

**INTERNATIONAL SOCIETY OF  
PHILOSOPHY AND COSMOLOGY**

# **PHILOSOPHY & COSMOLOGY**

**Volume 31**



**Kyiv, 2023**

# **Philosophy and Cosmology, Volume 31**

## **Academic Journal**

ISSN 2518-1866 (Online), ISSN 2307-3705 (Print)

The State Registration Certificate of the print media KB No. 20780-10580P, June 25, 2014.

<http://ispcjournal.org/>

E-mail: [bazaluk@ispcjournal.org](mailto:bazaluk@ispcjournal.org)

*It was printed in the manner of scientific-theoretical digest "Philosophy & Cosmology" since 2004.*

*It was printed as the Academic Yearbook of Philosophy and Science "Философия и космология/Philosophy & Cosmology" since 2011.*

*It was printed as the Academic Journal "Philosophy & Cosmology" since Volume 12, 2014.*

Printed according to the resolution of the Scientific Board of the International Society of Philosophy and Cosmology (Minutes of meeting No 4 from September 30, 2023)

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# Part I: PHILOSOPHY OF THE COSMOS

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## Could Our Universe Have Been Initiated Intentionally: An Epistemological Framework

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Broadbent, Dan (2023) Could Our Universe Have Been Initiated Intentionally: An Epistemological Framework. *Philosophy and Cosmology*, Volume 31, 4-12. <https://doi.org/10.29202/phil-cosm/31/1>

*The possibility that our universe was initiated intentionally is a compelling philosophical and scientific question that can be evaluated probabilistically based on four primary considerations: fine-tuning in our universe, hypotheses about the multiverse, the likelihood that intelligent life may be able to initiate a universe, and the possibility that we live in a simulation. This paper offers an equation analogous to the noteworthy Drake equation that is intended to be used as a structured thought experiment to help identify factors related to the initiation of our universe and to facilitate examining each in terms of what we know, do not know, and potentially could know about them.*

*Keywords: multiverse, fine-tuned universe, simulation, cosmology, creation of universe, epistemological framework, Drake equation*

Received: 24 April 2023 / Accepted: 22 May 2023 / Published: 15 October 2023

## Introduction

The possibility that our universe was initiated intentionally is a compelling philosophical and scientific question that does not necessarily require involving religious beliefs. This paper offers an epistemological framework for considering factors related to the initiation of our universe and to facilitate examining what we know, do not know, and potentially could know about them. The framework presented should not be rejected as speculative because, as will be shown, the factors it includes are directly correlated to the underlying theories of fine-tuning, the multiverse, and simulations, about which many articles and books have been published. The unique contribution of this paper is that it explores the implications of following details of those theories to their ultimate conclusion and explicates the combined effect of considering all three constructs within the same framework.

To put the value of this approach into context, consider the historically noteworthy Drake equation (see Appendix A). In the 1950s and 60s there was growing interest in the possibility of extraterrestrial life and its potential detection. The astronomer Frank Drake formulated an equation in 1961 (Shostak, 2021) that included all the factors he considered relevant to estimate the number of civilizations in our galaxy with which communication might be possible. This equation was never intended to be precise, but it provided a “conversation starter” (Drake, 2021, para. 7) and an excellent way of “organizing our ignorance” (Dick, 2020: 111).

In recent years, there has been significant scientific interest in the topic of how our universe could have begun. This paper develops an organizational framework in the spirit of the Drake equation – one that allows for some big thinking and captures factors related to the possibility that our universe was initiated intentionally. There are at least four considerations that are relevant for such an equation: fine-tuning in our universe, hypotheses about the multiverse, the likelihood that intelligent life may be able to initiate a universe, and the possibility that we live in a simulation. This paper reviews the current thinking about each of these and then provides an equation to facilitate examining the relevant factors and their interrelationships.

## 1. Fine-tuning

Fine-tuning is not a settled topic. Opinions range from confidence that it is evidence that our universe was initiated by a supreme intelligence (Chan, 2017) to conclusions that what tuning there is, really is not *that* fine (Adams, 2019). However, the consensus seems to be close to the view expressed by Barnes: “Of all the ways that the laws of nature, constants of physics and initial conditions of the universe could have been, only a very small subset permits the existence of intelligent life” (2012: 561).

Understanding fine-tuning starts with the concept that our universe is governed by several laws and parameters that determine what can take place, in a way like a set of very detailed and inviolable building codes. The codes for our universe are such that life like us was able to develop. But if some of those codes were different, conditions might have been impossible for life. Given that there are so many other ways that these parameters could have been, why did they happen to be in the ranges that allow for life? Scholars offer several answers, including (Friederich, 2019: 1012):

1. There may be underlying fundamental laws that require the attributes to be what they are.
2. The parameters of our universe ended up what they are by chance.
3. The parameters were set to those values by some intelligence.

- 
- 
4. There may be many universes, or what is called the multiverse. Given a “sufficiently vast and diverse multiverse, it is only to be expected that it contains at least one universe where the laws and constants are right for life.”

These considerations will be included in the proposed equation.

## 2. Multiple universes

The idea that there could be more than what we perceive as our universe has existed for a long time. For example, “Anaximander, in the 6th Century BC, speculated about a plurality of worlds such as our cosmos, appearing and disappearing in an eternal movement of generation and destruction. A few centuries later, Epicurus described how an unlimited number of worlds fills the infinite vacuum” (Alonso-Serrano & Jannes, 2019: 2).

Current views of the multiverse were summarized by Max Tegmark (2007), who outlined four distinct levels of multiverses: regions in our own universe that we cannot observe or reach, other bubble universes that are separate from ours, quantum physics–related parallel universes, and other universes based on mathematical possibilities. A good general summary of the topic is “ours is not the only universe but part of a multiverse containing an unlimited number of individual universes extending an unlimited distance in all directions and for an unlimited time in the past and future” (Stenger, 2011: 22).

While these ideas may seem more philosophical than scientific, the majority of those who work in the field agree that “some version of the multiverse hypothesis can be defined in a scientifically rigorous way and (...) is or will become testable” (Manson, 2020: 34).

Some conclude that the existence of unlimited universes dismisses intelligence from being involved in the initiation of a universe – even one with fine-tuning – since within the vast numbers, inevitably some will have the right conditions for life. However, that reasoning could lead to the opposite conclusion. According to Adams (2019: 80), “the allowed parameter space is large” for universes to be compatible with life-forming requirements, which means many universes could result in life. If so, what is the likelihood that life in those universes could develop to a level of intelligence capable of initiating other universes?

To answer that question, we have only one data point relating to the capabilities of intelligent life – our own. Somewhat surprisingly, there are scientists who, in fact, think *we* may be able to learn how to trigger the start of a universe. This leads us to our next section.

## 3. If we can figure it out

The idea that we, or any other intelligence, could intentionally initiate a universe is grand indeed. However, some physicists like Brian Greene think it may be “within the realm of possibility” (2020: 247). Alan Guth (2014), Andre Linde (1992), and others have investigated the prospect and concluded the laws of physics do not preclude us from doing so.

Accounting for the element of time deepens the question even more. Life on our planet has existed for three to four billion years. During that time, it has reached a point of intelligence with which it is contemplating how universes are initiated and if it could be done intentionally. Life should continue to be possible on our planet for several billion more years. Beyond our planet, our universe will continue for eons. What levels of knowledge and capabilities will life reach in our universe in the distant future? James Jeans described this future as holding “almost endless possibility and hope” and that “we are drawing plans and laying foundations for a longer future than we can well imagine” (1929: 331). Furthering the

thought, Donald Goldsmith described how currently we “see no sign that life has affected the cosmos on a grand scale. That will change in the future. All the universe will become our garden” (2012: 38).

So, if given enough time and we figure out how to initiate a universe, would we do it? What about other universes from the multiverse that came before us? If they had a life that reached intellectual capabilities equal to or greater than ours, could they have played a role in the initiation of our universe? These considerations will be factored into the proposed equation.

## 4. Simulation

The idea that we could be living in a simulation is based on the rationale that advanced civilizations could have sufficient computing power to simulate us and our experiences, much like our current video games simulate characters and experiences in a rudimentary way. Those who are open to the possibility that we live in a simulation have already accepted the potential of what this paper is describing as our universe having been initiated intentionally.

The simulation idea was analyzed in 2003 by Nick Bostrom in an article that evaluated if a “technologically mature “posthuman” civilization” (p. 255) might use their capabilities to perform simulations about their ancestors. The concept has been generalized to any advanced civilization – in our future, in another place in our universe, or in another universe – simulating life. As the thinking goes, once the technology is available it would be much easier to run simulations than create physical universes. Therefore, the likelihood of living in a simulation would be greater than living in a physical universe.

Some evaluations based on looking at seemingly arbitrary limits imposed on our universe (like the speed of light) (Khan, 2021) and analyses using Bayesian statistics (Ananthaswamy, 2020) put the chance of us living in a simulation at about 50%. Of course, there are opposing opinions. Frank Wilczek “has argued there’s too much wasted complexity in our universe for it to be simulated” (Khan, 2021, para. 2) and Lisa Randall placed the chances at “effectively zero” (Moskowitz, 2016: 2).

Whatever the probability is for a simulation, the relevant components can be included in the proposed equation.

## 5. The equation

The intent of creating the proposed equation is similar to the motivation behind the Drake equation, which was “to quantify all of our understanding[,] (...) using our own system as a model” (Flatow, 2022, para. 8) and use it as “a thought experiment, a probabilistic argument, and a framework for thinking” (Drake, 2021, para. 22). Further, it can provide a placeholder for information if and when it becomes available.

The parameters and factors presented here likely will benefit from modifications and are not comprehensive. They are offered as a starting point to allow the thought experiment and discussion to be done with some structure and for revisions to have a base from which to begin.

An equation for the probability that our universe was initiated intentionally,  $P(I)$ , can start with three broad parameters:

- $P(PUI)$ : the probability that intelligent life in a prior universe initiated ours.
- $P(S)$ : the probability that we are in a simulation.
- $P(FTU)$ : the probability that the level of fine-tuning in our universe is unique.

Putting these into an “at least one” probability equation looks like this:

$$P(I) = 1 - [1 - P(PUI)][1 - P(S)][1 - P(FTU)] \quad (\text{Equation 1})$$

This equation represents that if at least one of the parameters has a probability, it will contribute to the overall probability.

Each of the three parameters in Equation 1 includes several factors.

The probability that a prior universe initiated ours,  $P(PUI)$ , is affected by these factors:

- $PU$ : the probability that there were prior universes.
- $n$ : the number of prior universes.
- $IC$ : the probability of life developing in a prior universe with intellectual capabilities equal to or greater than ours.
- $IP$ : the probability that intentionally initiating a universe is possible.
- $LH$ : the probability that we can learn how to initiate a universe.
- $IM$ : the probability that once learned, the capability to initiate a universe will be implemented.
- $FI$ : the fraction of existing universes that were initiated intentionally.

These factors can be combined into the following subequation:

$$P(PUI) = (PU)(1 - [1 - IC]^n)(IP)(LH)(IM)(FI) \quad (\text{Equation 1.1})$$

This subequation combines the ratio  $FI$  with the compound probability of independent factors  $PU$ ,  $IP$ ,  $LH$ ,  $IM$ , and the probability of at least one  $IC$  based on  $n$ .

The probability that we are in a simulation,  $P(S)$ , is affected by these factors:

- $CP$ : the probability that humans reach a ‘posthuman’ civilization with sufficient computing power to perform simulations with the detail exhibited in our universe (Bostrom, 2003).
- $AS$ : the probability that posthuman civilizations would be interested in performing ancessor simulations (Bostrom, 2003).
- $HUS$ : the probability that other civilizations in our home universe could and would run simulations.
- $OUS$ : the probability that civilizations in other universes could and would run simulations.
- $FS$ : the fraction of existing universes that are simulated.

These factors can be combined into the following subequation:

$$P(S) = \{1 - [1 - (CP)(AS)][1 - HUS][1 - OUS]\}[FS] \quad (\text{Equation 1.2})$$

This subequation combines the ratio  $FS$  with contributions from at least one situation of  $HUS$ ,  $OUS$ , or  $CP$  and  $AS$ .

The probability that the level of fine-tuning in our universe is unique,  $P(FTU)$ , is affected by these factors:

- $NM$ : the probability that there is no multiverse.



- *NFL*: the probability that there are no underlying fundamental laws that require the degree of fine-tuning exhibited in our universe.
- *NR*: the probability that the degree of fine-tuning exhibited in our universe could not happen randomly.

These factors can be combined into the following subequation:

$$P(FTU) = (NM)(NFL)(NR) \quad (\text{Equation 1.3})$$

This subequation represents the compound probability of independent factors *NM*, *NFL*, and *NR*.

In addition to the relationships defined in equation 1 and subequations 1.1, 1.2, and 1.3, the 15 factors presented above can be considered independently in terms of what we know, do not know, and potentially could know about them.

## 6. Discussion

As stated in the introduction, the factors identified in the equation are not speculative. They are directly correlated to the theories of fine-tuning, the multiverse, and simulations. What is speculative is what values will be assigned to each of the factors. This is not a flaw in the equation or the approach; it is a natural part of how science progresses: create a framework that accounts for factors that contribute to a specific phenomenon, speculate on their relative values and interrelationships, then find ways to determine those values through theory or experimentation. Hence, the equation contributes to that process with regard to how our universe began.

As an example, *n*, the factor representing the number of prior universes, is generally thought to be infinite by multiverse theorists. If that is the case, the equation demonstrates that it is extremely likely that some universes will be intentionally initiated – provided that it is possible to do so (and other factors omitted here for simplicity). Whether it is possible to do so, the factor designated by *IP*, is another area of scientific inquiry that so far has resulted in a positive outlook. But is *n* really infinite? Or is *IP* in fact zero? That is the type of discussion the equation facilitates.

Regarding the value of pursuing this kind of reasoning in the first place, recall that the topic of how our universe began has prompted countless philosophical and scientific discussions throughout history. Typically, these discussions derive from two entrenched camps: a great intelligence (God) made it happen through supernatural means, or natural laws brought it about. This equation clarifies the possibility that intelligence could work through natural laws to do it.

Additionally, previous research in this field has missed a critical point. Those who reach conclusions based on the multiverse assert that the existence of essentially infinite universes disproves claims that the fine-tuning in our universe came from any deliberate action because it can all be explained by the huge numbers eventually resulting in a universe where life can develop. Those who lean into our universe's fine-tuning consider the multiverse an extravagant overextension just to explain away its uniqueness. The missed point becomes evident by following the theories beyond the level of just trying to disprove each other. As described previously, it is a valid line of scientific inquiry that we, or other intelligent life that arose because of fine-tuning in our universe, may be able to initiate another universe. Unless we reject the Copernican principle and hold to the view that we are in a unique

place (spatially or temporally) means we must accept that if there are other universes, some will hold similar prospects as ours, including the possibility of initiating universes. Thus, a full consideration of if our universe could have been initiated intentionally must contain factors related to the theories of fine-tuning and the multiverse in the same analysis. Finally, including in the analysis the possibility of our universe being a simulation furthers the effort to be comprehensive in the treatment of the topic.

## Conclusions

Attempting to quantify the probability that our universe was initiated intentionally is a unique and constructive exercise to identify the relevant factors and examine each independently as well as their interrelationships. The epistemological framework contained herein, with the proposed equation and its 15 factors, is intended to be used as a structured thought experiment to facilitate discussion and further inquiry. This initial equation is presented with the open invitation to add or eliminate terms and adjust how they are combined.

Interestingly, based on this assemblage of parameters and factors, it seems likely that the probability that our universe was initiated intentionally is not zero. While this is not intended to be an example of “anything is possible when dealing with infinities” thinking, this exercise *is* intended to be a way of considering specific ideas judiciously and to see where they lead us. This approach aligns with guidance from Albert Einstein: “To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks real advance in science” (1966: 92).

## Considerations for further work

There are additional interrelationships between some of the equation factors. As examples, *IP* affects *LH*, and *PU*, *n*, and *IC* affect *FI* and *OUS*. While the focus of this initial effort was to keep the equation, and its subequations, as simple as possible, more sophisticated models might offer a more thorough accounting of correlating effects.

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## Appendix A: The Drake equation

The Drake equation is as follows:

$$N = (R_*) (f_p) (n_e) (f_i) (f_c) (L)$$

$N$  = the number of civilizations in our galaxy with which communication might be possible (i.e., which are on our current past light cone)

$R_*$  = the average rate of star formation in our galaxy

$f_p$  = the fraction of those stars that have planets

$n_e$  = the average number of planets that can potentially support life per star that has planets

$f_l$  = the fraction of planets that could support life and that actually develop life at some point

$f_i$  = the fraction of planets with life that actually go on to develop intelligent life (i.e., civilizations)

$f_c$  = the fraction of civilizations that develop a technology that releases detectable signs of their existence into space

$L$  = the length of time for which such civilizations release detectable signals into space

Source: Shostak, Seth. 2021. Drake equation. SETI Institute. <https://www.seti.org/drake-equation-index>.

# Measuring and Classifying Levels of Futures

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Costa-Leite, Alexandre (2023) Measuring and Classifying Levels of Futures. *Philosophy and Cosmology*, Volume 31, 13-20. <https://doi.org/10.29202/phil-cosm/31/2>

*This is a paper dealing with methodological and foundational issues in the realm of Futures Studies. It provides possible metrics for the temporal coordinate in the cone of plausibility. As a consequence, some adaptable scales to classify levels of future with respect to a certain time interval relevant to measure the future of humanity are suggested.*

*Keywords: cones of plausibility; levels of future; flexible cosmological decades (cosmological  $\sigma$ -years); scale; methodological and foundational issues in futures studies*

Received: 28 February 2023 / Accepted: 19 March 2023 / Published: 15 October 2023

## Introduction

Profound and deep inquiries on the notion of future have a substantial role considering that they are able to empower humanity to establish strategies and mechanisms to manage its own development through time and future. So, besides the pertinent techniques to study particular attempts to foresight in the context of specific domains, the importance to clearly understand possible types and kinds of future seems to be relevant, essential and somewhat evident. In this sense, departing from an analysis of the concept of *future* based on an inquiry on different approaches to the subject, this paper suggests and provides a tool to classify possible futures according to a given specific and limited time interval.

The main result of this article on the foundations of methodological issues in Futures Studies is inspired on previous researches such as the Kardashev Scale (Kardashev, 1964) and the Barrow Scale (Barrow, 1998) to compute and order knowledge and possible technological expansion and developments of a civilization. These scales are useful to precisely organize and provide resources to give a general perspective and surgical measure of the technological level of a given (conceivable) civilization. Kardashev scale, originally, classify three types of civilization according to the ability these civilizations have to manage and control planets, stars and galaxies, respectively (Kardashev, 1964). Barrow scale, otherwise, classify seven types of civilizations according to technological abilities they have to manage and handle

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smaller and smaller objects: from entities to the size of themselves up to quarks and even the very basic specific framework and constitution of spacetime (Barrow, 1998). Moreover, Barrow (1998) seems to organize four types of future with respect to the duality given by resources provided by Nature and knowledge we have about it. Combining these, let's say, numerical classifications with qualitative classifications of types of futures based on cones of plausibility proposed by Taylor (1988), Hancock & Bezold (1994) and Voros (2003), the central motivation and aim of this paper is to introduce possible metrics to distribute and control forms, types and levels of future taking time intervals into account. The intervals considered are adapted from those based on cosmological decades introduced by Adams and Laughlin (1997, 1999). So, this research establishes rather a quantitative than qualitative approach to futures. These are regularly classified according to time intervals, not in pure forms such as possible, preferable, probable futures, and so on. By the way, these pure forms are the main essential feature of the traditional cones of plausibility.

Time intervals giving rise to timescales dealing with future (and past) are frequent in science and they are used to measure a plurality of things: ages of the universe, geological processes, life on Earth, technological development etc. In this research, adaptable timelines based on interval scales are used to measure levels of futures allowing us to comprehend the limits, directions and values of our investigations concerning, especially, supposed long-term or far distant futures. But these are long-term futures for the humanity, not for the universe. In order to reason about possible timelines concerning the long-term future of the universe there are many substantial works in cosmology (for instance, Adams & Laughlin, 1997, 1999).

In this way, the structure of the paper is divided in two parts: the first one presents and discusses some inspiring and rich contributions to the study of the future. The second one introduces possible metrics to partition cones of plausibility using a kind of flexible cosmological decades adaptable to reason about the future of humanity.

## 1. Perspectives on futures

From the scientific and empirical viewpoints, time, however, should not be explored alone, assuming that it is part of a complex hybrid combined entity mixing space and time: spacetime. This one is something containing three spatial coordinates  $x, y, z$  and a temporal dimension  $t$ . In this sense, spacetime should be understood and thought as a special four dimensional object of the form  $\langle x, y, z, t \rangle$  (Einstein (2015) and Penrose (2005) for general issues concerning spacetime). Therefore, futures vary in the coordinate  $t$  when we consider an order relation and take an instant  $t'$  such that  $t' > t$ . There is no need to consider and talk about spacetime if we are investigating future, but it is important to have a general view on the subject. The vision of time as something encoded in an unique entity combined with space is the rule rather the exception in the context of sciences. This gives rise to the fundamental temporal notion of light cone (Penrose, 2005). This notion can be divided into two directions: past light cones and future light cones. This last one plays an essential role in Futures Studies, especially because some authors proposed a cone of plausibility, based on a future light cone, to deal with and classify types of future (Taylor (1988), Hancock and Bezold (1994) and Voros (2003)). Future, therefore, is something which exists potentially, and we do expect that at least a part of this potentiality will become actual in due time.

From the logical perspective, the notion of future may be studied and investigated from different dimensions. For instance, this concept has a precise and interesting understanding inside the context of formal logic: Prior (1957) originally has proposed a logic able to deal with time and, as a result, future can be thought inside this framework. In some temporal

systems, the notion of future can be understood as a modality applied to a linguistic entity yielding to the following situation: let  $p$  be a proposition, and let  $F$  be an operator which scope is  $p$ . Then,  $Fp$  means “it will be the case that  $p$ ”. Consider  $Fp$  and an ordered set of instants  $\{t_1, \dots, t_n\}$ . Then,  $Fp$  is true in a given instant  $t_i$  if and only if there is an instant  $t_j$  such that  $t_i < t_j$  and in  $t_j$  we have that  $p$  is true. Informally, a sentence  $Fp$  is true in a given instant if there is a (possible) instant in the future in which the sentence is true. This is compatible with the regular idea that we all have when we think about the future. Despite the fact that time can be studied alone in the context of temporal/tense logic, it can naturally be combined with space leading to formalisms to model spacetime. Future, thus, is a complex network of conceivable possible worlds in which a given sentence will be true or false.

From the philosophical viewpoint, time, as well as future, has an autonomous and spontaneous metaphysical existence. Notwithstanding, to determine the configuration and behavior of the future is a very complicated issue, especially if we ignore the cosmological principle and take into account and consider, for instance, Hume’s problem (also known as the problem of induction introduced in Hume (2007)) according to which there is no necessary connection between a cause and an effect (i.e. it is not possible to deduce, with certainty, the future departing from the past and the present). Imagination and conception can always be used to control and simulate what is logically possible (Costa-Leite, 2010). Therefore, the future, be it whatever, is always measured and determined by what is logically possible, not merely by what is physically possible. In this precise sense, conceivable futures are controlled by logical mechanisms which establish what are the possible facts with respect to a given theory. In the traditional reading of time as an arrow departing from an initial point, future is the way in which the arrow goes, it is the flow, despite the fact that there is not a terminal object called the future, as it is always a becoming. Future is, of course, not entirely determined by the present, but certainly a part, a fragment of it can be characterized, even if vaguely, taking into account pieces of the present reality. Otherwise, studies on the future would not be possible.

All these three perspectives are interesting and give clues to understand the limits and scopes of our investigations with respect to the future. As the concept of future is rich and hybrid, and it can be approached from a great variety of perspectives and domains, in order to study it we need to use tools to guide us in the network and complex nature of futures. It seems that, although future has been studied from many viewpoints, a general framework to organize and manipulate possible particular periods of futuristic scenarios in the context of Futures Studies and the future of humanity – not in cosmology and in the future of the universe – has still room. Instead of predicting and foresighting particular futures, from now on we attempt to provide a tool to be used as a roadmap to manage and understand futures by means of infinitely many possible scales to introduce metric and classify futures labelling specific periods of future displayed by cones of plausibility.

## **2. Classifying, ordering and organizing futures**

Initially, a general, abstract and complete framework is introduced to serve as background for a panoramic scale. Generality and abstraction allow the application of the scale to precisely posed contexts in Futures Studies. Considering cones of plausibility such as those of Taylor (1988) and Hancock & Bezold (1994), we verify that these authors even consider time intervals inside future light cones, but the intervals are reduced to dozens of years and, as such, they are not so expansive and large as possible intervals that could be taken into account. Thus, in some sense, we can think about the next classification as a tool able to in-



depth slice cones of plausibility, generalizing previous mentioned perspectives: the suggested interval scale slices pieces of future light cones (instantiated by cones of plausibility) using powers of generalized base  $\sigma$  such that, for each application, a particular  $\sigma > 1$  should be considered trying to reach expressive forms of future. The fragmentation and slicing of cones of plausibility uses flexible cosmological decades (i.e. *cosmological  $\sigma$ -years*) and then it follows the approach developed by Adams and Laughlin (1997, 1999). These authors consider  $\tau$  and  $\eta$  to introduce scientific notation to measure time in years proposing then cosmological decades represented by  $\eta$  in the identity  $\tau = 10^\eta$  years. Then, they provide a wide and enlarged timescale structured in powers of base 10 to capture the totality of possibles ages of universe, following a timeline up to what they call the dark era of the future of the universe. The next introduced scale to deal with specific issues in the future of humanity can be viewed as a particular and specific cut in the scale of Adams and Laughlin. Their scale, however, is used to handle the total timeline of the universe, from the very past to the ultra almost infinite future.

Let  $t$  be a given year and each  $\sigma^\eta$  with  $\eta \in \{0, 1, 2, 3, \dots\}$  corresponds to years. As such, it measures a certain amount and flow of time based in years. Years are the natural selection assuming that it is the current measure used by humanity, and it is something that makes precise and clear sense from our viewpoint, as our duration in spacetime is limited. So, we are directly concerned with the future of humanity. A *flexible cosmological decade* is a kind of generalized cosmological decade changed with an extra varying amount of years  $t$  and a general number  $\sigma$  for the base of the logarithm. The only adaptation concerning the original idea of cosmological decade by Adams and Laughlin (1997) is that now for *cosmological  $\sigma$ -years* we have something of the form

In this sense,  $\tau = (t + \sigma^\eta)$  years. This is a very particular kind of flexible cosmological

$$\eta = \log_\sigma \left( \frac{(\tau - t_{yr})}{(1yr)} \right)$$

decade because the parameter  $t$  is not fixed. In the original proposal of Adams and Laughlin (1997, 1999), they use a strict and rigid  $t$  dividing the whole timeline of the universe in some eras. In the cut presented here, a generic, abstract form of an interval scale to estimate, classify, order, name, and organize cones of plausibility containing forms of futures is proposed. Each particular choice of a  $t$  and a  $\sigma$  gives rise to a specific scale. But in a rather generalized version, the pure form of the scale is the following:

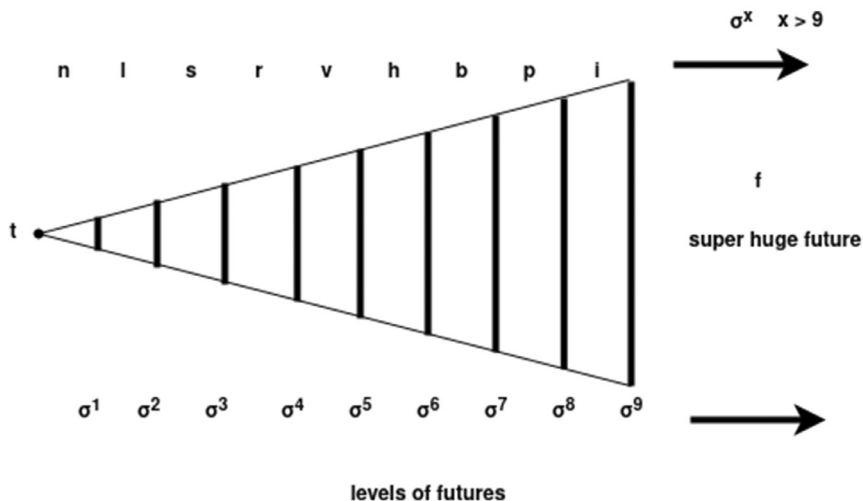
- Type I Future:  $t < n \leq t + \sigma$  (negligible future);
- Type II Future:  $t + \sigma < l \leq t + \sigma^2$  (low future);
- Type III Future:  $t + \sigma^2 < s \leq t + \sigma^3$  (shallow future);
- Type IV Future:  $t + \sigma^3 < r \leq t + \sigma^4$  (regular future);
- Type V Future:  $t + \sigma^4 < v \leq t + \sigma^5$  (relevant future);
- Type VI Future:  $t + \sigma^5 < h \leq t + \sigma^6$  (heavy future);
- Type VII Future:  $t + \sigma^6 < b \leq t + \sigma^7$  (reasonable future);
- Type VIII Future:  $t + \sigma^7 < p \leq t + \sigma^8$  (profound future);
- Type IX Future:  $t + \sigma^8 < i \leq t + \sigma^9$  (intense future);
- Type X Future:  $t + \sigma^9 < f \leq t + \sigma^\eta$ , for  $\eta > 9$  (super huge future).

Fixed a particular  $t$  and a particular  $\sigma$ , it is clear that the lower we go into the scale, our



predictions and foresight capacity concerning humanity seems to be clearer and clearer, but this of course strictly depends of the content of the prediction. The deeper we go it becomes super difficult to say what will happen, at least if we consider human expectations and projects. Notice also that nothing is said about the content of the intervals  $n, l, s, r, v, h, b, p, i$  and  $f$ , as this task has to be conducted for the applied engaged and able futurist. The letters  $n, l, s, r, v, h, b, p, i$  and  $f$  correspond to futures with respect to a given year  $t$ . This gives rise to the set **FUT** containing long periods of dilated futures as objects and each interval has a great number of years. There is an obvious order  $<$  separating levels of future. It is a natural consequence that a cone of plausibility could be layered and sliced by the above levels of future, generalizing temporal issues raised by Taylor (1988) and Hancock & Bezold (1994). Now, we could also think using a function. In this sense, let  $t$  be a constant,  $\mathbf{N}$  the set of natural numbers,  $x$  a variable, and let  $g$  be a one variable function  $g : \mathbf{N} \rightarrow \mathbf{FUT}$  with domain the set of natural numbers  $\mathbf{N}$  and **FUT** as codomain such that  $g(x) = t + \sigma^x$ . By means of applications of this function (which generates flexible cosmological decades) we can find lower and upper borders of a given interval in the abstract scale. It is clear that it could be extended to a two-variable function, but there is no need to perform this. The above mathematical *future function* serves as an underlying mathematical tool to formulate the scale based in flexible cosmological decades. Figure 1 can be viewed as a reduced, restricted, two-dimensional and metric version of cones of plausibility, which can be found in Taylor (1988), Hancock & Bezold (1994) and Voros (2003). Moreover, it is worth noting that the limit of the function  $(t + \sigma^x)$  when  $x$  tends to infinity is infinity. This fact leads us to think that there is a relationship between great ages and super huge future. That is, the abstract upper borders of super huge future in some sense are too large that for us they coincide with a kind of eternity. If the powers tend to infinity, then we could enter into eternity by means of a physics of eternity in the sense of Adams and Laughlin (1999). Though, we have to be aware that the field of Futures Studies cannot be reduced to a chapter of Cosmology, but to reach substantial results in Futures Studies, it is conjectured that we have to take into consideration expressive ages like those provided by *cosmological  $\sigma$ -years*.

Figure 1: A cone of plausibility divided by *cosmological  $\sigma$ -years*.



Notice that in order to apply the scale we have to consider a given fixed time  $t$  (but this  $t$  is

not absolutely fixed and it varies according to specific uses). So, it is with respect to this  $t$  that the scale should be used. Now, let's apply the methodology to partition cones of plausibility taking as a starting point our current year 2023 (i.e. a fixed  $t = 2023$ ). Let's select a relevant  $\sigma$  to think about the future of humanity from our viewpoint. It seems that  $\sigma = 4$  sounds to be a good choice. Therefore, if  $t$  is 2023 and  $\sigma = 4$ , then 2027 belongs to its negligible future, and then the year 2039 corresponds to its low future and so on. In this way, we can consider an application of the scale based in the current year 2023 as follows:

- Type I Future:  $2023 < n \leq 2027$  (negligible future);
- Type II Future:  $2027 < l \leq 2039$  (low future);
- Type III Future:  $2039 < s \leq 2087$  (shallow future);
- Type IV Future:  $2087 < r \leq 2279$  (regular future);
- Type V Future:  $2279 < v \leq 3047$  (relevant future);
- Type VI Future:  $3047 < h \leq 6119$  (heavy future);
- Type VII Future:  $6119 < b \leq 18407$  (reasonable future);
- Type VIII Future:  $18407 < p \leq 67559$  (profound future);
- Type IX Future:  $67559 < d \leq 264167$  (intense future);
- Type X Future:  $264167 < f \leq 2023 + 4^\eta$ , for  $\eta > 9$  (super huge future).

The scale, it is obvious, can be applied for any kind of  $t$ , as it has a good plasticity to be adapted to very divergent timelines, considering that the departing point is a generic  $t$ : the initial point  $t$  is not, mandatorily, fixed. As a consequence, it is interesting to note that many results in the domain of Futures Studies are developed and located in the borders of their low, shallow and regular futures depending of a particular choice of a  $t$  and a  $\sigma$ .

Some other issues that could be raised are the following: first, from one side, pure cosmological decades are not good to reason inside the realm of Futures Studies because these decades are too large. They are relevant for, let's say, Cosmology and Big History. For instance, a human being reaches, with good luck, at most, a regular future in existence considering  $t$  as his or her birthday and a small  $\sigma$ . But, from the other side, cosmological decades provides a unified perspective on time and, as we human beings are objects inserted in the universe, our size gets a precise dimension when even *cosmological*  $\sigma$ -years are considered. Anyway, other measures could be proposed using different exponential functions:  $t + 2^x$ ,  $t + 5^x$  and so on. It would be straightforward to design these divergent scales, and maybe, why not, other exponential functions would be more compatible with human futures. There are theoretically infinitely many ways to measure time inside future light cones of plausibility. Second, if we consider temporal operators as those of Prior (1957), we could divide them in nine operators (or more if one wants), one for each kind of future. This could be done like this: let  $p$  be a sentence and  $F_r$  a temporal operator. Then we could adapt Prior's idea and say that " $F_r p$ " means that  $p$  is true in a point of its regular future and so on. Semantics and logics for this and other similar situations could be easily elaborated.

In any case, we can apply an instance of the general scale to relative particular years. For example, we can evaluate now some articles exploring the future using the suggested general scale above. In each case, a particular  $t$  is assumed and we use, for the analysis,  $\sigma = 4$ . Take, for example, Bilgin (2011) published in 2011. So, in this case  $t = 2011$ . The article explores the year 2020. So, it was an article on the low future. Consider, for instance, Son (2013) published in 2013. So,  $t = 2013$ . It deals with the year 2030. So, this article when it has been published it was a research on aspects of its shallow future. The original cone of plausibility

proposed by Taylor (1988) goes up to its shallow future, as well the improvement of the cone suggested by Hancock & Belzold (1994). Wright (2018) has  $t = 2018$  and the author evaluates 2100. Thus, it is also about its regular future. Glenn (2000) published in  $t = 2000$  attempts to reach its relevant future. It is rare to find studies going through all levels of the scale when we are dealing with the future of humanity. One exception is Stager (2012) who attempts to go up to forms intense future, which are called by the author as *deep future*. One interesting task is to check the scope of validity of articles dealing with Futures Studies in the realm of the scale proposed here.

## Conclusion

This methodological and foundational paper provided a reflection concerning classifications of types of future. As a byproduct, adaptable scales based in intervals to measure, name and classify conceivable futures with respect to time intervals were suggested. This enables us to have a panoramic and comprehensive view concerning our own goals. The idea can be viewed as a methodology to provide substantially many temporal sliced cones of plausibility generalizing and complementing works of Taylor (1988) and Hancock & Belzold (1994) by means of *cosmological  $\sigma$ -years* (i.e flexible cosmological decades adapted from the original idea of cosmological decade by Adams and Laughlin (1997, 1999): we have used this strategy to divide cones of plausibility in order to explore the formal structure of the future of humanity. Besides that, it gives a methodology to model, slice and shape futures relevant for human concerns. It also displays a tool to organize and manage future scenarios inspired by the scales of Kardashev (Kardashev, 1964) and Barrow (Barrow, 1998). Using the mechanisms in this paper, researches on Futures Studies (which should not collapse with a fragment of Cosmology) can be equipped with a roadmap to establish levels and particular scopes in a determined class of inquiries: researches on futures could take into account a particular scale to state what are the levels of future which are studied and considered in a given specific and particular investigation. In order to perform this task, futurists can select a fixed  $t$  and a special  $\sigma$  as suggested by this article or futurists have to decide what is the best way to introduce metrics in cones of plausibility. Anyway, we need a stable highway to explore the potential levels of future.

## Acknowledgments

Thanks to Edelcio Gonçalves de Souza (University of São Paulo), Edgar Almeida (Federal Institute of Brasília), Gabriel Santana Lima (University of Brasília) and Gustavo Schmidt for comments, discussions and remarks concerning the main ideas of this paper.

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# Vedic Residue, Cosmic Inflation and a Unified Vision of Everything

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Giammarchi, Marco and Luca Guzzardi (2023) Vedic Residue, Cosmic Inflation and a  
Unified Vision of Everything. *Philosophy and Cosmology*, Volume 31, 21-36. <https://doi.org/10.29202/phil-cosm/31/3>

*We present a unified vision of human knowledge, the external world and ourselves in the frame of an overall unity of Everything. Two main sources of knowledge are considered to this goal: an admittedly reductionist version of Modern Science and a few key elements of Oriental Philosophy. Our view is based on an analogy between the fundamental unity of Vedic ontology and the Grand Unification scheme of Particle Physics traced along the evolution of the Universe. Our key statement is that these two sources of knowledge describe the same ontological story of separation, from an original One down to the multiplicity of the phenomenological world. We further substantiate this vision by drawing an analogy between the Residue of the Vedic sacrifice and the post-Big-Bang cosmological Matter-Antimatter Asymmetry. We also discuss a Big-Bang analogy between the postulated field of Inflationary Cosmology (the Inflaton) and the Vedic dissolution-decomposition of the cosmic progenitor Prajapati – whose body, according to Brahmanas texts, provides the material substrate of which the Universe is built.*

*Keywords: Indian Philosophy, Quantum Theory, Theories of Everything, Vedic Sacrifice, Big Bang*

Received: 13 March 2023 / Accepted: 31 March 2023 / Published: 15 October 2023

“Ich bin ein Teil des Teils, der anfangs alles war,  
ein Teil der Finsternis, die sich das Licht gebar.”

J.W. Goethe, *Faust*

“Science is much closer to myth than a scientific  
philosophy is prepared to admit.”

P.K. Feyerabend, *Against Method*

## Introduction

The present study considers the general unification trend in Modern Physics and compares it with analog approaches originated in a specific tradition of what is usually called “oriental” thought.

