The Placement of Two-sided Time in Physics

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November 2019

Abstract. This note describes two-sided time, as different to time as a one-way flow. Possible investigations of two-sided time in physics are recommended in areas pertaining to: the second law of thermodynamics; treating gravity as an echo returning through an aether; a chronology of cosmic inflation; in the standard model of physics; and in the holographic principle.

1. Introduction

Something must be said about seeing time as a one-way flow, when its probably not. The one-way flow of time looks like frames of film that when projected on a screen while the frames are permitted to move (from one frame to the next) shows a motion picture. The one-way flow can be represented by transitions coming as a before and an after, by a flow of determinism showing cause and effect, a deductive flow of entailments depicting a logical chain, following instructions on a blueprint to build a machine, etc.

The subject of information exchange can be taken up by the study of semiotics. Ferdinand de Saussure (1857-1913) came up with the simplified semiotic model that conforms with a time that's seen as a one-way flow: given as the signifer and signified, and little else beyond the two-way interaction demonstrated by flow because the relationship between signifer and signfied is taken as arbitrary. Charles Sanders Peirce (1839-1914) rejected Saussure's dyadic model, in preference for a triadic model showing a three-way interaction: among the representamen, interpretant, and an object that is brought into consciousness. Peirce's triadic interaction hints of something beyond time as a one-way flow.

Physical laws at the fundamental level, at the level of action principles, also show a three-way interaction, again departing from Saussure's dyadic model. The thee-way interactions come from the observation that the laws are time symmetric, or look identical under charge-parity-time (or CPT) inversion. What is found is a pattern of information transfer: something is sent; something is received, and the two modes are held in union. The middle-term, or the union, is particularly interesting because it represents something that is beyond the law. A photon unites two electrons, for example, but the photon is timeless in the sense that it experiences no time passage.

To confuse the appearance of the one-way flow of time with a one-way causation (even an overlaying determinism) requires a big leap of faith, as David Hume discovered. However, if time is found two-sided, a wider agreement with Peirce's semiotics is automatically established, and an ontology becomes possible that does not fall for the fallacy of excluded middle because an undeclared middle-term is immediately placed with two-sided time (e.g., Smith 2018, 2019). This research note and outline presents a possible physics project that may lead to the development of new theory, and the publication of results, based on the concept of a two-sided time. Therefore, this note is offered freely to help stimulate ideas in the public domain, given that I am not a trained physicist.

Regarding the second law of thermodynamics, it is already possible to describe the 2nd law as two-sided following the work published by William James Sidis (1925), and therefore the physics project may also explore this as noted in Section 2. Another related topic that can be included in a physics project is presented in Section 3, to better describe how a two-sided time permits the unification of general relativity with quantum mechanics. This project can include an account of cosmic inflation to chronicle the emergence of the forces of nature, as outlined in Section 4. It may also involve a translation of the standard model of physics in terms that are compatible with a two-sided time, leading to the questions in Section 5. The physics project can also investigate the holographic principle, as described in Section 6.

2. Revision of the Second Law of Thermodynamics

The 2nd law is often described as emergent. However, its better to describe it as not a law, but a logical deduction that describes the behavior of mindless free bodies that interact and migrate in a closed ensemble that depicts a state-space. The context of state-space is assumed to be bounded, and well matched with a sample space that is assumed to exists. This context is arbitrary, and when its applied to the universe as a whole it leads to paradox: that the universe must have started in the state of very low entropy, or that some time in the past the entropy is found higher than what it is today.

So the statistical derivation of the 2nd law does not explain how it is that nature seems to obey this law, that ordered information representing energy flows to a disordered state universally by all appearances, and never has this flow been observed to flow in reverse.

William James Sidis solved the riddle by arguing that it is possible for the 2nd law to flow in reverse in some pockets of the universe, and that the second law as it appears is only that - a psychological law that governs what is necessary for a rationally appearing universe. Without stating it, Sidis permitted an understanding of a two-sided law where one sides gives itself over to appearance while the other side provides a covert grounding that typically goes unnoticed. Moreover, it is now easy to justify the CPT-symmetric universe described by Boyle, Finn and Turok (2018), because one side of this symmetric world sees the 2nd law as its normally assumed to be, while on the other side the law is found inverted.

