschamp event of around 41,000 years ago, first observed in lava fields in France. This event forced modern humans to adapt their way of life to strong ultraviolet radiation due to the loss of the protective function of the Earth's magnetic field and was, among other things, at least contemporaneously correlated with a volcanic eruption of the Campi Flegrei (Phlegraean Fields near Naples) and the extinction of the Neanderthals. Causal relationships seem possible [25].

Plate tectonics characterized by volcanism (Figure 10), which, despite probable synchronous plutonism [1], do not occur on any other planet in the solar system, encompassed with the formation, fragmentation, and collision of continents and their slow shifts, including the formation of fossil-, ore-, and petroleum-rich sedimentary basins as valuable archives of Earth's history, partly associated with the metamorphism of crustal rocks, as well as the ongoing regeneration of the sea

floor as a result of heat-fed mantle convection and the subsequent submersion of the Earth's crust back into the mantle and the simultaneous mountain formation,

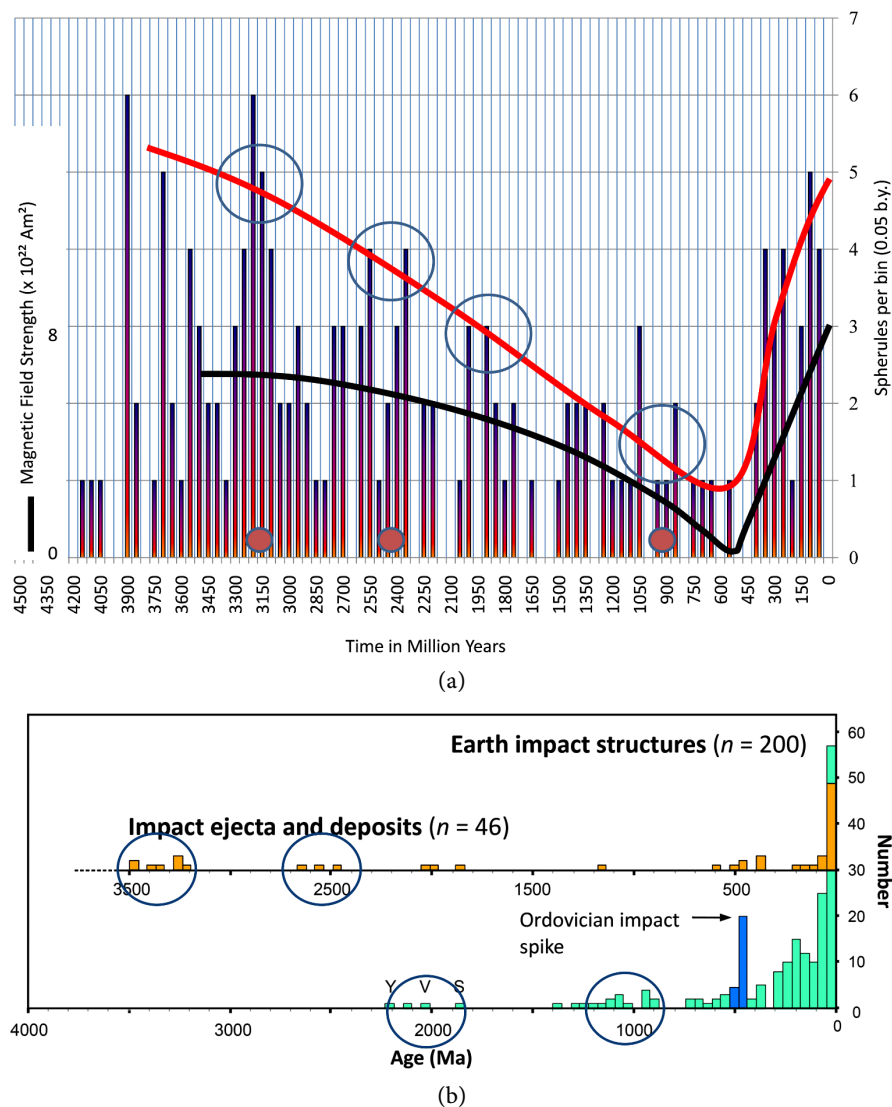


Figure 9. (a) Relative frequency distribution of lunar spherules according to [18]. Large blue open circles indicate longer-lasting impact events on the Moon, which correlate with the distribution of impact craters and ejecta on Earth (Figure 9(b)). Small red circles indicate measured maximum magnetic field values, which may indicate increased strength at specific times. They coincide with three of four impact maxima at approximately 3200, 2500, and 1000 million years (Ma). The three major crater events Y, V, and S (see Figure 9(b)) at approximately 2000 Ma do not appear to be an anomaly in magnetic field strength. This observation may be related to missing magnetic data at that particular time. The red line represents the trend in spherule frequency over time, and the black line represents the trend in magnetic field strength. Modified from [5]; (b) Histogram showing the age distribution of terrestrial impact structures (turquoise and blue) and ejecta deposits (yellow-orange). The ages are average ages. Note the significant Ordovician impact increase around ~470 to 450 Ma (darker blue). S = Sudbury; V = Vredefort; Y = Yarrabubba. Blue circles indicate longer-lasting impact events on Earth that correlate with the distribution of lunar spherules (Figure 9(a)). Modified from [21] and [5].

