Mythological and Psychological Time

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In this paper I will explore psychological and mythological time using ideas that modern physics has about metric time as my starting point. Because a fundamental tenet of the theory of relativity is that time and space cannot be separated, but must always be considered in terms of a space-time continuum, I will frequently discuss them in the space-time context.

I will cover a variety of time's aspects and manifestations and use current scientific theories to propose models that can help us understand psychological and mythological time in these contexts. I will also use ideas about psychological and mythological time to suggest avenues of inquiry that might prove beneficial to modern science.

Metric time is the time we share with each other. It facilitates television schedules, meetings, festivals and all sorts of group gatherings. Certain aspects of life, such as aging and history, support a view of metric time as being a linear movement from past, through present and into the future. Others, such as the moon's phases, day and night, the seasons of the year, and the rotation of our galaxy, suggest a cyclical, repeating nature of metric time.

Psychological time is the unique, internal, subjective experience of each person. There is mind time for our daily lives, memory time for our memories and even times associated with our organs.

Mythological time is the eternal time of mythology, the underworld and depth psychology.

BLOCK TIME

Block time refers to the idea that all of time already exists and is laid out as a timescape.

Einstein's Theory of General Relativity demonstrated that the past, present and future of metric time are all relative. What appears to me as B happening after A, may appear to another observer as A happening after B. Without a universal agreement about the order of events, we cannot have a model in which time flows in an agreed upon direction. Instead, we must consider the past, present and future to be different views of a single vast timescape.

The Nobel Prize winning physicist Richard Feynmann proposed a "sum over histories" approach to understanding elementary particles which says that there are many ways of getting from one point to another and all of them are true. This further shatters any notions of a specific past.

Memory is a block time for our psychological time. It gives life to the past and lets it live with the present.

Mythological time is primarily block time. In the Dreamtime of Australia's aboriginal people, the past exists with the present. Chronos, a god of time, exists in the past, present and future. As Calypso said to Ulysses:

> For (the gods) there is no before or after, only now, wherein all things are and always were and always will be.[1]

WHAT PURPOSES DO TIME AND SPACE SERVE?

Metric time and space help our conscious mind participate in and make sense of the world. Without time, there would be an incredible jumble of images simultaneously presenting themselves. Without space, everything would happen at one point.

The eternal truths and archetypes of myth may not need time or space, but we need to bring them into space-time so we can talk about them with stories, which have heres and theres as well as beginnings, middles and ends.

Death, a key part of mythology, needs time.

Free will needs time so we can think our decisions affect the future.

HOW IS TIME LIKE AND UNLIKE SPACE?

Time serves to simplify the descriptions of our observations of events in metric space-time. Prior to an event, time is not a factor. Space is the only consideration as we get everything in the right position. Once this happens, the event occurs, time begins and there is a formula which expresses spatial location as a function of time. It would be possible to express one spatial location in terms of another, but those formulae are frequently much more complicated. For example, if I throw a ball, it is easiest to describe its height as a function of the time since I threw it and its distance from me as a function of that time. It's possible to describe both its distance from me and the time since I threw it as a function of its height, but the equations are more complex.

The uncertainty principle of quantum mechanics introduces fuzziness into all measurable quantities on a microscopic scale, including space and time, which may be smeared together and indistinguishable at the quantum level. The smearing could go away as the size increases out of the quantum range, allowing time to emerge. Physicists Steven Hawking and James Hartle have constructed a model of the big bang theory of universe creation which starts with time looking like space and later, thanks again to quantum possibilities, separating.[2] They call this time-that-looks-like-space imaginary time because it is expressed as multiples of imaginary numbers, the square roots of negative numbers. These square roots don't exist in our real world, so we need to imagine them.

Time appears to have a preferred direction. We can perceive space equally well in all directions, but most of us can perceive past time much better than future time. We can also move around in space in any direction and at a variety of speeds, but our mobility in time is much more restricted. This may have something to do with the fact that we have eyes to perceive space, but no identifiable organ to sense time.

