Article

Two-sidedness, Relativity and CPT Symmetry

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Abstract

The property of two-sidedness that also makes a unified whole is developed, and showed consistent with unified field theory, general relativity, thermodynamics and cosmological theories that describe a mirror universe. Two-sidedness is described as a principle of relativity that defines the visible universe by recognizing constraints that are carried by reflection. Two-sidedness is consistent with the process philosophy of A.N. Whitehead and the phenomenology of E.G.A. Husserl. Moreover, the property of two-sidedness is an observed fact of nature, coming with abundant evidential support. Speculation about a hypothetical aether that joins the sides of the two-sided is more theoretical, and open to debate. Otherwise, this paper makes a strong case for the reality of two-sidedness, if not Whiteheadian panpsychism.

Keywords: Two-sidedness, relativity, CPT symmetry, Whitehead, panpsychism.

1. Introduction

Since I wrote my proposal on two-sided time (Smith 2019), a better articulation was found in my thinking. Hence we have the present paper. The argument being made is that the universe, not to mention time that is a part of reality, is radically two-sided and overlaid. Moreover, it's a new principle of relativity that underwrites the pattern of visibility where unity is revealed while the separateness of the sides is concealed, hence reality looks to be one-sided rather than two-sided. Not just the overlay of sides is concealed, but the possible aether that joins the sides is also concealed.

We might conclude that we live in a mirror universe, one that both reveals and conceals. Leibniz described monads that carry reflections of the universe in their interior. This division of reflection versus the object-of-reflection signifies the category of two-sidedness. Reflection of this sort becomes a necessary condition for consciousness, and if panpsychism[1] is real then it follows that this fundamental reflective capacity is hardwired into the fabric of space-time. Moreover, mind can describe the universe and arrive at the perfect solution by unifying itself with the overriding reflection, then the mind must be equally two-sided and convergent with Langan's (2017) *Cognitive Theoretic Model of the Universe* (CMTU). The two-sided breaks down into three categories, however, the two sides and the middle-term that remains undeclared. This sets up the sender and receiver dyadic union forming a triad, and staying within the triad defines a more existential philosophy that rarely overreaches. However, as this paper demonstrates, the triad may expand and become more speculative as the triad transforms into the Logos of Heraclitus, if not the CTMU. While awareness and thinking is necessarily constrained

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[1] This is the view that consciousness is not just a fundamental property of matter, but also the entire universe.

by self-referral and circular thinking, the circles of awareness become more comprehensive and join with the two-sided universe.

This paper is organized as follows. In Section 2, the property of two-sidedness is developed from an intuitionist foundation. Sections 3, 4 and 5, describe the compatibility of two-sidedness with unified field theory[2], general relativity, and the second law of thermodynamics, respectively. Cosmology is treated in Section 6, introducing two resent theories (Boyle, Finn and Turok, 2018; and Barbour 2020), and showing compatibility with two-sidedness. The future discovery of a possible violation of CPT[3] symmetry is taken up in Section 7. Direct evidence of two-sidedness and concluding remarks are presented in Section 8.

2. Two-sidedness

The intuitionist mathematician, L.E.J. Brouwer, described two-ity in his first of two acts of time-based intuition (Van Atten 2004). Two-ity is on display when the present moments falls into the past, making two math-constructs out of one where the originating construct is held by memory and the new construct becomes apparent in the present. Two-ity is responsible for the linear progression, e.g., the whole numbers are generated by augmenting zero by one over successive moments. Two-ity is responsible for a deductive chain where the principle of excluded middle is enforced, and where the chain resembles a linear sequence of determinism and causation showing a before and after.

Brouwer's second act of intuition rejects the principle of excluded middle, and permits the creation of new constructs by free choice and association thus making new sequences and classifications that may represent sets containing constructs. For example, a spatial dimension may be induced by representing a family of generated constructs that can be placed anywhere in the hypothetical space, and the spatial dimension may be characterized as continuous as characterized by Brouwer's choice sequence (Van Atten 2004, Chapter 3). To the extent that the second act permits the noted generalizations, it resembles inductive thinking that's opposed to the deductive thinking that emerges from the first act of intuition. Induction tracks particulars back to generalities (categorizing or defining membership in a class, creating associations, etc.), whereas deduction progresses in the opposite direction from general to particularity.