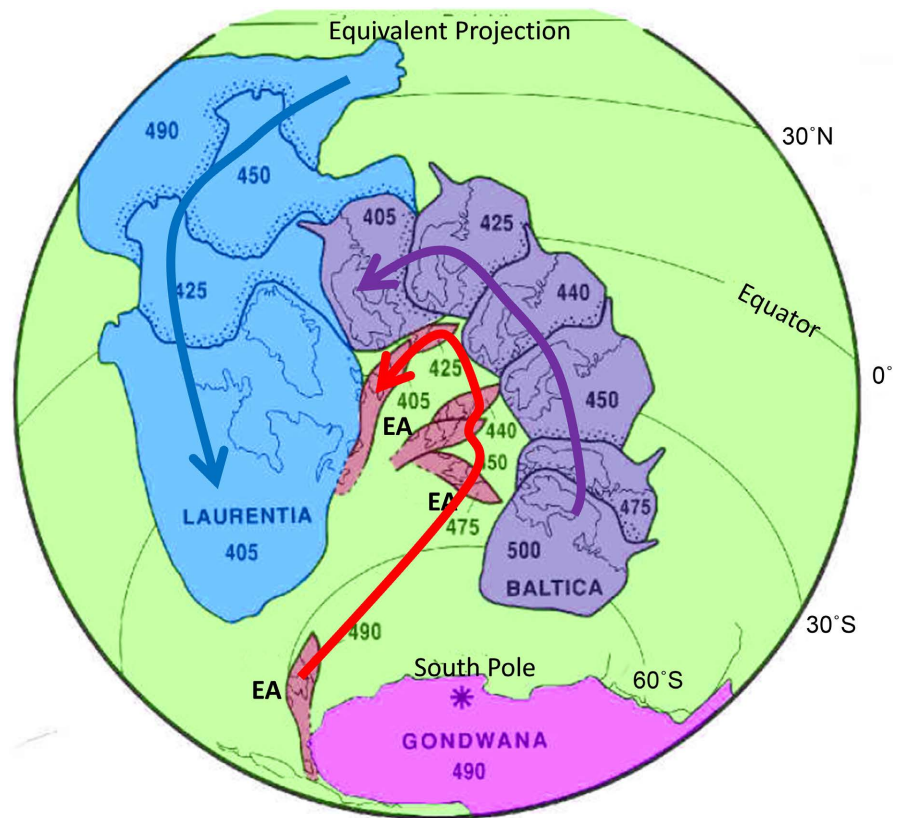


Figure 10. Modeled continental drift between the northern and southern hemispheres of Baltica, Laurentia, and East Avalonia (EA) during the early Paleozoic (approx. 500 - 400 million years ago (Ma)) with separation and collision. East Avalonia is considered to be the underpinning of the natural gas and oil-bearing North German Basin. Ages are given in Ma. Opposite and co-directional migrations with counterclockwise rotations of the three former continental fragments chosen as examples (modified from [26], original references therein).

contributed to the complex and challenging design of the habitat of all animals, fungi, and plants on Earth and, through their many coincidences among Darwinian mutations and selections, provided further surprises in the evolution of life.

The volcanic hotspots of varying sizes and longevity, fed from the depths of the Earth's mantle, such as the Galapagos Islands, Hawaii, Yellowstone, the Azores, East Africa, the Eifel, and many others, also contributed to the surprises of evolution. In Faust II, Goethe (1832) [4] commented on this with reference to the mythical creatures Griffins (Translation by George Madison Priest):

GRIFFINS:

“We know not if once already This the case in Eden were. Our lot gratefully we treasure, For we find things here are best; Mother Earth brings forth with pleasure In the east as in the west.”

The Galapagos Islands in the Pacific Ocean are famous for their extraordinary wildlife thanks to Darwin's studies.

The volcanic Yellowstone hotspot in the western USA, with its exemplary geological features is certainly worth a reference to the journal “Petermanns Geogra-

phische Mittheilungen” for all geographers, as the adventure writer Karl May (1842-1912) used information on the discovery history and extent of the Yellowstone region from the article “The newly discovered geyser regions on the upper Yellowstone and Madison River,” published in 1872 in “Petermanns Geographische Mittheilungen,” among other things, for the episode of Winnetou’s death in his novel Winnetou III (Wikipedia).

East Africa, around the volcanic region of Kilimanjaro, is considered the Miocene to Pleistocene cradle of humanity, approximately 10 million years old, due in part to its challenging geographical, plant, animal, and climatic development. However, humankind’s awareness of the question of a higher meaning only occurred in the course of global migration, probably while maintaining existing or developing contacts in many other places on Earth.

4. The Matter

Whether life in a similar form exists anywhere in the Milky Way or in the universe at all remains a hotly debated question. Should conscious life exist elsewhere in the universe, many philosophical and religious questions will arise. These questions also include what was in the beginning. Was it the word, in Greek “Logos” with the additional meanings of reason, thought, language, teaching, argument, that initiated the complex material history in the universe, or was matter, including its radiation, involving that of light, of which we only know about 4%, while the rest is still defined today as unknown dark energy and gravitationally active dark matter, the origin of the development of the mind? If the mind (representing the unspoken word) was there first, the amount of matter that formed and its composition required interplay of natural laws controlled by coincidences so that conscious life with a technological civilization could develop on Earth at all, as will be shown.