The use of this label is subject to debate. On the one hand, the term is commonly used, together with cognate expressions such as “Eastern thought” or “Asian philosophy,” to refer to traditions of thought that flourished in Asia in different times and cultural contexts and had preoccupations similar to those of “western” philosophy, and occasionally also came into contact with it. On the other hand, characterizations of this kind are a product of eighteenth and nineteenth-century European scholarship (Said, 1979; Harrison, 2019; Asif, 2020), and easily give the misleading impression of monolithic conceptions – which is disputable both in the case of the “western” and the “oriental” traditions. In light of this, in the following pages, we shall use the label “Indian Philosophy” as a shorthand for systems inspired to the complex of beliefs, conceptions, and reasoning styles that developed in the northern Indian Subcontinent between the eighth and the second century BCE (we adopt the periodization advanced by Ganeri, 2017). This somewhat arbitrary and conventional characterization is broad enough to include Vedic wisdom and Hindu philosophical and religious thought as well as many strands of Buddhism and Jainism. However, it is also sufficiently narrow to exclude other traditions of thought, mostly religiously oriented, that developed in the same area, or are highly influential in the Subcontinent, such as Sikhism, Islamic philosophy, and Zoroastrianism.

Modern Physics is usually viewed as a product of western civilization. However, there is also ample evidence that many (western) scholars became interested in the analogies Modern Physics bears with oriental conceptions, particularly those connected with Indian philosophies. Undoubtedly, Modern Physics and the multifarious cultures of the Subcontinent have very different ontologies, viz. they diverge very much in terms of the fundamental entities they deal with, and also diverge in style, i.e., with regard to the tools they use to describe those entities. This notwithstanding, both seem to move toward a common ontological goal: a cosmological vision of the unity of Everything. According to these two sources of knowledge, the colorful, individual forms composing the world came into being from a previous “homogeneous” era, a non-differentiated state of the Universe.

Of course, the analogy itself can be treated from different perspectives. From the point of view of the history of ideas, it raises the question of how the oriental systems of thought became conceptualized in the West, and in such form influenced prominent scientists and philosophers, who in turn propagated that credo. Thus, one could even think that the asserted analogy is not but a social and cultural construct. However, others might point out that there is, indeed, a common, ancestral origin of such traditions. In fact, we are dealing here with

cosmologies that are expressed in Indo-European languages or have been developed by populations characterized by a continuous, mutual cultural exchange.

As for the present paper, we shall take an agnostic approach on this dilemma. We shall start with the minimal assumption that there is an analogy about a “Unified Vision of Everything” between Modern Physics and Indian philosophy – no matter if this is a socio-cultural construct or a real analogy. Then, we explore the significance of the analogy in itself and try to see where this coherently will bring us. In particular, we discuss a unified vision of Everything through analogies between the Vedic tradition and the evolution of Cosmology and Particle Physics. In doing this, we shall treat Vedic texts and myths only with regard to their cosmological/cosmogonic content, leaving aside questions about other possible meanings, such as moral, spiritual, symbolic, etc.

## 1. The unification trend in Physics

The trend towards a unified physical world picture is a long-standing one in Physics. Still, the search for unity has manifested itself in many different ways in the course of time and has sometimes brought to dramatic controversies. In fact, approaches that attempt to unify the multiplicity of the views in accordance with some common principles seem to face serious problems, since different theories of unity may disagree about what needs to be unified. For example, it is not the same to wish, with Newton and the Newtonians, that any natural process can be derived from central forces (Newton, 1687: 382-383) or to expect, with Ostwald (1892, 1902), that in due time every phenomenon in nature will reveal itself as an energy exchange.

Here we are not faced with two different unifying principles (forces against energy); rather there is a difference in kind between these two attempts. Newton did not maintain that nature was the expression of a unique underlying physical entity, the force (putting *energy* in place of *force*, this was, in fact, Ostwald’s position), but that all phenomena at least in the non-living domain – gravitation, electricity, magnetism, light, chemical affinities, etc. – display an identical mode of action, thus can be investigated according to the same principles. Of course, in singular cases, the mathematics of the laws might be more complicated than for Gravitation, with forces not obeying the inverse-square law. To discover their exact ratios as well as their carriers (which might well be different) was matter of experimental physics; but essentially, in every case, we are dealing with *central* forces, all of them being proportional to the product of the quantities at play and inversely proportional to some power of the distance.

In a certain sense, this strategy – that we call *epistemic unification* – is a minimalistic approach, because it does not require that the fundamental entities a theory deals with (in this case, forces) are ontologically the same. Epistemic unification only mandates that they obey the same laws or principles, without guessing about their nature. Other attempts, such as Ostwald’s, are more ambitious. Explicitly or implicitly, they require that all entities in nature are reducible to the same underlying *thing* – therefore, an appropriate name for this tendency could be *ontic unification*.

## 2. Epistemic versus ontic unification

It is not difficult to find appropriate examples of both efforts throughout the history of physics; they can be conceived as two poles on the same continuum, so that every theory of unification can be located at some point along the line between epistemic and ontic unification, and every theory can be said to be *more* or *less* ontic/epistemic regarding unity than another theory.



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Only in rare, extreme cases we shall be faced with a completely ontic unification; in rare cases as well, we shall be confronted with theories of mere epistemic unification. In most cases, however, we have to do with mixed strategies that locally aim at an ontic unification of something but are globally committed to an epistemic form of unification or are incomplete attempts of ontic unification.

The combination of the classical theory of electromagnetism with classical gravitation provides a good example of a mixed ontic-epistemic strategy. According to the field-theoretic picture of Faraday and Maxwell, electricity and magnetism can be described as perturbations of space; such perturbation is what we call the electromagnetic field, an entity that is independent from the nature of the charges (electric or magnetic) that have produced it. Electricity and magnetism can therefore be conceived as different phenomenal manifestations of the same basic entity: the electromagnetic field, completely described through Maxwell's equations. This unification has therefore an important ontic character. On the other hand, according to the Newtonian viewpoint gravitational force is generated by masses and varies from point to point. So, we can describe the "gravitational field" as a physical quantity excited by the mass distribution, in analogy with the description of a classical electromagnetic field, with the important feature of both having the same  $1/r^2$  force law (for electrostatic and gravitational fields). We produce, therefore, a kind of unified description that depends on the similar epistemic structure of the two theories (the same dependence from the distance of the sources of their respective fields). But this is by no means an ontic unification, being electromagnetic and gravitational fields two very different entities. In other words, we have a partly unified description that depends on the epistemic structure of our theories and not on the nature of the processes they describe. Moreover, with the emergence of general relativity as a deeper theory of gravitation, even this epistemic analogy was lost and Gravitation is nowadays the main example of a fundamental force being very different, also epistemically, from the other fundamental (quantum) fields: quantum electrodynamics, strong and weak nuclear Force.

In general terms, identity of formalism may hint at identity of nature – it could be that we are able to describe different things with the same formalism because, in truth, the difference is not but apparent and the things we are describing are, at some more profound level, the same thing. If this is the case, pursuing further the process of epistemic unification we can gradually extend the unification to the ontic level.

### 3. The Standard Model as a developing ontic unification

Following a period of proliferation in the discovery of subatomic particles during the 1950s and 1960s, as well as of theories describing them, the following decades marked the rising of the Standard Model (SM in the following). The SM is a quantum field theory based on local gauge invariance (Aitchison & Hay, 2013): mathematically expressed by means of a quantized Lorentz-invariant Lagrangian formalism. The SM organizes the fundamental particles into *fermions* (quarks and leptons, with spin  $\frac{1}{2}$ ) that interact exchanging *gauge bosons* (with spin 1), and a *scalar field*, called the *Higgs field*. The SM describes three of the four fundamental interactions that modern physics deals with, namely the weak, the electromagnetic, and the strong interactions, whereas gravitation remains the domain of general relativity, which describes it as the curvature of the space-time.

By the beginning of the 1970s, consensus was increasing that all three quantum interactions could be described by gauge quantum theories, and, in addition, based on the Glashow-Salam-Weinberg model (Weinberg, 1967) another unification was emerging – this time between



weak nuclear and electromagnetic interactions. Starting from a general idea of epistemic unification, the so-called electroweak theory was found to describe a complete quantum field, having full ontic status. The success of the unification of weak and electromagnetic forces culminated with the discovery of Z,W bosons in 1981 (Arnison et al., 1983) and the proof of the renormalization of the electroweak theory ('t Hooft, 1971). This generated the current modern view of fundamental forces, with two relativistic quantum fields (strong nuclear and electroweak) plus gravitation.

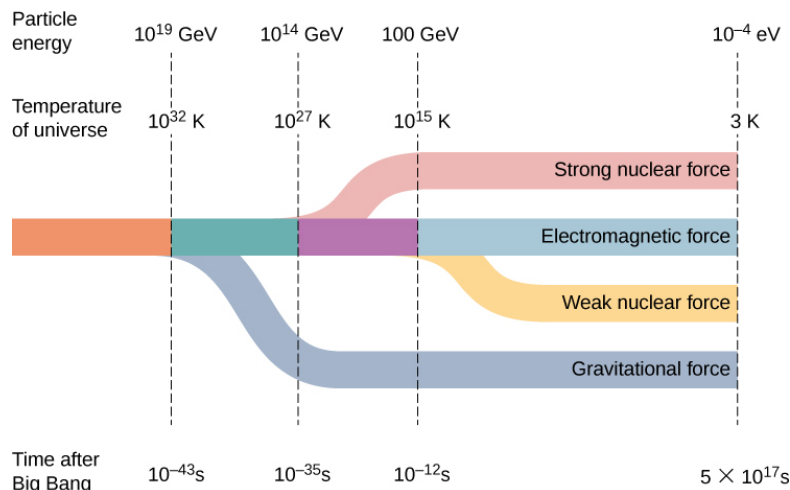
This remarkable road to unification is based on the key idea that interactions are unified at high energies – in the electroweak case, above the Z mass. From a symmetric high-energy state, properties typical of the electromagnetic interaction on the one hand, and the weak interaction on the other hand, emerge at some point when the energy decreases. This happens because of a mechanism called “spontaneous symmetry breaking”, a property of theories in which the ground state does not show the symmetries of the full Lagrangian. This idea, inspired by the case of superconductivity, was advanced by Nambu & Jona-Lasinio (1961) and then applied to the SM (and its gauge invariance structure) by Higgs, Brout, and Englert (Higgs, 1964; Brout & Englert, 1964): it is generally called *the Higgs Mechanism*, predicting the existence of an observable Higgs particle. The experimental confirmation of the electroweak unification and the Higgs Mechanism came with the already mentioned discovery of the Z,W massive bosons in 1981 and with the observation of the Higgs particle in 2012 (Aad et al., 2012).

To appreciate how the unification process happened, let us abstract from the historical circumstances of how theories and models were formulated and present the situation in a somewhat simplified form. Let us imagine the two theories – one describing electromagnetic interaction, the other one for the weak interaction – each one being consistent as itself but having little to do with the other. They describe different processes, which, however, superpose and influence one another, so a unified description would be desirable simply by Occam's razor. However, these theories can hardly be joined together. Our theory for the Electromagnetic interaction (Quantum Electrodynamics, QED) preserves, in fact, a very important symmetry, called “local gauge invariance” implying that the photon, the carrier of the electromagnetic interaction, has zero mass. On the contrary, the mediators of the weak interaction (The W and Z bosons) are known to be massive. However, the Higgs mechanism outlined above suggested a way to overcome the difficulty: this is a mechanism that let emerge massive quanta from zero-mass states, while preserving gauge invariance.

In order to better illustrate the meaning of the electroweak unification, let us come back to the Newtonian distant action law as it was conceived in the eighteenth century. According to Newton's law two masses attract one another in a manner which is directly proportional to their product and inversely proportional to the square of their distance. This law can be (and in fact was) applied to electricity and magnetism as well: charges and poles at rest also attract (and repel) in the same manner. However, electricity, magnetism, and gravitation are ontologically different: they behave according to the same law, but there were no mechanisms behind them that could “transform,” e.g., an electrical process *as described in Newtonian terms*, into a magnetic or a gravitational one. Therefore, in spite of the fact that we can use analogous theoretical tools (e.g., an inverse-square law), the electromagnetic and the Newtonian gravitational field remain different in nature.

In this regard, the Standard Model is essentially different: in the case of the electroweak unification, electric and weak charges are linked (by the so-called Weinberg angle). The electroweak Lagrangian therefore represents a single theory, indicating a unique electroweak

field *in the things themselves*, a state which, via a certain mechanism (when the energy is lower than the  $Z, W$  masses) effectively develops in two apparently different interactions: the weak nuclear and the electromagnetic. In other words, in the case of the electroweak interaction, the achieved *epistemic* unification is the consequence of an original *ontic* unified state.



**Figure 1.** Interplay between fundamental forces during the evolution of the Universe, according to the most commonly accepted view. Starting from a single unified initial field, the first breaking involves Gravitation and a force acting between  $10^{-43}$  and  $10^{-35}$  seconds of cosmic time, called “the Grand Unification Theory”, or GUT force. Other breakings of symmetry follow as the energy of the Universe is decreasing: the field that unifies weak and electromagnetic forces, between  $10^{-35}$  s and  $10^{-12}$  s is called Electroweak field. This last unification has been experimentally demonstrated in modern physics, as discussed in the text. (From Physics LibreTexts, Chapt. 11.8: Evolution of the Early Universe, <https://phys.libretexts.org/@go/page/4956>, retrieved September 10, 2021.)

## 4. Unification next

According to current understanding, we can assume a fundamental physical description of the particle universe based on the *two* quantum fields of electroweak and strong nuclear interactions evolving within space-time as described by general relativity. In addition, we have several candidates for more profound unifications comprising the strong and the gravitational interactions. However, we neither have a (viable) “Grand Unified Theory” of the strong and the electroweak interactions nor we have a so-called “final” Theory of Everything, for all interactions. In other words, we have three different field theories. Two of them describe two specific quantum fields (strong nuclear and electroweak), whereas a third one – general relativity – covers gravity.

We shall not discuss current attempts at grand unification theories or the candidate theories of Everything. We limit ourselves to note the crucial aspect in both attempts: the high-energy scale needed in order that ontic unification could possibly occur. In this respect, the need for high energy is twofold:

1. One should get rid of all the possible symmetry-breaking structures of the vacuum (or the ground state) to appreciate the full symmetry of a theory.

2. Increasing the energy reproduces the conditions that prevailed at the very beginning of the Universe, where symmetry was probably the highest and therefore offers a window on a fundamental aspect of all that exists. A window on the primal cosmogonic event that created our Universe.

Again, in this process, we can conceive a unifying mechanism by virtue of which we could recover a fundamental, highly symmetrical state. A state in which all was a non-differentiated Whole, governed by one sole theory featuring multiple spontaneous symmetry breakings during the evolution of the Universe, allowing to gradually step out from the whole and let the One develop into the Many.

The general tentative idea of how this happens throughout the history of the Universe is presented in Figure 1: the starting point is the creation instant when interactions are unified: it is the so-called Planck era, when the cosmic time was of less than  $10^{-43}$  sec, also called quantum gravity era. At this time, we conjecture that the many fields were One. After this time, Gravitation and a Unified quantum field differentiated, making the one-two (gravity and the “Grand Unification Theory,” GUT field).

At cosmic time  $10^{-35}$  s, the GUT field in turn differentiated into the strong and the electroweak fields – another breaking of symmetry. The energy at that time was an amazing equivalent temperature of  $10^{27}$  K, sufficient to maintain the electroweak unification, so that there were three field: gravitation, strong and electroweak.

Then again, because of the cosmic expansion, the energy (temperature) decreased, and reached, at  $10^{-12}$  s, a temperature equivalent to the energy of the W, Z masses. At that point, the electroweak symmetry started to break, manifesting the four fundamental fields that we experience in our “everyday Universe”: gravity, strong nuclear, weak nuclear and electromagnetism. In other words, the story of Physics fundamental fields is a story of broken symmetries that generated the Many from the One.

Therefore, the combination of modern cosmology and quantum physics provides a description of how from a single unified field, the plurality of fields characterizing our Universe emerged (and it also offers a general narrative of how that one initial state has transformed into the many fundamental particles of which the Universe is composed, from quark and leptons to the atoms).

## 5. Matter-antimatter asymmetry in the Universe

Typical of modern quantum field theories (like the Standard Model) is that every ordinary particle has its own antimatter partner, i.e., an *antiparticle* that is identical to the *particle* except for its discrete quantum numbers (like the electric charge; a typical example is the electron and its partner, the positron, with the same mass and opposite electric charge). Our Universe, however, appears to be entirely made of matter particles. No significant amount of it appears to be made of antiparticles: no anti-planets, no anti-stars, no anti-galaxies. Antiparticles are in fact very rare: they are produced by processes occurring in particle accelerators or in radioactive decays or by some high-energy cosmic ray accelerators. In addition, matter and antimatter cannot be easily handled together: when a particle and its own antiparticle partner collide, they annihilate producing radiation.

The Standard Model and the current cosmological picture are therefore facing the problem of explaining why matter dominates over antimatter, in fact, one of the major unsolved problems in Modern Physics. The most widespread explanation, in accordance with both the Standard Model and most cosmological models (Peebles, 1993), is that in the first

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picosecond after the Big Bang, two mechanisms called *baryogenesis* and *leptogenesis* took place generating a slight asymmetry between matter and antimatter. For this asymmetry to form, three conditions – called the Sakharov conditions (Sakharov, 1967) – need to be satisfied:

1. A non-zero CP violation.
2. Baryon number conservation violation.
3. Interactions taking place out of thermal equilibrium due to rapid cosmological expansion.

The first two conditions refer to features of the Standard Model (they are *quantum* conditions), while the third one compares the rate of the microscopic reactions to the rate of cosmological expansion (being therefore a *quantum-cosmological* condition). These conditions could make it possible to explain (within the current theoretical frame) how, during primordial matter-antimatter annihilation, a minuscule particle-antiparticle asymmetry (at the scale of one part out of  $10^{10}$ ) was generated.

While this model is not fully substantiated with evidence (the amount of detected CP violation seems not sufficient to explain the cosmological effect), it provides a consistent framework connecting our current understanding of cosmology and particle physics. According to this view, the matter-antimatter asymmetry has been produced starting from a single, otherwise highly symmetric state. And it was this tiny asymmetry, this *residue*, that triggered nucleosynthesis and the various steps towards the formation of more and more structured and complicated material aggregates, from hydrogen atoms to stars and planets – among others the Earth with all its inhabitants. All made up of matter particles, coming from that residue.

## 6. The Inflationary Universe

The other key element that we will consider is the mechanism of Primordial Inflation, proposed by A. Guth, A. Linde and A. Starobinsky (Guth, 1998), also known as the Inflationary Hypothesis.

The Inflationary hypothesis solves important problems in Modern Cosmology, such as the Flatness, the Horizon and the Isotropy problems; without going into details (for which see Peebles, 1993), these problems generally emerge from observing equal properties of regions of the Universe that have never been into reciprocal causal contact. Therefore, without Inflation it would not be understandable how the Universe had reached (for instance) the present global flatness as well as its amazing level of isotropy.

While the detailed particle physics mechanism responsible for Inflation is not known, the hypothetical quantum field considered to be responsible for it, is called the Inflaton. This field features a slow-roll dynamics evolving on an almost flat potential from  $10^{-36}$  to  $10^{-33}$  seconds of age of the Universe. At the end of this stage, the field dissolved itself converting all of its residual potential energy into what is actually considered the beginning of the Universe: the Big Bang of energy and elementary particles.

It is generally accepted that the Hot Big Bang Model with the supplement of the Inflation (and dark matter and dark energy, see Mukhanov, 2005) is able to explain the known characteristics of the current Universe, to the point that this combination is frequently called the Standard Cosmological Model (Guth, 1998). And the initial conditions of this model include the dissolution of the Inflaton field. Its “self-sacrifice” to produce the Big Bang.

As we shall notice, the process of evolution and dissolution of the Inflaton field offers a powerful analogy with Vedic knowledge. In addition, that same dissolution could possibly

not be complete: a residual, exceedingly small remnant of the Inflaton field could explain the value of the Cosmological Constant responsible for the dynamics of 70% of the Universe: the so-called Dark Energy (Mukhanov, 2005).

## **7. Subject-object separation and Quantum Mechanics**

If the unification trend in fundamental Physics is one of the pillars of our analogy, the other one (or another epistemological “lesson” from Modern Physics) is related to the exquisitely quantum mechanical effect that is popularly known as entanglement – actually, a close consequence of the superposition principle and the microscopic measurement process.

Quantum Mechanics in itself has a long history of being perceived as in contrast with the commonsense ansatz of local realism; in fact, since its very construction, this theory was subjected to a variety of historical criticism, culminating with the famous EPR paper (Einstein, Podolski & Rosen, 1935). While this subject is under perennial debate, there is a general consensus about Quantum Mechanics not being in agreement with the so-called realistic paradigm of a reality independent from the observer (Baggott, 2004). This is because of the formalization of local realism in terms of the Bell’s Inequalities (Bell, 1987) and the subsequent demonstrated violations of such inequalities, starting with the famous Aspect experiment.

These characteristics of the theory are connected with its mathematical structure, for instance the very concept of wave function. Since the wave function lives in an abstract configurational space (and not the ordinary space), it automatically tends to interrelate different spacetime points, a statement which is true also in relativistic Quantum Field Theory. Because of these reasons, we accept the ontic hypothesis (at the quantum mechanical level) of the existence of physical quantities independently from the measurement process.

While other approaches can be considered (Aspect et al., 1982), it is our viewpoint that decoherence (Joos & Zeh, 1985) is the main mechanism to elegantly bridge the gap between the micro and the macroscopic-objective world, also basically solving what is generally called the measurement problem. In this view, at the fundamental level reality does not allow subject-object separation and also encompasses every observer’s view (as a consequence, as many Theories of Everything as there are observers might exist). Decoherence then produces (through the reduction to diagonal of the density matrix) what is perceived as the commonsense world at the macroscopic level.

This subject-object non-separation at the fundamental level is, in our view, the most important lesson – at the same time epistemological and ontological – of Quantum Mechanics.

## **8. Indian Philosophy as a trend toward the One**

Our current theories of Particle Physics and Cosmology describe the physical story of the Universe: at the very beginning (until  $10^{-43}$  seconds) all was undifferentiated matter-energy in a superdense state (see Fig. 1); then a process of separation took place, symmetries got lost and fields (forces) as well as matter and antimatter became separated. As illustrated in Fig. 1, after the first picosecond of cosmic time, four forces emerged as independent fields, the ones that are in action today in our everyday life. The story of the Universe after these first stages has continued for about 13.8 billion years, through the generation of stars, galaxies and planets. And life itself.

In addition, during all these stages of evolution, a vast number of structures have been formed, from planets to forms of life, where the original quantum imprint was lost and classicality (and apparent realism) emerged. While we live in a mostly “decohered” world,

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the pre-existence of entangled predominant non-separated quantum states in the Universe seems an unavoidable conclusion. Likely, the cosmological evolution of the Universe has proceeded from a fully entangled state to a level of higher and higher decoherence, and the current present Universe generally shows an apparently “realistic” and “decohered” structure. Leaving of course entanglement and quantum mechanical effects at the level of atomic and subatomic processes.

We emphasize here that there are *structural analogies* between these concepts of Modern Physics and specific traditions in Indian philosophy: concepts that are different by nature but hold the same functional position in their respective systems. What is the reason of these analogies, or whether there is one or more reasons, is unclear and we do not intend to advance hypotheses. For the purposes of the present study, we content ourselves to claim that very different cultures have envisaged a similar problem: to explain how the many forms composing the world can be generated from a single, non-differentiated primeval state.

First of all, subject-object (non-)separation holds true also in many traditions of Indian Philosophy, where the divide between the two is relegated to the role of an illusion, for which Arthur Schopenhauer coined the expression *veil of maya*. This is what hides deeper levels of reality where the two sides of cognition process (subject and object) are just one (Jones, 2014). According to many doctrines in Indian Philosophy, such a pristine state of unity can be re-enacted through practices such as meditation aiming to (re)join the individual Self with the ultimately, impersonal Real – the ātman with the *Brahman*, as they are conceptualized, e.g., in the *Upaniṣads*. Of course, there are such things as individual consciousness, the ego, personal thoughts and volitions, perceptions, etc. However, they are conceived as attributes that have emerged in the macroscopic world for factual reasons. As noted by Banerjee and Chatterjee:

At the heart of Indian views with regard to the character of internal states, lies its understanding of the temporal scales associated with conscious experience ... We can thus classify properties into ‘fundamental’ which are relevant across all [temporal] scales and ‘derived’ as those pertinent within a circumscribed temporal regime. Thus, (as per the Abhidhamma or Buddhist sources) consciousness (*viññāna*), volition (*cetanā*), psychic energy (*jīvitindriya*), feeling (*vedanā*), perception (*saññā*), emotional formation (*sankhāra*) and attention (*manasikāra*) are fundamental universal properties of all internal mental states regardless of the duration for which they exist, while other derived ‘macroscopic’ attributes such as notions of self (‘I’) or ego, full blown perceptual objects, thoughts by way of words and images only appear within certain temporal limits ... This goes to clarify several sources of confusion in Indian systems. For example, when Buddha uses the term *anātman* ‘no self’, it does not mean that categorically and absolutely there is no such thing as an ‘I’ or ego. This would indeed make a travesty of even our everyday experiences which are definitely centered about an ‘I’. It simply means that Buddha is describing a conscious cognitive process at a temporal level which is no longer supportive of an experience of ‘self’ and all such notions of ‘I’ and ‘mine’ have lost all practical relevance. (Banerjee & Chatterjee, 2020: 5-6.)

This, of course, does not amount to say that recovering unity is the only purpose of meditation, nor that there are no differences between traditions, schools, and phases in Indian thought (Harrison, 2019; Ganeri, 2017; Newcombe & O’Brien-Kop, 2021). However, “the unanimous view of all Indic systems appears to be that all internal states are by default conscious states or can be made conscious states” (Banerjee & Chatterjee, 2020: 5). Seen in this light, meditative techniques are means in order that what appeared unconscious can be brought into the realm of consciousness.



The re-enactment of a primordial Unity does not only concern consciousness – no matter if this is conceived as a mental state (like in the quote above) or as a “pure” substance of its own. It is also involved in Indian cosmology as this is expressed, e.g., in the Hymn of Origins of the *Rg-Veda*: “There was neither non-existence nor existence then; there was neither the realm of space nor the sky which is beyond ... / There was neither death nor immortality then. There was no distinguishing sign of night nor of day. That One breathed, windless, by its own impulse. Other than that there was nothing beyond.” (Maṇḍala 10.129, in Van Nooten and Holland, 1994: 554/25; see also Jones, 2014). In fact, these are tightly interrelated aspects.

A crucial concept is that of Vedic Sacrifice (*yajña*), a kind of worship that usually occurs in the form of offering oblations to the Gods in front of a sacred fire, often with the aid of *mantras*. According to the *Śruti* and the *Smṛti*, the system of *yajna* was given by the God(s) at the beginning of the world to human beings and deities like Indra, Agni, Varuna etc., as a link between them. The human beings were to satiate the gods through the sacrifices and the gods in return, would bestow, on them, rains, food and other things, needed for their prosperity.

The rituals of *yajna* (Potdar, 1953, esp. chapter 3) can be conceived as a mechanism to relate the realm of mankind with that of deities. In this sense they are, first of all, a re-activation of the primordial sacrifice through which all has been created. According to the early Vedas (“Hymn to Puruṣa,” *Rg-Veda* 10.90), Puruṣa was a cosmic being that offered himself in *yajna* to (or was sacrificed by) the gods. He is said to have “a thousand heads, a thousand eyes, a thousand feet”, where these metaphoric gigantic proportions indicate that he is all that there is: Puruṣa is “all this, whatever has been and whatever is to be”, therefore he is also “the ruler of immortality”. His cosmic body joins the immortal domain with the mortals, since “all creatures are a quarter of him; three quarters are what is immortal in heaven”. Even from the “one quarter of him still remaining here ... he spreads out in all directions”. In the verses, Puruṣa is sometimes referred to as “the sacrifice”, meaning both the sacrificial victim and the act of scarifying (see esp. verse 16: “With the sacrifice the gods sacrificed to the sacrifice”). The sacrifice was performed by the gods and consisted in the dismemberment of Puruṣa, whose effects are described in vv. 11-14:

11 When they divided the Man, into how many parts did they apportion him? What do they call his mouth, his two arms and thighs and feet?

12 His mouth became the Brahmin; his arms were made into the Warrior, his thighs the People, and from his feet the Servants were born.

13 The moon was born from his mind; from his eye the sun was born. Indra and Agni came from his mouth, and from his vital breath the Wind was born.

14 From his navel the middle realm of space arose; from his head the sky evolved. From his two feet came the earth, and the quarters of the sky from his ear. Thus they [i.e., the gods] set the worlds in order. (Maṇḍala 10.90, in Van Nooten & Holland 1994: 531/29)

The primordial sacrifice also functions as an archetype for any future ritual sacrifice (verse 16: “These were the first *dharmas*”, here in the meaning of ritual laws. See, e.g., vv. 6-8: “When the gods spread the sacrifice with the Man as the offering, spring was the clarified butter, summer the fuel, autumn the oblation / They anointed the Man, the sacrifice born at the beginning, upon the sacred grass.)

In the sacrificial practice, *yajna* is carried out in various forms. It generally takes place in a space where an array of sacrificial fires are set up to ritually burn food and beverages (*agnihotra*). Combustion, or maybe the symbolic consumption of the food offered in oblation,



produces what is known as *úcchiṣṭa* (the residue), originally a Sanskrit term meaning the leavings after a certain process has occurred (particularly after a meal). As pointed out by Gonda (1975), *úcchiṣṭa* is conceived as preserving and potentially transmitting the powers of its producer, e.g., the Brahmin performing the sacrifice, the eater of a meal, or the substances themselves of which a particular *úcchiṣṭa* is the remnant. Thus, this concept plays a remarkable role in ritual as well as in everyday life of a Hindu. Whether the *úcchiṣṭa* has wholesome or harmful and “contaminant” influence depends on the relation between its producer and its consumer. Whereas the leavings of food eaten by a guru are beneficial to his followers, the opposite is generally considered harmful; the *úcchiṣṭa* of a sacrifice is beneficial insofar as it transmits the powers of the sacrificed to their users. This profound meaning is included in Hymn 7 of Book XI of *Atharva-Veda*, commonly interpreted as a praise for the remnants of an oblation:

1. In the *úcchiṣṭa* [are set] name and form, in the *úcchiṣṭa* [is] set the world; within the *úcchiṣṭa* both Indra and Agni, Everything is set together.
- 2 In the *úcchiṣṭa* heaven-and-earth, all existence is set together; in the *úcchiṣṭa* the waters, the ocean, the moon, the wind is set.
- 3 In the *úcchiṣṭa* [are] the being one and the non-being one, both, death, vigor, Prajapati; they of the world (*lāukyá*) are supported (*ā-yat*) on the *úcchiṣṭa* (AV. 11, 7, translated in Whitney, 1905, v. II, p. 643).

This eulogy follows a series of hymns extolling food in the ritual sphere and is tightly connected with the previous Hymn 3 from the same book. Here, the sacred rice-dish is told to contain the earth and the heavens, sun and moon, waters and winds, animals and vegetables (AV 11, 3, translated in Whitney, 1905, v. II, esp. p. 626). On the other hand, the above-quoted Hymn 7 has been brought in connection with the cosmogonic hymn of *Rg-Veda* 10.90 (Scherman, 1887; Deussen, 1920), where – as we have seen – Puruṣa is sacrificed in order that the world would be generated.

Despite the variety of interpretations and discussions that the two hymns have raised, commentators old and new, agree that they point to a unique quality of Vedic Sacrifice. This is seen – in accordance with following the so-called non-dualistic tradition (*Advaita Vedanta*) – as a means to recovery unity after the “fracture” that created Multiplicity from the One. From the Hymn to Puruṣa, we can extrapolate that *yajna* does not only follow oblation norms in order to earn gods’ favor, rather it is a re-enactment of the primeval sacrifice through which the world in its colorful multiplicity has been created from an original state of unity in the one body of Puruṣa. Similarly, in the Hymn to the *úcchiṣṭa* we are told that in it all is one. Moreover, in that context *úcchiṣṭa*, the residue, acquires a cosmogonic/cosmologic value. On the one hand, *nāmarūpa* – rendered in the first verse as “name and form” – is the principle governing the formation of the individual, empirical substances; according to the Śatapatha *Brāhmaṇa*, an important commentary to the Vedic texts, the impersonal *Brahman* was able to descend again into the world through “name and form” (Stutley & Stutley, 1997: *ad vocem* “Nāman”). On the other hand, deities that are frequently associated with cosmogonic qualities are mentioned. In the above-quoted verses we find Indra, the combative lord of gods connected with strength and generative power; Agni, the god of fire related with ritual sacrifice, whose praise opens the *Rg-Veda*; and, most of all, Prajāpati, “the lord of creatures” who, similarly to Puruṣa, created the Universe through its own dissolution (Calasso, 2010) due to the *tapas*, the internal heat that is commonly conceived as being produced through ascetic practices.

## 9. Indian Philosophy and Modern Science: Analogies

It is now possible to clarify the main analogies between the history of the Universe (and ourselves) as told by Modern Physics and the one envisaged by Indian philosophy. The concepts of Vedic Sacrifice, the Residue and the Progenitor (Prajapati), will be – one by one – the subjects of our analogies.

### 9.1 The multifarious Universe from the One

The first (and the more general) is a *structural* analogy that develops itself along the history of the Universe. Since Indian Philosophy is a *Weltanschauung* of Unity, once the “veil of maya” is lifted, the deeper levels of reality (accessible by means of mystic or meditational experiences) becomes evident. There is therefore a parallel between this approach (by definition, an ontic unification) and the Unification of Forces that Modern Physics is patiently re-constructing by the means of increasing the energy in dedicated experiments.

The Vedic Sacrifice (*yajña*), discussed above, is the tool to re-construct (re-enact) the non-dual *Advaita* nature of reality by playing a role that is analogous to the Unification Theories of Particle Physics. The Universal Cosmogony and subsequent evolution consist of a story of separation among all things that were originally One. According to this view, a structural analogy is in place, leading to a common ontological description of Reality and us. The very origin of the Universe is from an undifferentiated One; this initial perfect symmetry is then broken into a multiplicity. This same story, however, can arguably be recounted in many ways, out of which we selected two, pertaining to two different traditions. On the one hand, Quantum Field Theory describes the multiplicity of particles (fields) emerging from that primordial state of unity that can be (conceptually) recovered through high-energy physics and the formulation Grand Unification Theories and the Theory of Everything. On the other hand, religious practices like Vedic Sacrifice aim at re-enacting, in the innermost life of the initiated, the pristine state of unity from which the Universe and all its individual existences was born.

This main structural analogy is also substantiated by two more specific analogies, that we call *functional* in character: the one between the Residue of the Sacrifice and Matter/Antimatter asymmetry and the one between the Dissolution of Prajapati and the role of the Inflaton field.

### 9.2 The Residue of the Vedic Sacrifice and matter-antimatter asymmetry

All that we know that is related to life in our Universe comes from what remains out of the primordial annihilation during the first second (more precisely, the first picosecond!). From the physical viewpoint, this residue is the imbalance between Matter and Antimatter that we described in Section 5. The realization of Sakharov conditions combined with the Physics in the early Universe produced the one-tenth of a billionth residue that is all the life-sustaining matter that we know about today.

This bears a striking *functional* analogy with the “*ūcchiṣṭa* set the world” that we discussed in Section 8. The *ūcchiṣṭa*, the Residue of the Original Sacrifice, therefore bears the fruits of the producer: by surviving the annihilation of all particles into radiation in the first picosecond of existence of the Universe, it is the generating principle of life. We therefore live in an Universe that was burnt as a Sacrifice almost 14 billion years ago. And we appear to be precisely this very tiny Residue.

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### 9.3 Prajapati and the Inflaton

As we have seen, Vedic Cosmogony involves an original self-sacrifice of the Progenitor: Prajapati dissolves itself and from its decomposition the Universe comes into light. There is clearly another *functional* analogy between this powerful image and the dynamic of the Inflaton, the quantum mechanical field that has been proposed as the “generator” of the very conditions of what we call “The Big Bang” (Mukhanov, 2005).

Prajapati and the Inflaton play the same *functional* role of generation of the dynamics of the Universe: from Prajapati’s mouth Agni – the God of Fire – comes, at the sound of the primeval Om syllable. Similarly, after the Inflationary Mechanism, the Inflaton dissolves itself by generating the Fire of the Big Bang, with all its elementary particles and their energy.

### Conclusion

Modern Physics and Indian Philosophy speak different languages, which bring, following different lines of development, to similar epistemological consequences. The analogies we have presented are several:

1. The research for a Unified Field at high energy has a functional structure similar to the Unity concept embedded in Vedic philosophy and the Vedic Sacrifice.
2. The Residue of the Sacrifice bears a functional structure similar to the CP-violating baryogenesis and leptogenesis that generated matter (*not* antimatter) as the predominant form populating the Universe.
3. The dynamics of the Inflaton field is functionally analogous to the dissolution of Prajapati in the Rg Veda creation.
4. Even the Cosmological Constant (which contains about 70% of the current energy content of the Universe) bears a similarity with Vedic Cosmogony: it could be another form of Residue of the Sacrifice of the Inflaton field which generates the Big Bang.

We therefore suggest that these structural and functional analogies strongly indicate that modern physics is pointing to the direction of the fundamental truth expressed by the ancient Indian tradition. The Unity of Everything.

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## Section Two

# NATURE AND CIVILIZATION

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### The World of Corporate Culture: Ontological, Anthropological and Organizational Models

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Hubersky, Leonid and Yevheniia Levcheniuk (2023) The World of Corporate Culture: Ontological, Anthropological and Organizational Models. *Philosophy and Cosmology*, Volume 31, 37-44. <https://doi.org/10.29202/phil-cosm/31/4>

*The article examines the peculiarities of corporate culture formation and development in the modern stage of societal development, which is characterized by high levels of dynamism and conflict. It has been said that culture is something created by Man just as Man is the creation of culture, because culture influences behavior in a person from the beginning of their socialization through the assimilation of norms, values, models of behavior, etc. A person implements all of these in various types of relationships which, in turn, develop structures, organizations, and all individuals, in particular. Corporate culture becomes the basis for the development of organizations at various levels through the application of management*

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*theory, especially when considering the current state of international, intercultural relations caused by globalization and migration processes. Corporate culture plays a particularly important role in ensuring the progressive development of science and education, and in preserving the intellectual potential of the state in conditions of social contradiction and military conflict. The development of corporate culture is based on such principles as tolerance, equality and partnership, which are embodied in the relations of any organization, corporation, etc. It has been shown that culture always involves some kind of change, and through such change, corporate culture can act as the criterion that will ensure a group's integrity under the pressure of external challenges and act as the measure of the internal stability of any team that has determined its goals, tasks and the purpose of its development and the effective implementation of its values and beliefs.*

*Keywords: culture, corporate culture, organization, tolerance, social partnership, globalization processes, migration processes.*

Received: 28 June 2023 / Accepted: 30 July 2023 / Published: 15 October 2023

## Introduction

The modern dynamic conditions of world development caused by the accelerated pace of globalization and the entry into the new development phase of post-globalization necessarily require the introduction of new methodologies, techniques, management technologies and the harmonization of newly created relations and structures. It especially applies to the sphere of education, the training of specialists in the field of management and the regulation of the migration processes, which have significantly intensified. This is because management processes permeate all spheres of human activity. Moreover, it is management that makes it possible to organize the coexistence of people because modern society is a complex system where everyone has their own needs and interests. Therefore, management appears to form a kind of methodological basis, building ways of coordinating individual actions in a single direction to develop the community.

