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[Essay]

What Little Remains of Life

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Abstract

Life is a non-equilibrium process involving a series of biochemical reactions that use external energy to build the cellular structure and the complexity of the organism. Humans strive for the continuation of their existence. This can be based on an illusory afterlife according to religion or on practical efforts through technology. But the temporality of individual lives is inevitable. Death in the universe, governed by the law of entropy, is unavoidable. Thus, as all traces of human existence fade away, what is most important in life is what one thinks and does at the present moment, when one is fully aware of life. Capturing each moment and filling it with some meaning is the only consolation in life.

So little remains of a life that has ended. So little is remembered. One is often reminded that in the end, all is ashes and dust, and personal memories and thoughts dissolve and vanish into nothingness. What remains of a life is a question for the future. But the answer could clarify what really matters in life and what one may or must do in the present. What one may do is realize that in the grand scheme of the universe, most things, including transient human beings, do not seem to matter much. And what one must do is free the mind from the self-centered assumption that humans are the chosen species in the world.

In the silence from high above, one is left with the struggle of finding the blueprint, if any, of the creation. The inevitable inability to reach the unknowable leads to a life of mystery, illusion, and tragedy. Each singular life is a series of intertwined choices that cannot be undone. Some measure of mystery of each life relates to the impossibility of ever knowing what the other choices would have led to. Another great mystery is the uncertainty of the afterlife, accompanied with the never-ending struggle to discover some measure of goodness in the constant presence of death.

The absurdity of human life is inevitable, as individuals are cast into an

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uncertain world, with death as the final outcome. But they are not given complete control over their lives. Thus, one has to make rational choices based on uncertainty and discover the elusive meaning in a seemingly meaningless universe. Natural disasters and the human suffering they cause were predetermined for humanity from the beginning because of the probabilistic nature of the universe. Although the universe follows certain laws and rules, the continuous creation and destruction processes may appear to the human mind as meaningless variations, and it is just a matter of chance whether humanity survives or not. Society, science, philosophy, culture, religion, and law, combined with various illusions provide a shelter against the absurd human condition. But in the end, death appears to be the only fitting culmination of human existence in an indifferent universe.

In order to reason about death, one must understand what life is. Living organisms consist of biological cells, which are the basic units of life. A living cell is a non-equilibrium system, which is constantly exchanging matter and energy with the environment in order to maintain its structure. The survival and functioning of the cells depend on the presence of semi-permeable biological membranes, which form boundaries between cells and their external environments and facilitate a selective process of exchange.

Life is based on DNA (deoxyribonucleic acid) and the genetic code (the blueprint of life) and the molecules it produces. DNA is a long polymer that contains the biological instructions required for the functioning and reproduction of the cell. In living organisms, DNA exists as paired strands forming the shape of a double helix. Within cells, DNA is organized into chromosomes, which are long structures that are duplicated during cell division so that each cell gets its own identical set of chromosomes.

In living systems, everything is constantly changing and transforming, including cell division and DNA replication and repair. Living systems continuously renew themselves. Nearly every part of an organism is continuously regenerated throughout the life of an organism. The set of chemical and physical processes that are continuously occurring within living cells and are vital for the maintenance of life is called metabolism. It involves constant flow of matter and energy through various chemical reactions. The required energy for the metabolism is obtained from the digestion of food, and the nutrients obtained from the digestion are carried to the cells by the circulatory system.

The biological functioning of a cell depends on its environment and on chemical and physical activities within the cell, as well as on numerous enzymes (catalysts) that regulate various chemical reactions, such as copying and repairing DNA and ensuring that energy is available for the cell. Changes in these activities beyond a narrow range of conditions can result in death of individual cells. Thus, to summarize briefly, life can be defined as a process of dynamic renewal, characterized mainly by metabolism, reproduction, internal regulation, growth, and adaptation. Life is a series of chemical reactions and changes.