P. Ward and D. Brownlee (2001) [27] expressed the basic prerequisites for the material formation of complex, high-quality life in a mathematical formula full of multiplications (x) of probabilities, which includes many of the aspects mentioned and is an extension of the frequently cited optimistic Drake equation, also called the Green Bank formula or SETI equation [28]:

$$N = N^* \times fp \times fpm \times ne \times ng \times fl \times fi \times fc \times fm \times fj \times fme$$

with conditions for a possibly lonely Earth in the Milky Way, with N = probable number of events:

N^* : Stars

fp : Planetary systems

fpm : Fraction of metal-rich planets

ne : Habitable zone

ng : Stars in the habitable zone of a galaxy

fl : Life

fi : Intelligent life

fc : Technical civilizations

f_m : Fraction of planets with a large moon (stabilizing influence)

f_j : Fraction of solar systems with a planet the size of Jupiter (protective function)

f_{me} : Percentage of planets with a sufficiently low number of mass extinction events ($\sim L/L_{\text{galaxy}}$, L = Typical lifetime of technological civilizations)

$$N = 10^{11} \times 0.1 \times 0.1 \times 0.01 \times 0.1 \times 0.1 \times 0.1 \times 0.1 \times 0.1 \times 0.1 \times 0.1$$

$$= \dots\dots\dots 1!? \text{ “(as of approx. year 2000)”}$$

Actually, as described, special and random developments on Earth itself also come into play and would further reduce the probability. However, since at least Earth is a successful event in the Milky Way, the estimated probability must be spread across other galaxies, or individual probabilities are underestimated. According to this formula and the assumed probabilities, humanity as a technological civilization would be alone and thus currently very lonely in the Milky Way. Whether other planets were inhabited by technological civilizations before us or will be inhabited in the future with us or after us is not ruled out purely statistically.

The result of Ward and Brownlee’s equation is confirmed in later studies by [29], although there are certainly more “optimistic,” sometimes popular scientific, ideas with 10 to 10,000 planets with intelligent life forms in the Milky Way (e.g., [30]-[32]). For example, reference [31] using an extended Drake equation and taking into account the latest knowledge about exoplanets, estimated the probability that a planet in a habitable zone develops a “technological species” to be greater than about 10^{-24} . Thus, humanity is likely not the only example of a technological species in the observable universe, with 100-400 billion stars per galaxy, each with at least one planet in its habitable zone, and approximately 100 billion galaxies in the known universe (total $> 10^{22}$), although the numbers don’t necessarily support this. In contrast, reference [29] rather assumes that there is a considerable probability that no other intelligent life exists in our observable universe. Of course, the time between the possible transmission of technical signals and their reception on Earth also plays a role in any assessment due to the limitations imposed by the speed of light. It should therefore come as no great surprise that no signs of this have been discovered so far. This result resolves the Fermi Paradox, thus rendering it superfluous. The Fermi Paradox is the conflict between the expectation of a high probability of intelligent life somewhere in the universe and the apparently devoid of intelligence outside of Earth, as actually observed so far. The origin and proven continuous development of complex multicellular organisms on Earth for billions of years would only be due to a comparatively unlikely constellation of astrophysical and geological conditions. This assumption would also influence whether humanity can assume that there are other habitable, water- and oxygen-rich planets in the universe, provided that the living organisms there, including other types of viruses and bacteria, do not pose an ultimate, lethal threat and that the planets are even accessible by a sensible journey, whatever that might look like.

5. The Word

However, if matter existed first, as another school suggests, why did it then create mind? Or should we not even ask this question because the two are interdependent? And then there is the interplay between them. Between word (idea, mind, reason, etc.) and matter, there is a play that is subject to chance and follows the laws of nature; however these laws may have come about in the course of the evolution of the universe.

Goethe (1749-1832) also devoted himself intensively to this topic and expressed it in *Faust I* [33] in the Study (1808) as follows:

“It is written: In the beginning was the Word! Here I already falter! Who will help me further?

I cannot possibly value the word so highly; I must translate it differently if I am truly enlightened by the spirit.

It is written: In the beginning was the meaning. Consider the first line well, so that your pen does not rush into it!

Is it the meaning that works and creates everything? It should read: In the beginning was the force!

Yet, even as I write this down, something is already warning me not to stick with it.

The spirit helps me! Suddenly I see counsel and confidently write: In the beginning was the deed!”

He plays with concepts that don't shed any more light on the drama described. Action always requires work and energy; otherwise it couldn't be carried out. Where does it come from? With directed work, order can be created out of chaos, which Voltaire (1694-1778) then used to contextualize the catastrophic, chaotic Lisbon earthquake of 1755 within his philosophical perspective.