For a long time, the concepts of “governance” and “management” have been identified in the scientific literature. In their scientific research, the authors have repeatedly proved the incorrectness of this approach. In our opinion, these concepts reveal different management strategies. Namely, management is a technique that, first of all, focuses on the management practices and standardization of approaches to solving specific problems that describe a part of reality without taking into account the organization's development cycle. It is based on a single function, that of management: the training of a professional manager who can solve the management tasks set before them.

*Management theory* serves as a *methodological basis* for revealing patterns in the development of management processes and covering both the global and local levels of the development of organizations, focusing on the peculiarities of the development of culture, traditions, values, national guidelines, etc. This factor is important in modern management theory since different people with different cultural and religious traditions, peculiarities of national character, etc., work together in single organizations.

That is why we strongly believe *corporate culture* should be the basis in the training of modern managers who will not only perform the management function but, above all, will be part of the team that can function as a whole while taking into account the characteristics of each team member, as well as the specifics of the whole.



The approaches of both domestic and foreign modern researchers to the understanding of corporate culture in various spheres of social life is the methodological basis of this study, particularly the work of Adizes, Bogatyr, Braun, Kramer, Coyle, Rudenko, Utiiuzh, Vlasenko, Turenko, Vedernikov, Sandyga, Gorton Gary, Grennan, Zentefis, Tian, Wan, and Chen. Through their work, it has been established that corporate culture has a significant positive impact on the development of organizations at any level.

### **The anthropological and organizational dimensions of corporate culture**

Corporate culture is a branch of knowledge that studies the organizational basis of the culture of interaction between people within an organization, as well as between representatives of different social structures. According to Huntington, culture today is a criterion, an identifier that is rooted in the essence of man and, on the one hand, distinguishes, as well as on the other hand, serves as a factor in the interaction between individuals. It should also be noted that although the problems of development and interaction of cultures are as ancient as mankind's existence, globalization processes are updating them and taking them to a higher level. Previously, anthropologists focused on the peculiarities of a particular civilization's or nation's development but today the interaction and interpenetration of cultures are in the foreground. As Brown and Kramer point out, "Today, anthropological concepts are applied to anything from marketing and design to medicine and entertainment. <...> Corporate anthropology demonstrates the internal hidden dynamics of the organization. It shows the difference between the formal organizational structure and informal authorities" (Braun & Kramer, 2018). Namely, they allow you to identify behavioral models and relationship peculiarities between people in the structure of an organization. According to Bogatyr, "business and media see anthropology as a discipline that has tools for deep penetration into consumption culture and an anthropologist as an ideal mediator who is able to connect the manufacturer and the consumer and make their interaction controlled" (Bogatyr, 2012). It is only one of the various aspects of organizational anthropology. Anthropologists perform another important function: they become an integral part of the corporate world.

Since the beginning of the 21<sup>st</sup> century, corporations, instead of creating focus groups, have been involving anthropologists in "branding" their products. Anthropological studies are enhanced by the use of the latest technologies, including webcams, blogs, social networks and more. In other words, anthropology has changed the vision of manufacturer-consumer interaction. Today, companies produce not only a product but, above all, a brand that becomes an integral part of modern life. Consequently, the function of the consumer has changed; the consumer is now regarded as a cultural and social actor. Emphasizing the importance of learning about these processes, we can not only describe the peculiarities of such relationships but we are also able to produce new solutions for the strategy of an organization's further development. It is especially important in crises and transitional periods in the development of any organization, as well as in the wider society. For example, inviting foreigners to work in the government has recently become a fashionable trend in public administration. However, such actors appear to have been ineffective. A specialist in the field of the international economy, Garbaruk, thinks that, concerning employment in the government, it is worth inviting people who permanently reside in the context of the Ukrainian culture and traditions and who are familiar with how to build relationships and what strategic goals to achieve rather than people who are only or who have recently received citizenship. In this regard, Adizes emphasizes that special attention should be paid to cycles of an organization's development since managers need

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to constantly change their management methods and approaches. For the effective development of organizations, it is necessary to perform four main functions: the first function is productivity (determining the value aspect of the company's existence, i.e., the production of the results); the second function is administration (this is the ability of the company management to find effective management models); the third is entrepreneurship (as our lives consist of changes, the skillful leader can manage these changes, taking into account such a triad as 'changes–problem/opportunity–solution', which, in turn, again stipulates change); the fourth function is integration (this involves forming the manager's ability to combine elements into a single whole to ensure the life and efficiency of the organization) (Adizes, 2018). As a result, taking into account these functions, it is possible not only to plan or to develop a strategy for the development of the company or organization but also to provide its successful functioning. There is a significant difference between an organization that exists only as a plan ("a project on paper" in which the organization's development strategy is embedded as effectiveness indicators and numbers) and a real organization that manifests itself in the stories, relationships and emotions of people who create and implement the strategy of its development. In such circumstances, the main task of a corporate anthropologist, at any stage of a corporation's development, is to study the language (culture) of each of the worlds (the world of management and the world of the lower level/average employee; the world of the client and the world of the organization; the world of training and the world of everyday work) and to be a translator between them. That is, to mediate between the different cultures. This will create appropriate relationships in the organization and will relieve the tension existing between representatives of different cultures and levels. For example, this may occur when there is a merger of companies, the introduction of reorganization processes, changes in the work schedule, etc. All of these procedures necessarily cause changes in corporate culture. Does it cause anxiety and fear? The answer is undoubtedly: "Yes!" However, you should not be afraid of change, because cultures are constantly changing, and each generation acts according to these changes and transformations. And in this context, thanks to its openness, corporate culture acts as an effective strategy for harmonizing relations not only in a specific corporation but also in society as a whole since the current stage of the development of societies has an accelerated dynamic character (crises, wars and migration processes). All this requires creating appropriate types of relationships that will develop each specific person, organization, society, culture and humanity.

It is our opinion that management is a methodology with clearly defined goals and standardized management methods that do not consider accelerated dynamic changes. Modern management theory, based on corporate culture, gives priority to the task that enables the creation of a mutually complementary team, taking into account the characteristics of each member of the team, as well as the sphere of the organization's activities and the limits of its existence at both the local and global levels of development. After all, if you look at the organization from the point of view of a corporate anthropologist, then it is a group of people who are connected by culture. As the Dutch anthropologists Braun and Kramer claim, "We work with 'spaces' or 'invisible lines' between people, that is, assumptions, beliefs, rules and norms that they share, and which make the group act as a collective and guarantee that each member of the group knows about the group's intentions and how to behave in it" (Braun & Kramer, 2018). So, from the point of view of anthropology, there is no void between people. This space is filled with culture, which, in turn, not only determines people's way of life and behavior but also causes change. That is, culture does not simply exist by itself; it is a product of people, just as it is what forms people. In other words, culture shapes people, and people also shape culture. Based on the content of this thesis, it can be argued that culture is never innate,

it is always in the process of creating. That is, “With the help of culture, people create order out of chaos” (Braun & Kramer, 2018).

Thus, culture becomes an important tool that people, acting together, can use to find answers to existential questions, to create relationships of any type (economic, political, family, etc.), to structure their lives accordingly, and to, together, try to create and embody in their lives social norms and values. Thus, corporate anthropologists claim that “we are not born with culture; we are born in culture and create it together with the people around us” (Braun & Kramer, 2018).

At the personal level, a person is involved in culture from childhood; they are taught how to behave, how to look, how to perceive the surrounding world, and how to communicate and interact with other people. All these skills are acquired by people as a matter of course since most cultural values and attitudes are so deeply rooted in human consciousness that they are transmitted from generation to generation at an unconscious level. For example, in the attitude toward children of different sexes, boys are more often told that they should be strong, steady, and not cry, while girls are told that they are beautiful, elegant, attractive, etc.

At the same time, humanity has developed a large number of forms of cultural transmission: for example, through language, gestures, stories, rites, rituals, symbols, behaviors, etc. Culture becomes an identifier for a separate group of people because one or the other collectively shares the same thoughts which create appropriate forms and patterns of behavior. In this context, we can talk about both national cultures and corporate cultures. People create a culture in an organization and the elements of this culture are passed on to the next generations (in society), as well as to new employees (in organizations, corporations, and enterprises).

For example, if an employee of a corporation resigns and another takes his place, the replacement is expected, after an adaptation period, to take on the corporate norms of behavior as a matter of course and to adapt to the new team. So, the team member changes but not the culture. However, it is worth noting that if culture can be learned, it can also be changed. “Changes in culture are, in fact, a modification of existing relations, behavior, and understanding of the meaning of words” (Braun & Kramer, 2018). According to our example, a new employee must not only adapt to the existing norms and patterns of behavior in the team but also bring new ideas to the group. These may be able to change the balance of forces in their favor; that is, they may change the culture itself: “Culture is constantly changing, sometimes subtly, and sometimes quite radically. It changes with the appearance of new people in response to technological innovations, to events in the world, in accordance with the spirit of the times” (Braun & Kramer, 2018). However, most cultural changes, and this is their peculiarity, occur without any plan or script. That is, they occur naturally. Conversely, if you try to change the culture actively and purposefully, it is a complicated process.

This leads us to ask about the need for change in the difficult transitional periods of the existence and development of corporations and societies, given that it is necessary to consciously influence the unconscious process. Thus, how can people be encouraged to believe in the same idea and act in a new way? How can the organization be made efficient and profitable, so that employees act together to achieve future common goals, overcoming the habits of old? When creating a strategy for the development of a company, organization, or society, there is and cannot be a ready method for cultural transformations. For example, some leaders and managers deliberately avoid planned cultural transformations because the process is too time-consuming and is quite often doomed to failure.

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## Basic methods of understanding corporate culture

Then they direct their main efforts to change the planned indicators, operational activities, etc. The second way is to change the culture where leaders immediately face resistance from team members, an approach that can lead to chaos. In this approach, according to corporate anthropologists, it is necessary to find ways that appropriately structure relations between people and direct their activities in a single direction. Such approaches have been developed and we can single out three of them.

*The first method is typologies.* They exist to describe organizations and involve a set of basic characteristics, where the names used to refer to organizations can be symbolic or metaphorical. Examples of this include the use of a color scheme (red, blue), trademarks, emblems, etc. “The advantage of typologies is that they immediately gave a general picture, which makes it easier to discuss culture” (Braun & Kramer, 2018). However, there are several disadvantages to this approach. First, the peculiarities and exceptions of one or another culture, which are characteristic of the description of a specific group, are not considered. Second, the question of the history of the development of a culture may be excluded: when it was born, how it developed, and what factors significantly influenced its development. Third, it excludes the question of the functionality of culture, i.e., which cultural model has proven to be effective and stable.

*The second method is measurement.* This approach is based on the idea that all cultures have the same parameters but their indicators differ. For this approach, tools such as questionnaires are often employed. With their help, researchers can measure selected aspects of corporate culture on a scale (from 1 to 10). For example, Hofstede has proposed several measurements that are important in any culture but have different indicators in different cultures. One advantage of this approach is the possibility of measuring various aspects of culture or the development of one aspect over time. For example, it is possible to evaluate the development of a company or corporation from its institution to the present. The main disadvantage of using measurements is that quality is assessed in a quantitative form, which may give a false sense of control and management.

*The third method is grounded theory.* Using this approach, the anthropologist examines the real working environment of the organization. This is done to find out how people collectively structure and make sense of their world. The peculiarity of this approach lies in the fact that it is impossible to achieve this goal by relying on a previously proposed hypothesis or typology. Reality should reveal itself: the researcher observes and identifies feelings while testing all the intricacies of the functioning of corporate culture in any organization (a university, police station), etc. The result of this approach is the identification of regularities in the collected data and the creation of a theory that can be tested in real conditions. A major feature of this approach is that the complexity of the structure of culture is considered here. Meanwhile, the disadvantage is that the process takes time, and the reliability of the results depends on the skills and personal characteristics of the researcher. For example, corporate anthropologists Danielle Braun and Jitske Kramer use all three approaches in their research.

Although it is often said that the first two approaches are more attractive due to their simplicity and the possibility of quantification, something which is very often requested by customers, these approaches falter in that they take away the opportunity to consider the unique nature of an organization. Therefore, from this aspect, grounded theory is a preferable alternative. Thanks to this method, it is possible to investigate not only the role and significance of individual aspects of a culture that unite people into a collective but also how these aspects are connected within a single whole. This allows for a better understanding of the culture and,

with it, a solid foundation for intervention for change. “Culture can be neither good nor bad. She just is. It is a connected structure that provides answers to the two main questions of group survival: How do we – a group or an organization – survive in the outside world? And how do we organize ourselves from the middle?” (Braun & Kramer, 2018). That is, it is the corporate culture that acts as a factor not only in the survival and development of the collective (the group or organization) under the pressure of external factors and circumstances but is also an internal yardstick (invisible ontological space) that binds people together for the realization of set goals and is ready for any changes and challenges.

## **The ontological dimension of corporate culture**

The current stage of world development is mostly characterized by conflict, which is caused by many factors, in particular economic pressures, political crises, military activity, intercultural, international and religious issues, and other contradictions, all of which require the quick identification and the implementation of an effective way of regulating social relations. In our opinion, the study and knowledge of culture will contribute to dialogue and the harmonization of relations between representatives of different cultures and worldviews because strength lies in the group or corporate culture: “Group culture is one of the most powerful forces on the planet” (Coyle, 2018). Her presence is felt in any successful organization (corporations, sports teams, happy families, etc.). For example, 200 companies took part in one Harvard University study, and it was found that a strong culture increased the company’s profits by 756% over 11 years. As Coyle states, “We all want a strong culture in our company, community, or family. We all know it works. We just don’t know how exactly” (Coyle, 2018).

Therefore, the question arises, what meaning do we attach to the term “culture”? Can it be defined as actual, that is, a set of skills, something constant and unchanging? This understanding of culture reduces it to inheritance and destiny, suggesting certain groups have a strong culture, while the rest do not. In this context, Coyle, who studied several successful groups, including the Marines, a professional basketball team, the film industry, a comedy troupe, etc., drew several interesting conclusions. In particular, he stated that “it turned out that their cultures are determined by a certain set of skills. These skills direct our social intelligence to create interactions” (Coyle, 2018).

## **Conclusions**

Corporate culture is a complex and multidimensional system of values, norms, beliefs, and principles shared by each member of a team, which is implemented in their behavior and activities to promote the development of the organization or the corporation, as well as their personal development. The ontological dimension of corporate culture concerns the deep factors of both universal and national cultures (the peculiarities of worldview, value orientations and attitudes, which are supra-corporate elements). Culture is a space of human activity, one of the models of the world that describes the structure of relations in society. The organizational dimension involves the use of management theory as a methodological basis to reveal the developmental regularities of management processes at different levels of development of the corporation or the society. The anthropological dimension of corporate culture regards a person as the center of the organization and the purpose of all executed events, including scientific research. Corporate culture sees a person as the figure and the organization as the background: the person influences the development of the corporation, they are active and dynamic, and the organization itself is relatively static. In this way, human capital is the determinant both

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for any successful company or any state and society as a whole. Therefore, in the context of intensified globalization transformations, in particular the world migration processes, corporate culture can be considered as one of the mechanisms to harmonize interactions between people to preserve the human capital of any state.

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# The Phoenix Complex and the Nihilism of Time

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Kazakov, Mstyslav (2023) The Phoenix Complex and the Nihilism of Time. *Philosophy and Cosmology*, Volume 31, 45-57. <https://doi.org/10.29202/phil-cosm/31/5>

*The proposed paper recaptures the concept of Phoenix Complex introduced by Spanish philosopher Michael Marder during his eight-session seminar held in The New Centre for Research & Practice. In a nutshell, the concept denotes a set of cosmological and natural philosophical implications rooted in human psyche, precisely beliefs, persuasions and attitudes regarding the infinite rebirth, fecundity and renewability of nature, its resources, entities, space in general. To overcome this attitude, Marder iterates, this set must be worked through as if it was any other thinkable complex in psychoanalytical / psychotherapist practice. In the paper, I argue that: Marder's concept is aligned with a tendency in history and contemporary philosophy known today as 'correlationism'; the grounding thesis of the attitudes of Phoenix Complex is a strong metaphysical claim about the nature of time, namely, one's postulating of time's infinity; finally, opposing to this metaphysical claim an opposite metaphysical principle that is defined as 'finitude principle', I would propose my own solution, a practice and approach of overcoming the Phoenix Complex, within the realm of nihilism of time and particular consequences which are legitimate to be inferred from facticity of the latter.*

*Keywords: phoenix complex, correlationism, philosophy of nature, philosophy of time, finitude principle, deep time, entropy, contingency.*

Received: 20 June 2023 / Accepted: 21 July 2023 / Published: 15 October 2023

## Introduction

Conceived as an *organon*, philosophy may be interpreted as an organon of (1) extinction, (2) resignation, and (3) unlearning. Their threefold synthesis may serve as a grounding for getting through, working with, and getting over what Michael Marder, in his series of seminars (Marder, 2022), defined as Phoenix Complex – an implication of indestructibility of nature, a belief and proclamation of its instant rebirth, against all the postulates of contemporary science. The aforementioned synthesis is achievable through the reflection on metaphysics of time, time-perception, time-consciousness and unfathomable cosmic time, precisely because the overcoming of Phoenix Complex may be conceived as unlearning with a disposition of



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its machinery/apparatus, a set of attitudes of human species towards time: its perception, interpretation and representation (in philosophy, religion, mythology, arts, literature and common sense).

In the philosophical realm, Phoenix Complex intersects with so-called ‘correlationism’: both share an attitude towards temporality definable as ‘unresolvability principle’ – explicit, tacit or implicit attempts of *domestication* of time as a long-term tradition, perhaps, preeminent, if compared to all the other modalities and attitudes towards time, since the beginning of human expression in observable and accessible scope. Domestication of time is an attempt, metaphysical disposition directly and univocally opposed to the idea of ‘Unbound diachrony’, time-as-untamed-and-unmastered, as well as possessing unidirectional impact on what and how happens in space. The idea of time-domestication is unfold by postulating, proclaiming, ‘deduction’ or another alleged ‘proof’ of time’s infinity, manipulability, circularity, property of non-depletion, possibility of its being regained, enhanced, augmented, relaunched, controlled in any other way from the position of space or an agent in particular, stretched further, conceived as having no beginning – to put it in short, bluntly speaking, these all are attempts of sewing ‘the end to end ad infinitum’, without the factual end as an ultimate event in time, after which nothing at all follows, attempts of stripping time from its most ghoulish, macabre and appalling property: its finitude.

If time is finite, then it is the destroyer of the Universe. If it is finite, then there is no rebirth: so, there is the day when no Phoenix would arise from the ashes. If the postulates of thermodynamics, and namely Clausius – Boltzmann – Prigogine implications concerning the disgregation, energetic dissipation, and time-arrow irreversibility, are legitimate, then the ashes of the Phoenix are doomed, being subjected to the heat death of the Universe – as anything else. If the ultimate and ineluctable End of All Things (as Kant calls it) is the case, and the end of each particular thing is asymmetrical with respect to the timescale, then everything is exposed to what Quentin Meillassoux describes, adding to the thermodynamical principle of entropy, as supercontingency: an alethic modality of abrupt potential finitude of any phenomenon, object, thing, law, process, at any given moment of time without exceptions (as well as to the possibility of its existence, but only until the ultimate end of time which is necessitated – as a strong metaphysical claim countering those where the infiniteness of time is a closing case). It must be admitted that almost all the history of philosophy [taken as a succession of the histories of systematised thought, as Foucault puts it], from its very beginning and up to the contemporary, has inherited the attitudes, intended to master, tame, dominate time at least in the realm of metaphysical domain of postulating what is time and how is it related to space, and to thought itself.

More precisely, correlationism designates [at least] three levels of strong metaphysical claims about the correlation between the I, the thinking agent, the mind, and the world, physical reality, Universe, you name it. It postulates that ‘I World’ correlation is inevitable and indestructible, that the world without thought cannot exist and, therefore, not merely ‘unthinkable’, but impossible. Contrasted to, for instance, metaphysics of subjective idealism, its distinctive feature is that its kernel in metaphysical foundations is not ontology, but epistemology. With respect to such a representation of correlationism, what was previously defined as three levels, was briefly and effectively put by Brassier: ‘[...] we can know the for-us but we can only think the in-itself. [...] we can know that what is for-us is also in-itself. [...] the speculative identification of the for-us with the in-itself is only for-us’ (Brassier, 2017: 68-69).

These three variations of correlationism may be, correspondingly, designated as: weak correlationism, speculative idealism and strong correlationism. The first is connected to the

thought of Kant, the second – to that of Hegel and the third – to the ideas of Heidegger, Habermas, Derrida and many others. In weak correlationism we have the reality of things (objects, properties, processes, relations) relativized to the transcendental correlation – objectivity subsumed to the correlation of it with transcendental subjectivity, the mind of a subject – posited to be the transcendental condition of time and space. In speculative idealism we have this correlation of ‘I’ and ‘World’ absolutised as necessary (rather than merely being factual). Hegel, in certain sense, temporalizes (historically) the correlation, nesting it in rational structure: the absolute is grounded in reason as a necessity underlying the unfolding of the world as such both to and for consciousness [in this sense, as Nick Land puts it, ‘Hegel thinks history, but not time’]. Strong correlationism, in its turn: (1) relativises dogmatised absolute (any possible in-itself) through the linking it to the correlation (as in-itself which is always for us); (2) absolutises the facticity of the correlation in order to block the facticity of finitude which, in its turn, enables to unfold and absolutise the impact of time on the correlation, de-absolutising it.

Such are the postulates of what we know today as correlationism, in one of many instances which are to be summarised as a philosophical intention to absolutise the ‘Mind – World’ correlation, to postulate the impossibility of the death of mind from two sides: transcendental status of the subject as epistemic subject (the notions about the world are constitutive to the world’s existence in absolute sense), and the world as something infinite or necessarily possessing a capability of circular ‘relaunch’ where such a relaunching ensures the infinite existence of the mind. On the other hand, what I understand as Phoenix Complex, actually retains the ontology as its kernel for strong metaphysical claims of a certain kind, postulating the perpetual rebirth as what may be regarded as one of the grounding claims of a kind. And that is what makes it different from the metaphysical grounding of the philosophy, which is referred today as ‘correlationist’. What common is this idea, which I denote as ‘unresolvability principle’ that becomes visible only if we try to demount, deconstruct, and decompose the Phoenix Complex. Perhaps, the former may be thought as one of the subcomplexes comprising the latter.

## 1. Phoenix Complex and Finitude Principle

Similarly to the given subdivision of the forms of correlationism, I would also like to present a set of principles, according to which the instances (the particulars) of the Phoenix Complex (conceived as a universal to such particulars) may be classified and, then, associated with correlation and unresolvability principle.

(1) Principle of Inevitability (strong anthropic principle) which is set out against contingency: whatever way the Universe is rerun in time ‘from zero’, it would never be short of life, at least in *some* form. The organic matter would *inevitably* be born and reborn from inorganic ‘ashes’.

(2) Totalisation-Rebirth Principle: everything discontinuous and particular which is destroyed is with necessity reborn as a part of One in the form of totality of eternal ‘true’ being; such One is unborn-undying, has no beginning and is unending. Wherever and whenever something discrete and particular is born and dies, it is never annihilated in a full sense, but, instead, in its quasi-dissolution conjoins with One, becoming a part of it.

(3) Non-Closure Principle. A notion of lifespan, in a sense contradicts the assertion of infinity. The problem of the beginning lies in the problem of birth itself: how the first birth has taken place? And was there such an Ur-Birth/Ur-Gründ at all? The implication of non-beginning would assume either having the end or not, but, at the same time, the absence

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of the arche is more plausible to deduce the absence of the end than having an arche. This principle deals with the postulation of the absence of Closure for things in particular and/or the Universe as such on the basis of the absence of the Opening. Any particular Closure always serves here as a new Opening, so the continuity always takes place as a general principle, precisely because at the very beginning, there was no Beginning, Ur-Birth, or Un-Universe (similarly to their aesthetic representations by Robert Fludd or Kazimir Malevich).

(4) Plenitude Principle: all the potentialities are eventually realised, thus, nothing can truly perish because, if it is, there would be an empty space, rupture in the nature as a space of realisations of possibles. This principle presupposes the totality of Aristotelian teleology: in the space of realisations, everything must be realised, because, if something remains unrealised, everything else either mustn't be realised.

(5) 'Protagoras' Principle: if a *human* is moral, then *everything* is moral, and the cosmos itself is built on the same basis as human's *Lebenswelt* does. Since it does so, then, since the purposelessness and absolute finitude is simply evil and immoral, there must be not only purpose, but some perpetuity or infinity which justifies the cosmos and, particularly, the human. This principle is an extrapolation of our moral principles onto the cosmic scales: to be annihilated is immoral, to discontinue the existence is unjust; therefore, there should be some sort of rebirth, reincarnation, or infinity.

(6) Cosmic Nonchalance Principle: an assertion based on the attitude towards the cosmos, according to which the extinction of the particulars does not negate the 'forever' status of life [particularly, life of the mind]; such an extinction (of species, biocenoses, planets, planetary systems) would not eventually matter since the intelligent life is not just *common* within the scope of the Universe (at least within Metagalaxy scales), but is also recurrent.

(7) Principle of Renewability: even if all the sources and elements of power (from food to energetic sources) would be fully depleted, there is always a possibility of somehow relaunching them, reworking, recycling, or, overall speaking, of recreation of what has been lost, to serve it to us in another additional way which would cover our needs.

(8) Genealogical Smooth-Continuation Principle: nothing can fully and eventually die precisely because everything that dies is reborn in another organism, better or worse than its predecessor, but anyway including the latter in itself. So even the species which is extinct 'as such' is preserved in species that follow. Although being partially based on evolutionism, this principle was formulated some time before Darwinian ideas and, therefore, doesn't imply evolutionary succession of species, rather considering the perpetuity of the interplay of what was and what it is with regards to what follows.

To all these attitudes, a viable counter-thesis, dismantling, demounting and, eventually, unlearning strategy, opening a possibility of eventual resignation, a discourse, narrative and methodology, is a metaphysical principle which may be defined as Finitude principle. This principle is itself what has been previously outlined as one of the forms of a synthesis of three organons: extinction, unlearning and resignation – a synthesis which is performed from the perspective of temporality. This synthesis is to be made on the basis of certain metaphysical assertions, distinctions, decomposition and criticisms towards the outlined principles of Phoenix Complex instances, correlationist philosophical attitudes and unresolvability principle's premises and consequences.

To outline this synthesis, we should go back to the problem of distinction between two such ideas as extinction and eschatology, for one being the part of the problem, and the other – its alleged solution. The three things discussed above (the Phoenix Complex, metaphysical 'I – World' correlation, and unresolvability principle), seem to be fairly grounded in a long-term

tradition within the history of human expression towards time as infinite or domesticated, but not only limited to this aspect as a unifying principle for them. All three, in addition, deny the extinction. As Thomas Moynihan writes about the meaning of the latter, which I think is important to be considered here, '[...] human extinction is a comparatively novel idea, one that remained entirely unavailable for the greater part of our existence as species' (Moynihan, 2020: 8). In its generality, 'Extinction means that the wider universe continues without our species' (Ibid.: 32).

The concept of extinction is different from what may be defined as apocalyptic narratives and eschatological traditions; for the latter represent 'the termination of humanity and that of nature as a whole are usually coterminous and coeval' (Ibid.: 32). Contrarily to the extinction, which would mean the end of observation (both actuality and possibility of the latter), eschatology is an observation of the end with an implication of a 'life after the aftermath': life after the end. Yet, in different modalities of such an afterlife, for instance, after-Ragnarok existence of the world is aligned precisely with Phoenix the new world is gradually being reborn from the ashes, becoming-as-old by its constitution (new gods, substantially old ones, are born again); while in Christian eschatology we deal with 'City of God Dystopia' which pretends to be endless, not as much reborn as part of the old world that is saved, transited into the new one, where some augmented elements are built and that is to be the new world 'after the End of Days' as a state to be preserved in infinity, as eternal order.

The matter is important because eschatological traditions, as well as apocalyptic narratives, are explicitly inherent for correlationism and, tacitly, for Phoenix Complex. In other words, aside from the mentioned instances: if the nature is undying, so does the mind, if the mind is eternal, so does the nature, and nature and the mind are co-constitutive in their eternal recurrence, being or re-birth. This is where we, again, have the nature (as-space) to be separated from time (as a nature-being transcendental condition). The nature, thus, is taken as atemporal and, at the same time, as a part of this correlation between the 'I' and what is allegedly conceived as 'nature' [deprived of its temporality – 'deep time' or, in other words, of cosmic time which constitutes the nature's dynamics]. It is what may be described in the most proper sense as a subjective and epistemically-grounded account of nature – the nature-as-atemporal or nature-as-synchronicity. Extinction refers to finitude (although, within the temporal dimension, only tacitly), while eschatology refers to infinity or eternity. Generally speaking, such a movement, as an instance of a violation of Hume's guillotine principle (a transition from logical possibility 'the nature is thinkable as atemporal' to physical necessity 'the nature is atemporal'), designates the tacit transition from metaphysical grounding to the ungrounded.

To continue, let us now take a closer look at 'time-domestication' attitudes in science and philosophy, for their subversion is a second target of the Finitude principle. First, elaborated and well-posed attempts of the liberation of the mind from the prodigal 'dogmatic slumber' of time-domestication on a serious level with relevant takes and stakes, perhaps, have their beginning in the 19<sup>th</sup> century. For instance, sr. William Herschel in 1814 asserts that, gazing into our galaxy, the Milky Way, one stares at a gargantuan chronometer; but what follows is, as he puts it, the fact that not only its past duration 'cannot be infinite' – in the same vein, 'it cannot last forever' (Herschel, 2013: 541). Another notable contribution was from the geology and palaeontology at their first stages of becoming, when they haven't been aligned with the evolutionary theory. In its 'less scientific' (than contemporary) form it has postulated the idea of irreversible and discrete, mass extinctions of species, populations and the whole ecosystems posited as having no descendants, successors or continuity: an abrupt ultimate elimination without any traces in futurity except for the fossils and 'archefossils'.

Although being refuted by contemporary science, back in the days, in this rudimentary form, this idea played a crucial role for the intellectuals, philosophers, scientists and writers to reflect upon our own past and future conditions and our perspectives, perils, risks – as well as all this at cosmic scales. It may be one of the first times when the fate of the Universe derived not from the extrapolation of our morals, wishes, fears, hopes, desires, imperatives, conditions, events and expectation, but, instead, then the fate of the Other was, instead, extrapolated onto our own fate, our past, present and future condition. The future-oriented implications of nature have been reversed: instead of future-oriented idea of nature drawn from our view of the human history in vital time, the vision of future, our history was plotted from the analogies derived from the observed ‘curves’ of deep time, non-living / inhuman temporalities, exposing the modality of the future of nature as future-without-us, but not only.

Other notably discovery which was indirectly implied by the concept of ‘deep time’, posited by such founders of geology as James Hutton and Charles Lyell, is that, deep time is not an infinite time [as they have put it, laying out the idea of perpetual, infinite ‘revolutions’ of planetary and interstellar scales], because infinity has no depths at all. Hutton’s ‘abyss of time’ actually represents the perpetual comeback to the starting point, that is, the point of the observer (we should keep in mind that the concept of ‘observer’ hadn’t been introduced into natural sciences of that time). As Moynihan puts it, ‘It’s more difficult to consider the approximately 14 billion year lifespan of the Universe than to simply affirm that it has always been here. [...] Eternity is shallow and uninformative. Moreover, eternity deprives our actions of any existential stakes because, in infinite time, everything valuable that disappears eventually returns’ (Moynihan, 2020: 206).

Although I do not completely accept the last consideration because it remains close to ethics and applies the concept of ‘value’ to cosmic scales, I agree with the first part and would extend it to the following conclusion (which would be explicated in what follows): it is infinitely harder to consider, accept and derive any inference from the fact of enormous but finite time that is left for the world than it is from the infinite time. While the latter is a thinkable synchronicity, a time domesticated, the former is ‘the rage of jealous time’, lethal, unbound diachrony, – a finitude imposing an ineluctable end on all things and, because of this imposing, even more, unfathomable to thought. That is to say, the length of cosmic time (both past and present) is so disproportionate to the vital time, be it species or its’ representative (or succeeding species), that, to put it into the graspable disposition is to conceptualise it as infinite instead of ‘unimaginably large, yet finite, cosmological [literally meaning, giving a logos/nomos to cosmos, ordering it] arrow’.

## 2. From Infinite to ‘Infinitely Long’ but Finite

What comes next, is an attempt to conceive a ‘paradox’ of an infinitely-long-yet-finite duration contrarily to infinite duration of time, in sound and consistent form. Just as the geology of the first half of the 19<sup>th</sup> century asserted that there is no origination, and, therefore, no extinction on cosmic scale would ever take place, that for an eternity the downfall of a singular is nothing, that time is an orbit, a cyclic return of the same in the guise of Plenitude, the opposite inference was derived later from the same facts and observations at the second half of the 19<sup>th</sup> century from the side of thermodynamics and fundamental natural sciences in general. In 1868, Rudolf Clausius lays out the basic principles of what he denotes as entropy (Clausius, 1868: 417-419). Entropy was the assertion and resignation that the changes in physical reality are actually derived through the disbalance and the movement towards balance eventualises into the end of any activity. That the equilibrium is actually

not a perpetual movement and change of the forces (active and retroactive), but a universal inactivity. Instead of going into 'unending cycles' with the same parameters and conditions constantly taking place, the Universe actually moves towards 'a state of unchanging death' where, eventually, no any further change would ever more be able to take place (Ibid.).

And this was the idea of nature without a future. The idea was that, contrarily to Lyell and Hutton, there is no perpetual equilibrium between the forces of destruction and creation put in effect on the universal scales – instead, since the time begun there is a constant and irreversible tendency, a movement/transition, to the decay, and all the cosmogenesis is this tendency to decomposition, putrefaction and perishing of cosmos. That the final state of what is in fact 'equilibrium', for us is a total disequilibrium, that is, a disintegration, heat death of the Universe, 'the impossibility of cosmology', as contemporary physics and philosophy put it. With respect to the described shift to 'no future' principle, it may be subsumed as: although the nature definitely has some futures, at the very end, it has no future as such, since everything would ultimately end, including what we understand as nature in any possible sense. When we speak about Boltzmann, as a continuer of Clausius, we may think of the postulates of thermodynamics as a transcendental law hinting to an inevitability of the dissolution of matter in time: the degradation of energy, the flux of tendential energy, the thermospasmic shock. At the end, this moves even beyond the thesis 'extinction is forever'; what the notions of 'entropy' and 'heat death of the universe' entail on metaphysical level is: 'there is even no forever'. Therefore, the question of a kind 'is it possible that life which has died at one location in the Universe would reborn elsewhere?' or any similar would be irrelevant because, eventually, there is no time available for any sort of rebirth, at a certain point. The lack may very well be not in 'where', but of 'when'. In the most profound, metaphysical sense, such an inference was derived through the cancellation of the opposition between absolute finitude and infinity in favour of the former, by eliminating the latter as an assumption and grounding for any possible claim about the nature of reality. This is Kant's antinomy resolved in favour of one of the possible solutions presented by Kant as unresolvable. To my mind, this antinomy, from the very beginning, is precisely a form of defence against the cosmos, described by Nick Land as 'the most elaborated form of panic in the history of the Earth'. As Michel Foucault tries to explain the problem of antinomies (as well as their genealogy), '[...] since Kant, the role of philosophy has been to prevent reason from going beyond the limits of what is given in experience' (Foucault, 2020: 298).

Indeed, the future, finitude – infinity antinomy, anything what follows is not something that is given in the experience, and it, as well, can be a fancy addition to Land's assertion. Yet, this is not a fruitful explanation or explication of the problem, because the problem of time, temporality etc. precedes Kant and his antinomies. What Kant does is an attempt to pinpoint the problem to certain grounding on which the domestication of time should be considered to be sufficiently reasoned. That is, what Land sees (in more metaphorical then philosophical sense) as 'panic' and Foucault tries to explicate in more precise manner: as putting the limits to philosophy, reason, mind etc. Kant's antinomies, implications of correlationism, unresolvability principle, as well as Phoenix Complex (those parts of it which I have outlined as relevant in part (II.) with respect to the essay's subject) may be viewed in general perspective as manifold instances of what Frederico Nieto describes as 'the explicit muting of cosmic trauma that is precisely brought to the fore by the overwhelming of transcendental temporality over our own whimsical and fairly lackluster empirical givenness within the indifferent contingent flow of the universe' (Nieto, 2023).



### 3. Lyotard's Wager

In the book *The Inhuman: Reflections on Time*, Jean-Francois Lyotard puts the problem of finitude and temporality in the following way:

'You philosophers ask questions without answers, questions that have to remain unanswered to deserve being called philosophical. According to you answered questions are only technical matters. [...] You turn to other questions that seem completely impossible to answer: which by definition resist every attempt at conquest by the understanding. [Y]ou grant yourselves the privilege of continuing to regard as unresolved, that is as well formulated, questions that technical science believes it answered but in truth only inadequately dealt with. [...] While we talk, the sun is getting older. It will explode in 4.5 billion years. It's just a little beyond the halfway point of its expected lifetime. It's like a man in his early forties with a life expectancy of eighty. With the sun's death your insoluble questions will be done with too. It's possible they'll stay unanswered right up to the end, flawlessly formulated, though now both grounds for raising such questions as well as the place to do this will no longer exist. You explain: it's impossible to think an end, pure and simple, of anything at all, since the end's a limit and to think it you have to be on both sides of that limit. [T]his is true of limits belonging to thought. But after the sun's death there won't be a thought to know that its death took place.

[...] In 4.5 billion years there will arrive the demise of your phenomenology and your utopian politics, and there'll be no one there to toll the death knell or hear it. [Y]our passionate, endless questioning always depended on a 'life of the mind' that will have been nothing else than a covert form of earthly life. A form of life that was spiritual because human, human because earthly coming from the Earth of the most living of living things. [...] With the disappearance of Earth, thought will have stopped – leaving that disappearance absolutely unthought of' (Lyotard, 1993: 8-9).

His brilliantly formulated challenge to the history of philosophy as being another idiosyncratic reaction towards the problem of temporality I call Lyotard's Wager. The Wager which has not merely reaffirmed the implications of metaphysical pessimism (of Schopenhauer, Mainländer or von Hartmann) or its late derivatives (such as Tønnessen, Zapffe, Crawford, Benatar, or Thacker) – Lyotard's Wager's significance lies in its act of transition of pessimism from the realm/domain of being to the realm of time (a thing perceived, but never achieved by such pretentious metaphysicians as Heidegger with his claims about mastering time, just as other correlationists after and before him). As such, this wager is thrown in the face of what has been defined as the unresolvability principle – it actually uncovers it as an implicit, tacit, or explicit dispositions within the history of philosophy. Since the principle itself is asserted as a component of the Phoenix Complex (and correlationism), I consider it is eligible to extrapolate the challenge postured by Lyotard to the extent of all three.

This implication of the philosophies of pessimism, wagered towards the historical philosophical 'time-domestication paradigms', is aligned with findings of the natural sciences of the 19<sup>th</sup> – first half of 20<sup>th</sup> centuries, from the ones which have been discussed above to even more 'neutral' and 'mainstream' theories and concepts: Big Bang, two instances of Einstein's Relativity Theory, Weinberg's and Hawking's M-Theory, Michio Kaku's



soteriological speculations on the nature of the Intelligence self-preservation in the face of the end of all things, Prigogine's motifs concerning the unidirectional irreversibility of the cosmological time-arrow aligned with the foundations of Boltzmann's/Clausius's/Kelvin's thermodynamics implications, as well as with Big Rip or Big Crunch hypotheses.