3. Gravity as an Echo Emerging Out of the Echo-Chamber of Two-sided Time

The two-sided CPT-symmetric universe, the manifest side that faithfully adheres to the 2nd law, and its CPT inversion, are now found to be completely consistent with the known laws (or action principles) of physics. Even general relativity is time symmetric, and presumably its CPT inverse specification is unconflicted. However, gravity is special because it has to be a foundation for the CPT-symmetric universe, and as its own force that is united with the other three forces its unclear how this foundation is to be represented. The speculation offered is that gravity emerges as an echo in the present moment, but returning as a resonance that emerged from the sides of the two-sided CPT-symmetric universe. In other words, the two sides of the CPT-symmetric universe are joined by an undeclared aether, and it's the aether that carries the gravity waves and other waves which are infinitely rich in diversity. We know of the existence of the aether by inference having seen waves of all sorts emerging from the two-sided echo-chamber. This formulation avoids the complexity of string theory while making an accounting for the four forces of nature, yet it leaves the universe open enough to recognize other types of waves that emerge from the echo chamber: quantum gravity in addition to the gravitation movement of celestial bodies; the waves in the particle/wave duality and of quantum mechanics; dark matter, dark energy, and other types of memories of a contextual nature.

The forward arrow of time is found opposite the gravitational arrow in new theories of the universe or cosmology (see Barbour et al., 2014; Billings 2014). This work on a gravitation arrow of time does not focus so much on CPT symmetry, but this work does relate to a possible parallel universe, or a mirror universe. If our apparent reality is innately two-faced given by the sides of CPT-inversion, there is now nothing stopping us from attributing the reverse-time pull into a big crunch to a generalized gravity that is now beyond general relativity, including the action of quantum gravity, dark matter, and freewill. These new theories about time and gravity may be congruent with two-sided time, a speculation I am now advancing is that the other side of time pulls context into the past by gravity.

4. Possible Chronology of Cosmic Inflation

(1) In the very early universe only time passage and gravity were detectible; that is, the

very first negation[1] happens when the violation of T symmetry is detected; prior, nothing is detected. This implies that by looking "forward" only a simple progression or tunnel vision can be detected, and by looking "backward" only a simple frequency can be detected. Looking forward and backward relate to a time sense in a gravitational field such that looking forward carries no necessary memory beyond the progression of the hands of a clock, while looking backward implies a memory that finds repeated patterns like in the gears of a clock. Therefore, time passage and gravity implies a two-sided time[2] that carries these orientations together, where charge-time (CT) symmetry is maintained only.

(2) When the universe expanded beyond (1), the strong nuclear force became detectible in the form of a CT violation that differentiates itself from the primitive action of forward marching gravity and backward regressing anti-gravity, making a first negation. The missing component of CPT symmetry[3] has to do with handedness or parity (P), as in the reflection from a mirror. The second negation is resolved by forming a synthesis of opposites. Therefore, the violation requires perhaps at least one spatial dimension, P_1 , on both sides of the two-sided time, to resolve the conflict, making a CP_1T symmetry for the emergent state[4].

(3) When the universe expanded beyond (2), the electro-weak nuclear force became detectible in the form of a CP_1T violation, the new force being an outgrowth of the strong force. What was left out was a larger spatial dimension on both sides of time. The speculation is that the electro-weak force requires two spatial dimensions, P_2, to distinguish itself from the strong force, making a CP_2T symmetry for this emergent state.

(4) When the universe expanded beyond (3), the electromagnetic force became detectible in the form of CP_2T violation, the new force an outgrowth of the electro-weak force. What is missing is a parity condition for regular three-dimensional space, denoted

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[1]Following Hegel's *Science of Logic*, negations will come in pairs (first and second). This first negation is the blunt realization that forward time is different from backward time.