6. Chance and Natural Law

Dice and the rules of the game—they are symbols of chance and natural law. Even though Albert Einstein (1879-1955) [34] once stated that God does not play dice, one repeatedly finds signs of chance guided by physical laws in nature. The painted dice on the medieval monastery church in Cottbus/Germany shows that chance was also a topic of intellectual debate for people in past times (Figure 11). The game and its rules are a natural phenomenon that has guided the course of the world from the very beginning: the formation of matter, its organization into living structures, as well as the social behavior of people (Eigen (1927-2019) and Winkler, 1975) [35]. In this respect, the human instinct to play is merely a reflection of nature, as it is primarily practiced by small children while learning, or as it is exemplified by beggars in a Murillo painting or on ancient amphorae, or as modern man spends his time in Monte Carlo or Las Vegas. If the instinct to play is a reflection, it is likely that other human characteristics that lie on the surface or deep within are also reflected, such as the will to work and the striving for order. Even in the extraordinarily risky exploration of oil and natural gas, a notable ex-

ample of global importance, play and chance are used in the analysis of the Earth's history and the treasures hidden in the deeper underground. With the help of geophysical methods for estimating economic viability, the most probable and rule-compliant prospect size is determined by multiplicatively rolling the dice hundreds to thousands of times for the only indirectly suspected deposit properties. After successful exploration, it is observed that the discovered oil and gas fields behave towards each other in the same way as the elements of other natural systems, as if they were all truly the product of a game of dice [36]-[38].



Figure 11. Dice at the monastery church in Cottbus/Brandenburg, Germany (photo by the author, 2003).

Natural, comparable objects in a system are often sorted according to their size or other properties and thus subjected to a “ranking” order. Geographical features on the Earth's surface and subsurface, such as islands and the natural gas fields in Lower Saxony (**Figure 12** and **Figure 13**), river systems, and even impact craters, which can each be assigned to a unified system, are no exception to this approach. Like many other systems in both inanimate and animate nature, as well as systems in the social sphere, they exhibit generally a normal (Gaussian) or lognormal distribution of their individual elements if each system is subdivided into classification units and the number per unit is plotted graphically against the classification variable (normal or logarithmic). In the cumulative representation (integration), the Gaussian bell curve becomes approximately linear in the central region. If the number of elements is too small, the selection and assignment of classification units becomes difficult, if not impossible. In such a case, if the individual elements belonging to a natural system are sorted by size and the logarithms of their values are plotted, a linear relationship between logarithmic size and position within the sequence becomes evident (exponential factor). This representation roughly corresponds to the cumulative (integral) lognormal distribution.

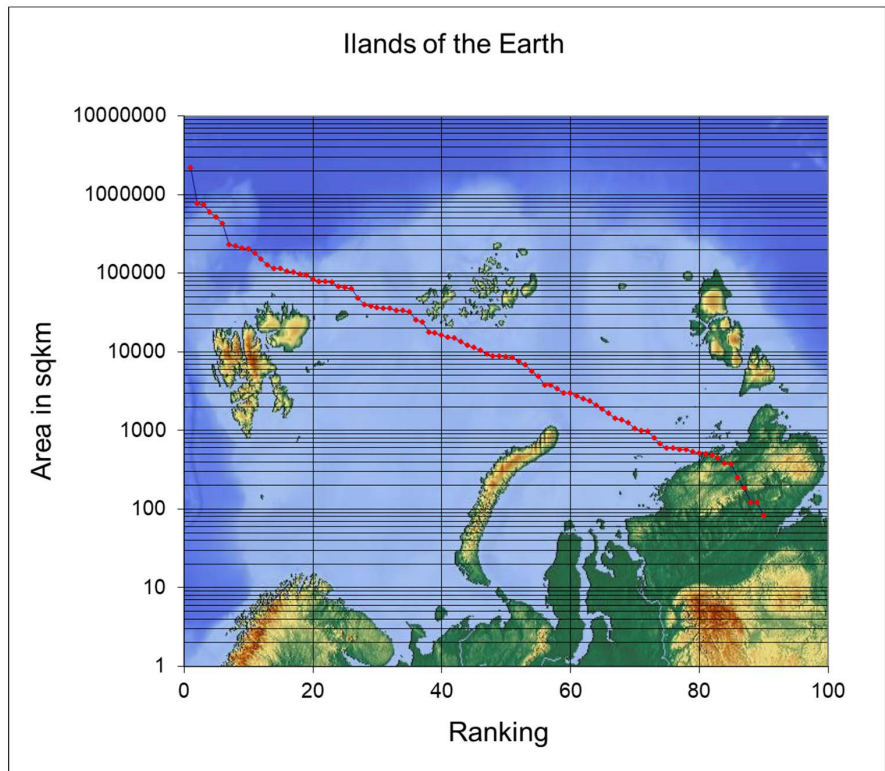


Figure 12. Ranking of the largest islands in the world by area [36] (background: <http://www.maps-for-free.com>).