There is an interesting way to redefine two-ity, where the principle of excluded middle is revoked making a new principle called two-sidedness where two constructs are held united making something that is two-sided; this is applying Brouwer's second act of intuition to the first. If an object is part of concrete reality it may look to be only one object even in the wake of time passage, but the case may be only that one side cannot be distinguished from the other. Two-sidedness restricts what is visible because a frame of reference is lacking that permits a distinction that sees one side different from the other. Hence, it is the system of relations given by the principle of relativity[4] that carries a seminal definition of the visible universe, thereby

[2] Includes quantum mechanics and special relativity.
[3] Acronym for charge, parity and time.
[4] Reformulated as prescribed by Whitehead (1921).

agreeing with Immanuel Kant (*Critique of Pure Reason*) that the *thing-in-itself* can be well removed from simple appearance, and moreover a possible aether that joins the two-sided will go undetected without a reference frame. If part of the aether can be detected, however, then it is likely that part of one side can be distinguished from its twin on the other side, but now separated by time with that part of the aether expiring and where the principle of excluded middle applies. But even in this case it is likely that most of the two-sided will survive in the new moment, coming with an aether that's mostly non-detectible.

When everything looks the same, from all points of view, the perfect symmetry is realized. However, this idealized situation cannot be arbitrarily taken as nothing because it is possible that there remains something pristine and without apparent time passage that is innately two-sided[5]. Even with time passage, there may be action principles that look the same from all points of view offered by a symmetry that polarizes itself into something two-sided. This is exactly what is found with the charge-parity-time symmetry, or CPT symmetry, as pertaining to the action principles of unified field theory.

3. Quantum Mechanics and Special Relativity

Unified field theory includes both quantum mechanics and special relativity, and the laws are invariant in both the apparent world and the hypothetical CPT inverted world. Based on these particular laws, there is no way to tell if the apparent world is two-sided or not. Based on these laws alone, we would have no way to tell if we lived only on one side or the other, or on both sides because the two-sided looks like one unified whole to us. Therefore, its necessary to consider other laws beyond unified field theory that may not be CPT symmetric or invariant, but there won't be any as we shall see. General relativity is considered first, followed by the second law of thermodynamics.

4. General Relativity

Villata (2011) transformed general relativity into its CPT inverted form by a transformation of variables, negating time and all spatial coordinates and leaving mass unchanged because antimatter still possesses positive mass. Villata's effort had been made in an attempt to show that gravity emerging from matter repels antimatter, but his effort was refuted by Cross (2011). However, Villata did show that the equations of general relativity are invariant under the CPT inversion, and Cross did not contest the consistently applied transformation that demonstrates this particular result.

By agreeing with Villata that general relativity is CPT invariant, we need to look elsewhere for a law that can overthrow the property of two-sidedness.

[5] Likewise, Henri Bergson in *Creative Evolution* criticized the abstract notion of "nothing" when it is meant to describe concrete reality.

5. Second Law of Thermodynamics

Because the CPT inverted world comes with antimatter and a reversal in time, the statistical law describing entropy can be reconstituted for closed ensembles containing interacting anti-particles, and in such a one-sided system entropy is expected to grow in the inverted time direction (Etesi 2017). There is basically no change in the dynamics after making the CPT inversion, and moreover the statistical properties are taken for granted in such an abstract thought experiment. So, the statistical derivation of the law is CPT invariant, but only applies to closed ensembles that are one-sidedly defined. Steam engines made of antimatter should operate normally following a rigid design that makes no room for alterations. Likewise, the same statistical law on the non-inverted side (the observed universe that's only assumed to be one-sided) applies to closed ensembles, and cannot be applied to the universe as a whole without creating paradox.

In fact, the statistical law leaves the apparent flow of energy in the greater universe unexplained, as it moves from ordered to degraded states. This caused Ludwig Boltzmann to question the validity of the statistical law as applied to the entire universe, and he realized that it might just be limited to closed systems where probabilistic transitions and time are both taken for granted. Albert (2000) looked at this question and realized that a past hypothesis had to be stipulated where the universe had to come into existence in the state of low entropy, otherwise the apparent asymmetry today goes mysteriously unexplained by the statistical law. If we were living in a CPT inverted world, with time flipped, we might see the same mysterious asymmetry that's left unexplained by the statistical law that's also CPT invariant, forcing us to conclude that our time flipped world came into being in the state of low entropy. However, deduction cannot come to this conclusion decisively because two-sidedness has not been ruled out. The presumed low entropy birth of the universe becomes necessary only when the one-sidedness of a closed system is enforced.

The main conclusion is that there is nothing in the statistical law that implies that the universe in not two-sided, rather than being one-sided like the closed ensemble. This is entirely a negative argument. To move forward with discovery we must stipulate two-sidedness, and this will permit a closer inspection of both entropy and time but only in the relative terms of one side looking at the other. Therefore, if the universe is two-sided and overlaid, CPT symmetry implies that time looks to move in opposite directions, and therefore entropy appears to flow in opposite directions; but only in terms of one side relative to the other. The thought that entropy is reasoned to move from disorder to order on the other side is not a contradiction of the statistical law because the statistical law is in full compliance on the other side; this is merely the implication of relativity.

