

Nothing Persists Except Change Itself

By Abraham Loeb on August 16, 2019

After my parents passed away recently, I wished to visit my childhood home and physically connect to my past. Arriving on site, I discovered that my home does not exist anymore since that space was renovated. Not only is the house a new construction now, but also the back yard - where I used to collect fresh eggs laid by our farm's chicken - was destroyed, and the peaceful ambience of my childhood was replaced by traffic noise from trucks on the adjacent road. Through this frustrating experience I came to realize that we can never return to where we were because everything changes. We are destined to always be refugees of the past without a permanent home. As with riding a bicycle, we must push forward and not reminisce about the past in order to retain our balance.

Although there is no escape from the bitter end, we have the privilege of enjoying the ride we take during our lifetime. Personally, I indulge on the beauty of everything I encounter along my path, especially transients like the sunset - as if they were low hanging fruits that are ripe and will soon rot. The Greek philosopher, [Eraclitus of Ephesus](#), already stated that "you could not step twice into the same river". However, persistent change extends well beyond our personal experience. Some changes are slow, giving the false impression of no change at all. For example, the atmospheric womb that enables biological activity on the surface of the present-day Earth was [devoid of oxygen](#) a few billion years ago. And planet Earth as a whole went through a plethora of [freezing ice ages](#) and [simmering hot episodes](#) throughout its history. But even slower changes occurred on much larger scales throughout the Universe at the same time.

Shortly after formulating his theory of General Relativity, Einstein advocated the notion that we reside in a [static Universe](#) and planted a cosmological constant in his equations for gravity to balance the cosmic deceleration induced by matter. Subsequently, he realized that a cosmic state of delicate balance is gravitationally unstable, with slight perturbations leading to collapse or expansion. Eighty years later, the cosmological constant [was discovered to actually exist](#) but with a magnitude that causes the cosmic expansion to accelerate in our future.

Einstein's advocacy for a static Universe was inspired by the popular notion at the time that the Universe is nothing more than the non-expanding Milky-Way nebula. Within less than a decade later, [it was realized](#) that the Milky Way is one out of many similar nebulae that are receding away from each other in an ever-expanding space. By reversing these receding trajectories back in time, one could not escape the conclusion that the nebulae must have been packed on top of each other at some earlier time and could not have existed forever. What really happened before that time, labeled the Big-Bang, is still unknown. But there is no doubt in everyone's mind that reality prior to the Big-Bang was very different than the one we witness now.

Astronomers quickly realized that not only the Universe and its galaxies but also the stars in them must have been born and eventually will die - as soon as their nuclear fuel will be exhausted. And we now know that long before our host star will die, [within about a billion years](#) from now, the increasing brightness of the Sun will boil off all oceans on Earth. At that time, all forms of life as we know it will cease to exist on Earth.

Fortunately, the circumstances around the Sun are not universal and life could survive for a longer time on the habitable planet around its nearest neighbor, the dwarf star [Proxima Centauri](#). Dwarfs with masses as low as 7% that of the Sun are the most abundant stars. These nuclear reactors burn their fuel much more slowly and will produce heat for [up to ten trillion years](#), a thousand times longer than the Sun. [After that](#), even they will fade away, leaving the Universe [in the dark](#), except for some weak flickers of light that might still be emanating from artificial nuclear reactors, those intentionally-produced burners that might warm up spaceships or rocky surfaces [inhabited by technological civilizations](#). But even those, along with long-lived evaporating black holes and decaying particles, will eventually burn up and dark silence should prevail in the very long run.

For now, we are an audience to a play that will only continue for a while. All we can hope for is to enjoy the show while it lasts. And we should not complain since we never paid to watch this show, and besides, there is no permanent address to which we can forward our complaints. All the employees we notice are temporary actors in the same show.

We never had an opportunity to bargain for more than a lease on our life. So we have no choice but to maintain humility about our temporary status or possessions and remain kind to those who share our transient fortunes, because everything – and I mean everything – will eventually be gone. The streaks of arrogance that some of us exhibit sometimes, reflect illusions about fictitious kingdoms that last forever only in our mind. Neither “kings” nor “kingdoms” will survive the ultimate guillotine of time.

ABOUT THE AUTHOR



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(Credit: Nick Higgins)