Human aging and death are inevitable for various reasons. First, as life is based on the cell and its DNA, the gradual accumulation of cell and DNA damage, or alteration having an abnormal structure, during multiple rounds of replication leads to cell breakdown. Most, but not all, of the damage is typically repaired by the cell, but the damage tends to accumulate, resulting in the degradation of cell structure and function. As DNA replication is not perfect, various genetic mutations (changes in the genetic code) can also occur and these can cause diseases leading to death. Then, with each cell division, there is continual shortening of telomeres, which are specialized structures at the end of chromosomes and which are vital for the maintenance of genetic integrity during replication. Below a critical length, telomeres become ineffective, and this eventually leads to the deterioration of cell functioning and cessation of cell division. Another cause of aging is the accumulation of debris, both inside and outside the cell. Such cumulative changes in the cellular and molecular structure and disruption of metabolic processes ultimately lead to aging and death. Aging, disease and trauma are the main causes of death. In the future, even if all the causes of aging and disease were eliminated, physical trauma would always remain a risk to existence in the world of random accidents and disasters.

In a broader context, aging and death are related to the dissipation of energy, which is described in physics by the law of entropy. This law states that every form of energy in the universe has a tendency to dissipate, and organized systems tend to become less organized unless hindered from doing so. Entropy is a measure of decay of a system or how much energy is dispersed in a particular process: the higher the entropy, the greater the energy dispersal. According to this law, all matter, including complex dynamic systems such as life, has a tendency to equilibrium.

The law of entropy plays a double role in living systems; it is essential for

life, but it also contributes to aging. First of all, the energy dispersal and spreading according to the law of entropy is vital to life, as complex molecular structures could only be formed by tapping, or harnessing, some of that energy. But human beings, as biological systems, are also part of the natural world and thus are subject to the law of entropy. The living systems overcome such effects of the entropy law by getting energy from the outside sources. But human body, this highly complex network of cells and organs, can gradually degrade with age as the energy supply declines due to the wear and tear of energy-producing parts of cells, resulting in their damage or death.

Death is constantly hovering over life. It is the ultimate boundary condition of existence. One expects things to happen in the future. Combined with the language that gives the sense of identity, this provides an insight into death and the associated fear of it as the termination point for the anticipated future. But the human ego strives for immortality of some sort, as it cannot accept the finality of death and an individual's non-existence. The reaction in general is a belief in a continuous existence in some form and another reality, where presumably immortality is not invalidated by random accidents. Some individuals adapt to the constant presence of death through various religions that offer a belief in some kind of afterlife. Others go through life by turning away from the awareness of death through involvement in various activities and causes directed at establishing some sort of legacy that will live on after one's death.

The fear of death and the desire for immortality is the main reason for the existence of the whole industry dealing with some kind of life or continued existence after death. The lasting power of such an industry relates to its ability to bring closure to the search for immortality, so that an individual can carry on with a relatively anxious-free life.

But immortality is a meaningless concept in a physical universe governed by the law of entropy. An endless life would be pointless, as human endeavors would have no urgency, and time to accomplish things would have no relevance. Then there is the issue of boredom and of endless uncertainty. Yet the human imagination and wishful thinking envision the afterlife as it is desired based on a painted paradise in heaven, where the pain and suffering do not exist, and all the unhappy memories from the past and worries about the future disappear.

Human beings seek answers that are beyond their grasp. And as human reason and rationality have their limits, religion tries to fulfill the longing for

answers. The desire for certainty is so great that there is a tendency to believe in anything and follow anybody as long as that desire is satisfied. This leads people to surrender their rational thought and prevents humanity to harmonize various interpretations of the world. The paradox of belief in an afterlife is that, although it appears to offer the desired certainty, in fact it is completely uncertain what to expect or what the afterlife would be like.

Some may argue that life without god is absurd; but so is life with the illusion that there is an unknowable entity, accepted without evidence, which takes care of each individual for eternity that cannot be even defined. But for those who prefer knowledge to faith and truth to hope, it would be a somber realization that the universe has no special obligation to humans, as it does not have any obligation to any other creation in it. Yet for some people, religious ambiguities may be preferable to the certainties and uncertainties of life. But if an all-powerful and caring god indeed created the universe and life, one would expect, if not a perfect creation, at least one with fewer flaws appearing randomly as birth defects or catastrophic planetary accidents.

Although the concept of god can provide powerful support for many people, in practical terms only humanity's factual knowledge and efforts can make human lives more bearable in this often-hostile world. Humans survive and thrive by solving existential problems and applying their knowledge to a deluge of new challenges. Comforting beliefs and illusions may calm one's fear of the unknown, but they are not helpful in arriving at the objective truth about natural phenomena and practical solutions.