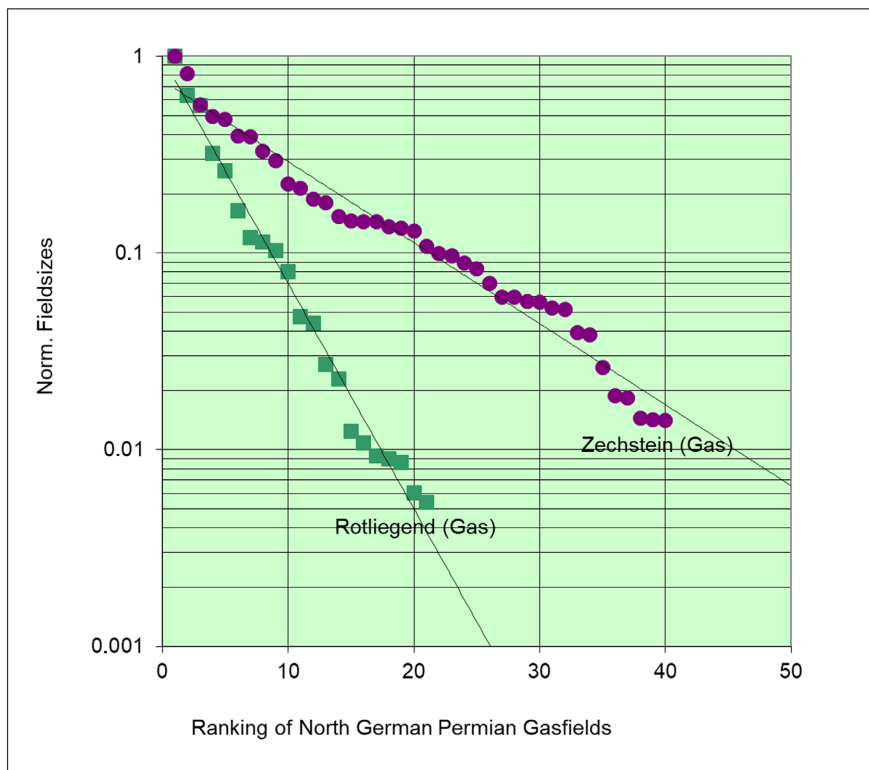


Figure 13. Ranking of Permian Zechstein and Rotliegend gas fields in Lower Saxony [36].

The distribution of the elements of a system can be easily approximated using the result of a dice game, where each die represents an independent parameter. Multiplying the four numbers from each throw of four dice results in an exponentially decaying curve in the chosen normal representation, *i.e.*, sorted values by ranking, and in a lognormal representation, the familiar image of a graphically linear relationship. If the experiment is repeated with a larger number of dice, the slope increases in the chosen representation of the lognormal distribution and thus, in the mathematical view, the exponential factor increases [36]-[38].

Albert Einstein's statement that God does not play dice cannot remain as it is (Figure 14), if one follows what has been discussed here. Believing in a personal God or viewing one's own development as the random result of a hyperparametric game of dice has confronted humanity with religious and natural-philosophical questions for millennia. Is there a plan that leads, via order-generating dice games in nature, to the becoming, being, and meaning of humanity, so that perhaps at least one living being can admire the entire complex "creation," or are its being and becoming randomly intrinsic and meaningless? From the Creator's perspective, relying solely on humanity and its earth, despite all its love and perfection and the many random imponderables, is also very risky for the Creator if admiration is important to Him. The end of the dinosaurs approximately 65 million years ago could already be a warning sign in this regard. Or it was part of a plan, but probably an "evil" event for these "innocent" creatures, if they had already been aware of "themselves." Without this "evil" event for the dinosaurs, there probably would have been no "good" event for any mammal or human.

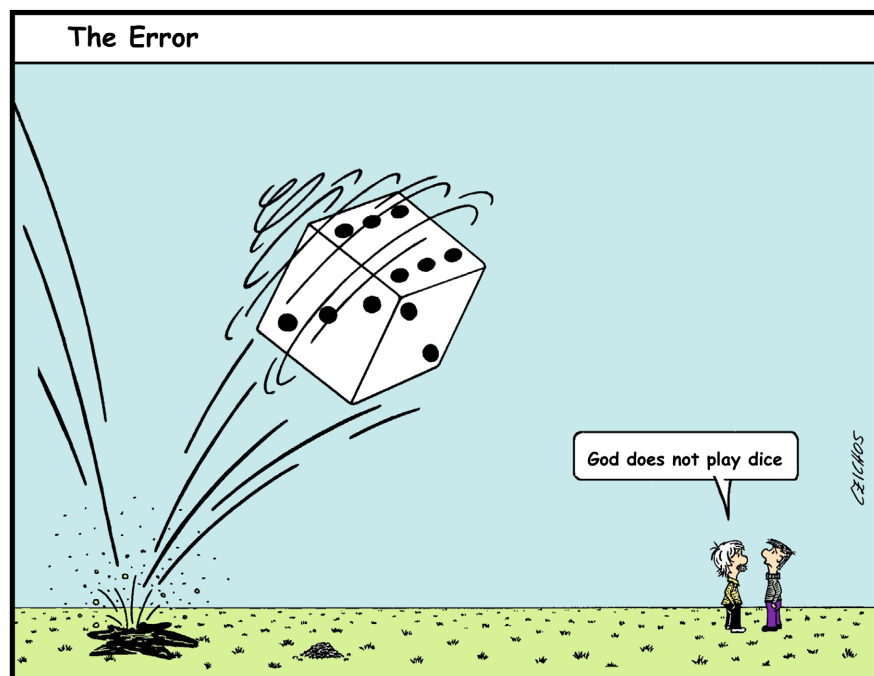


Figure 14. The Error © Joachim Czichos, <http://www.joachim-czichos.de/>.