Comparing time and space is like comparing apples and oranges unless we agree on some conversion factor to give them similar units. Physicists convert metric time to space by multiplying it by the speed of light. In this case, one second corresponds to 186,000 miles (the distance light travels in a second.) This methodology leads to the conclusion that both the detail

and range of our spatial and temporal fields are very similar in metric space-time. I.e. our range is about 15 billion light years away and 15 billion years into the past. The detail with which we can observe time and space in microscopic reactions is also similar.

We cannot draw conclusions about the detail and range of our spatial and temporal perceptions in the psychological space-time of our experience, because we have no agreed upon ways of measuring psychological time or psychological space and have no conversion factor. The speed of light, which plays an apparently minor role in our internal workings, does not appear applicable. If we wanted to use a signal speed, we could use the measured speed of nerve pulses. If we wished to use something more psychological, we might try to determine a speed of comprehension or insight. This speed may also be a factor in how fast psychological time seems to pass (see the later discussion on how fast time is moving.)

Time doesn't appear to play as precise a role in describing mythological events as in metric events. This is probably because mythological events are full of gods and people, who introduce a degree of unpredictability. Since Helios drives his chariot across the sky, we can't expect to be able to predict a precise location for the sun. We know that Zeus' thunderbolt will land where he intends and it route is irrelevant.

Time probably has more of a hold on our imagination, as indicated by the beautiful instruments we use for telling time and the utilitarian tools we use to measure space. This may be because the measurement of time depends on motion and space is frequently measured with inanimate objects.

WHERE DID TIME COME FROM?

Quantum physics has abolished metric time close to the big bang, in which our universe sprang from nothingness. General relativity predicts the total energy of the universe to be zero and quantum mechanics stipulates that the rate of passage of time is related to the energy of the system. A no energy universe has no place for time.[3]

However, a total of zero energy doesn't mean there is zero energy throughout the universe, just as a total of zero for summing a group of numbers doesn't mean they all have to be zero (Three plus five plus negative eight also equals zero.) In a universe which is large enough to contain subsystems, which ours is (galaxies et al,) there is a place for time. How did the universe without time become a universe with time?

Scientists have traced time back to the point where it stops making sense in their descriptions of the universe and that value is about 10 to the minus 43rd seconds (a decimal point followed by 42 zeros and then a 1.) Although this is when metric time apparently began, we can't say time didn't exist before then because words like "before" don't make sense without time. It's not possible to say "when" that time-less universe existed for the same reason. It didn't exist "then" and doesn't exist "now." It doesn't exist in time. At least time as we know it.

What happened to that timeless universe? If we limit our speculations to those which can be verbalized without using any words that rely on time, it's hard to describe anything that could have "happened" to it. That universe and our universe are connected in our time of 10 to the minus 43rd seconds, but is that the only connection? Perhaps it is the only one that can be

described with the mathematics that is valid to physicists, but the worlds of mysticism and mythology affirm many connections to the eternal.

If each person is their own universe, could conception be the big bang of psychological space-time? It is certainly the creation of something (life) from nothing. If the fetus can't perceive time, then pregnancy is a timeless period in the child's universe, during which eternal, archetypal events may be happening. At the time of birth, the imaginal space of the womb spawns the beginning of time and consciousness (but that timeless, archetypal world stays with us as well, perhaps as our unconscious.) In my discussion of black holes, below, I will trace this idea back further to draw a model of reincarnation.

This sequence also occurs in mythology. In Greek Mythology, Uranus and Gaea were the first gods. Chronos, the god of time, came out of them just as metric time came out of the timeless universe of the big bang.

Since we cannot comprehend eternity, we can only deal with its structures by imagining them into time and stories. This imaginary time we create to let us explore the timeless world of the gods serves the same purpose as the imaginary time Hawking and Hartle use to explore the timeless world of the big bang. Stephen Hawking and James Hillman say some very similar things about the fundamental importance of the imagination:

> Stephen Hawking: "So maybe what we call imaginary time is really more basic, and what we call real is just an idea that we invent to help us describe what we think the universe it like"[4]
>
> James Hillman: "Imagination (is) the ground of certainty, … nothing is more certain than fantasy"[5]

BLACK HOLES - THE TIMELESS UNIVERSES THAT COEXIST WITH US

When a star more than twice as big as our sun runs out of nuclear fuel, it explodes into a supernova and then collapses into a black hole. If it was similar in structure to our sun before collapse, it will all squeeze into a black hole about one million – trillionth (a decimal point with 17 zeros and then a 1) the size it had been, e.g. our sun's current radius of 700,000 kilometers would be reduced to about 3 kilometers. The unbelievable (except mathematically) strong gravitational force at the surface (called the Schwarzschild radius) of the black holes prevents anything, even light, from escaping.