What all these share in common is the factuality of obsession with time and its finitude, and, consequently, the aftermaths of finitude arriving immediately after the Finitude principle is accepted; the basic and foundational assertion of the irreversibility as a ruling principle instead of the implications aligned with 'solarpunk' attitudes, those of the renewability, salvation, resolution, deferring or denial of the imminence of end; the resignation that only blind faith and ungrounded hopes, dreams, desires are nowadays the sources for the beliefs implying at most potential (not speaking of actual) possibility of infinity, perpetuity, repetition, rebirth, eternity. In other words, it may be viewed as a stimulus for a response which, in its ultimate form, is the Finitude principle: when his challenge concerning the Solar System and life of the mind on the Earth in particular, is extrapolated to the Universe in general, no place remains for rebirth in any thinkable.

Subsuming: the most prominent hypotheses of physical cosmology, such as the Heat Death of the Universe, Big Rip, Big Crunch, etc., are grounded on Finitude principle. Each of them, in one form or another, postulates the irreversible and absolutely transcendental, as well as contingent, End of All Things. From Lyotard's Wager, it is eligible to make a transition to more universalised problematisation, developed further by Land and Meillassoux: even if the Death of the Sun wouldn't eventually be the cause of the ultimate perishing of human species or intelligent life in the Universe in its generality (be it our Solar System or any alike), the Heat death of the Universe / Big Rip / Crunch will be such an ultimate. On the other hand, even if, on the timescale, the cause for such a perishing wouldn't be calculated as a factual singular or polyvocal death-event with relatively high degree of probability, there's always a place for a transcendental catastrophe – an imminent disaster with irreversible eliminative consequences which mind is simply incapable to calculate, deduce, assume or anticipate: a disaster which has already taken place in future which will have happened in the sequence of the events unfolding in a time-space continuum from a human-like observer's perspective with regards to the future events related to this observer's ontic strata.

The perspective of the problem of the impossibility of prediction and calculation of the possibility or even the existence of such an imminent annihilating threat here is stressed not with regards to space as such, but to time-consciousness limitations, if we are to speak about the actual and hypothetical host of intelligence, that is, any host of intelligence capable of only one-directional and one-dimensional perception of the time flow. Lyotard's Wager stems in two directionalities of temporal nature, the first is of the finitude of the Universe in time, and the second is of the impossibility of probabilistic calculation of the disaster which may potentially eliminate – at any moment – mind or life as such, without any possibility of its renewal or re-emergence.

In the first instance of such an emanation of what may be defined as *transcendental catastrophism*, we deal with the impossibility of prediction and vision of things to come. In the second – with knowing very well of such things, as well as knowing that there is no way to change them, and the ultimate outcome, despite knowing what the outcome would be and what are its causes.

As for the last attempts of preservation of the Phoenix Complex / Unresolvability principle attitudes in science, there is a set of hypotheses known as Big Bounce hypotheses/theories. Their general idea is grounded on oscillatory model of the Universe, postulating a cyclic

repetition of the Big Bangs/Crunches, sequences where the first cosmological event, that is, a primordial Big Bang, is a result of the collapse (Big Crunch) of some ‘previous’ Universe. Despite the recent successful creations of theoretical models (such as nonsingular Big Bounce theory in the Einstein-Cartan-Sciama-Kibble theory of gravity), the question with such models remains open, especially with regards to the nature, flow, and secondary, but still problematic, the directionality of temporality: why had the Ur-Universe started expanding at all? was there such a beginning? why, if there was, must one assume the infiniteness of [postulated] bouncing? Instead of the latter, one may assume not an infinite bouncing, but rather finality and finitude, the possibility of collapsing into None instead of the infinite repetition.

Implicit or tacit assertion here, again, must be one and the same thing: the infinity of time! If the Universe is a physical-cosmological Phoenix, which dies and reborns from the ashes each time throughout the enormous cosmic time scales, then, to be actually *undying*, it must be *unborn*. What Big Bounce hypotheses are unable to respond is this problem of unbirth / undying, precisely because of lacking coherent explanation of why has anything born at all and why has it not disappeared immediately after taking place or prior to it.

Previously, we have discussed a weak correlationism. Now, with regards to the problem of in-/finitude and Phoenix Complex, the penultimate attempt should be discussed. In-between the two dispositions lies also a set of numerous hypotheses of time reversal, commonly known as T-symmetry. It postulates a preservation of qualitative symmetry of the physical laws under the hypothetical condition/event/sequence of time reversal. In a sense, this attitude represents ‘weak’ Phoenix Complex instances, some of the best coherent attempts, more or less, to save its foundations and groundings in a realm of physical cosmology.

Yet, it may be said that any asserted implication of the T-symmetry as such that would speak in favour of the Phoenix Complex attitudes is, in a sense, ill-founded when it actually comes to time-reversibility as a potential or virtual eventuality. Even if this would be the case that time becomes reversible and that such a process (uni-directional flow/sequence of events in time in reverse order, given hypothetically) is to be actualised; even if the whole set of the basic physical laws is to be preserved, there is a minimal actual set of classical variables which is proven to be negated by the fact of the time reversal (where potential and virtual set may exceed this minimal postulated set). To them there are included at least such physical variables as magnetisation and magnetic field; power; electromagnetic vector potential; particle velocity; particle linear momentum, angular momentums (orbital and spin); event occurrence time; electric current density; Poynting vector (electromagnetic field powerflow).

All that actually speaks in favour of the fact that, even if there would have been at least basic form or aspect of time-domestication, its material consequences would have fallen to some of these possibilities: (1) either the sequences would be fully uncontrolled and unpredicted; (2) or they would be irreversibly destructive with regards to microscopic parameters which are to change with regards to quantum objects; (3) or, if those consequences would not be totally destructive [in a full sense of meaning], then, at least, they would be contingent enough to turn a reversibility from an alleged virtue into a potential – virtual – actual disaster.

#### 4. ‘3Rs’ Ungrounded

The last case I would like to discuss is a set of ideas, attitudes and principles aligned with Phoenix Complex, correlationism, and unresolvability principle. These are the ideas of recombination, re-potentialisation, reactualisation, lineage, rebirth, relaunch, circularity,

succession, plentitude, preservation, totalisation, recycling, reincarnation, revival, regrowth, and reassembling. All these are reducible to '3Rs': Repeatability, Replaceability and Renewability. Each of these attributes, in a sense, represents the modalities, conditions and properties of the states of affairs implied by the instances of Phoenix Complex in thought, expression, practices and normative commitments. Renewability, for example, is aligned with the implication of immortality – an idea of not-coming-to-an-end through the constant regeneration and reparation. The same is true for Replaceability – like Theseus' ship, it postulates the possibility of the replacement of a part or the rebirth of a whole in a far different time and place. Or, as principle (8) from representation of the Phoenix Complex instances goes, everything that is extinct is reborn into something new which includes what has gone extinct as its part in itself, bearing its part as a Continuity. That is, the Continuity precisely aligns, in this sense, with both Replaceability and Immortality.

It is worth mentioning that Immortality itself is not identical to Infinity, and Infinity is precisely what derived from the attribute of Repeatability. If Immortality would mean one or another form of undying, with Infinity we deal with a sort of perpetuity, as a path of constant return without the final return (non-return step is withdrawn); or eternal recurrence as Nietzsche puts it; or as Levinas' death → rebirth continuity of I in the Other. Repeatability, therefore, implies one or another form of Infinity: the infinity of repletion of the resources (in contrast to Renewability as a revival or rebirth, it implies the infinite amount of them allocated in the infinite spacetime continuum); the infinity of repetition of being in the form of birth and rebirth of what dies, either as the same or as the Other as carrying the continuity with what has died – infinity as non-perishing.

If we consider Phoenix Complex as a failure, refusal or incapability of conceiving and resignation of the absoluteness of finitude or, which is the same, the finitude as principle, we, then, should try to propose a counterpositions to '3Rs' from the viewpoint of Finitude principle. It may go as follows: even if the Repeatability is the case, either with regards to the infinity of resources for repletion, or with the fecundity principle as a guarantee of the infinite/recurrent/eternal replication/reproduction in the domain of space, if time is finite, these infinities, regardless of their exact nature, are exposed to perishing because of the imminence of the End of all things, including those which are potentially capable of infinite reproduction and growth; even if Replaceability is the case and everything that has gone extinct would reappear in any other place, or, even if, in the physical reality, there are always 'spare parts' for the replacement of the 'parts', 'details', even worlds or species which have been lost, eliminated, damaged, – the finitude of time nullifies the potential replacements ad infinitum, that is, even the replacement is physically possible, it is never the case that it is by the same token would be temporally possible; as for the Renewability: even if there is a possibility of instant recycling, rearrangement, renewal of the energy, fuel, food, being, matter, life, etc. from the metaphysical 'ashes' (any material which is eligible to being the substrate / substance to be the basis of such a renewal), even if there is a substance capable of the infinite renewal, because of the finitude of time, this potential of the unending renewal is nullified and becomes finite by its actuality (regardless of potentiality).

## **Concluding Remarks**

The Phoenix Complex is closely connected with philosophical dispositions of correlationism and the unresolvability principle. All three are grounded on an assumption of the infinity of time as a transcendental condition of their proper functioning, soundness, consistency and reciprocity of their discourses. Because of that, in my assertion, one of

the ways of at least partial overcoming of the Phoenix Complex is a development of the narratives, concepts, theories, speculative models opposed to its metaphysical claims about time and temporality, generally defined as Finitude principle. The latter implies, relies on and explicitly adopts finitude and contingency – in arts, philosophy, literature, science, or any of their intersections, as a metaphysical grounding of the narratives, dispositions, theories, etc. which they produce. As the historical review shows, the basis for establishing, proclaiming, adoption and resignation of Finitude principle has already formed within the literature, science and philosophy in manifold instances and from the different angles of problematising.

If overcoming of the Phoenix Complex is taken not only as something of the psyche (unconscious and conscious) which should be worked with and undergone through, but also as an unlearning, then the crucial step to such an unlearning is a resignation. And, as such, a resignation is possible only through the acceptance of 'Lyotard's wager' and its derivations, as well as the other developments of the implications of Finitude principle. This resignation would as well involve the necessity of the acceptance of the fact of the superiority of time over space with regards to the dominating representations of 'space – time' continuum intrinsic relations, especially, those of their ordination and subsumption. On the one hand, one accepts the contingency of events with regards to the transcendental catastrophism brought by the time arrow with regards to the sequencing and ordering of the events; on the other, one resigns the facticity of the end of all things and the ultimate face of the Universe as being in one or another form finite, with the finitude be postulated either not from the domain of space, or regardless of the finitude of space, but because of the finitude of time – in both cases.

The idea of space being supervenient on time (time being superior over space) in such an acceptance must not be taken as merely a logical possibility or necessity, but as the one of ontological nature – as an assertion or the claim about the nature of physical reality with all the derivable consequences from such a state of affairs. In the context of unlearning, the three 'Rs' of the Phoenix Complex, Repeatability, Replaceability and Renewability should also, gradually or simultaneously, should be changed by their opposites as grounding attributes: Singularity (as non-Repeatability), Uniqueness, and Depleting (negation of the idea of perpetual).

Finally, with respect to the implications of the Phoenix Complex, unresolvability principle and 'I – World' correlationism, the crucial distinction should be made from the side of the attitudes and narratives aligned with the Finitude principle: the distinction between the apocalypse/eschatology and extinction. Where the former tells off the path of the eternity and infinite time, the latter postulates the path of finitude and non-return – extinction is forever, and, at the same time, in a physicalcosmological sense, there is no forever. Moynihan writes: 'Above all, the strange evolutionary path of the human has somehow made it the only creature to be conscious that, beyond the individual's precarious condition, its kind as a whole faces existential risk' (Moynihan, 2020: 355). To reiterate his claim: human is the only known creature apt of unlearning of its own metaphysical *implications* towards *temporality* – the only known to date conscious of subjective, intersubjective, species, mesoscales levels, as well as universal finitude and contingency towards time.

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# Towards a Spiritual Model of Cosmic Education Based on Advaita Vedanta Philosophy

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Pulido-Moyano, Rafael (2023) Towards a Spiritual Model of Cosmic Education Based on Advaita Vedanta Philosophy. *Philosophy and Cosmology*, Volume 31, 58-81. <https://doi.org/10.29202/phil-cosm/31/6>

*The author outlines a spiritually oriented model of cosmic education inspired by Advaita Vedanta philosophy. The description of the general principles of this Nondual Vedantic Cosmic Education (NVCE) will be preceded by a brief review of the writings of two Indian authors, Vivekananda and Aurobindo, who led the revitalisation of nondual vedantic philosophy. In order to utilize the nondual vedantic spiritual wisdom as a curriculum substrate for teaching/learning processes in classrooms, the NVCE model uses some core ideas from Ken Wilber's Integral Theory, which can serve as an interface theory between nondual vedantic philosophy and this new conception of cosmic education. NVCE will be organized around three main curriculum realms: a) "Purifying the mind", b) "Controlling the Mind" and c) "Expanding the Mind". These three curriculum realms are shown to respectively correspond with three processes in Wilber's Integral Theory, such as a) Show Up, b) Wake Up and c) Grow Up), and also with the four classical yogas mentioned in the wisdom traditions of Hinduism: a) Bakhti Yoga and Karma Yoga, b) Raja Yoga and c) Jnana Yoga. The author holds that this world has no future unless spirituality becomes the substrate of educational processes. In NVCE, which is a proposal to raise the educational building from spiritual pillars, to educate is to guide others and ourselves on the path that leads to the nondual experience. From the nondual vedantic perspective, cosmic education is the path through which human beings progressively dissolve their limited individualities into the nature of God.*

*Keywords: cosmic education, nondual Vedanta, Integral Theory, Vivekananda, Aurobindo.*

Received: 10 May 2023 / Accepted: 30 May 2023 / Published: 15 October 2023

## Introduction

“Man will feel no rest until he finds some meaning for himself in the cosmos. And this is so, because there is a meaning which we feel hazily, and which draws us forward along the path of evolution”

(Tapasyananda, 2020: 15).

In total agreement with those words, we feel the urge to understand our place in this universe. And we feel the need to have a theory upon which we can make decisions about how to conduct our life at both individual and societal levels, a theory which could answer “such difficult philosophic questions as “the place of a human being in the material world”, “the predetermination of the mankind”, “the sense of human life”” (Bazaluk, 2022: 155). Driven by that urge to understand our place in this universe, in a previous article (Pulido-Moyano, 2021) we presented a cyclic cosmological theory called “*Consciousness Endomitosi Theory*” (CET). This theory, no matter how speculative and metaphysical could appear to be, was subjectively satisfactory for us, and we hope it can be also so for others. CET nurtured itself explicitly by philosophical ideas from Advaita Vedanta (Nondual Vedanta) and included some concepts borrowed from Ken Wilber’s Integral Theory.

The main thesis of that previous article was that consciousness is the only *substance* of the universe, the only *context* of everything, the only *subject* (albeit temporally localized in many points of apparent individual subjectivity or specific perspectives) and the only *object* (albeit manifested in a multiplicity and diversity of things). Inspired by the teachings of Nondual Vedanta, in that article we said that consciousness neither “emerge” (because it is the very ground from which everything emerges), nor is a property (because it is the unique substance of which all existing physical properties are mere modulations or manifestations).

In line with the nondual vedantic inspiration of CET, here we outline a new model of cosmic education inspired by our interpretation of Advaita Vedanta philosophy and, as we did in our previous article, we will develop some of our main arguments with the help of Wilber’s ideas. To be more precise, our conception of cosmic education ground itself mainly on the works by Vivekananda (1863-1902) and Aurobindo (1872-1950), two leaders of the revitalisation of nondual vedantic philosophy, though we will mention many other authors belonging to the Ramakrishna-Vivekananda tradition. Vivekananda defined education as *the manifestation of a perfection already existing in man* (Vivekananda, 2016, vol.4: 349).

In Section 1, we will see what Vivekananda meant by such a definition and how Aurobindo interpreted and developed it. In Section 2, we will introduce some core ideas of Ken Wilber’s Integral Theory, which can serve as an interface theory between nondual vedantic philosophy and a new conception of cosmic education. In Section 3, we will describe the overall structure of a Nondual Vedantic Cosmic Education (henceforth, NVCE). We present NVCE as formed by three main curriculum realms: “Purifying the mind,” “Controlling the Mind” and “Expanding the Mind.” We hold that these three curriculum realms articulate themselves respectively with three processes in Wilber’s Integral Theory: *Show Up*, *Wake Up* and *Grow Up*. At the same time, each curriculum realm -and its corresponding wilberian process – relates itself to the traditional “yogas” of the Hindu tradition: Karma Yoga and Bakhti Yoga (Purifying the Mind / Show Up), Raja Yoga (Controlling the Mind / Wake Up) and Jnana Yoga (Expanding the Mind / Grow Up).



## 1. The educational process as seen by Vivekananda and Aurobindo

The *Vedas* (from *vid* “to know”) are the most ancient spiritual scriptures of humankind, “considered to be a direct revelation from God to the mystics of the past” (Easwaran, 1986: 236). *Vedanta* (from *anta* “end” or “aim”) refers to the philosophical culmination of the *Vedas*, and *Advaita Vedanta* (literally “Non-dual Vedanta”) is one of the various vedantic schools, originally articulated by Sankaracharya around the eighth century C.E. (as an introductory text see, for example, Sharma, 2007). The impact of Advaita Vedanta throughout the history of Indian philosophy has been enormous though, for many centuries, its influence was shadowed by other schools. At the end of 19<sup>th</sup> century, Advaita Vedanta was revitalised thanks to the teachings of Ramakrishna and his foremost disciple, Swami Vivekananda, followed by other Indian thinkers like Aurobindo. The 20<sup>th</sup> century witnessed a series of milestones in this revitalization movement, in the figures of Ramana Maharshi, Atmananda Krishna Menon or Nisagardatta Maharaj – just to mention a few of them-, whose teachings helped western spiritual seekers to understand the depth of the advaitic philosophy. From 1970 onwards, the “New Age” spiritual flowering clearly has resonated with the “nondual wisdom”, though not always from an adequate understanding of it.

In his analysis of the contemporary relevance of Advaita Vedanta, Devaraja (1970) asked what constitutes its special significance for modern man, that is, “for the person who is aware of the strains and tensions characterizing contemporary life and sensibility and shares the concern of a disillusioned generation for objective evidence and verifiable utterance.” For this autor, it is clear that “Advaita Vedanta claims our attention today as a well-knit system of doctrines offering connected solutions to a number of problems, logico-epistemological and ethico-religious” (p.130).

It is a fact that an increasing number of people all over the world tend to define themselves as “not religious but spiritual.” Ranganathananda (2019) noticed how the idea of religion has naturally become distasteful to young people in all parts of the world, so they go away from all religion. However, this author thinks that religion has a profound message to every human being, if we approach it scientifically. This is precisely “the great contribution of India’s ancient philosophy and spirituality of Vedanta and of its powerful modern exponent, Swami Vivekananda” (p.10).

According to Bone et al. (2007), spirituality is seen very often as a source of division and is sometimes constructed as something to fear in secular societies. However, these authors explain that “spirituality is not the same as fundamentalism or religious doctrine and spirituality as an integral part of the early childhood curriculum has the potential to connect not divide, hence the emphasis on whole/holistic” (p.344). Miller and Drake (1997) noticed that educators avoid the word “spiritual” because somehow “it makes them uncomfortable.” According to these authors, “this discomfort and avoidance betray the sad state of education today”:

We focus on outcomes rather than have students explore the fundamental questions of life. These questions include such issues as: what is the purpose of human life? What is our role in the universe? What is the nature of reality? How can we deal with human suffering? To be educated should mean that one has addressed these issues in the course of one’s life (p.239).

We hope that an increasing number of educators will accept spontaneously and naturally the incorporation of spirituality in their work. In the case of higher education settings, Crowe

(2013) holds that this incorporation “provides an additional way for students to construct knowledge, make meaning of experiences, and move toward authenticity, all contributing to transformation”, and she explains:

For religious students, activities that contain spiritual components allow students to connect to their established practices. For students who are spiritual, but not affiliated with an organized religious group, these activities can serve as the inspiration for students to critically examine their existing environmental attitudes, question their assumption and beliefs, and through reflection and discourse, transform their view of their place, responsibility, and importance in the natural world (p.76).

Throughout his life, Vivekananda very explicitly addressed the type of questions posed by Miller and Drake. For him, intelligence is at the beginning and at the end of this universe:

At the beginning, that intelligence remains involved, and in the end it gets evolved. The sum total of the intelligence displayed in the universe must therefore be the involved universal intelligence unfolding itself, and this universal intelligence is what we call God, from whom we come and to whom we return, as the scriptures say. Call it by any other name, you cannot deny that in the beginning there is that infinite cosmic intelligence (Vivekananda, 2016, vol.2: 206).

For Vivekananda each of us must complete the circle and go back to this cosmic intelligence which is God. According to him, “this cosmic intelligence is what people call Lord, or God, or Christ, or Buddha, or Brahman, what the materialists perceive as force, and the agnostics as that infinite, inexpressible beyond; and we are all parts of that” (Vivekananda, 2016, vol.2: 231). Vivekananda holds that true education contributes to “complete the circle” by helping us to come back to the “source” or cosmic intelligence known as God. Rather than a going back, it is ultimately a remembrance or a recognition of our divine nature. For him “education is not filling the mind with a lot of facts”. The ideal of education is perfecting the instrument -the mind – and getting complete mastery of my own mind:

If I had to do my education over again, and had any voice in the matter, I would not study facts at all. I would develop the power of concentration and detachment, and then with a perfect instrument I could collect facts at will. Side by side, in the child, should be developed the power of concentration and detachment (Vivekananda, vol.6: 39).

In order to be an educated man – Ganeswarananda says – one does not have to go through books, one does not have to talk a lot, and one does not need to be an information bureau or a card – index. “Anything that helps us in bringing into manifestation the perfection that is already within us, is true education. This ideal of education is very different from the average conception” (Ganeswarananda, 2021: 45).

Tapasaynanda (id.) admits that we cannot find in Vivekananda’s writing any details of work or methods of organization for accomplishing his educational vision on a nationwide scale, not to mention on a worldwide scale. He lived for a short time only and he had neither a political party nor governmental power to support or work out his ideas. However, some of his suggestions are very clear and specific. For example, Vivekananda said that the only duty of the teacher is to remove all obstructions from the way: “Hands off! as I always say, and everything will be right. That is, our duty is to clear the way” (Vivekananda, 2016, vol.4: 349). Ahmad (2009) holds that “Advaita-Vedanta claims that if the teacher embodies and reflects the values

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he is teaching then the impression he leaves on his pupils is very deep and indelible”, and he explains:

A teacher must be conscious and careful in his behaviour, attitude and professional ethics. Both the teacher and learner are travelers on the path of self-realisation but the teacher is comparatively advanced and superior in age, experience and dignity (p.35)

As a goal, the perfection of the mind-instrument was much more important than a mere “academic perfection” as an accumulation of knowledge. According to Banerji (2017), reformers of Indian educational system at the beginning of the 20<sup>th</sup> century, like Tagore and Aurobindo, were firmly convinced that the reduction of knowledge to “intellectual understanding” need to be countered by other forms of legitimate knowledge which, in Sri Aurobindo’s case, “it was a tapping into inner sources of wisdom that Vedantic knowledge wrote about” (p.7).

This idea was further developed by the Indian thinker and mystic Sri Aurobindo, for whom Vivekananda was a source of inspiration (he said: “It is a fact that I was hearing constantly the voice of Vivekananda speaking to me for a fortnight in the jail in my solitary meditation and felt his presence”). Aurobindo writes:

Any system of education founded on theories of academical perfection, which ignores the instrument of study, is more likely to hamper and impair intellectual growth than to produce a perfect and perfectly equipped mind (Aurobindo, vol.1: 383).

From Vivekananda’s or Aurobindo’s perspective, the perfection of mind is something that goes beyond an increase of complexity or enrichment of cognitive resources. According to Aurobindo, there is no proof that education and intellectual training by itself can change man; “it only provides the human individual and collective ego with better information and a more efficient machinery for its selfaffirmation, but leaves it the same unchanged human ego” (Aurobindo, vol.21-22: 1094). That is why...

... it is necessary for the mind too to grow in perfection and this it can do best when it depends less on the fallible intellect of physical mind, when it is not limited even by the more orderly and accurate working of the reason and can grow in intuition and acquire a wider, deeper and closer seeing and the more luminous drive of energy of a higher intuitive will (Aurobindo, vol.13: 530).

This “drive of energy of a higher intuitive will” opens the door to the purely spiritual or divine element, which is already present in us but mostly unnoticed. We will be truly educated (meaning “spiritually mature”) only after recognising our divine nature, which is veiled by layers of mental conditioning. However, for such a recognition to take place, it is absolutely necessary to understand God without anthropomorphic limitations. In one of his writings, Vivekananda told the story of a man of eighty years who said that he “could not conceive God except as an old man with a long beard sitting on a cloud”. For Vivekananda, those words showed that “[this man of eighty years’s] education is not complete. There has not been any spiritual education, and [he] is unable to conceive anything except in human terms” (Vivekananda, 2016, vol.6: 60-61).

The concept of god is at the very core of any philosophy of cosmic education from a vedantic perspective. However, it is necessary to emphasize that Vivekananda’s ideas on education are far away from abstract speculation or any beatific or spiritually romantic attitude. His famous

dictum “education is the manifestation of the perfection already in man”, was immediately followed with another crucial statement: “religion is the manifestation of the divinity already in man”. Ashokananda (2019) drew out attention to “the nice distinction Vivekananda made”, and explains:

Perfection includes divinity, of course, but it means a little more. You might almost say that he gave a higher place to education than to religion. Religion as it is ordinarily understood is limited to the conception of attaining to God, whereas man, a human being, has many other things in him because of which he is man (p.166).

In other words, Vivekananda was fully aware of mundane implications of “real education”:

You consider a man as educated if only he can pass some examinations and deliver good lectures. The education which does not help the common mass of people to equip themselves for the struggle for life, which does not bring out strength of character, a spirit of philanthropy, and the courage of a lion – is it worth the name? Real education is that which enables one to stand on one’s own legs. The education that you are receiving now in schools and colleges is only making you a race of dyspeptics. You are working like machines merely, and living a jelly-fish existence (Vivekananda, 2016, vol.7: 141).

Both Vivekananda and Aurobindo got their inspiration from the Bhagavad Gita when they defend the need to articulate the most pragmatic, politically and socially committed view on education with its deepest spiritual foundation and orientation. Thus, Aurobindo talked about “a new creation, a spiritual education and culture, an enlarged social spirit founded not on division but on unity, on the perfect growth and freedom of the individual, but also on his unity with others and his dedication to a larger self in the people and in humanity” (Aurobindo, vol.13: 511). In his famous poetic style, he explains:

As the mental development foreshadowed above proceeds to its goal, man will begin to evolve and realize himself as a mighty and infinite Intelligence, not limited by sense-perception or the laborious and clumsy processes of the reason, but capable of intuitive and infinite perception. And when the evolution of Mind is complete and the evolution of Supra-Intelligence proceeds, the liberation of the Will involved in its operations will lead man to the highest evolution of all when he realizes himself as a potent and scient Will, master of creation and not its slave (...) (Aurobindo, vol.17: 243)

In other words, both Aurobindo and Vivekananda hold that a truly cosmic education would be like an upward path through which a human being progressively dissolve its limited individuality into the nature of God. A truly cosmic education is a Godward path. From the Advaita Vedanta perspective, an authentic cosmic education would help us to become God. Once a human being had completed this educational process, his/her only mission on this planet would be to assist others to complete the same educational process. Vivekananda succinctly stated this idea: “First, let us be Gods, and then help others to be Gods. *Be and make*. Let this be our motto” (Vivekananda, 2016, vol.4: 342).

Vivekananda’s powerful words can be easily misunderstood, because he used the plural “gods”, in a mere rethoric way, but it is obvious that he holds, like any follower of nondual or advaitic Vedanta, that there is just “one” God, and nothing apart from God, because only God is. For the nondual vedantic follower, God is consciousness, the only substance out of which

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the universe is made. In that sense, the nondual vedantic approach to cosmic education would define it as the process through which God “remembers” Itself or rediscovers Its divine nature.

The pillars of cosmic education lie in the self-knowledge capacities of the human mind. As Aurobindo wrote:

First, he has to turn his eyes upon his own psychology and distinguish its natural elements -ego, mind and its instruments, life, body – until he discovers that his whole existence stands in need of an explanation other than the working of the natural elements and of a goal for its activities other than an egoistic self-affirmation and satisfaction. He may seek it in Nature and mankind and thus start on his way to the discovery of his unity with the rest of his world: he may seek it in supernature, in God, and thus start on his way to the Discovery of his unity with the Divine (Aurobindo, vol.21-22: 722).

Aurobindo claimed that the soul or spirit within us, if it is divine, immortal or celestial, “cannot be sent here solely to be put to school for this kind of crude and primitive moral education” (Aurobindo, vol.21-22: 836-837). For him, the mundane perfection is sometimes conceived of as something outward, social, a thing of action, a more rational dealing with our fellow-men and our environment, a better and more efficient citizenship and discharge of duties, a better, richer, kindlier and happier way of living, with a more just and more harmonious associated enjoyment of the opportunities of existence. But by others again a more inner and subjective ideal is cherished...

... a clarifying and raising of the intelligence, will and reason, a heightening and ordering of power and capacity in the nature, a nobler ethical, a richer aesthetic, a finer emotional, a much healthier and better-governed vital and physical being. Sometimes one element is stressed, almost to the exclusion of the rest; sometimes, in wider and more well-balanced minds, the whole harmony is envisaged as a total perfection. A change of education and social institutions is the outward means adopted or an inner self-training and development is preferred as the true instrumentation. Or the two aims may be clearly united, the perfection of the inner individual, the perfection of the outer living. (Aurobindo, vol. 23-24: 616)

Aurobindo admits that the discovery that education must be a bringing out of the child’s own intellectual and moral capacities to their highest possible value and must be based on the psychology of the child-nature was a step forward towards a more healthy because a more subjective system. However, this step still fell short because “it still regarded him as an object to be handled and moulded by the teacher, to be educated”. Advanced educational ideas must lead to the ultimate discovery that man is inwardly a soul and a conscious power of the Divine. Thus, “the evocation of this real man within is the right object of education and indeed of all human life if it would find and live according to the hidden Truth and deepest law of its own being” (Aurobindo, vol.25: 32-33). According to him, “the first principle of true teaching is that nothing can be taught”:

The teacher is not an instructor or taskmaster, he is a helper and guide. His business is to suggest and not to impose. He does not actually train the pupil’s mind, he only shows him how to perfect his instruments of knowledge and helps and encourages him in the process. He does not impart knowledge to him, he shows him how to acquire knowledge for himself. He does not call forth the

knowledge that is within; he only shows him where it lies and how it can be habituated to rise to the Surface (Aurobindo, vol.1: 384).

For Aurobindo, the prevailing idea of education in his time was “still primarily that of intelligence and mental capacity and knowledge of the world and things, but secondarily also of moral training and, though as yet very imperfectly, of the development of the aesthetic faculties” (Aurobindo, vol.25: 75). In quite a premonitory declaration, considering our current chaos of “infixation” due to mass media multiplicity and social networks, Aurobindo wrote the following:

Modern education has not in the mass redeemed the sensational man; it has only made necessary to him things to which he was not formerly accustomed, mental activity and occupations, intellectual and even aesthetic sensations, emotions of idealism. He still lives in the vital substratum, but he wants it stimulated from above. He requires an army of writers to keep him mentally occupied and provide some sort of intellectual pabulum for him; he has a thirst for general information of all kinds which he does not care or has not time to coordinate or assimilate, for popularised scientific knowledge, for such new ideas as he can catch, provided they are put before him with force or brilliance, for mental sensations and excitation of many kinds, for ideals which he likes to think of as actuating his conduct and which do give it sometimes a certain color (Aurobindo, vol.25: 90).

Aurobindo received a letter from a worried man, father of a son, who wanted to know Aurobindo’s view about the adequacy of his son’s education. The father has doubts concerning the rightness of having a “mundane” education as opposed to spiritual advance of his son. In his reply, Aurobindo said that he sees “no objection to [the boy’s] going on with his studies,” and he made clear:

Whether his studies will be of any use to him for a life of sadhana [spiritual practice] will depend on the spirit in which he does them. The really important thing is to develop a state of consciousness in which one can live in the Divine and act from it on the physical world. (...) There is no reason why *X* should not complete his studies or learn something which will make him useful in life. To be useless is not a qualification for Yoga (Aurobindo, vol.31: 71).

These words give us a clear indication of the overall attitude showed by both Vivekananda and Aurobindo in these matters. For them, true education must obviously serve for solving “real-world” problems related to our human existence, hence we need to acquire as much knowledge and competence as possible. As we will see below, we need to “*Grow Up*” as high as possible, in Wilber’s sense. However, this knowledge for action has to be grounded on our communion with the divine (the “*Wake Up*” process in Wilber’s view), and act (“*Show Up*” in Wilber’s view) from it on the physical world. It is time to explain the meaning of these wilberian processes, as they are a useful tool to translate nondual vedantic ideas into the language of educational philosophy.



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## 2. From Ken Wilber's Integral Theory to nondual vedantic cosmic education.

In our previous work (Pulido-Moyano, 2021) we used several concepts introduced by Ken Wilber in order to illustrate the dynamics of evolutionary processes. For example, physical structures were “holons”, and the four fundamental forces operating in the universe were “Eros”, “Phobos”, “Agape” and “Thanatos.” Now we will instrumentalise Wilber's Integral Theory in order to articulate the principles of nondual wisdom with policies and practices of cosmic education.

In order to utilize the nondual vedantic spiritual wisdom as a curriculum substrate for teaching/learning processes in classrooms, we need this interface or any other with similar power. Otherwise, it would be impossible to pour the essence of non-dual knowledge into the field of educational institutions. Wilber's work -see Wilber 1995 and 2017 for his core theoretical ideas, and Wilber 2008 and Wilber et al. 2008 for practical applications – can serve as the interface we need to translate into educational practice the non-dual wisdom expressed in traditions such as Advaita Vedanta.

Ken Wilber's theory on the development of consciousness must be analysed within the context of his “kosmological” thought, expounded mainly in three of his works (Wilber 1995, 1996, 1997). In those works, Wilber used the term *kosmos* -with “k” and not “c” – to include in his vision of the universe all the five planes of reality, which he refers to, in accordance with many ancient wisdom traditions, as energetic, material, biological, mental and spiritual. For Wilber, *kosmos* is the totality of what exists, and the components of *kosmos* are “holons” (a concept borrowed from Arthur Koestler). If something exists, then it is a holon. To be a “holon” means to be simultaneously both a *whole* in itself and a *part* of another holon. To be a *whole* implies that the holon is internally composed by other holons, which are not only included or encompassed by the higher holon, but also transcended by it. To be a *part* implies that any holon is externally related to other holons, all of them contributing to form a holon of a higher order.

Thus, atoms are holons, stars or galaxies are holons, cells, living organisms and, of course, human beings all are holons, but with different “depths”. As a holon, a mosquito is much *deeper* than a star, because the mosquito transcends and includes various levels of lower holons, such as cell level holons, molecule level holons, or atom level holons. More depth means two things: a) more complexity – what Bazaluk and Karchenko (2018) would call “progressive complication of the structure of matter”; and b) a broader awareness.

In agreement with nondual Vedanta, Wilber holds that consciousness is pervasive throughout the universe. For him, everything that exists is nothing but an “emanation of Consciousness”, which in Wilber equals to “emanation of the Spirit”. Consciousness manifests or expresses itself in infinite different ways, the vast majority of which are completely oblivious to that essential fact. That is, most holons ignore their true nature as mere modulations of consciousness or spirit. Stars, rivers, trees or stones, all of them ignore that they are external forms in which consciousness manifests itself. It is evident that basic biological forms show a certain “sentience”, but only the human holon is self-aware. Human beings alone are aware that they are aware.

Thus, from an evolutionary perspective, as far as we know, we are the first holons where consciousness has become self-aware. Unfortunately, it seems that we are also the first ones to turn our backs on this fact, to ignore it, to deny it. As the history of humanity demonstrates, we can act in a thousand ways contrary to self-awareness, instead of leading our individual and collective lives by taking that recognition as the foundational ground. In any case, this



resistance is not something that should surprise us. Wilber would remind us that the forces he calls “Thanatos” and “Phobos” are always active and quite often they win battles, although “Eros” and “Agape” will end up winning this evolutionary war.

### **2.1. Some educational implications of Wilber’s Integral Theory**

Ken Wilber has not articulated any discourse on education in his more than thirty books. However, along the last three decades, many educators have explored the educational consequences that could derive from Wilber’s Integral Theory, sometimes in the form of specific organizational and pedagogical practices inspired by it. Gidley (2007) said that the educational momentum emerging from Ken Wilber’s holistic approach offers an approach with enormous transformative potential for people and cultures around the world.

In the educational field, the adjective “integral” often has been used to describe a type of education sensitive to the multiple dimensions of the human being (cognitive, affective, social, physical, spiritual). Sometimes the adjective has been used to indicate a type of education where theoretical and practical knowledge are equally important, or a type of education characterized by the convergence or coordination of the efforts by all the agents of the educational community. In this sense, there is a certain “integral inspiration” in different pedagogies like “learning by doing”, “situated learning”, Paulo Freire’s emancipatory education, “learning communities”, “service-learning”, or in the educational ideas and practices of Froebel, Decroly, Dewey, Waldorf and especially Montessori, the Italian pedagogue who very directly talked about cosmic education. Approaches like “multiple intelligences education”, “collaborative learning” or “problem based Learning” also show some “integrality” in their respective theoretical underpinnings.

Our proposal of a *Nondual Vedantic Cosmic Education* (NVCE) goes beyond any classical “holistic” or “integral” approach to education. However, our idea of a NVCE is clearly compatible with Wilber’s concept of “integral”. His Integral Theory is organized around five core elements (“Quadrants”, “Stages or Waves of Consciousness”, “Lines”, “Types”, and “States of Consciousness”) and four main processes (*Grow Up*, *Wake Up*, *Clean Up* and *Show Up*). Each of the five element is specially associated with a particular process. Thus, “quadrants” is related to the *Show Up* process, while “Stages of Consciousness”, “Lines” and “Types” are closely linked to the *Grow Up* process, and “states of consciousness” to the *Wake Up* process. In our view, NVCE would utilise the following general guiding principles, which are inspired in Wilber’s Integral Theory:

1. In relation to the *Grow Up* process, NVCE should promote the achievement of the maximum altitude in the stages of consciousness of the individual, taking into account all his/her *lines* of growth as well as the diversity of *types* among people.
2. In relation to the *Wake Up* process, NVCE should promote the experience of different *states* of consciousness.
3. In relation to the *Clean Up* process, NVCE should encourage “shadow” work, helping individuals to be aware of their fixations and allergies, addictions and resistences of all kind that hinder transitions between *stages* and between *states* of consciousness.
4. In relation to the *Show Up* process, NVCE should facilitate and monitor the ways in which *growth* and *awakening* translate themselves into concrete ways of thinking and acting in people’s lives.

In the next section, we will describe in more detail the curriculum structure of NVCE. In so doing, we will indicate the connections of NVCE with some tenets of CET, our cyclic

cosmological theory (Pulido-Moyano, 2021) and, with the help of Wilber's concepts, we will describe in general terms each of the three great curriculum realms around which NVCE is organized. Though the three realms are inextricably linked to each other, for practical purposes each realm can be thought as a relatively separate field of educational practices, which would include specific goals, learning contents, activities and methods of evaluation (all of which are beyond the scope of this article). Any advance in one of the three realms contributes to the advance in the other two. However, the first realm ("Purifying the Mind") precedes the other two in the sense that it is a requirement for an adequate development of the second ("Controlling the Mind") and the third ("Expanding the Mind").

