RESEARCH ARTICLE

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Human Consciousness versus Cosmological Reality

Patrice Foutakis

ABSTRACT

Human consciousness is a theoretical expanding universe within one which is likewise expanding from an astronomical point of view. Uncertainty about the line separating the cosmological and the human universes, makes the latter richer as it learns more about the former. By means of three topics – the difficult path towards scientific truth, the sense of time and the identification of life – I will propose an ultra-deterministic time dimension, and a way for understanding life, which are two assertions that introduce a paradigm in cosmology. Perceiving, conceiving and acting are neither prior nor posterior to time, they are inherent to time. Moreover, life at cosmological scale is presumably not the same as that imagined by *Homo sapiens*. It is to obtain access to reality that science, be it sometimes trapped by preconceptions, tries to discover more and to improve knowledge by erasing prejudices and errors.

Keywords: Cosmology, Epistemology, Philosophy, Science

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I. Introduction

It has taken too long for humanity to start realizing what kind of reality human beings are living in, and what does existence mean. Since the dawn of human civilization, some 12,000 years ago with early urban settlements and agriculture development, everything in nature has been considered according to human scale; even natural reality to which human needs and priorities are completely irrelevant. The structure of artistic, religious, and philosophical process was built upon five "bets" that have been lost as time has gone by and knowledge has evolved: 1) The universe was created in order to please Man and for God's Glory. 2) The universe is wisely, spherically distributed around the Earth with Man occupying a central, privileged position in the universe. 3) Human will is free and human soul stands immortal. 4) Man is superior to woman. 5) *Homo sapiens* is the goal of animal evolution.

II. A Slow, Painful Way for Scientific Evidence

The idea of the uniqueness, the centrality, and the superiority of humankind arose as soon as human consciousness emerged. The theories for breaking with these beliefs were rare, and they were not generally accepted at the time they were asserted. As early as 570 B.C.E., Anaximander argued that there had never been a real beginning for things and for the worlds because the principle and constituent of everything is infinity; everything is made and perishes according to necessity, in all skies and in all worlds within the skies (Aristotle, § C4, 203 b7, b23. Simplicius, § 24, 13). For Giordano Bruno, in 1584, there was a plurality of eternal worlds; motion is infinite, and a moving body tends toward infinity and to the formation of innumerable compounds (Bruno, dialog I). In 1957, Hugh Everett, in his application of quantum mechanics, proposed that a complete conceptual model of the universe is possible, containing more than one observer. He argued that although the essential point of a theory is that it is a mathematical model together with an isomorphism – in other words that there is a fair enough match between the model and the world of experience from external world – the idea that a physical theory should contain no elements which do not correspond directly to observables would probably stifle seriously the progress of physics (Everett, pp. 109, 133, 136). New theories followed during the 1980's giving cosmological answers to physical questions. The inflation theory by Alan Guth introduced the extremely rapid expansion of the early universe that might explain the flatness, homogeneity, and isotropy of a universe which is expected to be curved and heterogeneous (Guth, pp. 347-356). At the same time, Andrei Linde's eternal chaotic inflation model suggested that instead of a single universe that is expanding in a more or less coordinated manner, some universes might have been created by quantum fluctuations, in some places through rapid expansion, in other places through slow expansion (Fig. 1.). Therefore, the

observable universe is only a small causal part of a single bubble, with its observed flatness, homogeneity and isotropy, among many other bubbles, which are potentially completely different (Linde, pp. 389-393).

