THE NATURE OF TIME

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Why Time?

This paper is an invitation to explore the nature and meaning of time, drawing from the Western philosophical and scientific traditions, as well as from Buddhist traditions. After examining some of the common-sense notions of time that we typically take for granted, we will look into the deeper mysteries of time. My intention is to understand these deeper aspects of time, and appreciate their intimate and meaningful connection with life—and death. We will approach time, therefore, as something that has immediate personal importance, for we come face-to-face with the meaning of life through the inevitability of death brought by time.

In addition to having profound significance for our personal lives, time is also fundamental to the nature of all existence. Thus, a substantial part of our inquiry will also deal with what are often called impersonal or metaphysical aspects of time. By the end of the paper, it will become clear, I hope, that the personal and impersonal aspects of time both open up into the same mystery.

What Time is it?

When we normally talk about time, we can mean different things. There is, of course, the conventional time measured by physical clocks. When we ask someone “what time is it?” it is this physical time we typically mean. But there is also a more psychological kind of time, as when we say “time flew by” or “that seemed like forever”. Such expressions show us that the subjective passage of time is sometimes faster or slower than the objective passage of time that clocks measure. It seems, then, that these two types of time are distinct, at least as far as the rate of passage of time is concerned. Our inquiry into time does not presuppose that objective time is more real than subjective time, or vice versa. Rather, our approach is to acknowledge both these aspects of time, and then to see what inquiry reveals about them.

Despite their differences, both subjective and objective time conventionally have the structure of past, present, and future. We remember our past, experience the present, and speculate about the future. While the future is full of possibility, the past is set in stone. And juxtaposed between the two is the directly experienced present that seems to move from the known past into the unknown future. We experience time as having a directional movement, an arrow. In other words, we experience an asymmetry of past and future. Whereas the past is known and determined, the future is unknown and undetermined. As we move into the future, it is as if the unknown is becoming known, the indeterminate is becoming determinate. In our youth, we experience our lives as full of future possibility. As we grow older, our lives are experienced more and more in relation to our memories of the past.

This difference between past and future is found in natural processes as well. Like a fading memory, a puff of smoke dissipates in the wind as time goes by. Similarly, the heat in our hot cup of coffee always dissipates into the rest of the room. The flow of time from past to future always involves dissipation of energy and decrease in order. Even in the case of self-organizing systems (such as life), their internal order increases only because they dissipate an even larger amount of disorder into their environment. The total disorder, therefore, still increases. Nature seems to have a built-in arrow of time.

The directionality of time suggests that time moves from past to future as one might travel in space from one town to another. But does time return cyclically upon itself, like a world traveler who continuously heads east and eventually returns home? Or is time strictly linear, extending in opposite directions into a past and a future that never meet? Is there an origin of time, a moment that has no “before,” or an end of time, which has no “after”? Our mortal lives seem to originate in our birth and end in our death. Is this a finite line segment contained within an infinite line, or is our death a circular return to a singular moment just prior to our birth? Similarly, perhaps the death of the cosmos will return it to its origin just before the big bang. Or perhaps cosmic time extends infinitely far into the past and into the future. Whether time itself is ultimately linear or circular, there are nevertheless many temporal cycles in experience that are similar, though not exact, replicas. Cycles of day and night, waking and sleeping, sunrise and sunset. Monthly cycles of the moon, annual cycles of the seasons. These natural cycles provided the original basis for the measurement of time. Although every day, month, and year is different from every other, yet a similar pattern repeats itself. Time has a cyclic component to it that confuses the distinction between past and future. Thus, we can wake up in the morning and not know what day it is. We can celebrate a birthday, but forget our age. Could this temporal disorientation indicate that time may not be, in essence, linear?

We might also question the asymmetry of past and future. In

spite of nature's arrow of time, the fundamental dynamical laws of physics are time symmetric, suggesting that the arrow of time is perhaps not essential to time. Somehow, the distinction between past and future seems to emerge as a secondary property of the natural world. In addition, our psychological experiences of past and future are sometimes confused as well. For example, the experience of *déjà vu* is neither a memory of the past, nor an expectation of the future. Rather, it is more like a "memory of the future," as if past and future were exchanged or confused somehow. In the
déjà vu
, the recall of the memory is triggered by the present experience of the remembered event. If the recall happens before the experience, it becomes a premonition, a memory of the future. Thus, the act of remembrance can refer to the past or to the future. Similarly, our forgetfulness can also refer to both the past and future. Insofar as we have forgotten the past, it is, like the future, unknown and indefinite. With no knowledge of our history, our past is as open to possibilities as our future. Perhaps the only real distinction between past and future is the degree of our capacity for remembrance with respect to each. We might even view the past-future as a single non-present domain that interacts with the present through memory and experience. What enters through experience we conventionally view as coming from the future, while what enters through memory we conventionally view as coming from the past. What our discussion suggests, however, is that these associations are not as solid as we might imagine.

