

Cosmic Time. Biological Time. Are They Reversible?

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Time may be considered as a generalized notion – **Cosmic Time**, as well as the way in which time is related to living beings – **Biological Time**. We can imagine other ways of perceiving time, such as **Psychological Time**. Here I try to

make a parallel between the notions of Cosmic Time and Biological Time.

COSMIC TIME

In the common literature there are thousands of references about cosmic time. I take only one, which gives us an idea about the immensity of the discussion (1).

Considerations about cosmic time are sometimes proved by scientists. And sometimes just supposed. They are often contradictory. Let's have a look at some examples!

What did Plato say about time?

Plato clearly says that time is the wanderings of these bodies – their movement – and not a kind of number that measures such movement. Abstracting time from motion was an innovation of Aristotle (see full answer on faculty.washington.edu).

What did Newton say about time?

According to Newton, absolute time exists independently of any perceiver and progresses at a consistent pace throughout the Universe. Unlike relative time, Newton believed absolute time was imperceptible and could only be understood mathematically (see full answer on en.wikipedia.org).

What did Einstein say about time?

In the Special Theory of Relativity, Einstein determined that time was relative. In other words, the rate at which time passes depends on your frame of reference (see full answer on amnh.org).

What do physicists say about time?

Nothing in known physics corresponds to the passage of time. Indeed, physicists insist that

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time does not flow at all; it merely is (see full answer on scientificamerican.com).

What is the true meaning of time?

Time is actually an integral part of the Universe. As earlier mentioned, the very linear concept of time is tied into the concept of the Second Law of Thermodynamics, which is seen by many physicists as one of the most important laws in all of physics (see full answer on thoughtco.com).

What did Stephen Hawking say about time?

Hawking proposed that time itself began at the big bang, implying that it was self-contained and that our Universe could come into being with no help from outside forces (see full answer on bloomberg.com).

Can we go back in time according to Einstein?

Einstein proposed that time travel into the past could be achieved through an Einstein-Rosen bridge, a type of wormhole. Wormholes are theoretical areas of spacetime that are warped in a way that connects two distant points in space (see full answer on blog.scienceborealis.ca).

Is time travel possible?

According to NASA, time travel is possible, just not in the way you might expect. Albert Einstein's theory of relativity says time and motion are relative to each other, and nothing can go faster than the speed of light (Daryl Perry. USA TODAY, 10 Sept 2022. <https://eu.usatoday.com/story/tech/science/2022/09/10/time-travel-possible-science/7847346001/>).

Let us try a summary! Einstein's Special Theory of Relativity states that time is relative – in other words, the rate at which time passes depends on your frame of reference. The Second Law of Thermodynamics regarding heat and energy interconversion states that heat moves from hotter objects to colder ones, and not vice versa. In terms of entropy, which is the degree of disorder of a closed system, entropy is normally increasing continuously.

The forward march of time is shown by the direction in which entropy (which is a measure of disorder) increases (1). But the systems in the Universe are not closed. Maybe only the Universe as a whole could be closed. But not parts of the Universe. Even the black holes – immense mass accumulation from which either substance

or energy cannot escape – have been demonstrated not to be closed. They lose some energy, which can accelerate their “evaporation”.

So, physicists have huge problems regarding “the arrow of time” in the systems which are part of our Universe. Some of them believe that time is an illusion, showing just the order in which things are positioning one *versus* another. For others, the arrow of time follows the “entropy=disorder” concept. But under those conditions, time travel could be imagined.

BIOLOGICAL TIME

For living beings and humans, relations to time seem to be simpler. Biological time and cosmic time have different premises.

With time, living beings are getting older and finally disappear. As for the cosmic time literature, there are thousands of titles regarding the biological time, which show how the aging process is developing and whether this could be a reversible phenomenon. Here I comment only one title, coming from Harvard, USA, in collaboration with many other science centers (2), which opens a wide range of options for citations.

Over the time, scientists have first believed that aging was due to the loss of DNA information in senescent cells, which was causing them to malfunction. The hypothesis was not supported because many aging cells have been proven not to lose their DNA information and, while cells in other beings were not aging prematurely despite a substantial loss of their DNA information (2).

Therefore, Sinclair and colleagues turned to the epigenome, another part of the genome. Taking the information from the basic DNA information of that being, the epigenome activity makes cells to differentiate into every morphological and functional cell of the body.

This process may be accelerated, but also reversed, according to several reports by Sinclair *et al* (2). In other words, the cells of an aging being may be reversed to their youth condition. This finding laid the foundation for the Information Theory of Aging (2, 3).

In recent papers, Sinclair and colleagues demonstrated practically how biological time could be reversed. They took information from the research of Yamanaka S (4), the Nobel Prize Winner of 2012, together with JB Gurdon. In their works, they demonstrated how mature cells

could be reprogrammed to become pluripotent again.

In works cited in (2), Sinclair and colleagues rejuvenated mice cells and produced an old being which was ready to begin its life from a young condition. For instance, they demonstrated it was possible to restore vision in old animals (2). Now, research is progressing towards other mammalian tissues such as human neurons, skin, and fibroblast cells.

In summary for the biological time, groups of scientists demonstrated that aging was accelerated by losing hallmarks from epigenetic information. But there is now evidence that this information can be reprogrammed, which reveals a way to drive age “forwards and backwards at will” (2).

I conclude with a quotation of D. A. Sinclair from *Time*, January 2023 (<https://time.com/6246864/reverse-aging-scientists-discover-milestone/>): “We don’t understand how rejuvenation really works, but we know it works,” he says. “We can use it to rejuvenate parts of the body and hopefully make medicines that will be revolutionary. Now, when I see an older person, I don’t look at them as old, I just look at them as someone whose system needs to be rebooted. It’s no longer a question of if rejuvenation is possible, but a question of when.” □

As a last remark, Cosmic Time may be reversible, but we do not have the proof. Biologic Time was demonstrated to be reversible, acting on the epigenome.



REFERENCES

1. **Jaffe A.** The illusion of time. *Nature* 2018;556:304-305. <https://www.nature.com/articles/d41586-018-04558-7>.
2. **Yang JH, Sinclair DA, et al.** Loss of epigenetic information as a cause of mammalian aging. *Cell* 2023;186:305-326.e27. doi: 10.1016/j.cell.2022.12.027. Epub 2023 Jan 12.
3. **Kane AE, Sinclair DA.** Epigenetic changes during aging and their reprogramming potential. *Crit Rev Biochem Mol Biol* 2019;54:61-83. doi: 10.1080/10409238.2019.1570075.
4. **Yamanaka S.** Pluripotent Stem Cell-Based Cell Therapy – Promise and Challenges. *Cell Stem Cell* 2020;27:523-531. doi: 10.1016/j.stem.2020.09.014.