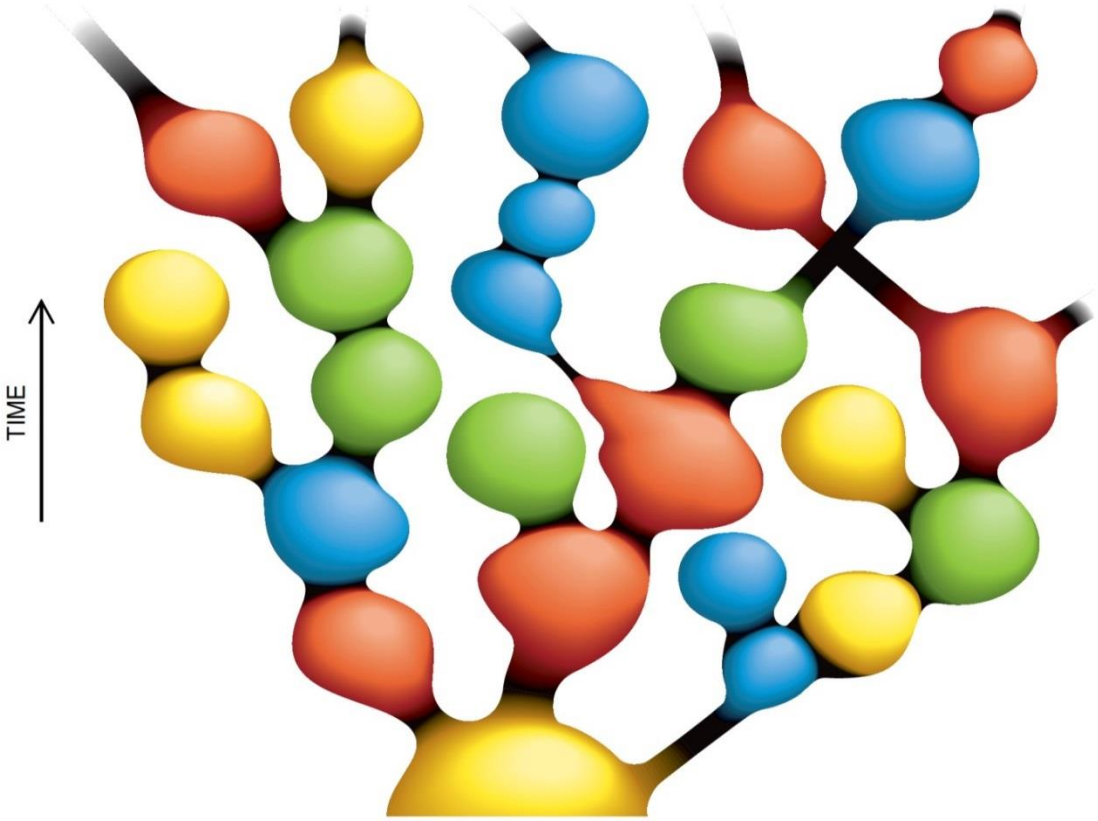

Fig. 1. Inflationary Multiverse in spherical shapes. Various universes are being created by quantum fluctuations in an endless process, either through rapid or slow expansion, as it is apparent from the different dimensions of the bubbles. Some of these universes are physically connected each other, others are not, and will never be. Different tones of colors indicate universes fundamentally different in the physical laws, yet evolving within the same spacetime. (Credit Andrei Linde: http://www.stanford.edu/~alinde/Multiverse2009.jpg)

There is thus a multitude of worlds, and the big bang was just a minor moment in a cosmological process that might be repeated at any time elsewhere in order to destroy or create other universes, by energy propagating into spacetime; and thereby creating infinitely the conditions of the first inflationary and chaotic instants of a world. The current universe is an expanding one, just one among other expanding universes, or contracting ones, or steady ones, or universes which are in inconceivable states. Ask "there was what before the big bang?" is meaningless because what existed before the big bang may still exist likewise in universes outside the observable cosmos.