There is nothing in known thermodynamics that can force us to conclude that we live on one side of reality, or on its CPT inversion, or on one side of a one-sided reality. The gross asymmetry in the way energy is observed to flow irreversibly in one direction gnaws at us, but it can be explained by relativity. If relative time flows in opposite directions on the sides of the two-sided there is no asymmetry in a hypothetical two-sided reality, but this is again abstract and beyond simple appearance. Sidis (1925) described an entropy law that permitted energy to flow into states of low entropy in some pockets of the universe, and moreover he concluded that the 2nd

law is actually a psychological law.

6. Cosmological Theories

Two very interesting cosmological models related to two-sidedness and time have recently been advanced: the CPT symmetric universe theory (Boyle, Finn and Turok, 2018); and the Janus point theory (Barbour 2020). These two propositions come off as compatible, not just among themselves but also with the property of two-sidedness.

The CPT symmetric universe describes a mirror universe, where our CPT inverted reflection is on the other side of the presumed big bang and making its own universe. The first inclination is to one-sidedly see these as separated universes, each with their own time arrow pointing in opposite directions and meeting at an origin representing the big bang. From the perspective of each universe, however, time would be moving forward in the direction of an expanding universe, in the direction where entropy appears to be increasing. It is only the relative direction of time, from the perspective of one universe looking at its twine, that the direction of time is switched; or the so-called God's eye view.

Indeed, if we lived in one of these universes we could not distinguish which side we were necessarily on because everything looks the same based on all the laws that are found CPT invariant. We can only say that we were on the side where the universe is expanding, and where entropy increases, but this one-sided declaration is the same for both sides! More importantly, we could not say that the two worlds are disjoint and separated, they could be overlaid like joined twins and all of our laws applied under the presumption of one-sidedness would fail to demonstrate separation because all of these laws are CPT invariant. We are back with the property of two-sidedness, but now applied to the universe as a whole!

Enter Barbour's Janus point model where the Janus point marks the beginning of time at the presumed big bang. Again, a gravitation arrow of time bifurcates making two universes and a theory of time, and as with the CPT symmetric universe one side is found reflecting the other across the Janus point. The situation with the CPT symmetric universe repeats, because we would have no way to distinguish one side from the other, and we cannot even demonstrate that these are separated universes. The property of two-sidedness reasserts itself when both halves of the universe are seamlessly overlaid.

I previously thought that my prior account of time (see Smith 2019) conflicted with Barbour's theory. I had been more sympathetic with Boltzmann's seeming accommodation of a bi-directional time that comes by setting the Janus point at the present moment (see Barbour 2020, page 99), separating the past and the future. The past, present and future mark the unchanging triad, or in the words of the esoteric traditions: the *Logos* with the present representing the *eternal now*. It later occurred to me that if the Janus point was set at the presumed big bang following Barbour's instinct, rather than the present moment, there would likely be no way to distinguish these two alternatives. Because the two half-universes (reflected across the big bang) carry the same perspective (e.g., the universe is expanding, entropy is increasing), they can be sublated into one universe that comes with a dominant time direction that points to an expanding

universe. However, the sublation is not 100% because a shadow of two will remain. The overt material in the visible universe is by convention called "matter," leaving what's called "antimatter" to be detected experimentally. By CPT symmetry the said antimatter can be deduced to follow a time direction that points in reverse, going into a big crunch. That is, a second arrow of time that is relative to the first arrow emerges with the sublation. Boltzamnn's bi-directional time reappears again which permits placing the Janus point at the present moment.

7. Possible Future Violations of CPT Symmetry

An argument can be made that a future violation of CPT symmetry is waiting for us, leading to a possible overthrow of two-sidedness in the future. However, if a deeper symmetry was also discovered, as would likely be the case, two-sidedness would reemerge. A question is being begged, one I have not answered: how would it be possible to demonstrate a violation of CPT symmetry without discovering a deeper symmetry that also supports a new theory?

A claim has been made that the lack of antimatter in the visible universe already constitutes a violation of CPT symmetry. However, this claim is revealed to be only one-sided, because the anomaly is explained by two-sidedness. It is just like the anomaly that's represented by the presumed low entropy birth of the universe that disappears once two-sidedness is considered. Most or all of the asymmetries disappear once the two-sided universe is found, and the presumed conflicts go away.

The fact that the observable universe is composed of mostly matter, with antimatter only showing itself in the form of virtual particles, is a direct result of two-sidedness given the demand that relativity makes on the visible universe. Observation only detects the unification of two-sidedness, hiding the fact that matter is relative and overlaid with antimatter. As a condition of visibility, one side provides a reference frame for the other, a reflection of sorts coming off of the mirror universe. Likewise, we cannot see the back of our head without the aid of two well-placed mirrors. The mirror universe both reveals and conceals. What is missing are better mirrors that may detect the abundance of antimatter hiding behind matter in the mirror universe.