[2]This represents the second Hegelian negation, forming the union of opposites. The second negation always resolves itself by the synthesis of opposites, which takes for granted the the middle-term as a possible aether that polarizes into time senses. This pattern is referred to as the absolute notion, and can build a dialectic but attempting to do so is moot given that time is already found two-sided making the initial charge-time symmetry.

[3]Known to hold in advance.

[4]Speculative hypothesis.

by P without the subscript. Therefore, CPT symmetry holds for this emergent state, making a two-sided time.

(5) Symmetries continue to break as the universe expands further, but we remain with a two-sided time and three spatial dimensions only because this is what is required for perception of quantities studied by physics, and because there is no ground to see more than these time-space dimensions and none should be expected given the principle of minimum sufficient reason. This is not to say that other types of dimensions are not part of reality that correspond to other types of awareness coming as echos returning from the other side of two-sided time, it just that they are not there as part of the regular space-time dimensions studied in physics. Note that this chronology has no need of complex string theory to make an accounting of quantum gravity. Gravity comes already with a two-sided time and echos back into the present moment, having to do with expanded awareness as symmetries breaks (and continue to break) and as the universe is found to expand, and as time directs our attention to even greater discoveries. Perhaps dark energy and dark matter are also better characterized as echos returning from the other side of time.

(6) In particular, two more Hegelian negations[5] came that permitted the discernment of the electromagnetic force as electricity and magnetism representing non-moving and moving conditions, respectively. No extra spatial dimensions were required for these detections.

5. The Standard Model of Physics

There are a number of possible questions:

(1) Can two-sided time be introduced into the Standard Model without complication?
(2) Are there any simplifications that follow by making this introduction?
(3) Gravitons need not exist given two-sided time, because beyond context as space-time curvature that represents a wave, context does not need to present itself as a particle. Are there any ramifications for this observation?
(4) How does the Higgs boson relate to two-sided time?
(5) How many spatial dimensions are needed to describe particle interactions with two-sided time?
(6) How many spatial dimensions are needed to detect the forces of nature?
(7) Are there any patterns worthy of comment pertaining to how elemental particles emerge, how the elements emerge in the Periodic Table?

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[5]Firstly negating that electric and magnetism are identical, and secondly negating that the two are disjoint.

(8) How does wave-particle duality relate to two-sided time, and are there any ramification of this relationship in the Standard Model?
(9) Is two-sided time and its representation of quantum gravity consistent with the Standard Model?

Attempts have been made to push the standard model to the point of breaking this model, including trying to invalidate CPT symmetry. Ulmer et. al. (2015) describe the creation of anti-protons generated by an anti-proton decelerator, and found them very similar to protons, and automatically mirror images to a high degree; i.e., in addition to being charge-inverted. This seems very odd that we get a mirror image when making an antiproton! Its not just the C-inversion, but also the P-inversion that came in the same generation. Moreover, given that an anti-proton exists over a duration before it finds annihilation, a theoretical avenue for T-inversion opens up simply by reversing the orientation of time over the duration. It is as if the anti-proton deceleration created full CPT inversions of protons.

Its unclear by my reading if this finding was anticipated assuming the correctness of the standard model and the principle of CPT symmetry, nevertheless, the reaction in the popular press implied that the creation of non-mirror anti-protons had been an open possibility given present theory. The fact that the anti-protons were found mirror reflected was treated as very surprising; but someone with a better knowledge of the physics can correct me if my understanding is wrong.

This vaguely hints that protons can “vibrate” into a CPT-inversion, just like the neutrons are hypothesized to do at Oak Ridge National Laboratory, but in that case vibrate into the so-called mirror universe that Leah Broussard is looking for (see Brooks 2019). Broussard is trying to break the Standard Model in her attempt to discover mirror matter, thus explaining why it is that neutrons decay at different rates. Her experiment was started last summer, and we wait for news. But if she discovers mirror matter, is this mirror universe ontologically different to the CPT-inversion? Can the two versions of reality be distinguished enough so that evidence for one does not automatically support the alternative view?