The path to new cosmological models is hence cleared. A counter proposition to the inflationary universe theory claimed that the universe experiences an endless sequence of cosmic epochs that begins with a "bang" and ends in a "crunch", with each cycle including a period of slow accelerated expansion, followed by contraction that produces the homogeneity, flatness and energy needed to begin the next cycle. Inflation requires two periods of cosmic acceleration: a hypothetical period of rapid expansion in the early universe and the observed current acceleration, while the cyclic model requires only one period of acceleration per cycle (Steinhardt & Turok, pp. 1436-1439). The string theory is the ambitious research in particle physics attempting to reconcile quantum mechanics and general relativity, by positing that the particles within the atom are not non-dimensional but that they have unidimensional oscillating lines, like strings, as some experiments try to prove (Maldacena, pp. 695-696. Cubrovic, Zaanen & Schalm, pp. 439-444). In doing so, the string theory has to formulate a theory of everything, a theory of a self-contained mathematical model that describes all fundamental forces and forms of matter (Nikolai, pp. 797-798). Meanwhile, physicists, in the light of observational data, are reconsidering the possibility of a cosmological constant (Krauss, pp. 230-231), and cosmologists are introducing different possibilities of a multiverse: the level I multiverse with parallel universes which is basically the same as the observable one; the level II multiverse with parallel universes that have different spacetime dimensionality and different physical constants; the level III multiverse with parallel universes which branch into multiple copies, one for each possible outcome, according to quantum mechanics; and the level IV multiverse with parallel universes which are fundamentally different as far as physical laws are concerned, and exist outside of space and time (Tegmark, pp. 30-41). Hidden dimensions are asserted to determine particle physics parameters and properties, with the assumption that a rich universe structure may imply very

different physics in an as yet unknown geometry (Randall, pp. 1422-1427). As it has subtly been stressed by Martin Bojowald, with too much lee-way being granted to the choice of final conditions, physics is in danger of becoming a tautology, that is a proposition which is already true by definition.

Most unexpected cosmological assertions will be confirmed or invalidated only by means of experimental physics, and sometimes against taken-for-granted theories which will turn out to be wrong. Since the appearance of *Homo sapiens*, some 300,000 years ago, significant stages for a new conception of cosmological reality occurred in 570 B.C.E., in 1584 and in 1957. Strikingly enough, human conception conceived at the time something different from the apparent reality which was until then considered to be true. This change in human conception took place *painfully*, for it hurts common beliefs, *rarely*, because it was the exception to the rule, and *slowly*, since it took so much time to be accepted. Absolute immobility was excluded by Heraclitus, absolute spacetime was eliminated by Einstein, absolute measurement was banished by quantum mechanics.

For a long period of time, astronomy human beings knew was limited to a spherical sky with a sun, a few planets, and many stars. After having discovered that stars are like the sun, science had to conceive one galaxy which contained all stars and planets. After having discovered other galaxies, it was admitted that there was a universe containing galaxies, clusters of galaxies, molecular clouds, and intergalactic space. After having discovered the limits of the universe, a local, observable universe was discerned, surrounded by other universes. Humanity is profoundly haunted by the concept of limits. It imposes limits to a reality that ignores them, instead of admitting that limits concern only human beings. Why does human perception do this? Because human psychology needs support to be able to confront before defending, to defend before understanding, to understand before assimilating a cosmological reality that is far beyond human reality in space and in time.

III. The Sense of Time

A time dimension is essential for orientation in cosmological reality. Nevertheless, time implies cases that might lead to paradoxical situations. The twin paradox claims that if an astronaut travels with a rocket at the speed of light, when he or she returns to Earth, he/she would be younger than his/her twin brother or sister stayed at home (Langevin, pp. 31-54). It is the consequence of time dilation according to special relativity. Supersonic planes carrying highly accurate atomic clocks have tested the veracity of this theory. Furthermore, human body can support acceleration until approximately 12 mi / 20 km per second. Let's imagine, for the sake of argument, an astronaut in a spacecraft accelerating at 12 mi / 20 km per second until the spacecraft reaches a speed close to that of light, continues at this speed, approaches the destination, decelerates at 12 mi / 20 km per second, arrives at the destination 10 light-years away from Earth, turns back, accelerates again to reach a cruising speed close to that of light, and approaching to Earth, decelerates and lands. According to Earth time, this journey would have lasted approximately 25 years, while a clock in the spacecraft would indicate a 12-years long journey. This would mean that the astronaut would be 13 years younger than his/her twin brother or sister who stayed at home. Such an experiment is theoretically realistic, however the result is not! I think that the astronaut's body, under exceptional accelerations and decelerations, will be physiologically developed faster than his/her twin brother's or sister's on Earth, who will grow in a steady manner according to the speed the Earth rotates on its own axis, to the speed it moves around the sun, to the speed the Solar System moves in the Galaxy, the Galaxy in the Local Group of galaxies, and the Local Group within the universe. The human organism is physically and biochemically determined by the conditions of its own planet, including speed. If these conditions are changed, human metabolism, chronobiology, growth standards, and cellular resistance-wear will be proportionally changed. Which means that even if the spacecraft clock shows a much shorter travel than the earth clock, when the astronaut returns to Earth, he/she will be most likely as old as his/her twin brother or sister, biochemically speaking.