Because gravity also slows down time, a black hole brings time to a relative stop for someone who is watching from a safe distance (but not for someone who is falling into it.) Consider Bob and Barbara who both travel to the vicinity of a black hole with a mass about equal to that of our sun. Assume they stop at the distance the earth is from our sun and synchronize their watches (Gravity at that distance would feel just like the gravity we feel from our sun.) Bob stays there and Barbara decides to enter the black hole.

As Barbara approached the black hole, Bob would notice her clock slowing down relative to his and Barbara would notice Bob's speeding up. As Barbara got very close to the Schwarzschild radius, Bob would see her clock (and her motion) almost stop. Barbara would not see anything

different with her clock, but would notice Bob's clock speeding up infinitely. By the time she crossed the Schwarzschild radius, she would see (except for a few details not relevant to this discussion) an infinite amount of time go by in Bob's universe. (If Bob, during his relatively brief existence, ever tried to calculate the time inside the black hole, he would have to use imaginary numbers.)

Barbara would keep going inside the black hole and, according to current theory, would go directly to the center, which has not just the incredible density of the entire black hole, but an infinite density. This creates what is known as a singularity, a place where time and space cease to exist, even for Barbara (Remember, Bob and his universe are long gone by now.)

In some ways, black holes are time reversals of the big bang. Some scientists believe that all the matter falling into this singularity might form the seed for another big bang for another universe. If the physical laws of the new universe allow multiple black holes (as ours do) then this theory postulates an ever increasing number of universes.

Reincarnation can be viewed as a combination of black holes and the big bang (see my discussion above) in psychological space-time. If light is a metaphor for our life force, we could look at the last glow of life as the supernova as life's fuel wears out, followed by the collapse of the life force into the black hole of the soul at the center of our being. It's a trip that would seem fairly normal to the dying person taking it, but an outside observer (remember Bob and Barbara at the black hole,) would see them go slower and slower and never get there. If the bright light which people report during near death experiences corresponds to the black hole singularity, the life force might then be reincarnated into a new life (universe) in a big bang process similar to the one I proposed before as a parallel to human conception. To avoid a conflict with the metric time-space fact that the outside universe would end before Barbara reached that singularity, reincarnation could not take place until every possible observer of the original death had died.

In addition to reincarnation into another body, the black hole/ big bang model can also be applied to spiritual rebirth.

In Stepping Over the Threshold, Marion Woodman says :

> "Many people are running as fast as they can around the outside of the black hole at the center of their being," which she later calls the "timeless world of the archetypes." She describes the journey into that hole as a "venture to find our own angels and our own devils." [6]

When we enter the black holes of metric space-time, we also enter a place that is timeless in the sense that its time is completely inaccessible to the world outside the black hole. This timeless place is natural places to find angels and devils, which are associated with the timeless realms of heaven and hell. James Hillman tells us that "self-understanding…is not in time to begin with." [7]

Woodman believes that dreams are an integral part of this journey of self-discovery. The dream is a move into image-time. The trip into the black hole is a move into imaginary time, a time for the imagination. Hillman says he is "working toward a psychology of soul that … starts…in the processes of imagination" and states his conviction that "Every single feeling or observation occurs …first (as a) … fantasy-image" [8]

Hillman tells us that dreams "present images of being rather than of becoming."[8] Because becoming requires time, and there is no (real) time in black holes, they are also places of being, places of the imagination.

Woodman says the goal of this venture is "to find the fire in our bodies, …to bring the sweetness of the body to life."[10] The fire in our body could correspond to the singularity at the center of the black hole, which like a fire, consumes everything, even time and space. Bringing the sweetness of the body to life is the new big bang of the soul, and, as Woodman says, brings us "…into the kingdom of love."[11]

Her observation that love is what makes all this possible suggests a new avenue of approach for understanding the cosmological question of why the big bang happened anyway. Could gravity, the universal attraction, be the metric space-time equivalent of love? Einstein told us that gravity is not a force, but something that permeates the fabric of space-time. Love also permeates our very essence.