6. The Holographic Principle

Ontology based on two-sided time may not provide a competing interpretation of the holographic principle, rather it may only be an alternative way to explain the same phenomenon: that information contained inside a three-dimensional space given as a black hole is somehow mapped on the two-dimensional surface of the event horizon. This realization was recognized by Hawking (1975) as he provided a sharper resolution of the Bekenstein bound where black hole entropy is directly proportional to the area of the event horizon. The holographic principle is sometimes described such that information in the interior of the universe gets mapped onto the universe's boundary. Susskind (1995) introduced the holographic principle into his interpretation of string theory.

Therefore, a potential physics project may investigate the connection of two-sided time with this deeper holographic principle. The Trinitarian definition of information is the synthesis of content with context (Smith 2008), e.g., a synthesis connecting interior points in the universe to boundary points, to which a time sense must be added. Inside the Schwarzschild radius of a black hole, idealized mathematics implies the entrance of an anti-world where time runs in reverse (Davies 1996, pg 224), the perfect account of two-sided time involving black holes. The particle/wave duality also carries the resonance of mass emerging in the present moment as a wave, but coming as a gravity returning from the echo chamber.

Note that playing cosmic inflation in reverse, as described in Section 4, 3-dimensional space is found collapsing into something 2-dimensional, before it collapses into 1-dimensional space and disappears into time. So its conceivable that information contained in a volume can be moved to surface area. Moreover, in special relativity, *proper time* is an invariant, and its notable that proper time measures a duration rather than a distance. Therefore, we may expect that time is more fundamental than space.

Letting F represent our forward looking reality, and B the CPT-inversion of F, our two-sided theory can be represented by: B{middle-term}F. Noting that the middle-term that holds the sides together is undeclared, we note that deeper layers of reality can be represented by the following:

{middle-term} = {{{...{M} ...}}}, where M is the center most middle-term.

Therefore, depending on what bracket is investigated, it is theoretically possible to happen upon something that looks very much like the holographic principle; including a Higgs field that assigns mass to particles of like type, further creating the potential of gravity echos that carry memories from the past.

This representation also demonstrates that two-sided time is sufficiently open ended enough not to box itself into a dogmatic theory-of-everything that does not permit alterative realizations having to do with the nature of reality; including the emergence of biology, and even the arts and the humanities, that are well removed from string theory.

7. Conclusion

A two-sided time model of reality is found consistent with known physics. This is the main conclusion, but it is also important to put this theory to testing, and the only way to do that is look for evidence that might be able to refute the theory. There are today a number of possibly congruent theories, having to do with a CPT symmetric universe

(Boyle, Finn and Turok 2018), a gravitational arrow of time (Barbour, Koslowski and Mercati 2014; Billings 2014), and a mirror universe that holds mirror matter (Brooks 2019). Scientists that are looking at these theories must also look to evidence that might support or refute theory. If these theories really are congruent with two-sided time, then evidence found in each case may also relate to the theory of two-sided time. So scientists are actively looking for evidence, as new observations are made, new interpretations will also be needed and its an open question if the theory of two-sided time can remain unchanged in the future.

A new prediction that is open to testing and is based on the theory of two-sided time is now presented: that organic memory and gravity belong to the same ontological category, as something that reappears as a contextual wave-form in the present moment, and that echos back from two-sided time and expresses itself in the present moment. Given the connection to the particle-wave duality, this provides a foundation for a possible science of memory where memories can be carried in the wave side of the duality depending on history. This means that these waves are not represented by a static unchanging function of quantum mechanics, but can in theory change. This prediction, for example, implies that water can carry its own memory in the form of wave interactions, as hypothesized by the controversial subject of homoepathy, and there is already some experimental evidence that supports this particular prediction (Korenbaum et al., 2006; Meessen 2018).

Understated in this paper, but strongly hinted, is that an account of two-sided time provides an ontological basis for a theory of consciousness, for a panpsychism and a neo-vitalism, for accounts of morphic resonance, quantum biology and epigenetics (see Smith 2018, 2019).

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