7. The Man

Carl Gustav Jung, Swiss psychologist (1875-1961), commented [39]: “Without the reflective consciousness of man, the world is utterly meaningless, for, in our experience, man is the only being capable of determining ‘meaning.’ Since a creation without the reflective consciousness of man has no discernible meaning, the hypothesis of a latent meaning ascribes to man a cosmogonic significance, a true *raison d’être*. If, on the other hand, latent meaning is ascribed to the Creator as a conscious plan of creation, then the question arises: why should the Creator create this entire world phenomenon, since He already knows in what He could be reflected, and why should He reflect Himself, since He is conscious of Himself.”

To flesh out the question of meaning, man had his sense organs, the most important of which are the ability to hear and see, even over great distances. Hearing means recording and processing slow sound signals, while seeing means the physically different with immediately identifiable optical observations. Hearing a word that may have been present at the beginning took time to understand, whereas seeing embodies the perception of an event without a significant time delay. However, the scientific analysis of repeatedly seen things also requires time, which may extend over centuries or even millennia. For all humanities, the acoustic, as the powerful language or converted into text, seems dominant; for the natural sciences, the optical, with its affinity for images, seems more dominant, even if the two senses are difficult to separate in their meaning and interact with each other.

With the accumulated evidence, we ourselves can, in principle, only look backward with regard to our development and that of our living space. We cannot say exactly where things will lead in the distant future, despite the knowledge we have now gathered about episodic extinctions, the significance of plate tectonics and cosmic impacts, the development of the Earth’s core with its magnetic field providing protection at the Earth’s surface, and much more. Even if we wanted to create ourselves and had all the time in the world, even with a precise backward analysis of our existence, we could not combine the infinite number of process parameters in such a way that, after approximately 13 - 14 billion years, we ourselves would be the result by modeling forward. In the hope of a positive individual outcome at all levels, we would probably have to roll the dice a trillion of times, create an infinite number of suns and planets, and assume all natural laws and the properties of matter to be “divinely given.” Goethe’s literary attempt in *Faust II* (1832) to explain the origin of the world based on the paradigms of the Plutonists and Neptunists, who at the time were arguing over the dominance of “volcanic” magma (Earth’s interior) or “water-bearing” sea (Flood), reveals not only the scientific but also the strong humanities and initially religious components of the entire question of the origin of creation. The cause of this dispute was the devastating Lisbon earthquake of 1755 with the subsequent catastrophic tsunami, and the question of why God allowed this disaster to occur on a religious holiday.

In *Faust II*, Goethe (1832) [4] lets Seismos speak as the representative of the Plutonists and Thales as the representative of the Neptunists (Translation by

George Madison Priest):

SEISMOS:

“I, only, wrought this little matter As men will finally declare; But for my batter and my clatter How would this world be now so fair? How would your mountains stand above there In clear and splendid ether-blue, If them I had not worked to shove there? A picturesque, entrancing view!”

THALES:

“From water first was all created! And water is the all-sustaining! Ocean, continue forever thy reigning. If thou the clouds wert sending not, Wert swelling brooks expending not, Here and there rivers wert bending not, And streams beginning, ending not, Where then were the world, the mountains, and plain? ‘Tis thou who the freshest of life dost maintain.”

The negative testimony of a purely spiritually influenced perspective still advocated today, with its rigorous exclusion of scientific findings, is provided by creationists, who are particularly vocal in the USA.

8. The Work

Probably impressed by the consequences of the apocalyptic Lisbon earthquake, Voltaire [40] grappled with Leibniz’s (1646-1716) [41] optimistic worldview—which calls our world the best of all possible worlds. Since work and the necessary order-promoting energy can be equated, let us now quote from his masterpiece “Candide, or the Best of All Worlds” (1759) about the experience of unspeakable suffering. It states, among other things, a free translation from the French: “Let us work without overdoing it. That is the only way to make life worth living. Let each try what he does best and then place his talent at the service of all. For work keeps three great evils at bay: boredom, vice, and want.” Without spirit as an unspoken word, there would be no human will to work in their living space flooded with matter and light; without the will to work, there would be no action; without action guided by rules, there would be no order; without order, there would be no evolution of humanity leading out of apparent chaos. For the “cosmogonic” human being, the word was thus vital for overcoming “darkness” and was truly present for him from the very beginning of his search for meaning. Furthermore, given the abundance of possibilities offered by nature, there would probably be no individual or collective destiny without chance. Perhaps this is what John meant unconsciously. Only with the uninfluenced or influenced protracted realization of human beings must the intended beginning have begun through the Creator’s word addressed to them, and not with the Big Bang and the subsequent coincidental events in the universe, such as the development of stars, sun, earth, and moon.

By working for the subsequent directed action—regardless of the agricultural, technical, social, scientific, or other context and how it is organized—humanity would fulfill its divine mission to establish a higher order, contrary to the seemingly usual physical-thermodynamic trend, as it already happened in one way or

another without it at the very beginning, and as it seems to be predetermined in the creative animate nature on Earth or individually universally in inanimate nature, including the continuous sequence of birth and death.