8. Direct Evidence of Two-sidedness

The arguments for the two-sided universe has so far been only negative. There are no physical measurements that can be made to distinguish a one-sided universe from a hypothetical two-sided universe that's overlaid. A proponent of the one-sided view may invoke Occam's razor to seek the more parsimonious explanation that there is only a one-sided universe, while completely dismissing the conflict created by the presumed low entropy birth of the universe, and also the lack of antimatter found in the observable universe. That might be fine if there were no more conflicts, and no evidence that directly supports the proposition that the universe is two-sided. But in fact there is abundant evidence to support the proposition. Two-sidedness is more an observed fact, affirmed many times in nature, it is much less a theory. A theory has more to do with the nature of the aether that joins the two sides together, but I am presenting no such

theory[6] other than the observation that the aether has evidently acted like a strange attractor.

Two-sidedness was there when René Descartes invented a dualism that artificially separated mind and the universe. This resulted in an abundance of unnecessary conflicts when attempts were made to extinguish two-sidedness from the scientific accounts of the universe. The scientific descriptions became very one-sided and incompatible with the need to establish values and set emotional goals. Many protested this development. On the other hand, Hegel's dialectal logic was explicitly two-sided because it was required to be in-itself (objectively formulated) and for-itself (subjectively motivated). Edmund Husserl developed his phenomenology to describe intentionality without preconceptions, which is necessarily two-sided because of the dependence on otherness. The same was true of Alfred North Whitehead and his process philosophy, where occasions of experience operated inside the two-sided or dyadic interplay of sending and receiving.

The aether that joins the two-sided, acted as a strange attactor leaving behind many reflections of itself, a shadow of twos is found everywhere. In psychology, it is there in the Chinese philosophy of Taoism, of the united Tao composed of Yin and Yang, going back 2000 years to Lao Tzu. A very similar philosophy was developed in Greece during the same time period, with the writing of Heraclitus. The shadow of twos is found in modern depth psychology[7], in particular in the writing of Carl Jung. Synchronicity and the collective unconsciousness were understood to show us things about ourselves that the one-sided mind could not accept directly; otherness was required to integrate the shadow. The two-sided was there in the cave drawings of ancient humans, showing reflections of animals and perhaps alien life. Otherness is hinted in the ancient geoglyphs in Peru, and elsewhere, because most of these can only be viewed well from the sky.

Ferdinand de Saussure developed his dyadic semiotic[8] model given by the signifier and the signified, hinting again of two-sidedness. However, Saussure's semiotic model was empty (or aether-less), much like Descartes' dualism. Therefore, Charles S. Peirce returned with an improvement, the triadic semiotic interaction, essentially adding back in the unnamed aether and turning the dyad into a triad.

In logic there is deduction and induction, both emerging from Brouwer's two acts of intuition. In statistical time series analysis there is the time domain and the frequency domain. The field of statistics is further bifurcated into a deduction-loving version based on sampling and experimental design, and an induction-loving Bayesian school. In music there is rhythm and harmony. In quantum mechanics there is decoherence and coherence, the particle-wave duality, and not to mention matter and antimatter again.

The shadow of twos is found in biology. There is male and female. The double helix comes with two complementary strands of DNA. There is genetic determinism on one side, and on the other there is epigenetic regulation. The condition called *situs inversus* is where internal organs are

[6] For example, a possible theory is the Aether Wave Theory, see internet link below: https://aetherwavetheory.blogspot.com/

[7] Jordan B Peterson, in Maps of Meaning, made the criticality 7 (or polarity) representing order and chaos fundamental in his treatment of psychology.

[8] Semiotics is a branch of philosophy having to do with the nature of signs.

found reflected to the opposite side of the body from normal. The implication is that reflective switching is actively part of biological development, and this possibly involves a driver that has an intimate connection with development. The right and left hemispheres of the brain show asymmetry and are specialized differently as if they represent two windows to view reality, a reflection of the universal driver[9] in the expanding universe.

Why do we need two windows to look out at the universe if the universe is only one-sided? Is it not useful to look out of both sides of the brain? Why do we have to treat people nice and following a two-sided protocol to maintain respect, if the universe is only one-sided? How is it that our limited circular thinking, restricted by self-referral and confirmation bias[10], is able to make progress anyway if not for the observation that the universe is also two-sided like the mind? How come after a day of hard one-sided work, when we relax and rest we encounter spontaneous insights that bubble up from the subconscious?

I am inclined to agree with Whitehead, that experiential occasions coming from the greater universe seek their satisfaction, like unidentified aerial phenomenon! It seems to me that requires something two-sided, leaving the greater question about the hypothetical aether unanswered!

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[9] Psychiatrist Iain McGilchrist offered this speculation.
[10] Donald Hoffman has made a major production about how human thinking is incapable of seeing reality as it is.