As we will see, each realm connects with different ways of unification or "yogas" in the Hindu tradition. Thus, the first realm relates itself to the practices of *Karma Yoga* (Action Yoga) and *Bhakti Yoga* (Devotional Yoga), whereas the second realm relates itself to *Raja Yoga* ("Royal" Yoga or Yoga of Mind Control, in Patañjali's sense) and third realm to *Jnana Yoga* (Yoga of Knowledge). In this sense, it is interesting to compare the educational usage of these four traditional yogas in this NVCE proposal with the position held by Elena Roerich, one of the "three major options for the Russian cosmic pedagogy" singled out by B. V. Yemelyanov (2004, quoted by Bazaluk & Blazhevich, 2012).

One of the foundational principles of Elena Roerich's *Agni Yoga* "is the continuous and infinite evolution of human spiritual qualities in unity and harmony with the Cosmos, with the society, and with the human being him/herself." (Bazaluk & Blazhevich, 2012: 151). In our view, among the three major options for the Russian cosmic pedagogy indicated by Yemelyanov in his article *The Cosmic Pathfinders for the Russian Pedagogy*, the option represented by Elena Roerich's *Agni-Yoga* ("Live Ethics"), is the only one that seems to be somehow compatible with the nondual vedantic cosmic education implicit in Vivekananda's and Aurobindo's thought. The other two options, represented by Konstantin Wentzel's cosmic pedagogy and by Daniel Andreyev and his *Rose of the World* ("Роза Мира"), seem not to be compatible. Notwithstanding their great insights and philosophical contributions-, as far as we know their discourses neither contemplate the centrality of God – as "One without a second" – nor develop a concept of education as the perfection of human inner divinity. In one of the *Agni Yoga* books -allegedly written by Elena Roerich – she said (1929):

161. Let us see wherein lie the similarities and differences between Agni Yoga and the preceding Yogas. Karma Yoga has many similarities with it as far as earthly realities are concerned. But when Agni Yoga provides ways to the realization of the far-off worlds, the difference becomes apparent. Raja Yoga, Jnana Yoga, and Bhakti Yoga are all separate from the realities of routine life, and because of this they cannot enter into the evolution of the future. Of course, an Agni Yogi should also be a Jnani and a Bhakti, and the development of the forces of his spirit makes him a Raja Yogi. How beautiful is the possibility of being fit for performing the tasks of the future evolution without rejecting the past conquests of spirit! One should not boast of bringing innovation, because only by a synthesis of the old and the new is a renewal of possibilities attainable.

We think that Elena Roerich was wrong in believing that "Raja Yoga, Jnana Yoga, and Bhakti Yoga are all separate from the realities of routine life". Thousands of yogis throughout history have used the practice of their respective yogas as an experiential ground from which to conduct their lives in very beneficial ways for their communities, thereby contributing to the social and even economical development of the latter. The idea that "they cannot enter into the

evolution of the future” seems unfair and unjustified to us. What Roerich did not say-as far as we know – is that, according to the several traditions of Hinduism, the four yogas do not exclude each other, and that all of them lead to the same goal: knowledge of Brahman or the recognition of our divinity.

For NVCE, the four yogas are four useful frames of reference to keep in mind in designing educational contexts and practices. All of them must develop themselves simultaneously along the educational career of our students, though one of the yogas could have some temporary preponderance over the other three during some educational levels, in some specific social and cultural scenarios or for some type of students.

### **3. The structure of a nondual vedantic cosmic education**

#### **3.1. First curriculum realm of NVCE: *Purifying the Mind***

“The true purpose of education is to make the heart pure and thus obtain a clear vision of the purpose of life and how to live life” (Bahr, 2021: 314). NVCE will promote the elimination of all selfish tendencies in students’ minds. The ideas of “I” and “mine” should be progressively eradicated as core elements of our identity. As Aurobindo said, “in the economy of man the mental nature rests upon the moral, and the education of the intellect divorced from the perfection of the moral and emotional nature is injurious to human progress” (SACW1: 389). Obviously, this position is unacceptable for any educational system based upon materialistic philosophies in agreement with capitalism and social darwinistic ideologies like the ones that form the plot of our world today. NVCE aspires to trigger the deepest world spiritual revolution by redefining the meaning of human life. NVCE is not just a mere “humanistic” educational alternative – like Waldorf or Montessori schools – attractive for parents who are unhappy with market-oriented educational practices. Vivekananda expected that our education would take a fresh turn attaching primacy to its essential purpose:

True education being manifestation of inner perfection brings out the spiritual nature of man, endowing him with divine qualities, such as non – violence, truth, freedom from anger, renunciation, tranquillity, aversion to fault – finding, kindness to living beings, freedom from covetousness, modesty and steadiness (Shandarshananda, 2021: 411).

According to CET -the cyclic cosmological theory that we use as the overall frame of reference – each holon has two sides (“*being*” and “*aware*”) and is subjected to four drives, its constant “tetradic structural field”: self-Preserving or *Phobos* drive, self-Transcending or *Eros* drive, self-Dissolving or *Thanatos* drive and self-Adaptative or *Agape* drive (see figure 1)

Along the horizontal axe (see figure 1), a holon is subject to either an increase or a decrease of its *being* side. In one extreme of this axe, *Phobos* drives the holon -through strong nuclear interaction, according to CET – into a decrease of its *being* side by isolating itself from other holons of equivalent complexity. This *Phobos* drive is the root of all our selfish tendencies as human individuals, which can adopt pathological versions in certain schizoid personalities. That is why NVCE must promote its annihilation, by pulling our mind towards the other extreme of this axe, namely, the *Agape* drive. Bakhti Yoga and Karma Yoga suit perfectly for this goal. *Agape* drives the holon -through electromagnetic interaction, according to CET – into an increase of its *being* side by union with other holons of equivalent complexity. In human terms, *Agape* is not only a pro-awareness drive, but also a source of brotherhood, of sense of oneness and, above all, an efficient antidote against the “ego disease.”

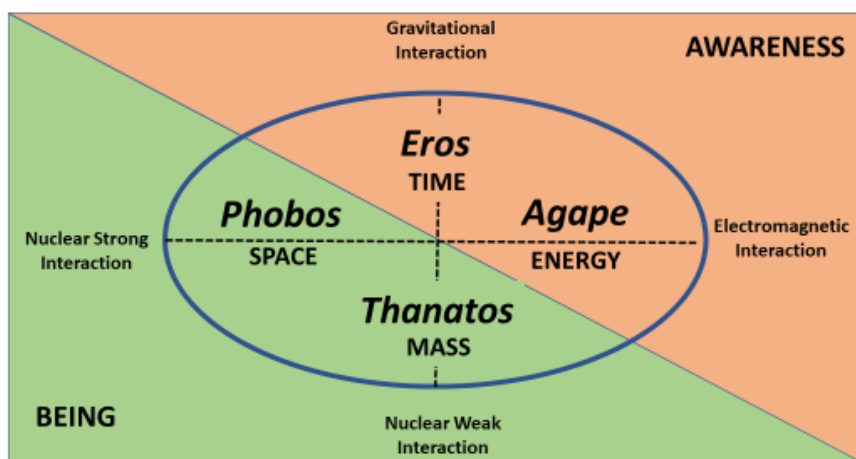


Figure 1. The tetradic structural field of all holons

NVCE should design learning experiences aimed at liberating us from the tyranny of our ego, that powerful agent that unceasingly makes plans for its own benefit, be it in the form of power, money, prestige or recognition, plans that we constantly feed and use to build our identity around them.

It is obvious that any advance in the “purification of mind” as defined by NVCE must automatically translate itself into specific behavior in real-life contexts. A purified mind leads to a more virtuous behavior in our life, that is, to a constant manifestation of generosity, compassion, acceptance, patience, sincerity and other qualities of our everyday conduct. This has to do with what Wilber calls “*Show Up*”, the process of externally manifesting our inner cognitive and spiritual development in terms of attitudes, behavioral patterns, relationships, social involvement and habits. Any educational advance in a NVCE sense should manifest itself in our students’ observable conduct. The practice of the aforementioned virtues is the only empirical evidence acceptable as a proof of a purified mind.

In one of the three scriptural sources of Vedanta, the *Baghavad Gita*, the doctrine of Karma Yoga was described as the true way for purification of our minds. Götz (1995: 490) holds that, “in a sense, the *Gita* itself provides an answer to the conflicting claims of modernization and traditionalism, science and spirituality, the material world and the self.” According to Götz, this appears in the *Gita*’s doctrine of Karma Yoga. Students need to develop a sense of duty so that they can fully engage themselves in accomplishing their works, but they have to learn how to renounce the fruits of those works. The most virtuous action is the one done without expecting any personal benefit. However, living according to these virtues is like swimming against the powerful current of our materialistically oriented societies. In fact, the whole idea of a curriculum realm of “purification of mind” understood as an anti-ego effort is clearly opposed to current education all over the world. Our educational institutions and philosophies base themselves on the idea that students – judged as “citizens in the making” – will enjoy the many things waiting out there for them, either in the form of material goods or other types.

Our young people fantasize about their future job positions, payroll or other monetary rewards, job promotion, prestige and a long list of related issues. They know that the day is getting closer when they finally enter the world of paid work, and that very few will actually be able to choose where they will work. The vast majority will accept the least bad of the options presented to them – if not the only one – and many will see how the years go by

without any option being available. Let us not allow education to be “the secret arm of this oppressive system, an institution complicit in the economic system which, instead of helping human consciousness and the balance of society, is serving the perpetuation of the status quo and, at the same time, hypocritically, of ignorance” (Naranjo 2014: 183). In relation to this idea, Miller (2002) talked about Maria Montessori’s cosmic education by echoing her words:

Modern societies, due to their pervasive materialism, have neglected the spiritual forces that animate the human being, and our institutions, particularly schooling, have become repressive and damaging, turning people into “slaves” of the machine rather than cultivating their spiritual sensitivity, she wrote. Modern people are ill prepared to deal with the great moral challenges of our age, and are unable to resist the demons of nationalism and war that threaten to engulf the world. To address this imbalance, Montessori envisioned a curriculum for elementary school students that she called “cosmic education” (p.6)

For many young people, and for the vast majority of adults, to have a relatively stable and “decently” paid job is the goal. It matters little if the economic activity in which that job is inserted contributes or not to the degradation of nature, or if it gets close or not the limit of fraudulent, or if it is a direct or indirect source or not of oppression against people. When Edgar Morin explained the reasons why the education of the future should “teach an ethic of the human race”, he spoke about how “the weakening of global perception leads to that of responsibility and that of solidarity” (Morin, 2011: 54-55), and of “(...) the false rationality that, used in the economy, has led to environmental disasters (id.: 58-62).

In fighting against *Phobos* and in favor of *Agape*, NVCE also educate for peace, which requires the awakening of an ecological awareness in students as well as the development of attitudes against voracious consumption or a ruthless competitive vision. Without a true spiritual dimension in our educational aspirations, not very much can we expect from any teaching effort aimed at social responsibility, equity, justice, or community wellbeing. Young people should know that it is possible to be an entrepreneur or to be a rich person and, at the same time, being honest and respectful of the natural environment and the wellbeing of our fellow human beings. Perhaps in this way some of them would feel inclined to move away from jobs based on the spread of fear, on the plundering of natural resources or on the mobilization of the worst tendencies of the human being, such as greed, anger or envy. The best job is not the one that provides us with the most money, but the one that causes the greatest wellbeing -or the least harm – to most of us.

By erasing any trace of spirituality from the educational scene, we make it easier for materialism, the desire for consumption and the dictates of the market to reign freely in the minds and hearts of the new generation. It is difficult and painful to live in a world based on the permanent stimulation of desires. Instructionally speaking, the least we should do is to raise a debate in the classroom and make young people think about where all this is leading us to, and to help them free themselves from the slavery of certain tricky aspirations, such as accumulating material wealth, assuming that happiness depends on it. What does “success in life” means? Is there a greater or more desirable aspiration than that of not harming anyone, always doing good and helping all beings?

### **3.2. Second curriculum realm of NVCE: *Controlling the Mind***

A central element in Ken Wilber’s theory is “States of Consciousness.” Following spiritual traditions such as Vedanta, Kashmir Shivaism or Vajrayana (Tibetan Buddhism), Wilber points

out that there are three states of consciousness, and they would correspond to (1st) *waking*, (2nd) *dream* and (3rd) *deep sleep*. In accordance with some tenets of those traditions, each state is associated with a “energy substratum”: physical or “gross” for the *waking* state, “subtle” for the *dream* state, and “causal” for the *deep sleep* state. In agreement with the explanation given by some spiritual traditions, Wilber adds two more states: (4th) *witness* and (5th) *nondual*.

This terminology is often rejected by those who adhere themselves to a rigid scientific-materialist vision, and it is not surprising that the educational institutions almost completely ignore the reality of the states of consciousness. The *Wake Up* process, as Wilber calls it, receives very little attention – if any at all – within modern educational institutions. However, the existence of several states of consciousness is a fact, and these states determine which realm of reality is accessible to consciousness at a given moment, that is, which realm (gross, subtle, causal) can be observed and interpreted from the stage of growth reached by consciousness. If the stages of consciousness determine the “epistemological position” from which the subject interprets a spectrum of objects, the states of consciousness delimit the “ontological spectrum” available at each moment for the subject.

Given the importance of this point, it is convenient to explain in more detail what we mean when we talk about expanding consciousness and its different states. The measurement of brain wave frequencies offers a scientific picture of the states of consciousness and their underlying energetic realms. Each state/realm correlates with different frequencies. From “gross” to “causal”, the “density” of the underlying energetic body decreases, thereby losing “thickness” and gaining “subtlety”. The less “dense” the energetic body underlying a state is (using the terms of spiritual traditions), the lower the frequency of synaptic exchange pulses (using the terms of neurophysiological research). The Gamma and Beta waves predominate in the waking state, and the Alpha and Theta in the dream state, while the Delta waves are typical of the deep sleep state. Although all of them coexist in the brain simultaneously, there is always one prominent frequency.

The states of consciousness, in Wilber’s approach, delimit which domain of reality has a certain priority, so to speak, at a given moment of consciousness. In other words, these *states* tell us which specific realm (gross, subtle, causal) is being observed and interpreted. However, observation and interpretation are cognitive operations determined by the *stage* reached by consciousness (as we will see in the subsection 3.3). As we said before, states of consciousness delimit the most readily available “ontological spectrum”, while stages of consciousness delimit the “epistemological stance” from which to observe and interpret this spectrum of objects.

*Grow Up* is the process through which the subject is “objectified” once and again, as he/she ascends towards the next stage by objectifying his/her previous self in the old stage. On the other hand, *Wake Up* is the process in which the object is “subjectified”, since it consists of a progressive elimination of false identifications, until the complete dissolution of the subject/object duality occurs (the nondual state), making consciousness recognize itself in everything (either *gross*, *subtle* or *causal*), since everything is made of the same substance: consciousness itself.

Not only do we go through all the states of consciousness every day, but also all of them are accessible to the individual at all times. The *waking* state / “gross” realm and a portion of the *dream* state / “subtle” realm -the portion that takes place when we think or immerse ourselves in our dreams, thoughts, fantasies or plans – constitute our habitual space while we are awake, about sixteen hours per day or so. The other portion of the *dream* state / “subtle” realm -when we have dreams during the REM sleeping phase – lasts between four and six hours each night. The *deep sleep* state / “causal” realm corresponds to the Non-REM sleeping phase, although it



can be said that we are in this state every time we find ourselves in the interstitial space between two thoughts, that is, every time thought disappears.

The latter idea is very important. *Deep sleep* state is the state of authentic peace. *Deep sleep* is not “absence of consciousness” but “consciousness of absence”, when only pure consciousness remains because there is no object present, no sensation, no perception, no thought, no emotion, no feeling, no oniric content. This state refresh us and gives us strength for the next day.

### 3.2.1. *Mindfulness and meditation in NVCE*

Controlling the mind through the turning inwards of our abilities of attention and concentration should be essential for a NVCE. In this respect, the key elements are learning how to focus our attention, how to meditate and how to observe our inner mental functioning like *raja yogis* do. Schools must embrace any practice oriented towards experiencing bodily and mental stillness in the “now”. Should educational institutions be truly interested in fostering students’ inner peace, they should favor the abandonment of the agitation of the body and mind through meditative practices. If we do not teach children how to look *inside* themselves, how to witness the dynamics of their minds and how to explore it for themselves, we are condemning them to look the world *outside* through distorted lenses. Flanagan et al. (2012) said that some writers note that, at a basic level, children have limited opportunities and space for reflection and contemplation in their busy lives, something they feel intuitively that must be detrimental to the young person’s development. The authors echoed words from philosopher and poet O’Donohue:

If you look at the educational system and you look at most of the public fora in our culture, there is very little time or attention given to what you could almost call learning the art of inwardness or a pedagogy of interiority (O’Donohue 2007, quoted in Flanagan et al., 2012).

Throughout all school years, teachers and parents make a constant demand from their children/students: “get concentrated!” Thus, “the first thing the teacher has to do – Aurobindo remarked – is to accustom the pupil to concentrate attention” (vol.1: 404). Children’s concentration on the task seems to be a basic requirement for a good performance. However, who – and when – has taught children to concentrate? Children and adults, if they are going to excel at something, it will be in what they practice most regularly, especially if they have received some training for it. Unfortunately, most of us are very good at the “art” of distraction. Many authors do not hesitate to consider the propensity of our children and youth to distractions as a true “epidemics of modernity” (Ruff, 2005). School should promote the meditative practice, which has shown its benefits over the millennia. As Naranjo said (2014: 170) “we should have an education that favors the contemplative disposition of the mind, and not only its intellectual and psychological aspects.”

In a clear correspondence with the *Samadhi* section of the *Eightfold Noble Path* exposed by Shakyamuni Buddha, this second curriculum realm of NVCE paves the way for the practice of meditation. Whether serenity-seeking oriented, analytical, contemplative, devotional or prayer-like, meditation is undoubtedly the engine of the spiritual path. If we do not teach our young generations to meditate, we are depriving them of what may be the greatest source of personal growth and spiritual awakening in their lives. Sitting meditation often appears as a paradigm of the practice of stillness in the present. In the Japanese Zen tradition, the term “shikantaza” represents this aspect of spiritual practice. When we sit (“*taza*”) we surrender the body in the immobility of the posture, and this bodily stillness will help to quiet the mind. But not only that.



“*Shikan*” means not doing anything other than what is being done in the now. Focusing and concentrating is the imperative of the present moment, a moment that has no duration because it is outside of time. Let us teach our students that, whatever they do, they must do it with total exclusivity, giving all their attention to it!

There are many different approaches to the use of mindfulness in educational contexts (see the *Handbook of Mindfulness in Education*, edited by Schonert-Reichl & Roeser, 2016), but NVCE would tend to promote those with a clear spiritual basis. Thus, NVCE can adopt the practice of correct mindfulness (*samma sati* in Pali) from the Buddhist point of view. It is interesting that *samma* means both “correct” and “integral”. The practice of mindfulness is “correct” if it is strongly linked to other practices mentioned in the first curriculum realm (Purifying the Mind, which would roughly correspond to the *Sila* section of the *Eightfold Noble Path* exposed by Shakyamuni Buddha), and those included in the third curriculum realm (Expanding the Mind, corresponding to the *Prajna* section of the buddhist path).

This practice of mindfulness can contribute to the gradual dissolution of three illusory separations that weave the fabric of our lives, namely, the separation between body and mind, between subject and object (the “root” duality), and between myself and others. We can overcome these three separations through the practice of *focused* mindfulness, *open* mindfulness and *empathic* mindfulness respectively.

In any case, as a training of the capacity to control our attentional resources, mindfulness is only a first step in the mastery of our mind. Meditation is the next step. NVCE would deliberately promote a meditative mind in our students so that they can reach the experience of oneness in different states of consciousness. In other words, meditation is the key practice to induce the mystical experiences that Wilber describes in the “*Wake Up*” process. From the NVCE perspective, education should help students to feel their deep interconnection with natural environment and with all human beings (what Wilber calls “natural mysticism”), with all mental realities (“subtle mysticism”), with their witnessing power as pure consciousness (“witness mysticism”), and ultimately, each student must ideally experience the absolute sameness of the *witness* and the *witnessed* (“nondual mysticism”).

Obviously, the vast majority of students would complete their schooling years without having reached the culmination of this sequence of mystic experiences of oneness or cosmic unicity. Each human being has a particular predisposition, sensitivity or propensity to experience those states, and education can only help to a limited extent. However, any advance would be a success. Education must plant the seeds of meditative practice in students’ hearts, with the hope that these seeds will flourish in adult life, their small fruits being a more serene, peaceful and joyful life, and their biggest one being the transcendence of individuality and the recognition of our true nature as Brahman.

This second curriculum realm of NVCE relates itself to the field known as Education for Peace, which implies promoting the practice of silence of the mind. Peace requires progressively breaking the ties of our conceptual mind, all those ideas, words, images, fantasies, fears and all kinds of mental objects that prevent us from recognizing that we are pure consciousness, the absolute subjectivity witness to all of them, but not identified with any of them. Schools should train students in their ability to detach themselves from enslaving thought, teaching them how to use thought without been enslaved by it. Inner peace reaches its maximum expression when we are able to “think without thinking”. Let us help students to know how to master their thinking, up to the point of knowing how to silence its noise completely.

### 3.3. Third curriculum realm: *Expansion of Mind*

Wilber defines “stage of consciousness” as the structural altitude reached by the development of consciousness in a holon. We can describe these stages metaphorically as the staircases of a ladder. Each staircase is cognitively more complex than the previous one. In the case of the human holon, Wilber has found numerous characterizations of these stages in various academic fields. In so doing, he has showed how the stage-like structure is intrinsic to whatever developmental “line” is under consideration. These multiple lines – also known as “streams” in Wilber’s theory – are equivalent to the so called “multiple intelligences” in Howard Gardner’s theory (1993), but also include other developmental sequences specified by research on emotional, ethical or artistic development.

A person can be at a certain altitude in one line, and at a different altitude in another line. The “average” altitude of all his/her lines would be something like the “center of gravity” that this person is currently enjoying within the spectrum of stages. Another element, “Types”, contributes to the dynamic nature of this theoretical characterization of stages. Within each line, the altitude reached by individuals may be subject to variables such as age or gender, but also to social or cultural variables of all kinds (like ethnic identity, religious beliefs or social class). Wilber defines “Types” as specific varieties within a line.

“Consciousness – our author explains – is not, in itself, one line [of development] among others, but the space in which all those lines emerge”:

Consciousness is emptiness, the opening, the clearing in which phenomena emerge, and when these phenomena develop through a series of successive stages, they form an evolutionary line (cognitive, moral, self, values). And the more phenomena that can emerge in the consciousness of that line, the higher the level reached in it will be” (2006, p.121). [A definition that he repeats almost literally in Wilber, 2017: 201].

In words reminiscent of Vedanta or even Mahayana buddhist discourses, Wilber says that “consciousness, ultimately, is not a thing, a process, an event or a system, but rather the opening or clearing in which things, processes, events and systems appear” (2017, p.201). From the perspective of humankind’s cognitive evolution at a historical or civilizational scale, we find Jean Gebser’s theory (2011) and its five stages: *archaic, magical, mythical, mental, and aperspectivic* (Wilber calls the latter “integral”). In the domain of individual cognitive development, we find theories such as Piaget’s and its four main stages: *sensorimotor, pre-operational, concrete operational, formal operations* (and fifth or *post-formal operations*, according to some neopiagetian researchers). And in the domain of social adjustment, just to mention one more “line” of development, Wilber mentions *Spiral Dynamics*, a theory originally conceived by Graves (1970) and later developed by Beck and Cowan (1996). This theory distinguishes up to eight axiological structures or worldviews, ranging from a first level of survival, focused on the purely physiological, to a higher existential transcendent level.

In Aurobindo’s opus magnum *The Life Divine* (2003, vols. 21-22) there is another theory based upon a sequence of cognitive development which is very important, both for Wilber and for our interest in depicting a spiritually oriented cosmic education. Aurobindo describes the consciousness spectrum from the “Unconscious” to the “Supermind” (see Figure 2). Medhananda (2022) summarized Aurobindo’s main argument with these words:

Divine Consciousness, Aurobindo claims, is “involved” in everything in the universe and progressively manifests itself at each stage of the evolutionary process from matter to life to mind, and ultimately, to Supermind. Up to this point, he claims,

humanity has evolved to the stage of mind, which is only a transitional stage on the way to the culminating stage of Supermind, upon reaching which we will realize that we are none other than the one infinite Divine Consciousness playfully manifesting as everything and everyone in the universe. Moreover, he argues that the evolutionary transition from mind to Supermind is inevitable, since the Divine Consciousness “involved” in the human mind will necessarily press forward until it can manifest itself here on Earth to the fullest extent (p.97).

Wilber often refers to Stages of Consciousness as “Waves of Consciousness” to highlight the fluid or wave-like character of their upward movement. Leaning on the vision of the biochemist Rupert Sheldrake (1990) and the philosopher Alfred North Whitehead (1978), Wilber affirms that we can understand these waves as kosmic habits inherited by morphic resonance and formative causation and by prehensive unification. This means that they first emerge as creative and undetermined novelty, but later become established as morphogenetic grooves inherited by later development.

Wilber has synthesized the contribution of different authors and, borrowing their terminologies, he has suggested a unified sequence of stages, as shown in figure 2. The “planetary and cosmic personality” mentioned by Bazaluk (2012: 155) roughly correspond to a person established in what Wilber calls “advanced vision logic” stage (see figure 2). Such a person is “capable of thinking tactically and strategically to the extent of planetary and cosmic scope and is also capable of organizing an interaction of the processes within a local material object and within the cosmos” (Bazaluk, id.).

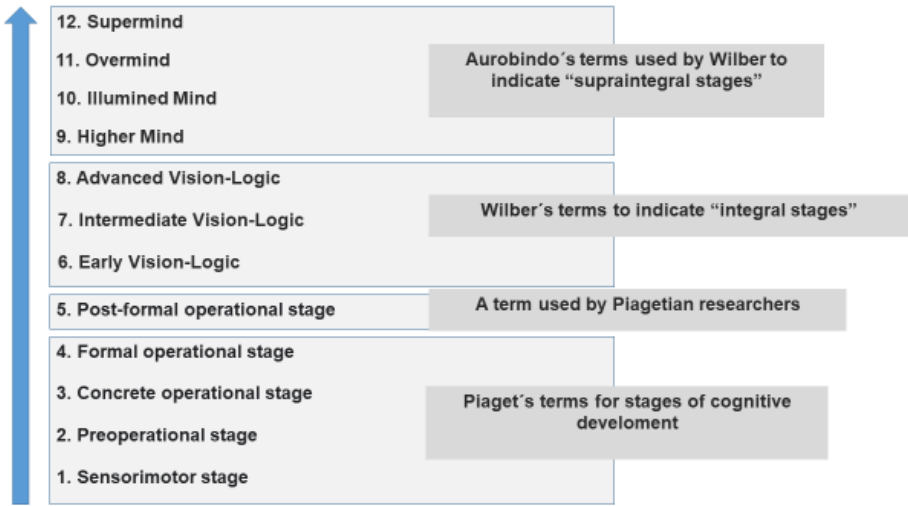


Figure 2. Ken Wilber’s spectrum of stages of consciousness based upon his unification of distinct terminologies related to cognitive development.

*Grow Up* is the process through which we move upwards. It is the process by which consciousness unfolds itself “vertically” as it were, becoming itself more and more encompassing, transcending and including the lower stages. The *Grow Up* process corresponds to the “self-Transcending drive” (Pulido-Moyano, 2021) mentioned in CET, where it is

associated to gravitational interaction. It is regulated by what CET described as the *Second Law of Holons* (all holons tend to transform themselves in a more complex holon with the minimum amount of time in this process), and the *Fourth Law of Holons* (all holons tend to make the most efficient use of energy for their adaptative purposes).

The *Grow Up* process amounts to a progressive increase in the complexity of consciousness, that is, an increase in the quantity and variety of objects, and in the number and kinds of perspectives on them. In this sense, a growth of consciousness equals to a qualitative enrichment of the representational capacity of the mind. The *Grow Up* process involves transitional phases between stages. During those transitional phases, any individual – any human holon – finds some obstacles in its upward movement due to – using Wilber’s terms – either “fixations” with the old stage or “allergies” in relation to the new one. At a cosmic level, Bazaluk (2012, quoted in Bazaluk & Kharchenko, 2018: 8) described this turbulence of transitional phases when he mentioned the cases of “Bioinert” and “BioIntelligent” matter:

[T]he “transition” states of matter complicate the systematization of knowledge, because, on the one hand, they are structurally and functionally the highest structures of the “mother” state of matter, on the other hand, they are included in the more perfect blocks of the “daughter” state of matter.

“Fixations” and “allergies” are nothing but resistences to change. As such they are due to what CET called the *First Law of Holons*, in virtue of which “all holons tend to conserve the space they occupy”, and the *Third Law of Holons*, in virtue of which “all holons with mass tend to conserve it” (Pulido-Moyano, 2021: *ibid.*).

Wilber introduced the *Clean Up* process in his Integral Theory precisely because those “fixations” and “allergies”, those critical relationships with “mother” and “daughter”, must be healed in order to get an adequate stabilization of the upper stage. We will not develop here the intricacies of the *Clean Up* process in Wilber’s theory. Suffice to say that it is necessary to face the “shadow” side of our psychic configurations, because this cleaning up plays a crucial role for a successful *Grow Up* process.

In sum, “Mind expansion” corresponds to the *Grow Up* process in Wilber’s terms. For NVCE, *Grow Up* is the training of the mind functioning by which our cognitive potential can reach its maximum level. In this respect, most of the classical cosmic education models are perfectly valid, in the sense that they talked about an increase of holistic and global thinking accompanied by an increase of social sensitivity. “A more evolved mind for a more compassionate society” could be the motto. Let us stop producing narrow patriotic minds through our national educational systems. We need citizens of the universe equipped with the most advanced minds.

NVCE shares the idea that “the object of the cosmic education is the permanent improvement of the intelligent matter of the Earth” (Bazaluk & Blazhevich, 2012: 153). However, the ultimate purpose of NVCE is to help students to reach the most important goal of their lives, namely, the knowledge of the absolute or Brahman (or God, Tao, Buddha Nature or whatever name we use from so many spiritual traditions). In that sense, NVCE would deliberately promote a kind of synthesis of yogas through which we can discover within ourselves our perfect nature as God.

NVCE is in favor of any cognitive enrichment of our intellect and any growth of our mental representational abilities only insofar as they contribute to our knowledge of Brahman or, at least, to purify our minds and hearts so that we can help others by improving life conditions in this world (the first curriculum realm).

When Bazaluk and Kharchenko (2018: 9) say that “in the philosophical tradition, knowledge is the way to the Divine”, we suppose they refer to the dualistic traditions that view knowledge as a gradual progression towards our final union with God. In any case, knowledge and rational analysis are mere instruments in Vedanta, used to discover or recognize that we are God already, so there is no God waiting for our union with Him/Her. To some religious people this can sound even blasphemous, but we are God-substance (or Consciousness) already. Many layers of mental conditioning veil this essential truth, and that is why we have to use the mind “against” itself, dissolving those layers. This path is *Jnana Yoga*, literally the “Yoga of Knowledge”. Thus, the “way” to the Divine is ultimately a “no way”, because it is beyond any space, time or causal constraint.

Here we can see the radical difference between any previous model of cosmic education and a NVCE. All models of cosmic education described in the last 150 years have been conceptually built around what here we have called, following Wilber’s terms, the *Grow Up* process. All of those models failed to separate mind from consciousness, a mistake also inherent to current neuropsychology and other cognitive sciences.

NVCE demands a strong articulation between *Grow Up* and *Wake Up* processes, which ultimately is an articulation between *Knowing* and *Being*. If we teach our younger generations how to reach the deepest meditative state, they will know how to “dissolve” their minds, an experience in which any differentiation between *knowing* and *being* simply disappears. This temporary experience of mind dissolution is the most precious treasure a human being can enjoy in this life. We can formulate the basic idea in very simple terms: in dissolving the mind, I discover that I am not my mind. This discovery makes me utilize my mind in much more efficient, healthy and virtuous ways, both for “my own” benefit and for others’ benefit.

On the one hand, *Grow Up* is the process by which *subjects are objectified*, so to speak, or put it in other words: I grow up insofar as I am able to observe myself, analyze myself, take some distance from myself and, thanks to this distance, I make a progress, transcending my previous self. On the other hand, *Wake Up* is the process by which *objects are subjectified*, so to speak, or put it in other words: I wake up insofar as I can experience “oneness”, as we have described it above.

It is a fact that human minds can become more and more holistic, more and more global in both a planetary and a cosmic sense, by increasing the scope of their representational power, and by deepening their understanding of more complex realities. However, the ultimate goal of human life, in terms of nondual Vedanta philosophy, is the recognition of our true nature, that is, God-Consciousness. The only way to reach this goal is by inducing the absence of all mental activity. Mind, our extraordinary instrument for survival, must be transcended. Consciousness is not a by-product of mind but “mind at peace”, and mind is “consciousness in action”. They are not two. As we said in the previous article:

Like any “material” object, the mind is just a type of modulation of consciousness. More specifically, the mind is a type of activity, but never an entity itself. This activity consists of sensing, perceiving, and thinking, that is, being aware of things/objects. When we say “I am aware,” we mistakenly assume that the “I” who is aware is an individual separated entity -an *ego* – that has the quality or property of being aware. In so doing, we simply ignore the fundamental truth that the only “I” that is aware is consciousness itself, not me, not you, but consciousness (Pulido-Moyano, 2021: 98).

## Concluding Remarks

The core message of Vedanta – that Man is essentially divine – is exceedingly valuable, and therefore, as admitted by Ashokananda, “we believe that it is going to be one of the major tenets of the future religion. I am almost willing to say that the future religion will fail to realize itself, unless the belief in the divinity of one’s own nature is emphasized” (2019: 147). NVCE’s overall purpose is to nurture this belief in new generations.

NVCE could help students to free themselves from their fears, which is the same as helping them find their true nature or recognize themselves as the pure consciousness or pure presence. Obviously, this would require a complete transformation of educational thought, not to mention the training of a new generation of teachers.

It is our contention that this world has no future unless spirituality becomes the substrate of educational processes. NVCE would be just a way to raise the educational building from spiritual pillars. In NVCE, to educate is to guide others and ourselves on the path that leads to the nondual experience. Paradoxically it is not a state that we can reach, since we cannot achieve something that we have already! It would be more correct to speak of a recognition or a remembrance of the non-duality of reality. This recognition is only possible from the practice of stillness. That is the rationale behind the second curriculum realm in NVCE.

NVCE invites us to commit ourselves to the new moral or categorical imperative that Wilber points out for each one of us: “act as if your behavior were to form part of a fixed structure that governs all future human behavior” (2015: 103). To a certain extent, NVCE is a social and educational initiative that promotes a sort of “spiritual activism.” Vivekananda used to say, ‘My religion is to learn.’ His master, Ramakrishna, maintained that life, from beginning to end, is one term of education in “the university of nature”. As Gnanaswarananda reminded us:

We are here on Earth for education. From the very first day to the last we are going through different phases of it. We are turning over leaf after leaf in the vast book of experience. We may yet have to go through many more lives to ‘graduate’, to manifest our Divinity. It is the manifestation of our inner, potential perfection which is the goal of all education. If education does not lead us towards that goal, it only confirms and consolidates our ignorance (id.: 48).

According to our *Consciousness Endomitoses Theory*, the frame of reference for NVCE, the life of a holon is the path this holon has followed in solving the inner tension between its original *being-awareness unlimited nature* and its acquired *space-time limited condition*. In nondual vedantic terms, this means that our life is the path we must walk in attempting to rediscover our true divine nature, the ultimate goal of life. The behavior of any holon is aimed at resolving that inner ontological tension, which basically consists of restoring a state of equilibrium. NVCE should facilitate this process of equilibration. Only a *Nondual Vedantic Cosmic Education* will enable us to dissolve all our *imaginary* acquired self-limitations so that we can recognize our *real* eternal divine nature and live on the Earth in accordance with this recognition.

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# Interplay of the Public and Private Sectors in the Development of Outer Space

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Teleshun, Iaroslav and Oleg Batrymenko (2023) Interplay of the Public and Private Sectors in the Development of Outer Space. *Philosophy and Cosmology*, Volume 31, 82-95.  
<https://doi.org/10.29202/phil-cosm/31/7>

*The article presents the results of a study of the interaction between the public and private sectors in the field of outer space exploration. The purpose of the study was to identify the peculiarities of interaction between public authorities and private companies involved in space activities. It has been established that all leading space powers create favorable conditions for attracting private companies to space exploration. The main areas of space activity that are most attractive for private investment are identified: 1) production, launch and operation of spacecraft and launch vehicles; 2) production and operation of ground equipment; 3) space research; 4) satellite observation of the Earth; 5) TV and radio broadcasting and lease of repeaters; 6) satellite internet; 7) mining in space; 8) space tourism; 9) space waste management; 10) cargo delivery to Earth orbit, etc. The current state of the space industry in Ukraine is determined. The main obstacles to space commercialization in Ukraine are also highlighted: 1) legal regulation lags far behind and does not meet the needs of space activities in Ukraine; 2) international agreements are not in line with the level of national regulation of advanced countries and new global trends; 3) Ukraine's space industry is focused mainly on less profitable areas of the space economy, which reduces the attractiveness for private investors; 4) there is no clear distinction between national interests and commercial activities in space; 5) mechanisms for coordinating private, state and public interests in the context of space commercialization are either absent or extremely ineffective; 6) there are no effective mechanisms for attracting foreign capital to space exploration. The authors identify two main competitive models of the interplay between the public and private sectors in space exploration: "American" and "European." It is emphasized that both models can serve as a*

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*model for the space policy implementation in Ukraine. However, given a number of considerations, it is determined that the “European” model is more optimal.*

*Keywords: space economy, space industry, space activities, space policy, public and private sector, business, public authorities, commercialization of space, Space industry of Ukraine*

Received: 16 June 2023 / Accepted: 13 July 2023 / Published: 15 October 2023

## Introduction

Several centuries ago, thoughts and dreams about space exploration were the prerogative of scientists and science fiction writers, but today, it is a commonplace that almost everyone can relate to. And if, in the 18<sup>th</sup> century, the idea of a “man in space” was a product of the vivid imagination of science fiction pioneers F. Godwin and J. Kepler (in the novels *The Man in the Moon* (Godwin, 1971) and *Somnium* (Kepler, 1967), in the 21<sup>st</sup> century space tourism is almost ordinariness.

The world is changing, technologies are changing, but the human desire to learn new things and find answers to eternal questions remains unchanged: “what is space?”, “what awaits humanity beyond Earth?”, and “how to reach the stars?”. However, if in the second half of the 20<sup>th</sup> century the main participants in space exploration were states, today, in addition to nation-states, the private sector is also a participant in the space race. Outer space has ceased to be a sphere of interest exclusively for the state, giving way to other influential actors in the process of making administrative-managerial decisions at both the national and international levels: corporate entities. The interest of transnational corporations in the exploration of outer space, as well as their growing influence on the domestic and foreign policies of national states, is not a new and unique phenomenon. In 2000, the head of the Secretariat of the International Political Science Association, W. Lafferty at the annual conference of the IPSA proposed the concept of “corporate coup” to characterize the impact of corporate entities on socio-economic and political processes in the world (Lafferty, 2000). Twenty years later, big business has become an integral part of national space programs, and the concept of space tourism is not surprising to the average citizen. As the Ukrainian journalist V. Nekrasov aptly noted, “It took humanity forty years to send the first tourist into space after Yuri Gagarin, and another twenty years for private companies to learn how to send tourists into space” (Nekrasov, 2021).