The individual quality of work according to Voltaire, “mathematically integrated,” provides a collective social quality for a larger number of working people, which was philosophically taken up in the 19th century, especially by Karl Marx (1818-1883). His ideas of alienated labor [42] became a political issue with global implications far beyond the 20th century, but have little connection with the issues addressed in this work.

9. The Limited Eternity

Based on current knowledge, the end of our world could well look like this [27]:

The Evolution of the Sun:

- In about 7 billion years, the sun will begin to extinguish itself.
- In its “death throes,” it will become a red giant, capable of consuming the Earth and all life.
- Or the Earth will evaporate first.
- Mars, the closest planet to Earth, will likely survive this phase, like all other more distant planets.
- Afterward, the sun will cool and shrink to a small white dwarf.

The Evolution of the Galaxy:

- The Milky Way and the Andromeda Galaxy are on a collision course!
- In about 3 billion years, they will collide.
- After a complex gravitational dance lasting approximately 1 billion years, they will merge into an elliptical galaxy.
- The Milky Way consists of approximately 400 billion stars and has a diameter of 100,000 light-years (spiral galaxy).
- The Andromeda Galaxy is about twice the size of the Milky Way and approximately 2.2 million light-years away.
- Both galaxies are approaching at 500,000 km/h.

What does the future of Earth look like?

In 5 billion years:

- The internal heat sources weaken
- The circulation in the outer core stops
- It may become solid
- The Earth’s magnetic field disappears
- The ionosphere is reduced
- Dangerous radiation reaches the Earth’s surface
- Convection in the mantle slows down
- Fewer continents in the Earth’s crust

In 6 billion years:

- The internal heat sources dry up
- The circulation in the mantle stops

- It becomes solid
- The crust forms a thick, solid plate
- Atmospheric gases and seawater disperse
- The planet is geologically dead

So we still have plenty of time, as long as we don't die out beforehand for whatever reason, which, in the case of an asteroid impact with extinction potential, could happen in about 15 million years, assuming the same cyclicality of about 26 million years as in the past 260 million years applies [43]-[46] (**Figure 15**).

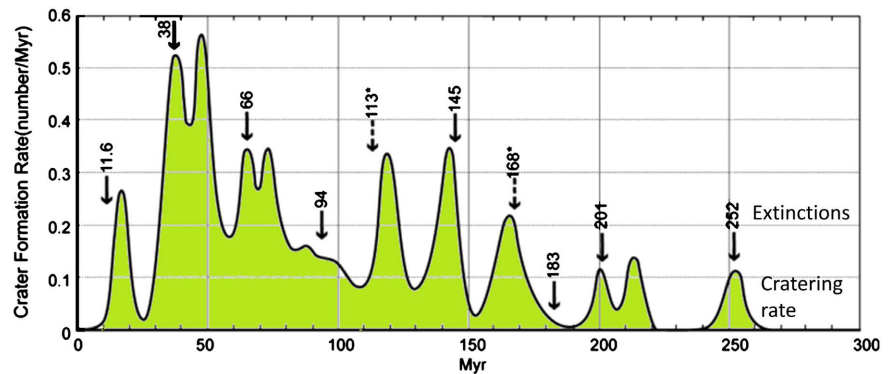


Figure 15. Species extinction and impact crater formation rate according to [43]-[46].

One of the last major impacts occurred approximately 15 million years ago in Germany (Nördlinger Ries, **Figure 16**), possibly followed by even larger ones in the Pacific Ocean until approximately 11 million years ago. May we use our time wisely and trust in Goethe:

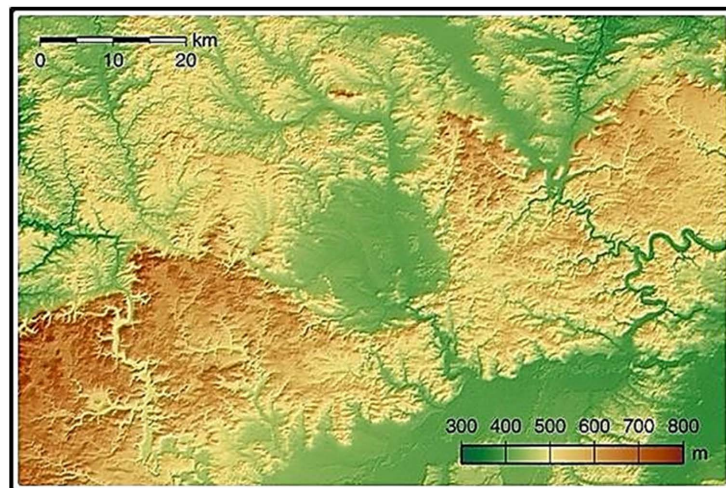


Figure 16. Asteroid impact in the Nördlinger Ries with a diameter of approximately 20 km. Topographic map: © San Jose/CC-BY-SA 3.0.