Our introduction to time thus brings us to the present moment, and its distinction from the non-present past and future. On the one hand, the phenomena of the present moment are always flowing, changing, and transforming. On the other hand, the present moment itself always seems to be the same present moment, in the sense that there is a continuity of awareness throughout the transformations of phenomena. The present seems to involve both constancy and change. But is it the present that is moving though a constant space of phenomena? Is the present like a moving “point” in a temporal continuum? Or is the present more like a spatial continuum with phenomena moving through it, like clouds in the sky? Although remembrances and experiences seem to enter into the present as if from a non-present past-future, perhaps, like clouds, these phenomena were present in a subtle and invisible form before condensing as visible objects. There would then be no such thing as the truly non-present, and both the past and future would be nothing but mistaken views of the ever-present reality. In other words, perhaps time does not exist at all. . .

A Brief History of Time

Having loosened up our imagination, let us now begin the more detailed inquiry into time. We will begin in this section by considering different influential views of time in Greek philosophy, classical physics, and modern physics. After this

background, we will explore views of time in modern phenomenology and in Buddhist philosophy.

Time in Greek Philosophy

The Greek philosophers initiated a long history in the West of trying to understand the relationship between Being and Becoming. On the one hand, Heraclitus emphasized Becoming, and taught that everything flows. For Heraclitus, this flux of all things is a perpetual becoming of birth and death, a dynamic unity of all opposites characterized by the transformation between pairs of contrary principles. In contrast, Parmenides embraced Being as the only true reality. Parmenides argued that change cannot actually take place. In particular, it was a logical contradiction for a One Being to become a Many. For if the unity and being of the One are taken seriously, he reasoned, the One cannot in reality become other than what it already is—no manifold world can actually proceed out of the One. Therefore plurality, becoming, change, motion, flux, and so on, are not real, despite what our senses may lead us to believe. As Parmenides writes,

Being is ungenerated and indestructible, whole, of one kind and unwavering, and complete. Nor was it, nor will it be, since now

it is, all together, one, continuous...That it came from what is not I shall not allow you to say or think—for it is not sayable or thinkable that it is not...How might what is then perish? How might it come into being? For if it came into being it is not, nor is it if it is ever going to be. Thus generation is quenched and perishing unheard of. (*Early Greek Philosophy*, p. 134)

Even though Parmenides and Heraclitus take opposite approaches, they both teach us that there are not fixed, static entities in the world of appearances. Yet, the apparent existence of distinct entities that change into one another continued to trouble philosophers. What is the relationship between the changes that seem to take place in the world of appearances and the eternal reality of Being? Plato attempted to resolve this tension between Being and Becoming, eternity and time, thought and experience. For Plato, Becoming and time originates from Being as follows:

[The creator] sought to make the universe eternal, so far as might be. Now the nature of the ideal being was everlasting, but to bestow this attribute in its fullness upon a creature was impossible. Wherefore he resolved to have a moving image of eternity, and when he set in order the heaven, he made this image eternal but moving according to number, while eternity itself rests in unity, and this image we call time. (*Timaeus*, 37d)

That is, the world of Becoming is an instantiation or manifestation of the more primary world of Being. Time, in other words, is an essential part of the process of manifestation. Plato relies here on the notion of “image” that is central to his theory of forms. All sensible phenomena are imperfect images or copies of eternal forms, particular instances of universal ideas, like shadows projected on the wall of a cave (*Republic*, 514a). The images participate in, and are patterned by their governing forms. It should be emphasized, though, that Plato himself deconstructs this naive theory of forms that is so often attributed to him (
Parmenides
, 130b-135a), showing that the eternal forms and their temporal images are neither separate nor the same. He then goes on to show, through a subtle dialectical exercise, that, in the end, the reconciliation of being and becoming (and hence the understanding of time) is a deep mystery that cannot be rationally comprehended. Reason can only hint at the mystery of time.