Today, the space industry is perhaps one of the most promising sectors of the economy. The country’s membership in the elite club of “space powers” is extremely prestigious and status-based and, to some extent, reflects the industrial and intellectual potential of the state. To strengthen their competitiveness in the international arena, national governments are creating favorable conditions for business participation in space activities, pursuing several goals: 1) stimulating the development of this strategic industry; 2) attracting additional investment; 3) commercializing the space industry; 4) partially shifting the “financial burden” to the private sector, etc.

Ukraine is claims for a membership in this elite club, and therefore must be prepared for incredible competition in space exploration. Given Russia’s aggression against Ukraine and the difficult socio-economic and political situation, the Ukrainian state cannot be the sole beneficiary of space activities, and therefore needs the support of all stakeholders. Only the involvement of all interest groups (private sector and civil society) and the accumulation of

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all available resources (intellectual, technical, financial, etc.) with their subsequent effective use will ensure Ukraine's place in the "league of space powers."

Understanding the nature of the interaction between the public and private sectors in the field of space exploration on the example of the leading space powers will allow us to propose an optimal model of such relations for Ukraine.

### **World experience of interplay between the public and private sectors in space exploration**

The current "space race" is not so much about a rivalry of superpowers seeking to demonstrate their technological, industrial, military and ideological superiority over their opponents as it is a competition between governance models and mechanisms for involving all stakeholders in space policymaking. A few decades ago, space exploration was the prerogative and "duty" of the state alone. This was clearly enshrined in the fundamental international document on space law: The Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and Other Celestial Bodies (or Outer Space Treaty of 1967). Article 1 of the Outer Space Treaty clearly states that outer space is open for exploration and use by all "States without discrimination of any kind, on the basis of equality and in accordance with international law, and there shall be free access to all areas of celestial bodies" (Outer Space Treaty, 1967). Today, space exploration, due to its conditional accessibility and commercial attractiveness, is a subject of interest to the private sector, which is both a competitor and a partner of the state in this area. As a result of this trend, relevant government agencies are increasingly relying on the success of business in space exploration and taking its interests into account when developing their programs. In turn, the commercialization of space activities has led to the emergence of a new sector of the economy: the space industry. And the competitiveness of national space programs largely depends on the effectiveness of interaction in the "authorities – business – civil society – individual" system.

Before proceeding to characterise the relations models between public authorities and the private sector in the field of space exploration in different countries, it is necessary to define the content of the basic concepts: "space activities," "space policy," "space economy" and "space industry." Space activities in the broadest sense are the study of outer space and celestial bodies and their use for practical purposes, carried out with the help of space technology (Netska, 2021). However, this type of human activity is not limited to outer space and can extend to the Earth and other celestial bodies, provided that it is related to the launch of space objects, their operation and return to Earth. The Law of Ukraine "On Space Activities" provides a more detailed definition of this concept. According to Article 1, space activity is "scientific space research, use of outer space, development, production, repair and maintenance, testing, operation, management of space objects (including their units and components), ensuring the launch, launching and return of spacecraft and their components from outer space to Earth" (Law of Ukraine, 1996). In turn, space policy in the broadest sense is the activity of public authorities aimed at carrying out space activities. However, world practice shows that, in addition to national states, coalitions of countries and international organizations are involved in space activities: specialised UN agencies, intergovernmental, non-governmental and regional international organisations, etc. (Bezzubov, 2018). Thus, it is reasonable to say that space policy is the process of making the administrative-managerial decision at the level of a state, a coalition of states, or international organizations regarding the use of outer space for both civilian (scientific, commercial, etc.) and military purposes.

Equally interesting are the approaches to defining the concepts of “space economy” and “space industry.” There is some terminological uncertainty, as active business participation in space programmes is a fairly new phenomenon that requires further scientific and theoretical substantiation. For example, the terms “space economy”, “space business” or even “satellite industry” are used synonymously with the concept of “space industry”. However, the concepts of “space business” and “satellite industry” are narrower, as they only take into account the production and launch of satellites and launch vehicles. Instead, the term “space industry” is much broader and encompasses various sectors that are directly or indirectly involved in the exploration of outer space. In our opinion, the most appropriate approach is to define the space industry as a sector of the economy that provides space-related goods and services (Schrogl et al., 2010). This definition goes beyond a narrow understanding and does not limit the scope of activities to the production and maintenance of space equipment (Bromberg, 2000). All public and private players involved in the development, production, maintenance and provision of space equipment and other services related to space activities are space industry actors (Jolly & Razi, 2007). Accordingly, the space economy is the whole range of activities and resources that create value and benefits for people in the process of exploring, researching, understanding, managing and using space (OECD, 2012). Despite their similarity and sometimes used as synonyms, these concepts are different but also interdependent, just like “economy” and “industry.”

The low level of regulation of space activities and the high level of investment attractiveness make outer space one of the most promising areas for the private sector. And this is despite the high risk associated with both the use of launch vehicles and the aggressive space environment. After all, the commercialization of space exploration is a kind of “Wild West” frontier for big business, especially in the face of increasing competition in the “full world” (Daley, 2005).

The development of the space industry opens up not only a new area for business development and a new “package” of services for all groups of interests, but also makes it possible to use space technologies in other industries: meteorology, energy, telecommunications, insurance, transport, aviation, urban planning, etc. The space industry is not only a promising industry for commercialization in its own right, but also a powerful catalyst for the growth of other sectors of the economy. The factors that influence the rapid development of the space economy are (ESA, 2019):

- a) the public interest in space activities;
- b) an extremely high level of private sector investment in space enterprises, driven by the commercial attractiveness of the industry and the growing venture capital market;
- c) the number of participants involved in space exploration, including representatives of the private sector, is constantly growing;
- d) a constant growth of space industry revenues;
- e) the development of space commercial activities: small satellites/cubesats, micro launchers, space flights, etc;
- f) a significant competition and market volatility that threatens the “traditional” space industry (but which still generates the bulk of the industry’s revenues);
- g) a rapid development of the NewSpace philosophy;
- h) the integration of space into society and the economy leads to new socio-economic benefits for businesses and citizens.



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According to some experts, the following list can be completed by additional factors of the rapid development of the space economy (Rani, 2022):

- a) strengthening the relationship between space and climate change, where the space industry is a tool for combating climate change;
- b) increasing the dependence of national security and space activities;
- c) the rapid development of satellite internet and other telecommunication technologies;
- d) the prospect of mining on asteroids;
- e) the interest in waste management in space;
- f) the rapid development of space tourism, etc.

The space economy is extremely attractive for private sector investment. One of the largest US bank holdings, Morgan Stanley, estimates that in 2020, the space industry's capitalisation reached \$350 billion. By 2024, the industry's revenue could cross the \$1 trillion mark (Morgan Stanley, 2020). The British astronomer B. Cox provides no less impressive figures. According to his estimates, every dollar spent on space exploration already brings between \$7 and \$40 in profit, directly or indirectly (McFarlane, 2019).

No less important is the fact that today, private investment in space activities is estimated to be five times higher than government spending on national space programmes. According to the Euroconsult consulting group, spending on the space industry in 2022 increased by 9% compared to 2021 and reached a record \$103 billion. The top 10 countries and state unions with the largest space budgets are as follows: United States (\$61.967 billion), China (\$11.935 billion), Japan (\$4.898), France (\$4.204), Russia (\$3.417), European Union (\$2.599), Germany (\$2.527), India (\$1.934), Italy (\$1.736) and the United Kingdom (\$1.154) (Euroconsult, 2022).

The interest in space activities is due to the fact that the space economy, in addition to its own investment attractiveness, is to some extent an umbrella industry that contributes to the intensive development of other sectors of the economy: telecommunications, energy, transport, automotive, tourism, agriculture, etc. Space activities are becoming a kind of trigger for a qualitative technological transformation of all sectors of the economy, increasing their profitability and investment attractiveness both in the domestic and foreign markets. While in the 1990s, the most attractive industry for investment was the IT sphere, today it is the space industry that is claiming to become a trend in the global economy. This is facilitated by the constant reduction in the cost of space activities, the involvement of new start-ups in space exploration, and the rapid development of space technologies.

The following sectors of the space economy are of the greatest interest to the private sector:

- a) production, launch and operation of spacecraft and launch vehicles;
- b) production and operation of ground equipment;
- c) space research;
- d) satellite observation of the Earth;
- e) TV and radio broadcasting and lease of repeaters;
- f) satellite internet;
- g) mining in space;
- h) space tourism;
- i) space waste management;
- j) cargo delivery to Earth orbit, etc.

According to a report by an analytical and engineering company BryceTech, in 2019, about 75% of the global space economy's turnover was accounted for by space radio communications, the Internet, navigation and satellite Earth observation (BryceTech, 2019). According to the UK publication Aerospace Technology, this is why Luxembourg is among the 10 most active countries in the world in space. The Grand Duchy actively operates communications and remote sensing satellites and is home to the headquarters of two of the world's leading telecommunications satellite operators: SES (Société Européenne des Satellites) and Intelsat SA (Aerospace, 2015). In addition to Luxembourg, the top 10 states actively exploring outer space include the United States, China, Russia, Japan, the United Kingdom, India, Canada, Germany, and France (Aerospace, 2015). Among them, only China and Russia moderately involve the private sector in the development of the space industry, leaving key functions to the state. However, it is worth noting that there are also some attempts to integrate private capital into their national space programmes. In 2018, the Chinese aerospace private company LandSpace Technology Corporation carried out the first launch of the three-stage rocket, ZQ-1, but it was unsuccessful. All other launches that year (38 in total) initiated by the state were successful. For comparison: The United States made 34 launches in the same year, and Russia – 20 (BBC, 2019). In turn, the first private space company was founded in the Russian Federation only in 2020 – Success Rockets (from 2022 – SR Space), as a response to the termination of cooperation between NASA and the Russian Federation on the delivery of astronauts to the International Space Station as a result of Russian aggression against Ukraine and the occupation of Crimea in 2014. In the same year, the United States launched a reusable rocket, Falcon 9, produced by the American private enterprise Space Exploration Technologies Corporation. In the summer of 2023, SR Space announced plans to develop and launch the first private launch vehicle, Nebo, for suborbital flights, but most experts consider this prospect doubtful. All other countries actively involve the private sector in the development and implementation of their space programmes.

The European Union is actively working to strengthen the competitiveness of its private sector involved in space exploration. In 2013, the European Commission prepared a policy document “European space industry – competing globally in a complex sector” (European Commission, 2013), in which it proposed mechanisms to improve the competitiveness of the space programmes of the European Union and its member states. The European Commission made adjustments to the EU space programme and strengthened the role of European institutions in regulating the space industry for two reasons: 1) more than half of the European space industry's turnover depends on the commercial market. However, the space market does not follow classical competition rules and is heavily subsidised by governments. Direct support from the supranational union is needed to strengthen the competitiveness of the European Union's space industry with the space industries of the United States, China, and India etc.; 2) the belief that over the next decade, the EU and its member states will be one of the largest customers of the European space industry. Dependence on the “space product” of other countries is a threat to the security and defence of the European community.

Today, the European Union is taking systematic steps to strengthen its economy and space industry by commercializing space and implementing innovative solutions based on space data and technologies: targeted investment programmes in European small and medium-sized start-ups (e.g., the CASSINI initiative) (European Commission, 2022). As a result of this policy decision, the EU has invested heavily in its space industry: over €5 billion in 2007–2012, €11 billion in 2014–2020, and over €14 billion in 2021–2027. According to

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European Commission analysts, COPERNICUS, Galileo and EGNOS programmes will provide socio-economic benefits to EU citizens worth around €60–90 billion over the next twenty years (European Commission, 2013).

The European space policy defines space activities as a key means of modern existence and competition in the context of technological competition. Strengthening the competitiveness of the space industry by attracting the private sector will allow (European Council, 2023):

- a) to create additional jobs and attract private investment to Europe;
- b) to stimulate the development of science and research (knowledge economy);
- c) to strengthen other EU policies in the areas of security and defence, industry, digital technologies, etc.;
- d) to accelerate the recovery of the European economy after the COVID-19 crisis;
- e) to fight climate change more effectively.

According to the European Commission research, the European space economy employs more than 231,000 people, and the industry's value in 2017 crossed the €53-62 billion mark (European Council, 2023).

No less interesting for analysis is the model of relations between the private and public sectors in space exploration in the most successful space industry in the world – the United States of America. In 2020, President D. Trump issued the National Space Policy Directive, which clearly states that “a United States commercial space sector that leads in the global space marketplace is foundational to national strategic objectives that include increased and sustained prosperity, free market principles, enhanced international partnerships and collaboration, technological innovation, and scientific discovery, and is vital to United States and allied security” (White House, 2020). The document also proposes mechanisms for strengthening the role of the private sector in space exploration and its priority over the state, if it does not contradict the national interests and security of the United States: “prioritize partnerships with commercial industry to meet Government requirements through the modification of existing commercial space capabilities and services when potential system modifications represent a cost-effective and timely acquisition approach for the Government and are consistent with system and mission-security practices and principles” (White House, 2020). It is worth noting that the extremely important role of business in space exploration is also enshrined in other regulatory documents: SPD-2: Streamlining Regulations on Commercial Use of Space, SPD-3: National Space Traffic Management Policy, SPD-4: Establishment of the United States Space Force, SPD-6: National Strategy for Space Nuclear Power and Propulsion, SPD-7: the United States Space-Based Positioning, Navigation, and Timing Policy; executive orders: 13914: Encouraging International Support for the Recovery and Use of Space Resources, 13905: Strengthening National Resilience through Responsible Use of Positioning, Navigation, and Timing Services; US Commercial Remote Sensing Space Policy, NAO 217-109: NOAA Commercial Space Policy etc. (OSC, 2023).

The US experience in the interaction of private companies and state institutions in space exploration is illustrative. It is believed that this North American country pioneered the practice of involving the private sector in space activities. The National Aeronautics and Space Administration (NASA) has been working with private aerospace companies such as Lockheed Martin Corporation, Northrop & Grumman Corporation, Boeing Company and North American Aviation since the 1960s. For example, North American Aviation developed the X-15 experimental *rocket-powered aircraft*, which in 1963 rose to an altitude of 107 kilometers, 7 kilometers above the boundary of outer space. At the time, such cooperation

was usually part of secret military projects under the auspices of the US Department of Defence. The interplay between private capital and the government further intensified during the R. Reagan presidency (1981-1989), who initiated a long-term programme to develop a global missile defence system with space-based elements – the Strategic Defence Initiative (SDI), better known as the “Star Wars programme.”

The significant changes in relations between the authorities and business in space exploration occurred in the early 2000s. In 2003, the Space Shuttle Columbia (28 space flights – the shuttle was developed by the private company North American Rockwell) crashed during re-entry into the Earth’s atmosphere, which led to a temporary freeze of the manned spaceflight programme, and after a while to the closure of the Space Shuttle programme (in 2011). The years 2004-2010 are considered to be a turbulent period for US space activities. However, already in 2009, the National Aeronautics and Space Administration, at the request of the US Office of Science and Technology Policy (OSTP), convened a working group headed by Lockheed Martin CEO N.R. Augustine, better known as the HSF Committee. The commission was tasked with reviewing the United States’ manned spaceflight strategy and plans to ensure that the United States has a “vigorous and sustainable path to achieving its boldest aspirations in space (OSTP, 2009). On 22 October 2009, the HSF Committee published its report “Seeking of US Human Spaceflight Programme Worthy of a Great Nation” (NASA, 2009), which identified five main models for the development of the US space programme, with the priority model being the one involving private companies.

Business was involved in the development of flights to Earth orbit, while NASA remained responsible for flights beyond Earth orbit. The draft US budget for 2011 already reflects this initiative (US Government, 2010). In 2011–2015, the US government and NASA focused on supporting two main areas of private sector space activity: 1) development of manned spacecraft (over \$6 billion has been allocated to support the private sector) (Nekrasov, 2021); 2) delivery of goods to Earth orbit. In the first area, the interaction between the National Aeronautics and Space Administration and the private aerospace company Blue Origin is illustrative. In 2012, they jointly tested the engine for the New Glenn super heavy-lift reusable launch vehicle. In 2020, Blue Origin and NASA signed a contract to use the New Glenn for the next decade (Bartels, 2020). The second is the signing of a \$1.6 billion contract between Space Exploration Technologies Corporation, better known as SpaceX, and NASA for the transportation of cargo to the International Space Station. Supporting its own private aerospace companies allows the state to minimise its dependence on the space activities of other countries. As part of the Commercial Crew Programme, the US space agency has allocated \$2.6 billion to SpaceX and \$4.2 billion to Boeing to develop a manned spacecraft to stop using Russian Soyuz spacecraft to transport crew and cargo to the International Space Station (ISS). Economists estimate that every dollar invested in the US space programme brings an average of \$7 in commercial benefits over the next 18 years (BusinessViews, 2019).

Undoubtedly, the “American” and “European” models of public-private sectors cooperation in space activities are not exhaustive, and there are other approaches to space commercialisation. However, in our opinion, these two models are the most competitive and best suited to Ukraine’s domestic political agenda and foreign policy vector.

### **Ukrainian experience of interplay between the public and private sectors in space exploration**

Ukraine is a state with a glorious history of space exploration, but it is important that it has an equally famed space future. The answer to this question depends on many factors,

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including the competitiveness of the Ukrainian model of public-private cooperation in space activities.

Ukraine has been and remains competitive in the space technology market. According to some experts, in 1991, Ukraine inherited one third of the industrial space potential of the former Union of Soviet Socialist Republics (Krawec, 1995). Even today, at a difficult time for the domestic space industry, Ukraine is among the TOP 5 countries with a full cycle of rocket and space technology production (NAS of Ukraine, 2019). In addition, since independence, more than 150 Ukrainian rockets have been launched from various launch sites: Baikonur, Vallops, Plesetsk, Sea Launch platforms, etc.; more than 380 spacecraft were launched into Earth orbit, including the Mohammed VI-B spacecraft developed by Airbus Defence and Space at the request of the Moroccan government; a fourth stage upper stage engine block for the Vega launch vehicle was developed at the request of the European Space Agency (ESA); six space programmes have been implemented (though not fully), etc.

Ukrainian state institutions directly related to space activities (more than 30 space industry enterprises) are also world-renowned. These include Dnipro state-owned enterprises Yuzhnoye Design Bureau named after M.K. Yangel and Production Association Yuzhny Machine-Building Plant named after A.M. Makarov, Kharkiv-based JSC Khartron and SOPE Obednannya Komunar, Kyiv-based SE Kyivprylad, PJSC Kurz and PJSC Elmiz, Chernihiv-based PJSC *Chernihiv Plant of radio equipment, etc.*

Until recently, the space industry was a budget-forming industry in Ukraine. According to Horbulin's estimates, the industry's enterprises annually fulfilled more than 150 international contracts worth up to \$450 million. Even after Russia's aggression against Ukraine in 2014, taxes and mandatory payments to the country's budget "amounted to more than €1 billion, which was 10-15 times higher than the funding received under state space programmes" (Horbulin, 2020). And in the best years, exports of space industry products and technologies reached 60-75% of the industry's total turnover.

On the sixtieth anniversary of the first human space flight on 12 April 2021, the Day of Rocket and Space Industry of Ukraine, President of Ukraine V. Zelenskyy noted that there are two main tasks of the state in the space industry: "We must preserve everything that has been done by older generations. And at the same time, we must make every effort to ensure that the successes of the past years are not the only ones. Our generation must make a significant contribution to the development of the space industry" (Ukrinform, 2021). After all, in the context of full-scale Russian military aggression, the space industry is a key element of Ukraine's national security and defence.

Today, Ukraine spends slightly more on space exploration than African countries. For example, in 2016-2018, Ukraine spent about \$320 million on space activities, while Algeria spent \$278.5 million and South Africa spent \$68.3 million. This is partly a result of Ukraine's neglect of the most profitable sectors of the space economy (telecommunications, the Internet and satellite Earth observation); the outdated technological base of the domestic space industry; insufficient funding for the industry (at 30% of the planned level, for example, for the fifth space programme (2013-2017), €377 million was allocated out of the planned UAH 1109 million; the lack of an effective model of interaction between the government and business, which could partially compensate for the limited state spending on space activities; inefficiency of public administration, etc.

To a certain extent, these problems are a Soviet legacy, partly due to the lack of a systematic vision of the future of Ukraine's space industry among the state's leadership and relevant state institutions. The first space programmes of independent Ukraine were mainly focused



on preserving the potential inherited from the USSR: the foundations were laid for a system focused on the full cycle of rocket and space technology development, launching spacecraft for various purposes, their operation in Earth orbit, etc. (Horbulin, 2020). According to the director of the Space Research Institute of the National Academy of Sciences of Ukraine, O. Fedorov, the introduction of a new competitive model of space activities is a necessary step to “restart” the national space industry, where the main goal is not “strategic pursuit in the name of leadership” but the implementation of the sustainable development principles and customer focus (Surzhyk, 2019). According to the scientist, today the effectiveness of space programmes “...is assessed not by the number of launches, but by the answers to the following questions: how much will the security of the country and the region increase, what is the benefit of disasters forecasting or assessing emergencies, how to improve specific management decisions” (Surzhyk, 2019). This task is extremely important, because, as noted above, not only the “status” and prestige of Ukraine, but also the prospects for further economic development depend on the effective functioning of the space industry. The state and prospects of the space industry directly affect the quality of national security and defence, the effectiveness of implementing the principles of sustainable development (or, in the case of Ukraine, sustainable recovery from the consequences of war), the depth of resource monitoring, the systematic nature of environmental protection and climate change, the efficiency of the agricultural sector and the competitiveness of communication and navigation services, etc.

The current space race is a competition to improve positions in the international division of labour; a struggle for market share of space products and services; global competition of national governance models; a competition to expand foreign policy potential and strengthen the state’s regional positions. Therefore, the question of the need to find and further implement a model for the functioning of the national space industry that would meet the challenges and threats of today and be a structural element of Ukraine’s development strategy is rhetorical. The strategy of space activities should be focused on the realisation of the national interests of the state and the satisfaction of social needs, and in no case be a “hostage to historically established trends” (Horbulin, 2020). As O. Fedorov aptly noted, “we inherited not only the Soviet space potential, but also the way of thinking” (Surzhyk, 2019). The disadvantages of this inheritance need to be overcome, and the advantages preserved and multiplied.

Developing a competitive national space strategy requires taking into account a number of important factors, both global and Ukrainian: the transformation and commercialisation of space activities; the security component of the space industry in the context of full-scale Russian aggression against Ukraine; reorientation of the space industry to other markets (both foreign and domestic); reforming the space management system as a structural element of an effective public administration system; determining the foreign policy vector of Ukraine, etc.

According to V. Horbulin, the implementation of a competitive model of space activities in Ukraine involves the following steps (Horbulin, 2020):

- a) formulation of the strategy and tactics of Ukraine’s space activities as a component of the national development strategy of the state;
- b) building an effective vertical management of space activities in the state authorities system;
- c) reforming the domestic space industry;
- d) systematic state support for scientific and technical projects aimed at developing and modernising infrastructure as a factor in attracting foreign investment;
- e) creation and development of the domestic market of space technologies and information;



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- f) stimulating scientific research and innovative developments in promising areas of space activities;
  - g) harmonisation of programme and strategic documents with the European Space Strategy;
  - h) comprehensive update of the space legislation of Ukraine.

In our opinion, the implementation of a competitive model of space activities, in addition to the above steps, requires strengthening interaction in the system “authorities – business.” The socio-economic and political situation in the country, taking into account all internal and external factors, is unfavourable for active space exploration and the development of the resource-intensive space industry. However, despite this, it should be acknowledged that certain steps have already been taken to strengthen cooperation between the public and private sectors. In his interview, V. Taftai (Head of the State Space Agency of Ukraine in 2021-2022) stressed two important points that determine the prospects for implementing the model of government–business cooperation: 1) Ukraine has decided on its foreign policy course, and the State Space Agency of Ukraine plans to join the European Space Agency in 2024; 2) only in 2019, the Law of Ukraine “On Space Activities” was amended to allow private companies to operate in the space industry. The amendments to the law came into force in 2020 (Taftai, 2021).

According to Article 1 of the Law of Ukraine “On Space Activities,” the subjects of space activities are “enterprises, institutions and organisations of any form of ownership and legal form, including international and foreign ones, which carry out space activities” (Law of Ukraine, 1996). A private space entity that intends to carry out space activities is obliged to submit a declaration on conducting economic activities in the field of space activities to the central executive body that ensures the formation and implementation of state policy in the field of space activities. In turn, space entities, regardless of their form of ownership, are controlled by the state, which issues permits for certain types of space activities, exercises state supervision (control) over compliance with the legislation on space activities in Ukraine, and bears international responsibility for their activities in outer space, etc. (Law of Ukraine, 1996). Taking into account this law and other regulations governing the space industry in Ukraine, it can be concluded that “space activities can be considered as a type of economic activity with its own characteristics” (Netska, 2021). Article 10 of the aforementioned regulatory document establishes a list of types of space activities that require the permission of state authorities: testing (except for computer tests) of launch vehicles, including their units and components, and spacecraft; starting launch vehicles and/or spacecraft; control of spacecraft in Earth orbit or outer space; return of spacecraft and/or their components from Earth orbit or outer space to Earth (Law of Ukraine, 1996).

Despite changes in Ukraine’s legislative framework and the implementation of a mechanism for involving the private sector in space exploration, significant obstacles to space commercialisation remain: 1) legal regulation lags far behind and does not meet the needs of space activities in Ukraine; 2) international agreements are not in line with the level of national regulation of advanced countries and new global trends; 3) Ukraine’s space industry is focused mainly on less profitable areas of the space economy, which reduces the attractiveness for private investors; 4) there is no clear distinction between national interests and commercial activities in space; 5) mechanisms for coordinating private, state and public interests in the context of space commercialisation are either absent or extremely ineffective; 6) there are no effective mechanisms for attracting foreign

capital to space exploration, etc. For example, the Law of Ukraine “On State Support of Space Activities” does not meet the current needs and interests of all space actors (The Law of Ukraine, 2000). The law focuses exclusively on supporting the public sector of space activities.

As a result, Ukraine is losing the opportunity to implement competitive space industry projects in cooperation with the private sector, which would contribute to the security of the state and the development of related sectors of the economy: the private US–Ukrainian aerospace company Firefly Aerospace (founded by Ukrainian M. Polyakov in 2017) is one of nine private companies that send landers as part of the lunar exploration programme commissioned by NASA; Space 1000 – (founded by D. Rudenko), a closed community of entrepreneurs, IT specialists and top managers of leading Western companies specialising in launching collectible coins and precious metals into space; Spacebit, a private British–Ukrainian company (founded by P. Tanasiuk in 2017) specialising in the launch of small lunar rovers; SpaceVR, specialising in space exploration using virtual reality, etc.

Given the glorious history of national cosmonautics, the formation of an innovative and competitive commercial space sector can become both a symbolic and a real catalyst for Ukraine’s sustainable development and its emergence as a regional hegemon. Take into consideration the foreign policy vector of Ukraine, enshrined in the Constitution (Constitution of Ukraine, 1996), the “American” and “European” models of interaction between the public and private sectors in the development of outer space are more relevant. Given Ukraine’s historical heritage, governance system and aspirations to become a member of the European Union, as well as the lack of sufficient resources to implement the “American” model of space activities (US space spending per capita is \$73, EU – €10, and Ukraine – 2 hryvnias), the “European” model is the most optimal.

## Conclusions

The space industry is a marker of a state’s competitiveness in the international arena. Today, no country can compete for the top spot in space exploration on its own, without cooperation with other countries and international organisations. However, in addition to international partners, the space programme also has a domestic partner – business. Effective interplay between the public and private sectors in the development of outer space is one of the formulas for the success of the state. Ukraine is faced with the task of finding and implementing its own model of interaction between the state authorities and private capital in the field of space exploration to strengthen its competitiveness and direct space technologies and data to meet the socio-economic needs of its citizens. The evolution of interaction between space actors has gone through a cyclical path: from the interest of individuals and society as a whole to the competition of superpowers for the exploration of outer space, to the commercialisation of this industry and, finally, to the orientation of space services and goods towards the needs of society and humans. Understanding the nature of such interaction between space exploration participants allows us to find and implement an optimal model of such relations for Ukraine.

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## **Part 3:**

# **COSMOS AND HISTORY**

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### **Feminine Origin in the Cosmogonic Ideas of the Slavic and Eastern Philosophy: a Comparative Analysis**

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Petinova, Oksana and Violeta Svitlytska (2023) Feminine Origin in the Cosmogonic Ideas of the Slavic and Eastern Philosophy: a Comparative Analysis. *Philosophy and Cosmology*, Volume 31, 96-107. <https://doi.org/10.29202/phil-cosm/31/8>

*The article is devoted to a comparative analysis of the role of the feminine principle in the cosmogonic ideas of the Slavic peoples and the philosophy of the Ancient East, in particular, India and China, to the establishment of common and distinctive features of female personification. The authors conclude that the ancient tribal culture, which was based on the logic of nature, the maintenance of the world in unity and the balance of opposites, was much more favorable to women than monotheistic religions, which*

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*affirmed the sinful nature of women. Ideas about the origin and development of the universe occupy a central place in the mythological heritage, in the cosmic processes and powerful forces of nature, the unbreakable harmony of male and female principles can be traced, where male energy consists in the idea of fertilization, and female energy – in birth and creation. In every mythological system, there is a character of the Mother Goddess, who acts as a co-creator of the world and living beings, but with the establishment of the patriarchal system, the mythological paradigm undergoes changes, and the female principle is gradually recognized as secondary, or it was completely leveled in the processes of world creation. The archetype of the Great Mother reflects the functioning of human values and runs through the entire history of philosophy and culture.*

*Keywords: culture, cultural phenomena, collective consciousness, cosmogony, cult, mythological traditions, female personification, substance, Archetype of the Great Mother:*

Received: 8 August 2023 / Accepted: 2 September 2023 / Published: 15 October 2023

## Introduction

Ideas about the origin and development of the universe occupy a central place in the mythological heritage of all peoples. They are interesting as a product of the collective consciousness of humanity at a certain historical stage, and also as a significant factor that influenced the further socio-cultural life of the community, its value orientations. Cosmogonic myths are the result of the study of such aspects of existence as the world structure and the connection between its parts (synchronic approach) and the process of the emergence of all things (diachronic approach). Comprehension of complex things took place through the use of categories and cultural phenomena familiar to mankind, in particular, the dichotomy of male and female principles.

The current century was marked by the active exit of women “from the patriarchal twilight”. The need to affirm the equality of the sexes and overcome misogynistic views prompts a rethinking of the deep layers of culture – even a return to its sources.

The purpose of the article is to conduct a comparative analysis of the place and role of the feminine principle in the cosmogonic ideas of the Slavs, the Ancient East (in particular, India and China) and establish common and distinctive features in the female personification.

Modern studies of the role of women in the world include different contexts. For example, we can define as original the articles of L. Škof, which focuses on the possibilities of the embodiment of the feminine principle in our time, and considers the problem of the extreme vulnerability of women’s life in the midst of the ancient crisis of sacrifice and proposes a future matrix theology of incarnation (Škof, 2020). K. Sharma focused on the research positions of psychoanalytic jurisprudence through female and male images. The image of the law is that of the paterfamilias – the biological father, the sovereign, or God. In contrast, the researcher presents the image of the mother and analyzes its influence on the subject’s attitude to the law (Sharma, 2018). Feminist intervention in the debate about the relationship between human subjects and the divine ideal is carried out by R. Anderson, who challenges the concept of “God’s eye view” of reality as masculine (Anderson, 2007).

## Cosmogonic ideas in ancient Indian culture

In Indian culture, the categories of female and male are presented as polar opposites, but at the same time doomed to mutual attraction to each other. They are the primary foundations of



being: the male hypostasis is an expression of active creative power, the female hypostasis is a passive, stable nature, but it is no less important, because even the great Shiva is powerless without Shakti, the female principle (Madan, 1990).

Hindu beliefs are rich in images of goddesses, which are mostly associated with the earth, a symbol of fertility. According to an ancient Aryan myth, all living things were created as a result of the union of the earth-mother Prithivi and the sky-father Dyaus. From the womb of the earth, moistened by the families of Dyaus, all beings were born, which will later return to the earth again. Thus, in the image of Prithivi, the cycle of life and death is closed. The cult of this goddess later spread in Buddhism as well, which indicates great respect for her (Shaw, 2006: 237).

The goddesses who symbolized the earthly elements were considered patrons of procreation, took care of the plant and animal world. That is, they appear not only as the primary foundations of existence, but also actively involved in the course of life. In particular, rituals in honor of female deities, which are supposed to facilitate the birth of a child, are widespread. The combination of female and male potential in cosmogonic myths occurs through the performance of a marriage ceremony. As the researchers emphasize, goddesses are usually in a certain place, and male deities come to them from some distant territories at a certain time, which symbolizes the opposite qualities of permanence and movement.

In ancient Indian myths, the image of an androgynous creature that harmoniously combines the feminine and masculine elements is widespread. To this type of cosmogonic characters belongs Purusha – the proto-man-ginant. Rigveda tells that he was sacrificed, and from his body the universe was formed. This story has been interestingly transformed in Indian philosophy, which considers Purusha as male energy – consciousness devoid of material expression, combined with Prakriti – female substance. At the same time, Purusha does not control Prakriti, but only observes its cosmic development.

According to another concept of archaic androgyny, the birth of the World took place as a result of the division of one divine hypostasis into male and female. The land of Prithivi and the sky of Dyaus were also originally one until the god Indra separated them. Researcher T. Doronina notes that the gods of the “first order” can be defined as androgynous: these gods, in addition to actions of a global scale regarding the world system, single-handedly gave birth to the gods of the second generation, after which certain spheres of the world order were established, which took place at the next stage of the creation of the world – the stage of its division into Heaven and Earth (Doronina, 2012: 41).

According to E. Meletinskyi, veneration of the Mother Goddess was widespread in India, even in the pre-Aryan period. In Hindu mythology, this role was performed by Shakti (Devi), who had several forms, according to some facet of her personality. For example, Parvati is a good creative form responsible for fertility, while Kali is the personification of fury and destructive energy. The multi-faceted image of the goddess not only indicates the changeability of the feminine nature, but also encompasses the many significant roles she performs. The material symbol of Shakti energy is the yoni – an image or object that imitated the organs of the female reproductive system and was used in rituals. The opposite and at the same time the filling of the yoni is the lingam, a phallic symbol associated with Shiva.

The mythological traditions of India allow variability and duplication of functions by different deities. In this context, it is worth mentioning the Vedic Aditi, who is characterized as the personification of the universe and the mother of twelve gods. She controls the space from the earth's surface to the sky.

The cult of the Great Mother was also projected on ordinary women, who were considered her reflection. In the collection of ethical and legal norms of Manu, dated to the 4<sup>th</sup> century BC, despite the establishment of the varna division in it, several dharmas are dedicated to the respectful treatment of women:

- a) A teacher (asagua) is ten times more important than a teacher (...) a father is a hundred times [more important] than a teacher; however, the mother surpasses the respectability of the father a thousand times (Bühler, 2023:145);
- b) Where women are respected, there the gods are pleased; but where they are not honored, no sacred rite is of any use. Where the women belonging to a family live in sorrow, that family soon perishes; But that family, where they live without sadness, always prospers (Bühler, 2023: 56-57).

Thus, the suppression of the feminine leads to the fact that the gods turn their backs on the family, and an imbalance in relationships leads inevitably to the decline of the home (Bühler, 2023:56-57).

### **The beginnings of the world structure in Chinese cosmogony**

Chinese cosmogony derives the origin of the universe from the existence of dark, boundless and indivisible chaos (hundun). An interesting nuance is that the Chinese endowed this substance with creative potential: hundun is capable of self-evolving to the state of space (yuzhou). That is, Chinese philosophy does not have the idea of a diametrical movement or the struggle of different principles, which became the starting point of the creation of the universe. At the same time, hundun contains the cause of polarity in the form of yin and yang. It should be noted that later in certain branches of the philosophy of nature, the primordial state of chaos began to be associated with yin and the water element.

According to a more artistically detailed version, the embodiment of the chaotic substance is the world egg, which was split in half from the inside by the first ancestor Pangu – this is how the sky and the earth were formed. Pangu pushed these surfaces away from each other for 18,000 years, after which he died, and the rest of the natural structures were formed from his body.

The concept of yin-yang, which long ago went beyond the boundaries of Chinese cosmology, enriching world culture, was born within the philosophy of Daoism, and further developed in Neo-Confucianism. Two opposites, which permanently balance each other, arose on the basis of qi – a special substance and at the same time energy. Each of the two elements represents a number of distinctive qualities: Yin – northern shaded mountainside, earth, darkness, moon, cold, heaviness, softness, stability, right side, sleep, rest, autumn, winter, feminine. Yang – the southern illuminated slope of the mountain, sky, light, Sun, warmth, lightness, firmness, dynamism, left side, wakefulness, activity, spring, summer, masculine;

In the context of the covered topic, the following aspects are important:

- a) none of the two bases is marked as something unequivocally good or bad;
- b) yin is not more important than yang, and yang is more important than yin, they cannot exist without each other;
- c) division, according to the principle of opposites, is not absolute, because yin contains a particle of yang and vice versa;
- d) yin and yang interact in each person;

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- e) women are associated with yin, and men are associated with yang, but this division is also mobile. For example, older women are considered the personification of yang.

Therefore, the original interpretation of the concept does not contain direct discrimination. Over time, different philosophical currents began to differ in their opinions regarding the concept of yin-yang: “Some interpreters of yin and yang prefer to emphasize the non-dualistic, harmonious nature of the relationship, while others emphasize the imbalance, hierarchy and conflict built into the idea” (The Chinese Cosmos, 2023). Since it is possible to apply the yin-yang principle to anything in life, in practical terms this resulted in the establishment of gender, age and social hierarchies. For example, on the basis of the dual pairs “top – bottom”, “strength – softness”, women were required to be submissive to their husbands and older relatives.

As in ancient Indian beliefs, in China, there was a cult of deities associated with the earth. The most revered chthonic personification is the goddess Nuiva, who is depicted as a snake with a human head and hands. It was she who created people from yellow clay and taught them to continue the family. In addition, as a result of the transformation of her body, ten more deities were born from her entrails. According to the legend, Nuiva saved the world from destruction: when heavenly fire and water flows destroyed all life on the earth’s surface, the goddess, repairing and strengthening the sky, stopped the elements. Thus, she appears as the personification of great creative energy, strength and mercy.

The concept of divine marriage is also inherent in Chinese cosmogonic myths. For example, Nuiva married Fusi, who was also her brother. The holy couple was often depicted with entwined snake tails. Unlike European myths, the feminine and masculine elements in this union are not antagonistic. Considering the fact that Fusi taught people how to farm, fish and use fire for cooking, it is more about the co-creation and development of what the wife created.

The issue of harmony and following Yin and Yang on the path of humanity is explored in articles by authors of the 21<sup>st</sup> century (Chai, 2023); the historical processes of Chinese traditional culture are analyzed with the help of innovative approaches, which make it possible to delve into the essence and basic structure of Chinese traditional philosophy (Feng & Chen, 2023) and the origin of Chinese civilization and history through the prism of the main traditional philosophical teachings (Zhongjian, 2023). Modern researchers of the inner meaning of the ancient and culturally important symbol, Yin-Yang, relate it to the concept of the Jungian archetype. The results show that the qualities of the symbol supported the concept of the Yin-Yang archetype and were consistent with the Jungian concept of anima and animus (Ray et al., 2010).