THALES (Faust II):

“Nature with all her living, flowing powers
Was never bound by day and night and hours,

By rule she fashions every form, and hence
In great things too there is no violence”

(Translation by George Madison Priest)

and hope that the 38 km wide Goethe Asteroid, discovered in 1960 by the Dutch research team of Cornelis Johannes van Houten, Ingrid van Houten-Groeneveld, and Tom Gehrels as part of the Palomar-Leiden Survey, never comes too close to Earth.

10. Conclusion

From the very beginning, there must have been interplay of divine word, matter, natural laws, chance, and work (energy) around planet Earth, as well as possibly many other unknown cosmic conditions that lurk behind the dark side of things, perhaps dark matter and dark energy, together perhaps covering the term “darkness” purely in literary terms. A term alone is simply not enough and would not do justice to the word itself. For the dark “evil” in the world, or what we consider to be such, must have come from somewhere. In the past, the devil (**Figure 17**) was popularly considered the legendary personification of “evil.”



Figure 17. The life-size bronze devil on the ascent to the Devil’s Pulpit near Gerbershausen/Eichsfeld/Thuringia by the artist Jochen Müller from Quedlinburg (2022).

For Leibniz (1710) [41], it would be the question of the cosmological dimension of evil, the *malum metaphysicum*. He argued that the entire real world, including its evils, possesses a necessity and rationality that distinguishes it from all other possible worlds. These evils would then include, in addition to earthquakes and other earthly catastrophes, with their short-term negative and long-term positive consequences, asteroid impacts associated with mass extinctions and their potentially vital influence on the stabilization of the Earth’s protective magnetic field. Thus, a future short-term, necessary and rational interception of some asteroids

before their potential impact on Earth might be counterproductive for the continued long-term survival of humanity, although this does not guarantee it.

Even if Goethe (1832) [4] ridicules philosophers with the following endearing cheekiness:

“For where ghosts take their place, The philosopher is welcome, too. That men his art and favour may enjoy, He straightway makes a dozen new” (Translation by George Madison Priest, modified);

it could, to put it mildly, be an interesting task for philosophy—but also for theology—to classify these five concepts adequately and “without ghosts,” possibly taking into account the “cosmogonic” significance of humankind and its ego, including its will to work and survive and its ancient search for the meaning of life, even under the conditions of a cosmologically limited eternity.

Should one separate “bad” and “good” egos, or are they both necessary and rational, according to Leibniz? Perhaps Teresa of Avila (1515-1582), highly revered by Christian theologians, can help overcome all human weaknesses with the prayer to the Creator attributed to her, which, full of wit and charm and with its universality, is certainly still relevant 500 years later to the author, an aging white man with an occasionally questionable penchant for paradigm shifts and without comparable outstanding humanities expertise, for his “cosmogonic” self-reflection:

“O Lord, you know better than I that I am growing older every day and will one day be old. Protect me from the illusion of having to say something on every occasion and on every topic. Deliver me from the great passion of wanting to organize the affairs of others. Teach me to be thoughtful but not brooding, helpful but not dictatorial.

With my immense accumulation of wisdom, it seems a pity not to pass it on. But you understand, O Lord, that I have kept a few friends I want.

Protect me from the enumeration of endless details and grant me wings to get to the essence. Teach me to remain silent about my illnesses and ailments. They increase, and the desire to describe them grows with each year.

I dare not beg for the gift of listening with joy to other people’s descriptions of their illnesses, but teach me to bear them patiently. Teach me also the wonderful wisdom that I can be wrong. Keep me as lovable as possible.

I don’t want to be a saint. Life is so difficult with them. But a grumpy old man is the devil’s crowning achievement. Teach me to discover unexpected talents in others and grant me, O Lord, the beautiful gift of mentioning them. Amen.”

The purely material development governed by natural laws and its probable dependence on astronomical conditions in the Milky Way certainly allows for the justified assumption that the Earth, in all its diversity, is alone in its galaxy, to the extent that our current intelligence allows for this analysis without limiting literary imagination. How this came about can be discussed, focusing on geoscientific considerations, starting from the New Testament statement “In the beginning was the word,” with the aid of quotations from, among others, Goethe (“in the beginning was the deed”), Einstein (“planning replaces chance with error” and “God

does not play dice”), Jung (“without the reflective consciousness of man, the world is of gigantic meaninglessness”), and Eigen (“the game and its rules are a natural phenomenon that has guided the course of the world from the beginning”). Imaginative man and his relationship to work play a central role in this. In the beginning and in the time thereafter up to the present, there must have been a multipolar interplay of word (spirit), matter, natural laws, chance, and work (energy) around planet Earth that transcended the bipolarity of spirit and matter, possibly including other unknown (chaotic?) cosmic conditions. The multipolar and complex, unpredictable interplay of “good” and “evil,” of “light” and “darkness,” of “life” and “death” or according to Chinese philosophy of “Yin” and “Yang” will continue to shape the future of our planet. Is the Earth perhaps a very lonely place in space with the history of a rather improbable (unplanned?) Phanerozoic eon instead of a (planned?) experiment among many other possible ones, taking into account the rules of natural law, coincidences, and system-immanent energy inputs (work) stored in matter and with the intrinsic intention to climb to higher orders?

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Conflicts of Interest

The author declares no conflicts of interest regarding the publication of this paper.

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