Black holes and the underworld of mythological space-time share a lack of time and a separation from our ordinary reality.

James Hillman reminds us that "there is no time in the underworld."[12] Black holes also do not contain time (as we know it.)

The Schwarzchild radius and the river Styx are the boundaries that mark the point of no return for the final journey into both the black hole and Hades.

However, it is sometimes possible to return from Hades, with the help of the gods. Scientists do not yet believe it is possible to return from a black hole into this universe, but the Hades metaphor suggests it may be, if we are able to enlist the help of some powerful forces.

WHERE IS TIME GOING?

Unlike metric space, metric time appears to have a motion and direction, and the future seems to be coming toward all of us at the same speed. Modernists think it's coming in a straight line, but perhaps it is a spiral, and thus incorporates the cyclical observations of the pagans.

This sense of past, present and future leads to the idea that there is an arrow of time, but the existence of such an arrow is unsupported by any of the known fundamental laws of physics, which are all time symmetric. It is just as easy to travel in any direction or dimension, including time, in the Hawking-Hartle model of the universe, which exists in a four dimensional space-time version of the two dimensional surface of the earth.

There are arrows of time for quantum mechanics, thermodynamics, evolutionary biology and possibly others. (Although entropy, the thermodynamic arrow, predicts a migration from the more ordered to the more chaotic, evolutionary biology predicts the opposite, an increasing complexity of systems.)

Scientists currently believe the arrows of metric time will ultimately be traced to the cosmology and large-scale behavior of the universe.

Since all outside realities must pass through our own perceptions before we can talk about them, it's possible that there is no metric arrow of time, just a psychological arrow of time which imposes itself on our external observations. Our perception of the flow of time might be similar to our sense that a room is spinning after we have been spinning and then stopped.

There may be a mythological arrow of time that points toward the soul. We think of the direction into the soul as depth, but perhaps it is imaginary time, which we have seen has spatial characteristics. Instead of entropy increasing in metric time, individuation is increasing in the imaginary time of our soul. The arrow exists in the sense that we cannot become less-individuated.

Entropy in metric time is about the tendency for things to fall apart and disintegrate (a classic example refers to the broken plate that does not reassemble itself.) Hillman, using similar language, tells us that "only by falling apart…do we…embrace…psychopathic potentials" and that "A psychotherapy that reflects these depths (of the soul) can therefore make no attempts at … encouraging a personal identity as a unified wholeness."[13]

When we try to interpret the mythological arrow of imaginary time by mapping dream images into metric time sequences, there is no smooth solution and we are left with a series of arrows that do not fit together consistently and confuse our consciousness.

HOW FAST IS TIME MOVING?

How fast does time pass? If time seems to go slower, does it?

Einstein demonstrated that the speed of time can't be defined in any absolute sense, but can only be compared in one place and time to the speed in another place and time. The rate of passage of metric time changes as we get near massively heavy objects or approach the speed of light. We can use this theory to explain some of the variations in the rate of passage of psychological time.

We sometimes use the word "heavy" to describe thoughts that make us uncomfortable or worried. Those times seem to go slower than other, lighter, times. This is consistent with general relativity's prediction that heavy objects slow time.

I have previously suggested that our psychological space-time universe may have an analogy to the speed of light that could be called a speed of comprehension or insight. As our mind approaches insights and illumination, psychological time seems to go much faster than when we are stuck in boredom (or the dentist's chair.)

This line of inquiry requires that we pay careful attention to the status of "who" is measuring time and the status of the clock they are observing. The status is known as the reference frame in relativity theory and its important characteristics include its motion relative to other reference frames and the external forces, such as gravity, which act on it.

Relativity theory has a class of special reference frames known as inertial frames. An inertial reference frame is free of all acceleration and external forces. If you are in an inertial frame, you observe all clocks in other frames (including inertial frames) as moving slower than clocks in your inertial frame.