Aristotle was the first of the Greek philosophers to provide a clear definition of time and discuss it at length (*Physics*, 217b-224a). He defines time as the counting of movement with respect to the before and after. Time, in other words, is the numerical measure of change in the continuum of before and after. But since time is the counting of change, it arises only

with counting. This raises the question of whether or not time exists objectively, or arises in the subjective activity of counting. Our moments of psychological confusion about time arise exactly because we have lost count—we know it is morning, but we don't know how many days or years have passed. Aristotle did not answer many of the questions he raised about time, but his notion of time as the counting of change had profound and lasting influence. Although he provided a useful working definition, time and its relation to eternity remained a mystery.

Plotinus, the most influential philosopher of neo-Platonism, followed Plato's basic conception of Time as a moving image of Eternity. In his *Enneads*, III. 7, Plotinus criticized Aristotle's conception of time as being mere numerical measurement of change, and presented his own views on Time and Eternity. According to Plotinus, Eternity is "that which neither has been nor will be, but simply possesses being; that which enjoys stable existence as neither in process of change nor having ever changed" (*Enneads*, III. 7, 3). Eternity, he says, "is a life limitless in the full sense of being all the life there is and a life which, knowing nothing of past or future to shatter its completeness, possesses itself intact forever" (*Enneads* , III. 7, 5). After his discussion of Eternity, he then explains how Time emerged from Eternity:

Time at first—in reality before that ‘first’ was produced by desire of succession—Time lay, though not yet as Time, in the Authentic Existent together with the Cosmos itself; the Cosmos also was merged in the Authentic and motionless within it. But there was an active principle there, one set on governing itself and realizing itself (= the All-Soul), and it chose to aim at something more than its present: it stirred from its rest, and the Cosmos stirred with it. ‘And we (the active principle and the Cosmos), stirring to a ceaseless succession, to a next, to the discrimination of identity and the establishment of ever new difference, traversed a portion of the outgoing path and produced an image of Eternity, produced Time.’ (*Enneads*, III. 7, 11.)

The origin of Time, clearly, is to be traced to the first stir of the Soul’s tendency towards the production of the sensible Universe with the consecutive act ensuing. This is how ‘Time’—as we read—‘came into Being simultaneously with’ this All: the Soul begot at once the Universe and Time; in that activity of the Soul this Universe sprang into being; the activity is Time, the Universe is the content of Time. (*Enneads*, III. 7, 12.)

Like Plato, Plotinus gives what is ultimately a paradoxical and metaphorical account of the origin of Time. Although Eternity and Being are in reality complete and perfect, there

nonetheless seems to be a mysterious principle in the heart of Eternity that gives rise to activity and time. There is a willful audacity of the Soul to govern itself and become something more than what it truly is, thereby giving rise to activity, process, time, and the entire world of existence. Plotinus, in effect, shifts the mystery of Time to another equally mysterious and paradoxical principle of activity within the heart of inactivity.

St. Augustine has written perhaps the most eloquent prose about the mystery of time. In his humble and brilliant perplexity, he asks,

For what is time? Who can easily and briefly explain it? Who can even comprehend it in thought or put the answer into words? Yet is it not true that in conversation we refer to nothing more familiarly or knowingly than time? And surely we understand it when we speak of it; we understand it also when we hear another speak of it. What, then, is time? If no one asks me, I know what it is. If I wish to explain it to him who asks me, I do not know. (*Confessions*, 11, XIV, 17)

Augustine’s inquiry into the nature of time arises from his attempt to understand how God, who is in Eternity, could create the world, which is in time. Like Plato, Augustine wants to

understand the relation of Being and Becoming. Because God creates time itself along with heaven and earth, Augustine argues that it does not make sense to ask what God was doing “before” creating. In other words, we cannot understand the creation of Becoming from Being in terms of a temporal becoming, for that either presupposes that time was already created, or that becoming is already part of Being. The creation of time and becoming must somehow be a timeless act. Augustine also presents what is perhaps the first phenomenological description of time, observing that the past and future are never directly experienced as such, but are only known as certain types of experiences in the present:

Thus it is not properly said that there are three times, past, present, and future. Perhaps it might be said rightly that there are three times: a time present of things past; a time present of things present; and a time present of things future. ...The time present of things past is memory; the time present of things present is direct experience; the time present of things future is expectation. (*Confessions*, 11, XX)

...see that all time past is forced to move on by the incoming future; that all the future follows from the past; and that all, past and future, is created and issues out of that which is forever present. Who will hold the heart of man that it may stand still and see how the eternity which always stands still is itself

neither future nor past but expresses itself in the times that are future and past? (*Confessions*, 11, XI)

Augustine thus sees all time as an unfolding within the eternal present. What, though, is the origin of the future and past within the present? Augustine considers this question in a discussion of the measurement of time intervals, such as a musical note:

Suppose now that a bodily voice begins to sound, and continues to sound—on and on—and then ceases. Now there is silence. The voice is past, and there is no longer a sound. It was future before it sounded, and could not be measured because it was not yet; and now it cannot be measured because it is no longer. (*Confessions*, 11, XXVII)

Yet, we do measure time intervals and durations. What is it, then, that we measure? Augustine concludes that what we are actually measuring are changes in mental impressions:

It is in you, O mind of mine, that I measure the periods of time. ...I measure as time present the impression that things make on you as they pass by and what remains after they have passed

by—I do not measure the things themselves which have passed by and left their impression on you. This is what I measure when I measure periods of time. (*Confessions*, 11, XXVII)

Here Augustine has displayed some original insight into the psychological aspects of Aristotle's conception of time as the measurement of change. Time is derived from the comparisons of mental impressions that have left their trace in memory. Yet, this cannot be a mere psychological act, since Augustine maintains that God is the creator of time, not humans. What Augustine appears to be explaining is how humans manage to measure time intervals, not how time itself is created. The manner in which time emerges from eternity is thus left as an unexplained mystery.

Time in Physics

In the 17th century, Isaac Newton developed his classical physics, and based it on a metaphysical conception of time as an absolute linear continuum that exists independently of motion and measurement, and even existed before the creation of the world. According to Newton, time itself is an eternal and unchanging divine substance that provides an infinite container for all changing events. Time is not itself an empirical or

physical phenomenon, but the fixed, absolute background or container of all phenomena. In Newton's view, time and space are the sensory organs of God. Because space itself is everywhere, and time itself is everlasting, God is omnipresent in perpetual divine contact with creation. Newton's view of time as the eternal backdrop of all phenomenal change is reflected in the equations of classical physics: time is not a solution to the equations, but a parameter in them. It is the time variable *t* that gives physical quantities their meaning by placing them in temporal relation to other quantities.

Today, quantum field theory and Einstein's general theory of relativity have superseded classical physics and overturned many of Newton's ideas of time and space. In particular, modern physics has rejected Newton's notion that space and time are distinct, uniform and absolute. Instead, space and time are now conceived as forming an integrated four-dimensional spacetime continuum in which both space intervals and time intervals depend upon the relative movement between observer and observed. There is not one "universal clock" as Newton thought, but many "local clocks" whose relative rates depend on their relative motion. Moreover, whereas Newton's space and time containers are immutable, the spacetime container of modern physics is capable of warping, and the apparent "force" of gravity is merely the residue of viewing this warped spacetime as if it were actually flat. Despite the radical non-intuitive consequences of this revisioning of the categories of space and time, in some ways it is just a sophisticated

variant of Newton's ideas. Instead of separate, immutable space and time containers, there is a single, mutable spacetime container. To put it in Newton's metaphysical terms, the big bang and subsequent expansion of the universe is the growth of God's integrated spacetime sensorum, and still provides a kind of background for all creation. The mutability of spacetime in general relativity, creates a problem reconciling it with quantum theory, which is based on the distinction between the background variables and the dynamical variables. With both space and time variables changed into dynamical variables, there is no longer a fixed background against which to formulate the theory. Moreover, because space and time are dynamical variables, the uncertainty principle of quantum theory implies that they lose their meaning below extremely small limiting values. Overcoming this problem is the most fundamental challenge of 21st century physics. Currently physics cannot meaningfully talk about extremely small time lengths in the present, or about what "happened" in the universe at times extremely close to the big bang. It appears that time itself becomes meaningless in these circumstances, and it is not clear how to describe the nature of physical reality prior to the emergence of time, or how such an emergence might take place. For physics, time is still a deep mystery.