Those who do not rely on god and religion look for salvation from death in technological afterlife. The aging process could be delayed with new technologies, such as growing new organs from stem cells and using genetic engineering to cure diseases. Some theorists even speculate that human immortality is possible in the near future. But such speculations are riddled with practical problems and paradoxes. In this context, it must be emphasized that, in addition to its intended purpose, every technology is likely to have unintended and unforeseen consequences and side effects, and that all technological systems can fail. Yet, in the face of death, people need a vision that offers hope for the future.

Some of these technologies include the human cloning (the creation of a genetically identical copy of a human) and cryonics (the technique of preserving bodies under very cold temperatures with the expectation of reviving them in the

future). Some speculate that in the near future it could be possible to realize digital immortality by downloading not just an individual human code (DNA), but also one's brain architecture and mental functions, programmed in software, into a computer system. This would allow a kind of virtual immortality. But, as an individual's identity is constantly changing, it cannot be captured and reproduced exactly with all the details. Besides, any copy of an individual would have completely different thoughts and feelings and thus would be independent. In general, because of the immense number and complexity of neurons in the brain and the enormous complexity of their interconnections, the analysis of the dynamics of such networks presents a monumental challenge.

Another form of immortality is related to the concept of transhumanism, which is based on the notion that technology will eventually replace biology and thus transcend the frail human body. If such a transformation occurs and death will be significantly delayed, the important question is whether human nature will change fundamentally and human aspirations will be different, as living in the constant presence of death is a basic aspect of being human. This transformation could also turn the dream of transcending human limitations into the nightmare of a world without privacy and meaning.

One of the main issues with these and other new technologies is the uncertainty about unintended and unanticipated consequences that cannot be undone. Humans are able to develop new technologies, but they are not always able to resolve the problems caused by these technologies. As for the immortality of any physical system, biological or otherwise, no technology can eliminate existential risk, as it is impossible to completely avoid physical death or destruction through accidents or natural disasters.

Humans wish to be remembered and to know that their lives meant something. Thus, as individual death is inevitable, one may try to ensure immortality through religion, or through identification with some enduring cause such as the pursuit of knowledge. Various rituals, especially those related to death and remembrance, provide some solace to the survivors, who anticipate that they will also be remembered and that their lives will not pass in vain. These rituals also try to reaffirm that life has meaning, which is accepted more as a desirable concept rather than an established fact. As for the dead, none of those rituals have any meaning. For the dead, after crossing into the domain of eternal unknowability, there is nothing, not a single word from the living left behind, nor thought or pain, neither peace nor war, and not even the silence that

must be contrasted with a sound. It is as though as life starts from nothing and ends in nothing. But humanity cannot reconcile with the possibility that all these, the universe and the molecules of life and intelligence came from nothing and may disappear into nothing. It is possible that what is referred to as “nothing” is actually some form of energy that would again be transformed into various forms of matter and possibly even life.

The greatest paradox of life is that it would have no meaning or value without death. As dark defines light, death defines life. Thus, one of the most important inquiries is to comprehend creation with or without some form of human immortality. The most perplexing dilemma in the perception of reality is between a difficulty accepting the world with human mortality and absurdity of human immortality. The former implies a lack of compassion, which is just a human concept, and the latter would imply the absence of meaning in the evolving universe, since the individual meaning can only be defined within certain boundaries and not in relation to the vague concept of infinity.

One of the basic questions about death is: What remains of life or what endures after one is no longer alive? The memories about a person that remain in the minds of others provide an invisible link with the dead as sort of an echo of life reverberating for a little longer. These memories remain for a while: sometimes just for a generation, and occasionally even for several generations. In some cases, the memories or legacy last for many centuries. But eventually all memories fade and disappear. Some physical traces of life will remain in the form of written records and photographs in the digital library of humanity. But because of the volatility of digital information, most of these may eventually be erased; and others will be lost or left behind in life’s migrations. So what little remains is framed in time, in periods of various lengths of remembrance that is inevitably followed by oblivion.

Life consists of small changes and departures, but with the final exit, small fragments of memories in others slowly begin to fade away. What little remains beyond an individual is always distorted. Memories are constantly modified with each recall, so an individual remembers not what it was but what evolves in the mind of a person. Life and its meaning are never resolved. Death does not resolve life; it ends a life and the search for meaning. An individual never reaches the necessary depth of understanding of reality.