To successfully apply the insights of relativity theory to the observations of psychological time, we need the following results:

> For heavy thoughts to slow the passage of psychological time, the observer must be in an inertial frame observing a clock in a non inertial frame.
>
> For an enjoyable activity or insightful activity to speed the passage of psychological time, the observer must be in a non inertial frame observing a clock in an inertial frame.
>
> For anxiously awaiting "our turn" for an enjoyable experience to slow down psychological time, the observer needs to be in an inertial frame observing a clock in a non inertial frame.

This would be possible if the inertial frame of relativity theory is analogous to our conscious mind. Leaving the inertial frame corresponds to letting go of our ego. In this case, we could rephrase the above conditions to say:

> When our conscious mind dominates our experience of "heavy thoughts", time goes slowly (however, if we let ourselves take the journey, we leave the inertial frame and time goes faster),
>
> When we lose our ego and leave our conscious mind behind to experience intense creativity or an enjoyable event, time goes faster and
>
> When we stay in our ego and watch someone else experiencing a blissful experience, time slows for us.

Relativity theory has also demonstrated that there is no such thing as absolute rest. All calculations work just as well no matter what speed we assign to two bodies moving relative to each other as long as the difference in assigned speeds matches the relative motion.

The absence of absolute rest contradicts the idea that it is possible to still our minds when we meditate. Stillness may then be more accurately thought of as bringing all of our mental functions into the same inertial reference frame. Because relative motion is essential for measuring time and there is no relative motion in this state, then there can be no experience of time. This is consistent with observations.

TIME TRAVEL

Metric time is frequently described as a flowing river. We are anchored in one spot as the future comes toward us and the present and past recede into the distance. For us to travel in time, we could go in two directions.

Traveling into the future would be similar to wading upstream so we reach the future sooner than if we waited for it to come to our position.

There are three types of travel into the past. If we could pull up our anchor and float freely with the current, we'd stay in the same moment forever. If we waded downstream faster than the flow of the river, we could catch up to moments that had already passed us by. If we waded slower than the flow, the present would recede into the past at a slower rate, but we would never catch up to past events.

It's easier to wade up a shallow river than a deep one because of the river's momentum, so this view of time travel requires that time has a property similar to depth. Or we could avoid the depth of time by swimming on its surface in the way a swimmer moves. This approach requires an idea about the surface of time.

Einstein-Rosen bridges, popularized as wormholes, approach metric time travel differently. They theorize that the river of time might have the equivalent of bends in it. By leaving the river at the right time, you can find a shorter path to a different part of that river, either upstream or downstream. A group of physicist at the California Institute of Technology has determined that there is nothing in our current science that prohibits the existence of wormholes, but no one has found any.[14]

Anti-matter also may play a role in metric time travel. Quantum mechanics predicts that for every particle there is an anti-particle with the same mass but opposite charge. The electron's anti-particle is called a positron. Richard Feynman suggested that the positron is actually an electron traveling back in time. His mentor and colleague, John Wheeler of Princeton University, extrapolated this idea into the theory that there may be only one electron in the universe, which travels back and forth in time so that it has multiple existences.[15]

A different view of metric time travel is held by Stephen Hawking, who does not believe time travel is possible because of the mischief it could cause. One classic paradox involves someone traveling to the past and killing their parents. Then they wouldn't be born, so they couldn't travel to the past. So their parents would survive and they would be born. And so on. Another conundrum involves the possibility that someone could take a modern scientific discovery into the past and show it to the person who was to be credited with its discovery. They would then reveal this knowledge and it would be available in the future to be brought back to them. Where does the knowledge come from?

Because of these, and other problems, Hawking has formulated a chronology protection hypothesis that states that nature will always find a way to prevent metric time travel.[16]

Let's apply the river of time, wormholes and anti-matter to psychological time.

Perhaps "memory lane" is the river of time with bends, or wormholes. We don't access our memories in a linear fashion, i.e. to remember last week, I don't have to recall everything that occurred between now and then. I can take shortcuts. Seers don't need to see everything between now and the future they are predicting. Perhaps as we learn more about how memory works, we'll learn more about the flows of metric time as well.

If experiences are the elementary particles of our psychological space-time, then perhaps some sort of denial serves as anti-matter. For every experience, there is disbelief that takes us through that experience again and again.