### **Cosmogonic ideas in Slavic mythology**

Slavic cosmogonic myths have been preserved fragmentarily. In some places, they are reconstructed based on folklore layers and cultural artifacts. In a broader context, this is part of the Indo-European mythological heritage, so common motifs are found in this space. In particular, the ancient Slavs also derived the beginning of the world from the world egg, which split in half. We can see the echo of this belief in the Ukrainian tradition of creating Easter eggs, legends and fairy tales (“Egg-raitse”). Folk tales also tell that the birth of life occurred due to the interaction of passive water and active fire elements, which correspond to the female and male elements, respectively (the king-fire and the queen-water created the world).

The cult of the earth among the Slavs has the same character as Hindu beliefs. It is positioned as the Mother who gives life and nourishes. In addition, the earth takes life and receives the dead into its bosom. This role is well revealed in traditional folk art, such as in curses: "May the wet earth devour you" (Nomys, 1993: 194), "So that the land does not receive him" (Nomys, 1993: 194); or proverbs: "Let the earth and water weep for him, not me, the young woman" (Nomys, 1993: 372). The moistening of the earth, which appears in the image of the Raw Earth Mother, is a symbol of fertility and fertilization with heavenly liquid. The highest manifestation of personification is the practice of naming an earthly entity by a female name, which was used, for example, in orders.

The folklore heritage of all Slavic peoples leaves no doubt that the ancestors also personified astral bodies – the Sun, the moon, and the stars. A notable feature of the Ukrainian interpretation is the representation of the Sun in a female form. In particular, in carols that have preserved pre-Christian symbolism, the Sun is called the “bright maiden.”

Slavic deities cause conflicting opinions among scientists. As a rule, the debates revolve around whether a certain mythological character can be considered a god/goddess or whether he was just a spirit or in general some kind of generalizing concept; and how widespread their worship was. For example, there are several interpretations regarding Rod – Rozhanitsy. In particular, *me* is attributed the status of the main god from whom other deities originate. His sphere of influence includes the role of a great creator, the patron of fate, and possibly fertility. According to other sources, this is a spirit that cares about the well-being of the family and the happy fate of the descendants.

Views on the “nature” of the deity also differ:

- a) he is attributed with primordial androgyny, from which the female and male elements were later separated;
- b) at first, people worshiped Rozhanitsa – spirits or goddesses of fate, and the figure of Rod is a later patriarchal transformation;
- c) in the Christian literature of the 13<sup>th</sup>–16<sup>th</sup> centuries, the worship of both personifications is mentioned, that is, they coexist in the same cultural-time continuum. Rozhanytsia is used as a general name, not a proper name.

It can be concluded that the gender variability testifies to the archaic nature of the cult. The social system contributed to the activation of one or another form.

The personification of the Mother Goddess in the Slavic territories was Mokosh. She was considered the patroness of fertility, and therefore of women. Probably later, in some regions, this function was supplemented by the promotion of “womenes” crafts – spinning and weaving. Mokosh was married to Perun, the lord of the sky and thunder. One version of the myth says that Veles, an earthly snake-like god who was Perun's opponent, also fought for her.

The story of Morana (Mara) and Yaril is a classic example of the myth of the god of vegetation and spring revelry, who dies every year only to be resurrected in the spring. A similar scheme of interpretation of natural changes is characteristic of the period of the birth of agricultural culture throughout the Indo-European space. The divine couple, around whose relationship events significant for nature are formed, are the children of Mokosh.

The mythical story consists of several significant periods:

- a) birth of twins – brother and sister;
- b) the abduction of the brother by the god Veles, who raised him in his underground world;

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- c) the return of Yarylo to the earth, as a result of which spring comes;
  - d) the meeting of Yarylo and Morana, the birth of feelings between them;
  - e) a divine wedding corresponding to the summer solstice;
  - f) the period of happy family life, which is associated with nurturing the harvest;
  - g) the murder of Yarylo, either by Morana herself, or by Veles for adultery – it is autumn time after the harvest;
  - h) Morana builds a house from the body parts of a deceased man – an action symbolizing astral renewal (there are clear analogies with the act of sacrifice of the Indian Purusha and the Chinese Pangu);
  - i) without Yarylo, Moran wastes away and turns into a gloomy goddess of death – winter is coming. Eventually the goddess dies too;
  - j) at the end of winter, Yarylo and Morana are born again, a new cycle begins.

Thus, in this myth, the feminine and masculine are interdependent, their interaction is related to the idea of death and rebirth of nature, but Morana takes a more active position. Beliefs in Yarylo and Morana, with some regional variations, were widespread among all groups of Slavs.

Lada was also called the goddess of world harmony, the universe, beauty and love, or there are other names such as Zhiva and Rada. She was born from the Tree of Life (Heavenly Tree, Tree of Knowledge, Paradise Tree). It is Lada who is called the Great Mother and is depicted in a wreath of wheat ears and flowers, holding a red apple and grapes in her hand. On the head is a baby, which meant the embodied material world, and an apple (like an egg) is a symbol of the beginning.

According to ancient legends, every year Lada gives birth to a new Sun. Even in folk songs of Bulgarians, Romanians, Serbs, Lithuanians and other peoples, Lada is called “Great Goddess”, “Great Lada.” This goddess is mentioned in rites related to rain and also symbolizes the Goddess of fertility, love and marriage. However, along with the female hypostasis, there is also a male hypostasis – the God of the Omnipresent order, the husband of the Goddess Lada – Lado. He was called the God of life, marriage, love and well-being. Legends say that Lado turns into a cuckoo in the spring to bring people long life. Lado is a kind of mediator between the Sun and people.

At the same time, the deity Zhiv (Living) is also another name for Lado, the supreme ruler of the universe. As we can see, it is Lada (woman) who gives birth to the new Sun, and the man is the mediator between him and the people. Together they carry out the process of “creation”, in the unity of the Male and Female beginnings and form the Heavenly Marriage. The symbolism of Lada is a sown field (displayed in the form of a rhombus combined with the motifs and elements of the Sun, the Tree of Life and the image of the Goddess Oranta raising her hands to the sky). Our ancestors “worship Lada, the mother of Castor and Pollux, and the twins born from one egg, Castor and Pollux, which can still be heard in the most ancient songs: “Lada, Lada and Lel, and Lel and Polel”, singing this, they clap in the palm of your hand” (Information-analytical, 2023).

Researchers hypothesize that the myth of Lada has parallels with other myths, for example, ancient Greek ones, which mention the Goddess Latona (Leto), the daughter of the titans Kei and Phoebe, the mother of Artemis and Apollo. The Romans also compare Lada with Aphrodite, and the Scythians with Argimpasa. It is likely that she was depicted in Scythian clothes with a mirror in her hand – a symbol of the Sun, fertility and femininity. In Poland there is the Lada River, the right tributary of the Tanva, in the Vinnitsia region

the Lyadova is a tributary of the Dniester, in the Kyiv region there is Lake Ladava and a tract with the same name. Folk craftswomen depict the symbolism of Lada in folk art – on household objects, in folk clothes, in particular, on embroidery. In Ukrainian folklore, we find the words “Bless, mother Lado, call for spring”, and the name “lada” itself is formed from the Proto-Slavic word “lad”, which meant harmony and order. Gifts in the form of flowers and cookies were brought to the gods Lada and Lado. The well-being of the family and the birth of children depended on their blessing. To this day, girls in some regions of Ukraine gather in groves, meadows, near rivers, lead dances, sing songs and throw wreaths into the water. Wherever the wreath floats, the bridegroom will come from there.

Slavic mythology is multifaceted and reflects the deep cosmogonic layers of the worldview of our ancestors. The mythological worldview embodies the movement from chaos to order, from Heaven to Earth, which is carried out cyclically. A duality has been inherited since ancient times – a strong feminine element, which goes back to the roots of the Trypylian culture, and patriarchal elements, which probably belong to the Scythian-Sarmatian peoples who were engaged in cattle breeding. Mythology is a unique phenomenon in world culture. V. Voytovych is a well-known contemporary Ukrainian researcher of Ukrainian mythology, who in his writings reflects the folk beliefs, outlook, worldview and mentality of the Ukrainian people (Voytovych, 2014).

Interestingly, a symbol very similar to Yin-Yang is depicted on a miniature model of an ancient temple in the Cherkasy region, found by archaeologists. Historians note that this find is a creation of the Trypil culture and dates back to approximately 7000 BC. Currently, the artifact is in the exposition of the “Platar” museum. The model of the ancient temple of the Trypilians is probably a miniature copy of the ancient cult temple, has a dome-shaped roof, decorated with images of moon haze, resembling the horns of a bull, which was the totem animal of ancient farmers. And the walls of the temple are decorated with symbols similar to snakes, which create a composition very similar to the Yin-Yang symbol.

## **The archetype of the Great Mother**

Archetypes, as initial images, ideas, original forms, resonate with the philosophy of Platon and his “*eidōs*”, the traditions of Platonism, scholasticism, which considered the images that were the basis of human knowledge. Archetypes play a key role in the analytical psychology of K. Jung (The Archetypes, 1981). They act as structural elements of the collective unconscious and universal models that spontaneously determine human thinking and behavior. The basis of spiritual life is the experience that is passed down from past generations next, and is a set of archetypes. Archetypes, projected onto the outside world, determine the uniqueness of culture. K. Jung is considered to be the founder of studies of the Archetype of the mother, who advocates the position of correlation of this image with the image of the Great Mother or the Great Goddess.

The research of the archetypes of the Mother at the present stage is focused on different aspects and has a different orientation. For example, one can single out the direction of ecofeminist rhetoric, within which the archetype of the Mother is defined as a rhetorically strong image that motivates the protection and support of the environment. A gender-neutral metaphor may more effectively serve both the environmental and feminist interests of the ecofeminist movement (Lynn, 1994); E. Leslie (Leslie, 2001) advocates the fusion of the Goddess archetypes with consciousness-raising methods, rituals and skills for empowering women in groups, the correlation of the Mother archetype with the Goddess archetype. Based on the biblical story of Moses and the golden calf and the archetypal spectrum of the solar



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spirit and its earthly and corporeal aspects, Junges original symmetry is analyzed: the male with his anima and the female with her animus, united together in tandem (Bradley, 2017).

The archetype of the Great Mother unites the value field of the Slavic peoples and is reflected in the rituals, folklore, and traditions of the Slavs. The analysis of the archetypes of national culture and national mentality, the prehistory of the image of the Great Mother and its manifestations in the culture of various Slavic peoples makes it possible to assert that for many centuries, from the cohabitation of the Slavic peoples to their separation, settlement in different territories and the formation of separate ethnic groups, remains of the researched cult in folklore, traditional celebrations and everyday life. The Ukrainian people, together with other Slavic peoples, belong to the Indo-European or Aryan race, which, due to its spiritual abilities, has reached world-historical significance, and is the bearer of modern civilization.

The national mentality, language, traditions, and folklore reflect the peoples metaphysical connection with ancient beliefs. The image of the Mother causes contradictions in interpretation and interpretation, and is dominant in the collective experience. This archetype reflects both the aspect of fertility, abundance, sexuality and the aspect of purity, chastity. The symbol of the eternity of human existence, its guarantee was the idea of the Great Mother, because as long as she exists, life does not stop. Her image has various hypostases, which are embodied in different goddesses, which contribute to the knowledge of her multifaceted functionality and significance. As you know, in the pantheon of Indo-Europeans, the supreme position was occupied by the goddess, the echo of whose cult is preserved in mythology and folklore. The archetype of the Mother found its full reflection in the national mentality of various peoples and cultures. Historians associate it with primitive matriarchal cultures, in which the Great Goddess acted as the beginning of all living things and reflected the immanent connections of the mother symbol with nature. The mother in cultures and religions may not be depicted in human form, but in natural objects, the most popular of which are a tree and a mountain. For example, the Tree of Life, which is discussed in both Eastern and Western worldviews, has a feminine energy. It is the female primary element, reflected in the image of the Mother, that initiates world creation and gives rise to life.

In early pagan cultures, the mother finds a different image and often appears as a goddess along with her husband. So, for example, as we discussed above, the Slavs have Lada and Lado. The woman was the patroness of fertility, personifying eternal rebirth. She is also a role model of a wife and mother. The feminine embodiment of eternal life is conveyed in the relationship of spouse or mother and child. The Mother Goddess can have a direct connection to the chaos that comes from nature as the primordial state of things. The connection to chaos and life shows the ambivalence of the Mother archetype.

We can also compare the archetype of the Great Mother with the images of the Verkhovna Rozhanytsa and Berehyna. The archetypal structure of the Ukrainian mentality is a symbolic representation of the earth as a maternal, feminine beginning of existence. The archetype of the Great Mother reflects the functioning of human values and runs through the entire history of philosophy and culture. The forms of manifestation of the archetype of the Great Mother in the image of the goddess Marena in the ancient culture of various Slavic peoples are presented in the research of O. Ryzhova, who proves that throughout the history of the development of individual Slavic peoples, the remnants of this cult were preserved in their culture. Rites related to Marena have a lot in common among various Slavic peoples, the appearance of the goddess herself, her functions and significance are different. It remains a common cultural and axiological heritage, shows the dual nature of Slavic culture and life itself (Ryzhova, 2020).

## Conclusions

The beginning of the universe in archaic cosmological ideas is associated with the transformation of an egg-shaped chaotic mass into an organized cosmos. Corresponding myths existed in all three cultures. The concept of androgyny played an important role in constructing the picture of the world. First, it was embodied in the images of human prototypes, thanks to whose self-sacrifice astral bodies and the earthly landscape were formed (Purusha, Pangu). Secondly, through the representation of the demiurges in the images of perfect androgynous deities, as a result of which the separation of heaven and earth, time and space arose. An example of such a personification is the Vedic deities Prithivi and Dyavus. Primordial androgyny determined the equality of male and female principles, they complemented each other, their essence was fully revealed only in interaction.

According to the Chinese version, a peculiarity of cosmogenesis is the lack of diametrization of “masculine” and “feminine.” The world was formed not as a result of a contradiction between principles, but as a result of the independent unfolding of a chaotic essence into an ordered cosmos. The first married couple among the gods are Nuiva and Fusi, who are similar in their form and direction of activity.

As mentioned, in the cosmic processes and powerful forces of nature, people saw an inseparable harmony of male and female principles, where male energy consists in the idea of fertilization, and female energy – in birth and creation. In each mythological system, there is a character of the Mother Goddess, who acts as a co-creator of the world and living beings (sometimes her functions are duplicated by several goddesses). In addition, she is the patroness of people, animals and plants.

The feminine and masculine principles correspond to certain dual principles:

- a) balance between yin and yang in Chinese philosophy;
- b) association of the female principle with the elements of water and earth, while the male principle – with the sky, wind, fire energy (an exception may be the fiery female energy of anangu in the Brahmanical tradition);
- c) the interaction of the cosmic consciousness of Purusha and the matter of Prakriti;
- d) the division of the world egg into white, which formed the sky, and yolk, which became the earth.

From the analysis of cosmogonic myths, it follows that none of the teachings insisted that woman has an inferior nature.

Nevertheless, with the establishment of the patriarchal order, the mythological paradigm began to undergo changes. Male deities were assigned the main roles. The feminine principle was positioned as secondary and dependent, in some places it was completely pushed out of the world creation process. Female personifications became limited to taking care of childbirth and some crafts (for example, weaving). This shift affected the social position of women in the future, because the relationship between the gods was considered a model that should be followed by people.

Separate spheres of activity and desired behavior patterns were fixed for women and men, and the gender role of women was narrowed. Figuratively speaking, throughout the history of mankind, a woman came down from the pedestal on which she was exalted as a Great Goddess, equal in strength and holiness to her companion God, reflected in the archetype of the Great Mother, and became a submissive executor of the will not only of God, but also of man.

It is worth admitting that the ancient tribal culture, which was based on the logic of nature, the maintenance of the world in unity and the balance of opposites, was much more favorable to women than the monotheistic religions, which affirmed the sinful nature of women.

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# Cosmological Ideas of Johannes Kepler in Their Relation to Antiquity Based on the Treatise *Harmonices Mundi*

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Rudenko, Sergii and Mariia Lastovets (2023) Cosmological Ideas of Johannes Kepler in Their Relation to Antiquity Based on the Treatise *Harmonices Mundi*. *Philosophy and Cosmology*, Volume 31, 108-115. <https://doi.org/10.29202/phil-cosm/31/9>

*The article presents the results of the authors' research on the cosmological views of Johannes Kepler in his Latin treatise Harmonices Mundi. The authors discuss the background of composing the treatise concerning the philosophical, religious, and cultural contexts of that period, and give a brief overview of the structure of the treatise, Kepler's theory and his third law of harmony. The paper demonstrates the connection and reception of philosophical ideas on the harmony of the world in Kepler's treatise and ancient philosophers, such as Pythagoras, Plato, and Proclus. This shows that Kepler's philosophical and scientific views largely depended on his theological background. The authors discuss the perception of ancient cosmological ideas in Kepler's Harmonices Mundi relating to Pythagorean tetractys, five Platonic solids or regular polyhedral, and cosmic harmony as well as Proclus' theoretical mathematics.*

*Keywords: Kepler, Harmonices Mundi, cosmology, philosophy, harmony, universe, mathematics, astronomy.*

Received: 5 July 2023 / Accepted: 30 July 2023 / Published: 15 October 2023

## Introduction

The Latin treatise *Harmonices Mundi* is a profound and intellectual study written by Johannes Kepler and published in 1619. It represents a continuation and expansion of his earlier work on planetary motion, based upon the laws that he formulated in his *Astronomia Nova* and *Epitome of Copernican Astronomy*. In *Harmonices Mundi*, Kepler explores the concept of harmony in the universe, seeking to find a connection between the motion of the planets and the principles of music and geometry. Inspired by the ancient Greek idea of the “music of the spheres” attributed to Pythagoras, Kepler sought to find musical harmonies in the motions of celestial bodies. The ancient belief proposed that the celestial spheres, each carrying a planet, emitted musical tones as they moved, resulting in cosmic symphony.

It was in Kepler’s *Harmonices Mundi* that his third law was formulated, also known as the “law of harmonies.” This law, which he had derived earlier, states that the square of a planet’s orbital period is directly proportional to the cube of its average distance from the Sun. Kepler believed that this mathematical relationship had a deeper significance and saw it as a reflection of the harmonies present in music. In his treatise, Kepler explored the relationships between planetary distances and their orbital periods. He found fascinating numerical patterns and ratios between the planets’ distances, which he interpreted as musical intervals, akin to those found in the tuning of musical instruments. Kepler delved into the relationship between geometry and harmony. He believed that the geometrical arrangement of the planetary orbits and the five regular polyhedra (tetrahedron, hexahedron, octahedron, dodecahedron, and icosahedron) played a crucial role in determining the harmony of the cosmos. He associated these shapes with the distances of the planets from the Sun. Although some of Kepler’s ideas about harmony and the geometry of the universe may not align with modern scientific understanding, his treatise laid the groundwork for future explorations in the fields of astronomy, cosmology, mathematics, and music.

The objectives of our study are the following: 1) to describe the philosophical, cultural, and religious context of composing the treatise; 2) to trace the idea of world harmony from antiquity to Kepler’s time; 3) to analyze the idiosyncrasies of Kepler’s perception of ancient ideas.

The methodology of the present paper is based on a number of approaches to the study of Kepler’s intellectual heritage: a) philosophical, represented by G.Claessens (2011), C.A. Cardona (2016), J.Michalik (2019), and O.Bazaluk (2021); b) historical, represented by J. Godwin (1993), J.R.Voelkel (1999) and P.Gouk (2008); c) astronomical, represented by J.V. Field (1982; 1988), B.Gingras (2003), and P.J.Boner (2013).

## Philosophical, Cultural, and Religious Contexts of Composing the Treatise *Harmonices Mundi*

Johannes Kepler’s treatise *Harmonices Mundi* was written in 1619, almost twenty-five years after he graduated from the Swabian University of Tübingen, where he mainly studied philosophy and theology and also attended lectures in astronomy and mathematics. Scholasticism dominated the educational system of Kepler’s time and was aimed at teaching Christian truths through philosophy and theology, while also based on the physical ideas of Aristotle. Kepler’s theological education contributed to his worldview and scientific research. He was aware of Plato’s idea of the Creator, but substituted it with the Christian God. Furthermore, in Book IV of *Harmonices Mundi* he claimed that Plato’s dialogue in *Timaeus* could be treated by an attentive reader as a commentary on Genesis or the first book



of Moses, which were converted to the Pythagorean philosophy.<sup>1</sup> In general, scholars agree that Kepler's idea of religion was based on rationality and pertained to God, humanity, and nature.<sup>2</sup>

The early seventeenth century was a time when Copernican theory was considered absurd, and students were obliged to study astronomy according to Ptolemy's theory. Through his teacher, Michael Maestlin, Kepler became acquainted with and accepted the heliocentric theory, which contributed greatly to his subsequent scientific works in the future. Scholars admit that it was Kepler's achievement that he substituted a dynamic system for the formal schemes, of the natural law for mathematical rule and gave a causal explanation for the mathematical description of motion.<sup>3</sup> At the same time, people started raising questions about the world order and what holds its elements together; in this regard, they were affected by Platonism. Plato's philosophy in late antiquity was developed into Neo-Platonism (mathematical philosophy) and Neo-Pythagoreanism (mathematics of natural philosophy). Below, we discuss the reception of these ideas in Kepler's treatise.

The harmonic principles of world order, which were discussed in Kepler's treatise, were found by him in *Harmonics* by Ptolemy. Though based on geocentric astronomy, this book was treated fairly by Kepler for pioneering the dissemination of the study of the harmonious structure of the universe. In Kepler's time, six planets had been discovered, and he gave the explanations for this number and found harmonic proportions in their motion. His treatise consists of five books. The first two books are devoted to geometry: Book One is mainly based on Euclid, while the second one is marked by originality. The third book analyses music harmony along with recent astronomical discoveries. The fourth book deals with astrology, and the fifth book concerns astronomy and harmonies. The main principles of Kepler's theory could be described as follows: 1) harmonies exist but they do not produce any sound; 2) harmonies are perceived from the Sun (heliocentric view); 3) harmonies are polyphonic; 4) harmonies follow the proportions of just intonation.<sup>4</sup>

It should also be mentioned that harmony was understood as the law of the world's organisation rather than only a musical term. The idea of harmony can be traced back to antiquity and was first attributed to Pythagoras and his followers. This idea was based on the presumption that the circular motion of the spheres produced a sound. People do not hear this sound because the spheres are present with them since their birth, so they do not perceive this sound, being unable to experience the absence of the spheres. This explanation was rejected by Aristotle, who said that we hear no sound because there is no sound. Along with the term "harmonics" was used another, "canonics," associated with Euclid's work *Sectio Canonis*, in which the author explained harmonics with a mathematical theorem.

The tradition of studying musical harmony along with mathematics, geometry, and astronomy goes back to antiquity, and due to Boethius, these subjects comprised the system of the quadrivium, analogous to the trivium, which comprised rhetoric, logic, and grammar. This system was part of the educational curriculum from the twelfth to the eighteenth centuries. It was also Boethius who proposed the classification of music into three types: *musica instrumentalis* (instrumental music as the acoustic harmony), *musica humana* (human music as the harmony of soul and body), and *musica mundana* (music of

<sup>1</sup> (Kepler, *Harmonice Mundi* IV).

<sup>2</sup> (Kozhamthadam, 1994).

<sup>3</sup> (Caspar, 1993).

<sup>4</sup> (Walker, 1978).

universal harmony).<sup>5</sup> The last type of this classification is represented by philosophers who can perceive and judge the world's harmony. When the new texts became available for the majority of readers, the view on the world's harmony changed. By these texts, we mean the published editions of *Corpus Hermeticum*, ascribed to Hermes Trismegistus, in 1463, Plato's *Timaeus* and *Republic* in 1484, and *Enneads* by Plotinus in 1492. These writings contributed to the spreading of a new understanding of harmonies, and knowledge of alchemy, astrology, and magic arts.

The idea of the harmony of the world is not taken seriously nowadays, but for Kepler and his contemporaries, it was an issue of serious philosophical, mathematical, and astronomical consideration. Almost simultaneously, several treatises on harmony appeared in different countries and different languages: *Harmonices Mundi* by Kepler (in 1619), *Harmonie Universelle* by Mersenne (in 1636–1637), and *Musurgia Universalis* by Kircher (in 1650). In his treatise, Kepler distinguished between the two harmonies, sensible and genuine, stating that sensible harmony relates to sensible things and may be of different kinds, as these things are different, whereas genuine harmony does not relate to sensible things and remains one and the same kind. He also describes in details the elements of the sensible harmony, which consists of two sensible things of the same kind; the soul, which compares these two things; reception of these things and necessary proportion, which is the harmony itself.<sup>6</sup>

## Kepler and the Pythagoreans

In Greek philosophy, the idea of a harmonious world was first observed by Pythagoras and his followers, who identified the intervals of the fourth, fifth, and octave with their ratios. These ideas, which were formulated at the end of the fifth century B.C., were preserved orally until they were recorded by Aristotle, Plato, and others. The Pythagoreans recognised seven planets: Mercury, Venus, Mars, Jupiter, Saturn, the Moon, and the Sun. They believed that each planet produced a particular note, and their pitch was determined by velocity, which depended on the distance from the Earth. This idea was supported by Kepler as well. It is worth mentioning that Scotus Eriugena, who lived in the ninth century A.D., espoused this theory. According to Eriugena, the scholars might have explained pitch change when the planets' distance from Earth changed accordingly. Pythagoreans distinguished between three main consonances as the octave, fourth, and fifth, with their numeric relationships as 4:3; 3:2 and 2:1. This idea was visually demonstrated in a triangle with ten spots known as Pythagorean tetractys. Aristotle summarises this Pythagorean idea of numbers, stating that everything in nature is based on numeric organisation, and the elements of numbers are the elements of all things, and the heavenly harmony is a number.<sup>7</sup>

So, according to the Pythagoreans, harmony depended on simple numeric ratios, and any other random combination of sounds could not produce pleasant sounds. However, this restriction to the consonances resulted in not including the thirds and sixths, which did not allow polyphony. Kepler commented on Pythagorean ideas in a way that they were so much engaged in philosophising in numbers that they started judging a melody, as well as consonants and dissonants, not with their ears, but with numbers.<sup>8</sup> Kepler's view was that we should find the cause of the consonance in geometry, rather than in number. He gave several reasons for this in his treatise: 1) theological reason argued that there is no explanation for

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<sup>5</sup> (Boethius, 1989).

<sup>6</sup> (Kepler, *Harmonice Mundi* IV).

<sup>7</sup> (Aristotle, *Metaphysics* 986a).

<sup>8</sup> (Kepler, *Harmonice Mundi* III).

God's choice of certain numbers in producing consonance. According to Kepler, God took the notes and intervals and arranged them in the shape of human spirits. This idea was inspired by God's contemplation of numbers, though it was not clear why certain numbers conformed with musical instruments and other numbers did not conform with them;<sup>9</sup> 2) rational reason assumed that musical intervals are continuous and cannot be rooted in discrete numbers. He distinguished between consonant and dissonant intervals, stating that consonant intervals are harmonious and thus have an intellectual basis, while dissonant intervals cannot be known as they do not enter the mind;<sup>10</sup> 3) philosophical reason explained that numbers are inferior to geometrical figures in the epistemological and metaphysical sense.<sup>11</sup>

Another Pythagorean idea, which is employed in Kepler's work and is present in illustrations to *Harmonices Mundi*, was the notion of five regular solids or five regular polyhedra, which are sometimes called the five Platonic solids: the tetrahedron, hexahedron, octahedron, dodecahedron, and icosahedron. Proclus ascribed this idea to the Pythagoreans, and Plato associated these solids with four physical elements as follows: Earth with the hexahedron, water with the icosahedron, fire with the tetrahedron, air with the octahedron, and the dodecahedron was associated with Heaven. This idea was shown in Kepler's drawings in the second book of his treatise (Kepler, 1997). In Plato's *Timaeus*, these solids consisted of equilateral triangles, but Kepler discovered two more new regular polyhedra, star octagons, and star decagons, which involve twelve-star pentagons and two semisolid congruences.<sup>12</sup> Kepler applied the five Platonic solids to explain the number of the six known planets, stating that these solids delimit the distances between the planets. He placed a certain solid between each planet in the following order: a hexahedron was placed between Saturn and Jupiter, a tetrahedron between Jupiter and Mars, a dodecahedron between Mars and Earth, an icosahedron between Earth and Venus, and an octahedron between Mercury and Venus.

### Kepler and Platonic ideas

The idea of harmony in Plato's compositions is mentioned twice, in his *Republic* and in *Timaeus*. Let us consider these two points in detail. In the tenth book of *Republic* is a passage relating to the eight heavenly spheres, which are described as circles, revolving around with different speed. There is a siren on each of the rims of these circles, who is singing a particular musical tone, producing harmonious sound together.<sup>13</sup> Regarding this passage, it is worth noting that the image of a siren in Pythagorean view differs from Homer's poetic description of these creatures in *The Odyssey*, as they produce heavenly music, rather than bringing death to sailors. Another thing concerns the word "Ἀνάγκης," which is translated as "necessity," so the motion of the spheres is turning on the knees of "necessity." In Aristotle's *Metaphysics* we find the definition of "necessity" as something that is the condition of being.<sup>14</sup>

Another passage from Plato concerning the harmonies of the world is found in *Timaeus*. There, we read that the Creator made a soul out of three elements: he took the indivisible and divisible essences, combined them, and created the third essence, placing it between the first two. This essence pertained to the nature of divisible and indivisible essences. Then the

<sup>9</sup> Ibid.

<sup>10</sup> Ibid.

<sup>11</sup> (Kepler, *Harmonice Mundi* Apolog.)

<sup>12</sup> (Kepler, *Harmonice Mundi* II).

<sup>13</sup> (Plato, *Republic* 617a).

<sup>14</sup> (Aristotle, *Metaphysics* 1015a).

Creator mingled the three essences and out of them made one, which was again divided into the number of parts that was fitting, and each part became a constituent of the three elements of the soul: Sameness, Difference, and Existence. The Creator's division was made in the following way, resulting in certain numbers (1, 2, 4, 8, and 1, 3, 9, 27).<sup>15</sup>

Kepler rejects Plato's numerology and gives priority to geometrical objects. In one of Kepler's letters, we read that Ptolemy had the courage to think of the world's creation in terms of geometry and Euclid's philosophy, because he did not know about God. According to his views, by geometrical objects, we can explain why God created this world in this way and not otherwise.<sup>16</sup> When Kepler quoted the passage about harmonic proportions from *Timaeus* in his treatise *Harmonices Mundi*, he mentioned that Aristotle did not support, and even rejected, this idea, but he himself thought that these words from *Timaeus* should not have been taken literally. Then he describes another idea from *Timaeus* concerning the role of the mind in distinguishing proportions, and seemingly shared it with the philosopher. The idea was that the mind rather than the senses is responsible for distinguishing between consonant proportions and dissonant ones, and it also distinguishes proportions from that which is proportioned.<sup>17</sup>

### Kepler and Neo-Platonic Ideas

In his treatise *Harmonices Mundi* Kepler quotes from Proclus' *Commentary on the Elements of Geometry*. It can be assumed that Kepler was acquainted with original Greek editions of Proclus in Plato's *Opera Omnia*, which was published in 1534, and in Euclid, published in 1573, as these editions were available in the library of the University of Tübingen. The quotations and references to Proclus are present on the title pages of three of the books making up the treatise. In the fourth book, we can find the three-page-long Latin translation from the *Commentary on the First Book of Euclid's Elements*. In the prooemium to the first book of *Harmonices Mundi*, Kepler called Proclus a theoretical philosopher who established the general principles of the whole essence of mathematics and distinguished between the limit as the form and the unlimited as the matter of geometrical objects.<sup>18</sup>

As a theoretical philosopher of mathematics, Proclus stated that mathematical notions take place between Plato's ideas and the objects of the sensible world. These objects of the sensible world belong to opinion, the ideas belong to the mind, and the mathematical notions are found between these two and belong to understanding. This is due to our imagination that mathematical concepts such as geometrical objects become visible and extended.<sup>19</sup>

For Proclus, each geometrical object is ontologically and epistemologically equal, unlike Kepler. According to Kepler's theory, priority is given to the circle and the arc, so he considered the other geometrical objects as derivative. The circle is the form of the soul, and the arc is a constituent part of the circle. Harmonization is created by these two objects: circle and arc. This leads to the central point of Kepler's theory: God, who created this world and universe, made the geometrical elements the entities of our soul and established the circle as the basic source of geometrical objects.<sup>20</sup> The other geometrical objects appear on the grounds of a comparison between the circle and the arc.

<sup>15</sup> (Plato, *Timaeus* 35a).

<sup>16</sup> (Kepler, 1951).

<sup>17</sup> (Kepler, *Harmonice Mundi* III).

<sup>18</sup> (Kepler, *Harmonice Mundi* Intro.)

<sup>19</sup> (Proclus, 1970).

<sup>20</sup> (Kepler, *Harmonice Mundi* IV).

## Conclusions

Thus, Kepler's *Harmonices Mundi* is a significant work of scientific and philosophical literature that explores the fascinating connections between planetary motion, musical harmony, and geometric order in the cosmos. It represents an ambitious attempt to find unity and harmony in the diverse workings of the universe, demonstrating Kepler's relentless quest to understand the divine order behind the celestial phenomena.

Johannes Kepler, the influential astronomer and mathematician of the seventeenth century, had a deep appreciation for ancient Greek philosophy. He studied and drew inspiration from the works of several Greek thinkers, incorporating their ideas into his own scientific and cosmological investigations. Three Greek philosophers, in particular, had a significant influence on Kepler's thought: Pythagoras, Plato, and Proclus.

Kepler was fascinated by the Pythagorean ideas of the "music of the spheres," which suggested that the planets and celestial bodies emitted musical tones as they moved through the heavens. This concept fascinated Kepler, and he sought to find connections between planetary motion and musical harmony in his treatise *Harmonices Mundi*. Pythagorean numerology and the emphasis on geometric harmony also influenced Kepler's views on the structure of the universe. Kepler's belief in the significance of the five regular polyhedra (the Platonic solids) in organizing the spacing of the planetary orbits in *Harmonices Mundi* was rooted in the Pythagorean tradition of associating geometric shapes with cosmological principles. Unlike the Pythagoreans, Kepler recognized the thirds and sixths as consonants and added these intervals to the geometrical theory.

Kepler was deeply influenced by Platonic ideas, particularly the notion that the universe was an intelligible and mathematically ordered entity. Plato's theory of forms posited that the physical world is a reflection of higher, ideal forms or archetypes. Kepler was drawn to this idea and believed that the principles governing planetary motion were rooted in a higher, divine order. Plato's influence can also be seen in Kepler's belief in the significance of mathematics as a tool for understanding the cosmos. Like Plato, Kepler thought that mathematics held the key to unlocking the secrets of the universe. He searched for mathematical patterns and harmonies in planetary motion, believing that they revealed the divine plan of the cosmos.

Kepler concurred with Proclus that the circle and the arc constitute the essence of the soul, but did not agree with Proclus about the other mathematical concepts, which were also attributed to the soul.

Overall, Kepler's engagement with Greek philosophy, particularly the ideas of Pythagoras and Plato, profoundly shaped his approach to astronomy and cosmology. Their emphasis on mathematics, harmony, and the search for higher truths resonated with Kepler's quest to understand the underlying order of the universe, leading him to make groundbreaking discoveries in the field of astronomy and lay the foundations for modern celestial mechanics.

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# On the Road to God: Einstein's Imaginary Journey Around the Universe

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Smrčka, Zdeněk (2023) On the Road to God: Einstein's Imaginary Journey Around the Universe. *Philosophy and Cosmology*, Volume 31, 116-132. <https://doi.org/10.29202/phil-cosm/31/10>

*A revived figure of teenage Albert Einstein is confronted at the threshold of the second millennium with a problem of a graphical likeness of the Lambert  $W$  function-based cosmological equations to a logarithmic-exponential discontinuous function that he has just plotted. To puzzle the issue out his mind is put onto an imaginary mathematical-philosophical-physical trail ride around the Universe. Euler's identity that he invited to ride pillion on his Pegasus of Imagination spans the cavalier's horse to carry him on wings of Leibniz' zero-nothingness unity-infiniteness array towards a non-Euclidean landscape of novel cosmological equations – which describe behaviour of principal cosmological parameters as an exclusive function of the scale factor. Zero, unity,  $\pi$ , and Euler's number become in the rider's eyes a quaternion of linesmen – and the imaginary unit the one who as a chief referee opens and controls on the space-time playground a collective mass-energy game. And while the young cavalier observes from a horseback of his mount that within the playground expansion the cosmic match is running into the order of timelessness and spacelessness the Universe with all of its ever existing forms and events, thoughts and memories, unveils to him its all-encompassing face of eternity and immortality attributable to God.*

*Keywords: Albert Einstein, Euler's identity, God, imagination, Lambert  $W$  function, scale factor, spacetime, thought experiment, Universe*

Received: 21 June 2023 / Accepted: 19 July 2023 / Published: 15 October 2023

## Introduction

*"...nature represents its simplicity in various physical systems..."*  
(Nojiri et al., 2017)

The famous portrait of teenage Albert Einstein taken in a Munich photo studio presents a high school student sitting on the top of painted seashore highlands (Fig. 1). His inner imaginative-like gaze of a dreamy mind seems to glimpse an infinitive scheme of sailing waves of time and space over the imaginary landscape. In two years later, being 16-years-old guy, his thoughts of the physical world will give birth to a very curious idea: *"What it would be like to pursue a beam of light?"* (Norton, 2013). By this question his most famous thought experiment (Gedankenexperiment) is ready to open the era of relativistic physics. But what kind of the thought experiment would have been performed by him as an abecedarian of the 21<sup>st</sup> century cosmology virtual class? Would have been his mind challenged by a quizzical daydream of a trail ride around the expanding universe? This is an oddish idea, indeed, but it came into the author's mind like a prepossessing wavy sparkplug above a return train of thought heading times of Einstein's youth. At an early point its terminal station was on the air; however, it was just a double reason and challenge to get on.

### 1. The Lambert W Function and Einstein's Novel Thought Experiment

In early 2020, the Lambert W function (Corless et al., 1996) being already well established in its generalized form in the class of relativistic physics (Scott et al., 2006; Mező and Baricz, 2017) is introduced as a potential *"...newcomer in the cosmology class"* (Saha & Bamba, 2020). The same year, a novel model of regular black holes highlights this special function along with exponentials for its *"...somewhat more elegant..."* quality when compared to *"...rather messy cubic and quartic polynomial equations"* (Simpson & Visser, 2020). Two years later a comprehensive treatise on the Lambert W function is published (Mező, 2022). The function which *"...seems to be ubiquitous in nature..."* (Corless et al., 1996) is invaluable in its ability of solving transcendental equations variable of which is found simultaneously outside and inside logarithms, like:  $x = \ln(3x)$ . Or outside and inside exponentials, like  $y = xe^x$ ; the famous equation the first references and studies of which were made by Johann Heinrich Lambert (1758) and Leonhard Euler (1783), 18th century Swiss mathematicians (Brito et al., 2008)).