Time perception refers to the sense of time, which differs from other senses because time is not directly perceived but mainly reconstructed by the brain in a most subjective way. I call *ultra-time* the time dimension which ignores direction in a spacetime where there is no random or contingency at all. Imagining such a deterministic universe, is a way of putting forward another type of universe existing outside the observable one. It is noteworthy that the behavior of certain species, like honey bees for instance, suggests that they ignore random and contingency, although they live within the current universe. Unlike other species, honey bees possess a highly-developed sense of time, knowing exactly the hour of the day and planning activities in an impeccable spatiotemporal manner (von Frisch, pp. 137-146). Certainly, an external factor, for example the destruction of the beehive, perturbs honey bees' sense of time, but apart from such an unpredictable event for honey bees' mechanism of predictability, their way of conceiving and accomplishing their work is typified by an absolute determinism according to the duration of the task. What matters for honey bees' sensory perception is not the duration when accomplishing a task, but the effort to be made so that the work is completed in the same lapse of time.

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Energy expenditure is calculated according to the effort that has to be provided in order to accomplish a given task, always in the same time programmed in advance, even if an obstacle occurs, such as the wind. Their behavior seems to obey to an ultra-time, a non-dimensional time logic that ignores random and contingency.

This ultra-time, this all deterministic way of living a reality, is the way some species perceive and thus conceive natural reality which is the same as the human reality, except that they perceive it differently because it is more useful for them. Maybe this ultra-time will be the way one day humans will indirectly perceive the reality of a foreign universe. In this case, the ultra-time of these species is a significant paradigm of conceiving reality. Therefore, the way some species act as if random and contingency do not exist for them, must be thoroughly and minutely examined. Such a research will procure useful paradigmatic tools about how humans could one day understand a foreign universe. A fundamental difference between space and time within the observable universe is that a space can be replaced by another space while time is impossible to be replaced by another time or something else. Perceiving, conceiving, and acting are neither prior nor posterior to time, they are inherent to time. It is legitimate to suggest that, in other universes, spatial geometries may not be inherent to time and so it might be possible to replace time by another time.

There is another topic which is connected to time, and especially to the arrow of time. Vacuum energy, the energy of the vacuum in the universe, has effects experimentally observed, but this energy is puzzling scientists because its calculated density exceeds by many orders the cosmological constant which is the density of the energy in universal space. This cosmological constant problem is considered to be one of the greatest challenges of theoretical physics (Hobson, Efstathiou & Lasenby, p. 188). I propose to review this topic from another angle (Fig. 2).

Entropy and the arrow of time are intimately connected. The second law of thermodynamics states that total entropy, meaning the total loos of energy, is irreversible and constantly increasing into an isolated system. The universe does have, or at least seems to have, the characteristics of an isolated system because it does not seem to react with other universes. Besides, if other neighboring universes exist and have completely different structure and physical laws, it is physically impossible that they react and exchange with the observable universe. It might then be useful for astrophysicists to consider the vacuum energy as a sort of universal entropy. In other words, the vacuum energy could be the result of the conversion of detectable “lost” energy into an energy that current physics cannot detect. According to such an assumption, the vacuum energy will continuously increase for it is the entropy of the actual universe.