Even though we travel into the past through our memories, and frequently change that past by remembering something different than what actually happened, most of us still accept the present. We don't so distort the past that the present becomes inconsistent with it; the way killing our parents would do in metric time. This may be because as we travel into the psychological past, we are still anchored in the present and our reconstruction of the past must not materially conflict with that present. So perhaps Hawking's chronology protection won't prevent travel into the past, but just makes our actions consistent with the present. After all, actions that result from travel into the past are as much future actions as past actions and future actions are always consistent with their past.

Thinking about mythological time travel may be helped by an extrapolation of Einstein's theory of relativity. He showed that all motion is relative, i.e. it's impossible to tell what is moving. If we apply this to the passage of time, we can shift our perspective from the river of time flowing past a fixed observer, to the moving observer in the fixed timescape. This shift in perception is very difficult for people to do, but the gods, as mentioned previously, naturally view time this way and have learned to move in it.

Although the gods can move in the timescape, they have limited abilities to act, for the Fates have laid out the timescape and left very little room for change. Perhaps this is another manifestation of Hawking's Chronology Protection mechanism. It also appears that the gods may be able to travel in metric space-time to see our future, but they may not be able to see their own. Otherwise, would the Titans have followed the same, losing strategy they did in their battle with Zeus?

POLYTHEISM AND DUALITY

Quantum mechanics has demonstrated that there are two very different, but equally valid and accurate, ways of looking at events is metric space-time. Wave-particle duality lets us view anything as either a wave or a particle, whichever works better. Making a distinction is useful for describing observations, but is meaningless in reality.

James Hillman observes this duality in psychological space-time when he tells us that "the upper and lower worlds are the same, only the perspectives differ."[17]

Hillman expands duality into polytheism when he talks about mythological space-time. He tells us that "each of the forms that figure (in dreams) are the full man himself"[18] which is identical to the concept that either wave or particle is a full reality in itself.

If there is no oneness, only multiplicity, is the physicists' search for a grand unification theory doomed to failure?

A MATHEMATICS OF MYTHOLOGY

The wave perspective of quantum mechanics describes systems, including the universe, using a very complex mathematical wave function. There are certain other functions, known as operators, which represent properties such as speed, charge, location, curvature et al. To evaluate these properties for any situation, the operator and wave functions are combined and then evaluated and summed for a range of values using differential and integral calculus. These properties are not specific answers, but a range of possible results with various chances of happening.

What would a mythological wave function look like?

The first step will be to understand what, in mythological space-time, plays the same role as mathematics does in metric space-time. Mathematics is the language that allows scientists to bring the fundamental nature of metric space-time into their experience. Music and art allow us to bring the spiritual world into our experience. (Music even has a significant mathematical component) Perhaps they are places to start on this quest for this mathematics of mythology. Examining the mythology surrounding mathematics would probably also be useful.

The mythological wave function would then use this mathematics of mythology to express what Joseph Campbell calls the "one originating structure" from which "ideas, images and related exercises yielding transformational experiences"[19] have come. The various pantheons of gods and goddesses might correspond to sets of cultural operators that map them into the local configurations. These configurations would not be specific answers, but ranges of possibilities. We can interpret this as telling us that instead of getting one specific description of Venus, we get a range of stories that tell us of her possibilities. This is indeed the case with mythology.

Dreams can function as psychological operators that bring them into our own personal configurations.

SUMMARY

I've shown that many models we traditionally use to understand either metric, psychological or mythological time can be applied to the other two aspects of time in a way that is consistent with what we know about those other aspects.

Believing this is not just coincidence, but confirmation that the outer cosmos, our personal psychology and the eternal realm of mythology are instantiations of a common metastructure, I have then used models from one realm to suggest answers and lines of inquiry in others.

Some of the interesting ideas this has led to are:

Reincarnation and spiritual rebirth are another facet of black holes and the big bang,

Gravity and love may be the same thing manifested in different realms,

It may be possible to return from the black holes of metric space-time,

The depth in "depth psychology" may actually be imaginary time,

Human memory can give us clues about time travel, and

The imaginary time that mathematicians sometimes need to use for their formulas to make sense has many parallels with the imagining we need to do as people to make sense of our existence.

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NOTES

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