Thereupon, at the threshold of the second millennium a revived figure of teenage Albert Einstein presents in the cosmology class an iterative solution<sup>1</sup> of the transcendental equation  $x = [\log(x) \cdot \ln(x)]^3$ . In order to set up its first approximation he makes a plot<sup>2</sup> of a logarithmic-exponential discontinuous function  $\sqrt[3]{x} / \ln(x)$  against  $\log(x)$ . The resulting graph (Fig. 2) immediately strikes his eye as it looks as if in terms of reflection symmetry two graphs (Fig. 3) of the Lambert W function-based cosmological equations for the deceleration parameter  $q$ , and for the energy density  $\rho$ , respectively (Saha and Bamba, 2020) were put together. The similarity provokes him to wondering about an eventual significance of the examined function  $\sqrt[3]{x} / \ln(x)$  to cosmology. His query is: "What if it is described there in the variable  $x$  a spatiotemporal dynamic factor which makes the function numerator  $\sqrt[3]{x}$  attributable to the non-Euclidean spatiotemporal geometry and concurrently the function denominator  $\ln(x)$  attributable to the maximum possible entropy referred to a measure of information uncertainty (Silagadze, 2010) of the mass-energy system?" To examine the idea he modifies the function  $\sqrt[3]{x} / \ln(x)$  in two different ways; separately for  $\log(x) > 0$  and for

$\log(x) < 0$ . The 'plus way' takes him to a general scheme of the deceleration parameter equation; while the 'minus way' to a general scheme of the equation for the squared Hubble parameter (its square represents an equivalent to the energy density). Within the 'minus way' he makes use of a fundamental 'trick' of absolute logarithmic values  $|\log(x) < 0| = \log(1/x)$ ; and within both ways he takes in a novel dynamic spatiotemporal factor  $e^\varphi$ .

$$(e^\varphi - 1) [\sqrt[3]{(1/x)} / \ln(x)] \xrightarrow{\log(x) < 0} \sqrt[3]{x} / \ln(x) \xrightarrow{\log(x) > 0} e^\varphi - [\sqrt[3]{x} / \ln(x)]$$

Both spatiotemporal dynamic factors  $x$  and  $e^\varphi$  call for their specification. Juvenile Einstein is aware of invalidity (respectively instability) of 'his' initial model of the static universe as it implies zero time derivatives for the scale factor  $\dot{a} = \ddot{a} = 0$ . So his mind is switched to a dynamic model of the expanding universe – which makes him put a trick question: “In case I will parametrize the spatiotemporal factor  $x$  just through the scale factor what it would be like to use a combined  $\pi$ -shaped and  $a$ -shaped pair of reins to ride Pegasus of Imagination around the expanding universe?” Instead a reply he grasps  $a$ -shaped rein in his left and an  $\pi$ -shaped rein in his right hand. And as he takes  $\log(x)$  to keep them in balance he gets the formula  $x = 10^{\pi a}$ . By analogy he takes the scale factor to parametrize both the spatiotemporal dynamic factor  $e^\varphi$  (that he decides to be defined for  $(1; e >$  and to be called the ‘perpetual factor’) and its variable  $\varphi$  (that is therefore defined for  $(0; 1 >$  and called by him the ‘dark factor’). So he grasps  $\varphi_0$  as a reference constant for a present epoch (its value will be specified later on) in his left hand and the scale factor  $a$  again in his right hand. And when he takes  $\varphi$  to keep this pair of reins in balance he gets the formula  $\varphi = \varphi_0 a$ ; and accordingly  $e^\varphi = e^{\varphi_0 a}$ .

## 2. Euler's Identity and Cosmological Equations

The parametrized factors  $10^{\pi a}$  and  $e^{\varphi_0 a}$  as they were received by juvenile Einstein operate explicitly with transcendental numbers of the eminent importance in mathematics –  $\pi$  and  $e$ , respectively; and implicitly with two more eminent numbers, 0 and 1. The fact navigates the explorer's train of thought towards the idea that spacetime could be under the continuous  $\pi$  -  $e$  - zero – unity orchestrated action based on a scheme of Euler's identity – a specific case of Euler's formula when its variable  $x$  is put equal to  $\pi$ :

$$e^{ix} = \cos(x) + i \sin(x) \xrightarrow{\text{for } x=\pi} e^{i\pi} + 1 = 0$$

Since Euler's identity formalizes growth as a circular motion which cannot be escaped within the area of complex numbers any way the trail rider deliberates that its scheme could explain why there is no escape to him beyond the universe. And why the identity could symbolize a wholeness of the universe existence. But what makes him wonder is the fact that the imaginary unit  $i$  holds in the identity simultaneously a role of its animator and of the keeper of its steady and irrefrangibly universal validity. Which evokes in his head the idea that the universe existence depends on the imaginary unit inherency – and that a 'super' transcendental number  $e^\pi + 1$  could mark the maximum scale factor of the universe. Defining the dark factor on grounds of this notion as  $\varphi = a/(e^\pi + 1)$  enables him to refine general schemes of the deceleration parameter and the Hubble parameter equations (while using the formula  $x = 10^{\pi a}$  and an empirical constant<sup>3</sup> of correlation  $10^7 [km^2 \cdot s^{-2} \cdot Mpc^{-2}]$  as well) into their definite forms presented below. Behaviour of both parameters these equations describe for a given range of the scale factor<sup>4</sup> is presented in Fig. 4. The Hubble parameter equation is viewed by him as a potential arbiter of the 'Hubble tension' disputes (Di Valentino et al., 2021; Freedman, 2021; Krishnan et al., 2021; Rameez & Sarkar, 2021).

$$q = e^{a/(e^\pi+1)} - [\sqrt[3]{10^\pi a} / \ln(10^\pi a)]$$

$$H = \{(e^{a/(e^\pi+1)} - 1)[\sqrt[3]{1/10^\pi a} / \ln(10^\pi a)] \cdot 10^7\}^{1/2} [km \cdot s^{-1} \cdot Mpc^{-1}]$$

At the next stop the juvenile cosmic rider meets a model of the perfect cosmic fluid that allows description of the universe by an effective equation of state  $w_{eff}$ ; via the relation of the fluid pressure  $P$  to the energy density  $\rho$ . Both of these physical quantities belong to key elements of the Friedmann equations (represented by the acceleration equation and by the Friedmann equation) which are derived from Einstein field equations of General relativity. Putting their simplified forms (the metric with  $c = 1$  for the speed of light is considered for commoving coordinates (Saha & Bamba, 2020)) together with the time derivative of the Hubble parameter enables young Einstein to formulate a simple effective equation of state:  $w_{eff} = (2q-1)/3$ . The deceleration parameter as its exclusive variable is represented by the equation that was formulated by him above.

$$\begin{aligned} \dot{H}/H^2 &= -(1+q) & 3H^2 &= 8\pi G\rho \\ \text{(time derivative of the Hubble parameter)} & & \text{(simplified Friedmann equation)} & \end{aligned}$$

$$\begin{aligned} \dot{H} + H^2 &= -(4\pi G/3)(\rho + 3P) \\ \text{(simplified acceleration equation)} & \end{aligned}$$

$$\dot{H} = -H^2 - qH^2 = -(4\pi G/3)(\rho + 3P) - H^2$$

$$q(8\pi G\rho/3) = (4\pi G/3)(\rho + 3P) \rightarrow 2q\rho = \rho + 3P \rightarrow P/\rho = (2q-1)/3$$

$$w_{eff} = (2q-1)/3 \rightarrow w_{eff} = 2/3 [e^{a/(e^\pi+1)} - (\sqrt[3]{10^\pi a} / \ln(10^\pi a))] - 1/3$$

Having been originally formulated on grounds of the Lambert W function<sup>5</sup> (Saha and Bamba, 2020) and suggested then “...to serve as a unification of dark matter and dark energy...” (Al Mamon & Saha, 2021) an effective equation of state  $w_{eff}$  may be seen as the rationale for a deliberation on the novel dynamical Lambert W Dark Energy model instead the Lambda cold dark matter ( $\Lambda$ CDM) model (Banerjee et al., 2021). Yet, some of the modified gravity theories (Nojiri et al., 2017) in which the purely geometric nature of dark energy is considered (Mandal et al., 2020) operate just with an extension of the  $\Lambda$ CDM model. And as regards a position of young Einstein he is convinced that the  $\Lambda$ CDM model authenticity and simplicity are like two sides of the same universal coin fineness of which is going to be argued in the following text.

### 3. The Scale Factor As an Exclusive Cosmological Variable

A call for a precise measurement of both the Hubble and the deceleration parameters (Sandage, 1970) led to proposition additional cosmological parameters and to formulation novel cosmological models (Neben & Turner, 2013). While they have been thought to improve understanding the universe expansion it has been comparison statistics (Davis et al., 2007) which argued in favour of “...models that give a good fit with fewer parameters...,” with reference to that “...the preferred cosmological model is the flat cosmological constant model, where the expansion history of the universe can be adequately described with only

one free parameter describing the energy content of the universe...” Ultimately, this model was found to remain the simplest and the best “...to explain the current data...” while giving “...no reason to prefer any more complex model over the concordance cosmology, the flat cosmological constant.” Hence, the  $\Lambda$ CDM model authenticity should be judged rather from “...either new physics or unknown systematics...” perspectives – as it was proposed for a resolution of the tension (D’Arcy Kenworthy et al., 2019).

The latter perspective of the yet “...unknown systematics...” is favoured by juvenile Einstein since it points to the fact that behaviour of cosmological parameters as it is described by the equations proposed above conforms an accelerated expansion of the universe (Riess et al., 1998) and supports an authenticity of the  $\Lambda$ CDM model with its hypothetical phantom energy action that would lead to a Big Rip. In the explorer’s opinion this event is about to happen when the scale factor of the universe meets the constant  $e^\pi + 1$ . Both the maximum radius  $r$  and the maximum age  $A$  of the universe may be calculated then according the following equations (the factors  $1 \text{ Mpc} \approx 3.0857 \cdot 10^{19} [\text{km}]$  and  $1 \text{ year} \approx 31\,556\,952 [\text{s}]$  are considered for a conversion of the Hubble parameter  $H_t [\text{s}^{-1}]$  to  $H [\text{km} \cdot \text{s}^{-1} \cdot \text{Mpc}^{-1}]$ ).

$$r = ac/H_t \approx (3.0857ac/H) \cdot 10^{19} [\text{km}]$$

$$A = r/c = a/H_t \approx (3.0857a/31556952 H) \cdot 10^{19} \approx 0.97782 (a/H) \cdot 10^{12} [\text{years}]$$

According these equations both the radius and the age of the universe are proportional to the scale factor and reciprocal to the Hubble parameter. However, since the scale factor is the only variable of the Hubble parameter equation (see a previous section) both the radius and the age of the universe have actually become exclusive functions of the scale factor.<sup>6</sup>

#### 4. The Time Dilation Factor and the Fate of the Universe

The young adventurer on his imaginary trail ride around the expanding universe is heading now a hypothesized sphere of the time dilation. He views it as a ratio of the ‘actual time flow velocity’  $v_a$  to the ‘initial time flow velocity’  $v_i$  that was effective in the earliest flash of the universe. Apart from an elusiveness of their absolute values he finds their ratio to be equal to a ratio of two specific time flow gradients defined on grounds of Euler’s number and with regard to Euler’s identity. According his assumption the ‘actual time flow velocity’  $v_a$  corresponds to the ‘perpetual factor time flow gradient’  $e - e^{a/(e^\pi+1)}$  and accordingly the ‘initial time flow velocity’  $v_i$  to the ‘singularity time flow gradient’  $e - e^0$ . Which enables him to formulate a dimensionless equation for the time dilation factor  $\Delta v_{dt}$ ; along with an equation for its impact on the age of the universe  $A_{dt} = A \Delta v_{dt} [\text{years}]$ . For a present epoch ( $a_0 = 1$ ) the time dilation factor is calculated by him to  $\Delta v_{dt(a_0)} \approx 1.00834$ .

$$\Delta v_{dt} = 1/(\sqrt[3]{v_a}/\sqrt[3]{v_i}) = \sqrt[3]{e - e^0}/\sqrt[3]{e - e^{a/(e^\pi+1)}} = \sqrt[3]{e - 1}/\sqrt[3]{e - e^{a/(e^\pi+1)}}$$

Juvenile Einstein is realizing now that a waveform of the time dilation factor as a function of the scale factor (Fig. 5) is strikingly similar to that of the Lorentz factor as a function of the relative velocity (Fig. 6). And that the similarity is of the physical nature. Unity represents a ground level from which both the time dilation factor and the Lorentz factor very gradually rise up at first; while the late accelerating phase corresponds to an uncontrollable expansion of the universe – respectively to velocity that is nearing the speed of light. When its limit

is met the time flow velocity is frozen up and the universe – since there is no time nor light anymore – should vanish away. A similar scenario emerges from a novel equation of state (Saha & Bamba, 2020) based on incorporation the Lambert W function; as both scenarios outline a cosmological model for an accelerating universe (Rani et al., 2015) with a late-time acceleration phase for which the deceleration parameter  $q \leq -1$  is established.

The very moment of the universe extinction may be likened either to a moment when the hologram animation is seized – like during the cinema show – by turning off the lights; or to a moment when an accelerated expansion of the universe with its spacetime coiling is terminated by the Big Rip in the black hole. While the former case implies primarily a state of the universal darkness the latter one implies primarily a state of the universal spacelessness-timelessness. Nevertheless, the thoughts-provoking idea of the end of time in understanding our universe (Barbour, 1999) may also imply an existence of a parallel universe in which time is passing in a countermarch (Boyle et al., 2022); but with the same course of the same events as they happen in our universe. Travel back in time would have then actually meant travel back to the future (Tobar & Costa, 2020). Which could explain a paradox of impossibility of making any change in any event that happened in the past so as to affect the presence – and simultaneously a possibility of knowing the future events. While seemingly never befallen yet potentially encountered events as alternatives to those which have been really experienced would have then passed by as an imaginary component of the complex cosmic game.

## **5. Reasoning About the Human Mind, the Universe, and God**

An outlined interplay of the  $\pi$ -aided and  $e$ -aided scale factor variables effective in the equations proposed above as twin-like weavers of the geometrical field unity puzzle – as it would occupied Einstein's mind a century ago – is presented there by his imaginarily revived figure to deliberation. He has just realized that not a high complexity but per contra the utmost mathematical simplicity may solve such a puzzle. Which could be why he was unable to solve a century ago a fundamental enigma of the geometrical field unity of everything in the universe – and why his method of the thought experiment has been applied there by his own fictitious juvenile personage as his scientific legacy. On its grounds it may be argued that a controversy about cosmological models has originated paradoxically to a large extent from intricately sophisticated mathematical interpretations of observational data.

From now on juvenile Einstein keeps in his view the statements that “...the general adherence to the mainstream concordance  $\Lambda$ -CDM model does not leave too much room for thinkers outside the accepted cosmic paradigm...” (Martinez & Trimble, 2009); that “...such model presently gives the best picture of how cosmic structures have emerged from the expanding background and have formed the cosmic web...” (Vazza & Feletti, 2020); that the flat cosmological constant model remains the simplest and the best “...to explain the current data...” while giving “...no reason to prefer any more complex model over the concordance cosmology, the flat cosmological constant...” (Davis et al., 2007); that “...nature represents its simplicity in various physical systems...” (Nojiri et al., 2017); that it is the Lambert W function which “...seems to be ubiquitous in nature...” (Corless et al., 1996); that “...transcendental reasoning in the spirit of Kant is becoming increasingly relevant in philosophy of science...” (Hoffmann, 2019); that there have been outlined “...transcendental perspectives on modern physics...” (Bitbol et al., 2009); and what's more, that “Transcendental arguments may be most important in physics.” as they were applied, for example, by Einstein for the creation of his theory of relativity which “...abandons Euclidean geometry as an a priori chosen



reference system for determining the spatial structure of the universe...” (Hoffmann, 2019); and last but not least that “...fluids with logarithmic equation of state may lead to interesting cosmological behaviour...” (Odintsov et al., 2018).

Having considered all of that and having surmised some divine will in the patterns of nature – and the essence of God in its transcendence – the young cosmic trail rider becomes truly aware why God cannot play dice with the universe; since the whole universe is nothing else but a mirrored face – or brain – of God. And herein – on grounds of findings about “...the similarities between two of the most challenging and complex systems in Nature: the network of neuronal cells in the human brain, and the cosmic network of galaxies...” which may be “...shaped by similar principles of network dynamics, despite the radically different scales and processes at play.” (Vazza & Feletti, 2020) – young Einstein takes the order of magnitude  $10^{27}$  as it has been reported by the authors for the scale difference between the cosmic/brain networks into account and wonders: “What if it could reflect a proportional difference in scales<sup>7</sup> between the size of the human brain and of the whole universe?” Since, when the human brain is viewed in its scale as a ‘tiny universe’ ( $a_{0(\text{human brain})} \approx 10^{-27}$  versus  $a_{0(\text{universe})} = 1$ ) its radius should be calculable according the equation proposed above. The answer 12.7736 [cm] he gets corresponds to 8730.29 [cm<sup>3</sup>] which is more than a brain volume of the sperm whale; while an average brain volume in the middle-aged females has been reported to be 1115.76 [cm<sup>3</sup>] (Ritchie et al., 2018). Yet, with respect to cortical folding (Toro et al., 2008) it is more reliable to consider the surface area of the human cerebral cortex. Taking the reported 2400 [cm<sup>2</sup>] into account the calculated radius 12.7736 [cm] corresponds then to the surface area 2050.39 [cm<sup>2</sup>]; which fits quite well the fact that female brains are approximately 10% smaller than male brains. No matter how speculative these findings are they suggest the idea that in evolution of the galactic network structures there has been implicitly encoded evolution of the neuronal networks. Which makes juvenile Einstein declare: “God is not playing dice with the network dynamics; neither that of the galaxies nor that of the human brain.”

Yet, the Universe itself cannot be a product of any Divine activity (or of any super intelligent simulation as it was suggested (Bostrom, 2003)) since in that case a position of God – or the programmer – would have been found ‘outside’ (Lane, 2021). And our presence would have been in that case a proof of our nonexistence – the finding which has emerged from an imaginary debate between Kublai Khan and Marco Polo about an existence of ‘Invisible cities’ (Calvino, 1974). Contrary to that there stands the idea of pandeism as “...the belief that God chose to wholly become our Universe, imposing principles at this Becoming that have fostered the lawful evolution of multifarious structures, including life and consciousness.” According a particular form of pandeism, living God pandeism, “...our Universe inherits all of God’s unsurpassable attributes – reality, unity, consciousness, knowledge, intelligence, and effectiveness – and includes as much reality, conscious and unconscious, as is possible consistent with retaining those attributes. God and the Universe, together ‘God-and-Universe,’ is also eternal into the future and the past.” (Lane, 2021).

With respect to Kant’s transcendental cosmology (Fugate, 2019) and with reference to the space-time unity and the mass-energy unity the idea of the ‘God-and-Universe’ unity seems to be evincible. Understanding this unity suggests that God, the Universe, and the human mind cannot be separated from each other – since they are the One. Actually, a journey towards understanding this unity represents a leitmotif of the allegorical tale ‘The Conference of the Birds’ by Farid al-Din ‘Attar (2017) in which a hoopoe as a mastermind eggs other birds on to their struggle for an escape from bonds of an ephemeral earthiness so as to reach a sphere

of ethereality. Just from its perspective they may find out at last that a mystery of Divinity, Eternity, and Immortality has been ever hidden in themselves.

## Conclusions

*"Any event is like a ball decorated with entangled ornaments,"* argues Alexander Grin (1975) in his magical parable of the 'Binary Star Man' who was able to fly just by virtue of his own mental capacity. The first book edition of the tale entitled 'The Shining World' (Grin, 1924) was published two years before Albert Einstein declared in a letter sent on 4 December 1926 to Max Born (Einstein, 2005; Einstein et al., 2005) that God does not play dice with the universe: *"The theory says a lot, but does not really bring us any closer to the secret of the 'Old One.' I, at any rate, am convinced that He is not playing at dice."* In these two parables the novelist's and the physicist's thoughts met each other to express almost simultaneously similar understanding the nature of all the existence. *"Time and space were to him measures of the same eternity,"* quotes Margarit Tadevosyan (2005) words of Vladimir Nabokov (1992) about Grin's mind. In a way, Grin could sense that *'entangled ornaments'* which decorated and would decorate the universe did not originate from God playing at dice. Rather, their pattern could be encrypted in and attributed to an orchestrated action of certain numbers. As it has been illustrated by Einstein's imaginary cosmic adventure they could be represented by the numbers of Euler's identity that relates together two principal transcendental numbers, 0 and 1, with two principal digital numbers, and, and with the imaginary unit  $i$ :  $e^{i\pi} + 1 = 0$ . And since this imaginary unit may be whatever it means it might be identifiable herein just as the 'Old One', the 'Great Composer', the 'Great Conductor', the 'Great Animator'; the 'Supreme Being'; the 'Chief Referee'. Or simply God – who has according Einstein's original conviction never played dice with the Universe (Carr, 2004; Carter, 2006; Ursic, 2006; Musser, 2015; Lincoln, 2017).

Which calls for an anecdote about Leonhard Euler, Denis Diderot, and a mathematical proof of God's existence (Robertson, 1996). One day in 1773 both scholars met each other in St. Petersburg in the court of Catherine the Great: Czarina's highly privileged and respected mathematician, a staff member of the St. Petersburg Academy of Sciences, whom she had had back soon after her accession to the throne, and one of her lately invited scholars, a leading philosopher and chief encyclopaedist of the French Enlightenment. Yet, before long Czarina realized that even the candlestick of Enlightenment entailed its dark place: a gospel of the rationalistic atheism that harbingered an accession of the new 'God of Science'. With the idea that Diderot – as a person who turned out to be an overt denier of the existence of God – should be debunked, discredited, and silenced somehow, preferably by his own belief in science, she set for him an ingenious trap. Having reliance on Diderot's scientific eagerness Czarina sensed properly that a rumour released by her courtiers about a hot news that Euler had discovered a mathematical proof of God's existence was to reach his ears soon. Euler as a firm believer in God accepted Catherine's plot (one may deduce he enjoyed it with a certain portion of *schadenfreude*). And since Diderot really asked to join a social event at which the proof would be presented a scientific farce could be launched. During the event Euler solemnly proclaimed an equation (mostly reported as  $[(a + b^n)/n] = x$  (Gillings, 1954)) as a scientific statement addressed directly to Diderot as a proof of God's existence. The philosopher was unable to formulate any witty counterargument by which the proof could be pronounced for its unreliable evidence invalid. Euler's language of 'irrational theism' gagged Diderot's language of 'rational atheism' – and soon afterwards the philosopher returned to France.

The anecdote authenticity was called into question in the past (Brown, 1942; Gillings, 1954; Struik, 1967) but a genuineness of Euler's gladsome, humorous, and charming character (Reiner & Reiner, 1990; Debnath, 2009; Calinger, 2016) supports its plausibility. Anyway, the question whether God can be really proved mathematically has remained open up to now (Robertson, 1996; Bischoff, 2022). But maybe there is an opportunity to be closed just by Einstein's fictitiously revived young figure whose trail ride around the expanding universe is going to be over. Euler's identity indicates that the rider has circumscribed on his Pegasus of Imagination but a semicircle of the universe so far: from +1 to -1. Fortunately, there is an algebraic trick:  $e^{i\pi} = 1/e^{i\pi}$  (therefore  $e^{i2\pi} = 1$ ; while  $e^{i\pi} = -1$ ) which fuels his journey to advance in a specular symmetry of the same counterclockwise direction till bringing him back to the springing point. Just at the moment his imaginary journey taken under the indiscernible guidance of Euler's identity is ending in real terms. Then, could this identity harbor within the principles of symmetry and reciprocity a scheme of the geometric/algebraic field unity of the universe? With its 'contra-twin' parallel existence? And with a presence of God in all of the created things? And eventually, could the equation  $[(a + b^n)/n] = x$  (as it is referred above as an enigmatic proof of God's existence) represent Euler's ingeniously encrypted notation of the identity? Imagine,  $a = 1$ ;  $b = e$ ;  $n = i\pi$  yield  $[(1 + e^{i\pi})/i\pi] = x$ ; which implies  $x = 0/i\pi$ , and hence  $i \neq 0$ . To conclude,  $i$  may mean 'Everything' except for 'Nothing'.

*"That which is above is from that which is below, and that which is below is from that which is above..."*, an inscription from 'The Tabula Smaragdina' (Holmyard, 1923) hits off casually the heart of Euler's identity. The juvenile adventurer identifies its imaginary unit as a supreme authority that controls from its unknowable and indefinable position beyond one's reach an orchestrated action of the remaining four numbers; of which  $e$  and  $\pi$  relate to spacetime while zero and unity reflect Leibniz' concept of nothingness-infinity as two cut-off points of the evolution of galactic networks and of neural networks of the human brain. On grounds of ascertainties that: *"In nature everything happens by degrees, and nothing by jumps."* (Leibniz, 1996); *"[...but] continuity is only a mathematical technique for approximating very finely grained things. The world is subtly discrete, not continuous."* (Rovelli, 2018a) the universe evolution is found by young Einstein to be a highly sophisticated discrete yet continuous game. Being principally different from playing at dice or from any card game it is viewed by him as a collective mass-energy match given on the space-time playground. With its expansion the match is running into the countless variants of physically more and more disordered schemes characterized by the entropy growth – that *"...distinguishes the past from the future for us and leads to the unfolding of the cosmos."* (Rovelli, 2018b). Which points out that the scale of the space-time playground represents a measure of entropy of the performed mass-energy game – and of an arrow of time defining its direction. And since Einstein's imaginary journey demonstrated on one hand that an accelerated expansion of the playground implied an accelerated dilation of time reserved for the match – and on the other that there was established an upper bound for the playground scale – the maximum possible entropy of the performed cosmic game has to exist then as well. When it is met both an arrow of time and time itself along with the imaginary unit vanish away and the Universe with all of its ever existing forms and events, thoughts and memories, unveils its all-encompassing face of Divinity, Eternity, and Immortality attributable to God.

## Notes

<sup>1</sup> Roots of the function have been iterated as follows:  $\log(x_1) \approx 5.5545318206$ , i.e.  $x_1 \approx 358535.21706$ , and  $\log(x_2) \approx -0.53640346864$ , i.e.,  $x_2 \approx 0.29080142568$ . The function has a local minimum equal to  $e/3$  for  $x = e^3$ .

<sup>2</sup> Graph 4.4.2., an open source application for plotting mathematical functions (the GNU General Public License) was applied to delineate graphs shown in Fig. 2, Fig. 3, and Fig. 5.

<sup>3</sup> The constant is definable as  $D_c = ([1/[2(e^\pi+1)]] + \pi)^2 \cdot 10^6 \approx 10.00017019 \cdot 10^6 [km^2 \cdot s^{-2}] \cdot Mpc^{-2}$ . One may note that  $[1/[2(e^\pi+1)]] + \pi \approx 3.16230457 [km \cdot s^{-1} \cdot Mpc^{-1}]$  is close to  $3.16227189...$   $[km \cdot s^{-1} \cdot Mpc^{-1}]$ : defined by the Hubble parameter equation for  $a = 3.62$ ; and numerically also close to  $\sqrt{10} \approx 3.16227766$ ; ) as well as to  $[10(10 + \pi^2)/(2\pi\sqrt{10})]^{1/2} \approx 3.16231171$ . And since  $10(10 + \pi^2)/(2\pi\sqrt{10}) \approx 10.00021534$  implies  $(10 + \pi^2)/(2\pi\sqrt{10}) \approx 1.000021534$  then  $(10 + \pi^2)/(2\pi\sqrt{10}) \approx ([1/[2(e^\pi+1)]] + \pi)^2/10$ . Should all of this point to a special role of the number ten in cosmology is left to discussion.

<sup>4</sup> The deceleration parameter calculated for a present epoch  $q_0 \approx -0.499$  nears to the referential  $q_0 \approx -0.5$ . And the Hubble parameter calculated for a present epoch  $H_0 \approx 72.42 [km \cdot s^{-1} \cdot Mpc^{-1}]$  lies between an upper limit of  $H_0$  similar to  $71 [km \cdot s^{-1} \cdot Mpc^{-1}]$  yielded by early universe physics and  $H_0$  similar to  $73 [km \cdot s^{-1} \cdot Mpc^{-1}]$  to which various local determinations may be converging (Krishnan et al., 2021).

<sup>5</sup> Proposals of the Lambert W function-based equations for the deceleration parameter and for the energy density are presented there; along with a disclosure of their authors that “... due to a high degree of complexity in the expression for  $\rho$ , we are unable to solve it for the scale factor...”:  $q = (3/2)\{1 + \vartheta_1 \ln[W(a)] + \vartheta_2 W(a)^3\} - 1$ ;  $\rho = \rho_0 \exp[-3\{\ln[W(a)][\vartheta_1 W(a) + \vartheta_1 + 1] W(a)(1 - \vartheta_1) + (\vartheta_2)/12\} W(a)^3 [4 + 3W(a)]]$ .

<sup>6</sup> The universe radius  $r \approx 3.8657 \cdot 10^{-35} [m]$  calculated for the scale factor  $a = 10^{-35}$  edges the Planck length:  $l_p \approx 1.61625 \cdot 10^{-35} [m]$  while the age  $A \approx 1.2895 \cdot 10^{-43} [s]$  edges the Planck time  $t_p \approx 5.39125 \cdot 10^{-44} [s]$ . Both data calculated for a present epoch ( $a_0 = 1$ ):  $r \approx 1.2773 \cdot [km]$  and  $A \approx 13.502 \cdot 10^9 [years]$  are 2% under current official data ( $r \approx 1.3043 \cdot 10^{23} [km]$  and  $A \approx 13.787 \cdot 10^9 [years]$ ). For the maximum scale factor ( $a_{max} = e^\pi + 1$ )  $r_{max} \approx 3.1079 \cdot 10^{36} [km]$  and  $A_{max} \approx 3.2852 \cdot 10^{23} [years]$  were calculated.

<sup>7</sup> Actually, the scaling ratio of  $1.875 \cdot 10^{27}$  between the cosmic web and the human cerebral and cerebellar cortex when their power spectra were examined ( $1,6 mm$  in brain samples corresponded to  $100 Mpc$  in the cosmic web) is referred. Synthetic samples of the cosmic web from a high-resolution ( $2400^3$  cells and dark matter particles) simulation of a cubic  $100^3 [Mpc^3]$  cosmic volume were used.

## Acknowledgements

The author's tribute is addressed to Čestmír Černý (1927-2009), professor of physical chemistry and rector of University of Chemistry and Technology Prague, for his illustrious chalked-based lectures once given to learners in a lucidly ravishing language of mathematics. A credit of coincidental encounter Euler's identity and Einstein's relativity belongs to Radúz Závěský, a schoolfellow and a good old boy.

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## Figures



Fig. 1: Albert Einstein in a Munich photo studio (1894). Unknown author. Image by: Wikimedia Commons, the free media repository. Public domain. [https://commons.wikimedia.org/wiki/File:Albert\\_Einstein\\_as\\_a\\_child.jpg](https://commons.wikimedia.org/wiki/File:Albert_Einstein_as_a_child.jpg)

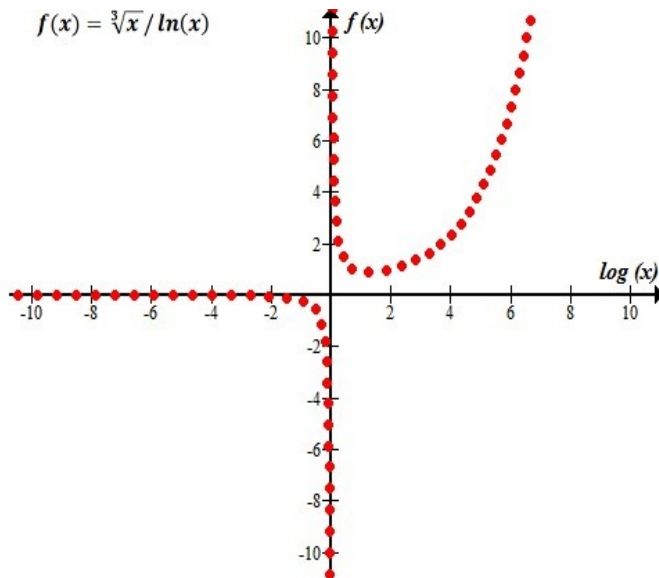


Fig. 2: The graph of a logarithmic-exponential discontinuous function plotted against. The function is derived from a transcendental equation.

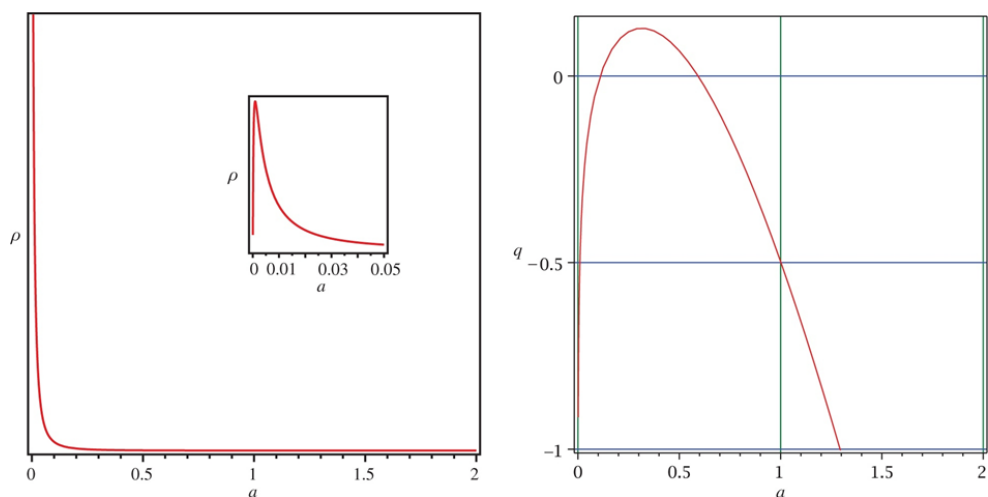


Fig. 3: Behaviour of the energy density and of the deceleration parameter as a function of the scale factor according the Lambert W function-based equations presented in: Saha, S. & Bamba, K.: “The Lambert W Function: A Newcomer in the Cosmology Class?”; in: Holthaus, M., Fetecau, C. & Kiefer, C. (eds.), *Zeitschrift für Naturforschung A – Physical Sciences*, 75(1), Berlin/Boston: Walter de Gruyter GmbH, 2020, pp. 23-27, fig. 1. Reprinted with a permission from the publisher.

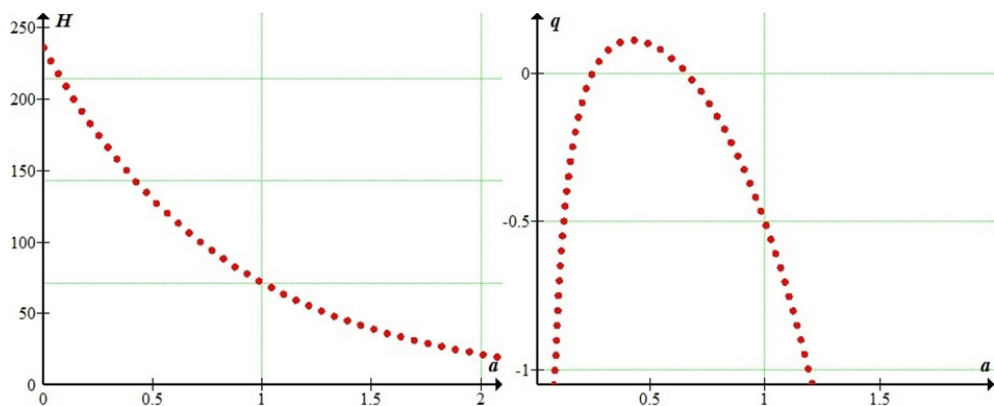


Fig. 4: Behaviour of the Hubble parameter and of the deceleration parameter as a function of the scale factor according the logarithmic-exponential discontinuous function ( )-based equations presented in this paper.

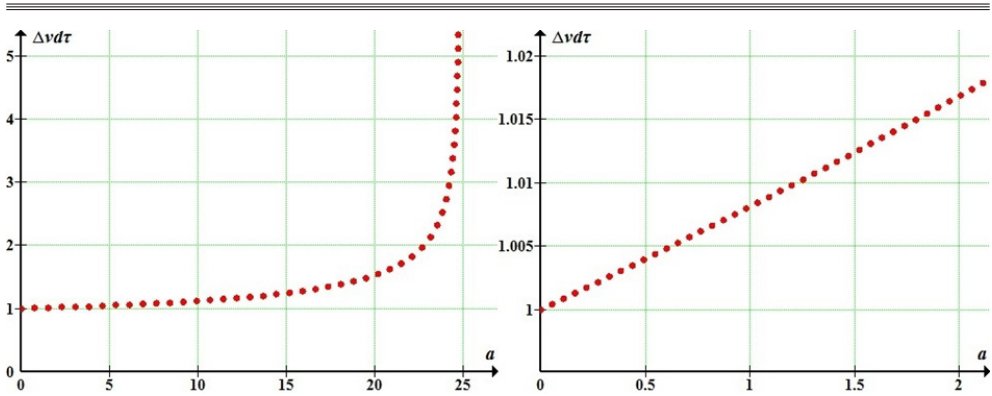


Fig. 5: Behaviour of the time dilation factor as a function of the scale factor according to the equation presented in this paper.

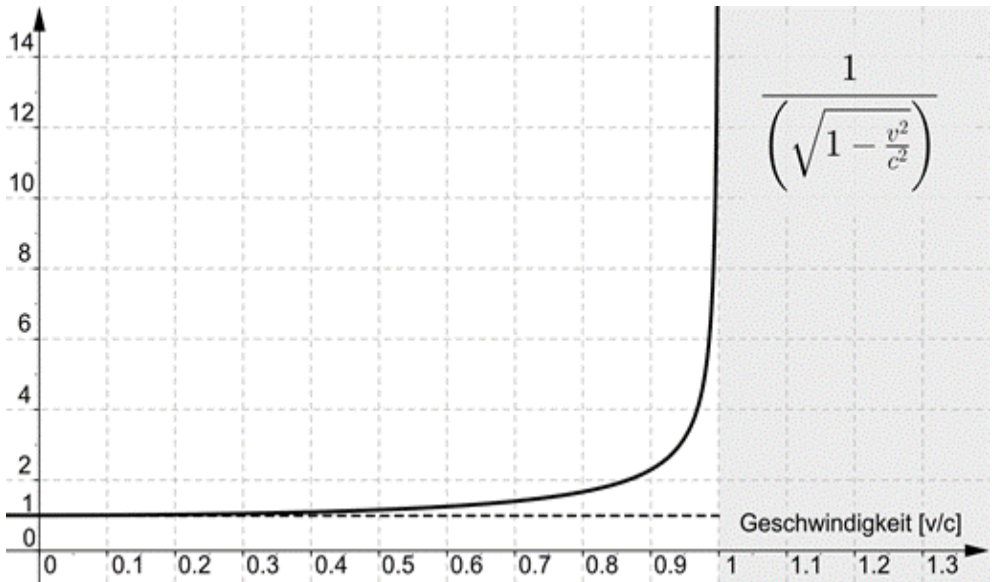


Fig. 6: Behaviour of the Lorentz factor ( $\gamma$ ) as a function of the relative velocity ( $v/c$ ). Figure from: File:Lorentzfaktor.svg; Klamann derivative work: MikeRun, Public domain, via Wikimedia Commons. <https://commons.wikimedia.org/wiki/File:Lorentz-factor.svg>

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**Philosophy and Cosmology, Volume 31, 2023**

**Academic Journal**

**Філософія і космологія, Том 31, 2023**

**Науковий журнал**

Коректура, комп'ютерне верстання – Панченко Н.В.

Макет обкладинки – Кулинич Є. А.