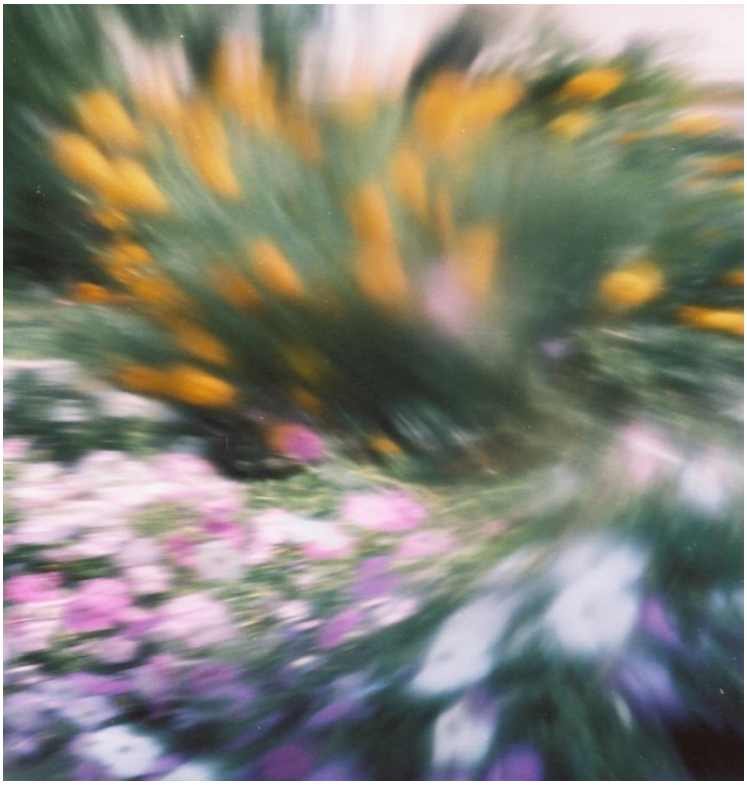

Fig. 2. Entropic arrow for matter and energy. The reality known by the five senses and described by science is made of matter and energy. The direction of the motion in this figure indicates the time’s arrow “before-after”. After a certain time, the system, here some flowers, comes to a point of no return, to a state of non-convertible energy when the entropy of the system increases up to a level that the flowers will not be flowers anymore because the contained energy / matter for the new state of order of the system cannot make back new flowers. (Author’s photo)

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IV. The Identification of Life

The human body, the social body, the celestial body are the three mirrors *Homo sapiens* has always liked to look into in order to recognize himself. Four fields – in chronological order art, religion, philosophy, and science – were created so that human beings can have a name and a home. Is it enough to pretend that they also have an identity? Is it possible to call identity this feeling of subjectivity, of singularity, of uniqueness, and at the same time designate Oneself by means of "I", of "Me", of "We", of "Us"? Man separated arbitrarily two universes which make one: material world and humankind, matter and intellect, brain cortex and soul, neuronal synapses and spirit, objective and subjective. An identity can be conceived, it is though out of reach because out of physical reality. Unless to admit that identity is to be aware that identity does not literally exist, being different does not confer an identity, and seeking an identity establishes borders which do not exist in the universe, separates persons from each other, and alienates the human species from reality; physically, chemically and astronomically speaking.

Different universes in structure and physical laws most likely exist. Some of them may possibly be discovered one day by advanced science, others may remain inaccessible forever. Among them, there is the current, observable universe (Fig. 3.).

Fig. 3. Inflationary Multiverse in random shapes. The universes are the small random shapes evolving in random directions. A few symmetrical shapes are due to local physical singularities. White areas correspond to known physical laws. Grey areas stand for physical laws that can possibly be understood by currently unknown physics. Black areas present inaccessible physical laws (Author's photo).

Uncertainty about the line separating the cosmological and human universes makes the latter richer as it learns more about the former. Human consciousness is a gnoseological expanding universe within a cosmological expanding one. However, the smaller universe will never reach the size of the bigger one because the cosmological universe expands much more rapidly than the human universe does. Moreover, infinite spacetime for the universe is normal, although it has spatiotemporal limits in its current reality, while infinite spacetime for humans is impossible, be they attracted to immortality. The only signature of known life is, for the time being, the carbon-based life evolved on Earth. An obvious characteristic, I would say a vital characteristic, of this kind of life is that it expands in every possible way even in hostile environment, such as extremely hot and cold places, or in the absence of light, and it evolves rapidly. Life seems to be in a hurry, in some ways it cannot wait in space and in time. Just like nature that abhors a