Humans have a tendency to view the end of life in abstract terms, as an event occurring in some distant future. Thus, many important or meaningful

goals in life are postponed indefinitely. In the absence of the sense of urgency in life, one is often trapped in a mundane life. Accepting death as an inevitable part of life intensifies the urgency of pursuing goals that are meaningful to the individual and encourages people to live in the present moment. The greatest irony of life is that the realization of what is most important in life usually comes at the end of it, when it is of little use. But this realization cannot be transferred to others, as it is typically derived from the individual's own experience or perspective.

The fate of humanity is constantly challenged by the random forces of nature, as well as by human activities. There may be a limit to life in general, and specifically to an intelligent life in the universe. The end of humanity could come as a result of planetary accidents, such as a massive asteroid impact causing global extinction. It is also possible that advanced civilizations, with highly developed technologies and means of destruction, perish through wars, because of the less developed wisdom to overcome ideological and political differences, or through unforeseen technological disasters. Humans are constantly developing new technologies, for better or worse; some of these interfere with nature, and most of them have their dark sides.

The probability of human survival for the foreseeable future may increase with the transformation of humanity from the politically and religiously diverse and self-centered groups, which believe in their superiority and special status, into a more coherent society that fully realizes that the human extinction is not only a possibility but also a very real probability. Over 99 percent of the species that ever lived on Earth are now extinct. Humans must finally free themselves from the assumption that they are the chosen species in the world. When it is fully realized that the universe has no special obligation to humans only because they exist, as it does not have any obligation to be reasonable or considerate to any other creation in it, one may arrive at a greater truth. It is a human responsibility to prevent avoidable hazards and to advance technologies that could safeguard the whole biosphere from natural disasters. One of the crucial issues of great concern is that of the growing gap between the human ability to shape its future through rapidly advancing technologies and the human moral and cognitive faculties that lag behind. This increasing gap makes the risk of human-made disasters more uncontrollable.

In spite of all the unintended and unforeseen consequences, technology is still the best hope for increasing the probability of human survival, although

future developments may lead to dramatic societal transformations. The central paradox is related to the fact that technological developments, which make human survival more feasible, may also result in either human demise, or eventual transformation of humans into transhumans with enhanced capabilities and lifespan. Thus, the nature of humankind, as one knows it, will be gradually transformed.

However, in a long run, humanity may not survive on a single planet because of either internal or external threats. Thus, before reaching a certain state of maturity in understanding of the universe, human civilization may collapse. But, even if these scenarios are averted, in several billion years, the sun will eventually run out of hydrogen fuel as it has been fused into helium, which then will fuse into carbon and other heavier elements. Eventually, the sun will cool, as will other stars, and human life will become unsustainable. Thus, human beings cannot survive indefinitely, even if they succeed to colonize other worlds. Ultimately everything in the universe will decay and vanish into oblivion. Then, it is also possible that the cosmic clock will reset for a new cycle, and new stars and new forms of life and intelligence will evolve again. But it would be of no consolation or relevance to humanity, as all traces of its existence would have been erased.

In the final analysis, nothing lasts forever in this world of constant change and transformation, as all things ultimately come to an end. Not just a short-lived butterfly on this planet or a bright star in the dark sky, but everything else fades away. Forever is a meaningless term, as it cannot be compared to anything else and there are no means to measure it.

Life is a struggle against the law of entropy and death in a cosmic casino, and human beings are participating in a kind of cosmic roulette in anticipation of inevitable death. In the end, each individual is alone, confronted with mortality; and most of the human efforts are directed at imposing temporary order and structure on their world. But ultimately everyone loses. One can never be certain if such an end would be followed by a new cycle of creation, as one can never be certain about the true meaning of time and reality.

But in the meantime, during human life, one has to endure and to keep discovering new things and searching for some meaning and purpose in life, such as the pursuit of knowledge that can reduce some of the uncertainty related to the unknown. Most likely, humans will never know why nature and its laws are the way they are, or what is the purpose, if any, of the universe and human

life. But a temporary experience of life, in spite of all the anguish and pain, is still a great journey filled with memorable moments of discovery.

What is important in life is not what one leaves behind, as it will fade away, but what one does in the present. What could be the most tangible meaning for the human being is to lighten the burden of life for others through words and deeds. The biggest challenge is to capture the present moment without judgment or expectation, or without past or future. The thing that matters most in this uncertain life is what one thinks and does at this moment, when a choice must be made that affects the next moment and the next.