vacuum, life seems to do so too. The Fermi paradox suggests that given the age of the universe and the number of the stars, extraterrestrial life should be common, unless the Earth is very atypical, and therefore our planet should have been visited long ago and many times over if a multitude of advanced extraterrestrial civilizations really existed (Jones, p. 3). This unfairly famous assertion is as naive as the following one: a big fish in a small, insignificant lake, located among some high mountains on the planet Earth, "thinks" that it is the superior form of life in this lake biodiversity containing smaller fishes, serpents, mollusk, and seaweeds. This fish "considers" that if a most advanced form of life existed somewhere else on Earth, this form of advanced life would have certainly visited the lake. The big fish would thus "conclude" that outside its lake, Earth is a planet without life!

A common attempt to assert on the possibility of extraterrestrial life is to change one aspect of the physical laws and then make compensatory changes to other aspects. Theories about alternative values of the fundamental constants, and consequently of alternative sets of physical laws, allow humans to conceive extraterrestrial life. The way current science is however searching for life elsewhere than on Earth (Stevenson, pp. 511-512. Jakosky, p. 890), by looking for signs from unicellular or multicellular organisms based on synthesized carbon, is severely handicapped by the infinity of space, time, matter, and energy. Some cosmologists start shyly whispering that forms of life, completely different from the Earth's biosphere, can exist elsewhere. But some astronomers, physicists, cosmologists, and geneticists support a counterclaim by asserting that life is a rare phenomenon because it requires a highly complex combination of circumstances to be fulfilled, and so there is very little chance that life can occur elsewhere. Nevertheless, the universe may include an infinite number of types of lives capable of responding to stimuli, of growing, and of reproducing, that will oblige science to change its definition of life. Some people confuse infinity and complexity. The complexity of the human organism should not be considered as a rule, a criterion of superiority, or as a natural purpose. The human organism is complex, but limited in space (some thousands of kilometers away on the same planet, and some more millions of kilometers away within the solar system and the galaxy in the future), in time (a few decades for a lifetime, and a few million years for past and future human History since the first *Homo habilis*), in speed (repeated accelerations and decelerations cause irreversible brain damage), in matter (a body), and in energy (electro-biochemical activity of the human organism). Besides, complexity of an organism should not be considered as a necessary condition for high intelligence and evolved civilization. Within a biosphere containing biochemistry where life is not based on synthesized carbon but on totally unfamiliar structures, high intelligence and evolved civilization can be the achievement of simple, or even very simple, organisms.

Human structure is too complex to be "natural", it is a kind of "perversion" compared to the fabric of the current universe which is almost, but not completely, unlimited in time, space, matter, and energy. Life in accordance with cosmological data is simple, unicellular life, probably spread everywhere (space is almost infinite, and cosmological life, unlike carbon-based life, may appear in a rapid way), during the existing time of different universes (almost infinite time), and maybe having a consciousness with which human consciousness will either never be in touch, or will come in touch in a manner we ignore today. It is out of the question to assert that unicellular life, or another unknown complex form of cosmological life that could be omnipresent in the universe, is superior to human life, or that it is a universe's goal. Goals are inventions by and for human brain to go further, but not a part of the natural process. The way universe is evolving, physically and chemically, the place contingence takes into cosmological reality, and the numerous imperfections and errors in nature make clear that if there is a goal in the universe, then it is that there is no goal! *Homo sapiens* has chosen a way to perceive and to conceive which is contrary to the way the universe is proceeding. Given the fact that the species *Homo* has not the simplicity of a known unicellular organism, nor the simplicity of an unknown complex form of life, he ignores what consciousness might be for such organisms and therefore, in order to understand, he needs more complex means that do not exist in a natural, less complex process. But at least he has to try to take into account the cosmological reality which is a completely different language. Hopefully then, the human consciousness will become polyglot. But even if this does not occur, taking into account cosmological reality will nurture the irrepressible human tendency: need for things that are new, thirst for things that are real, hunger for things that are correct.

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