On the Embodiment of Space and Time:
Triadic logic, quantum indeterminacy and the metaphysics of relativity

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Abstract (Thesis Statement)

Triadic (systemical) logic can provide an interpretive paradigm for understanding how quantum indeterminacy is a consequence of the formal nature of light in relativity theory. This interpretive paradigm is coherent and constitutionally open to ethical and theological interests.
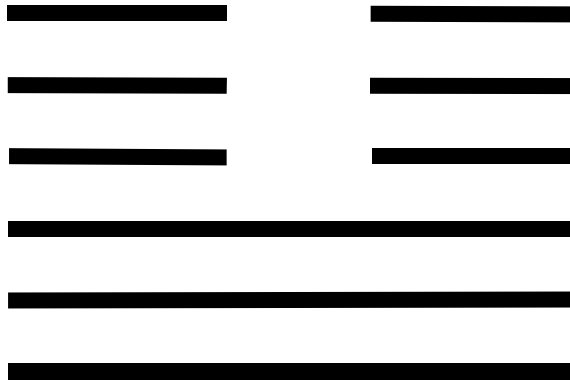
In this statement:

- *Triadic logic* refers to a formal pattern that describes systemic (collaborative) processes involving signs that mediate between interiority (individuation) and exteriority (generalized worldview or Umwelt). It is also called systemical logic or the logic of relatives. The term "triadic logic" emphasizes that this logic involves mediation of dualities through an irreducibly triadic formalism. The term "systemical logic" emphasizes that this logic applies to systems in contrast to traditional binary logic which applies to classes. The term "logic of relatives" emphasizes that this logic is background independent (in the sense discussed by Smolin[1]).

- An *interpretive paradigm* refers to a way of thinking that generates an understanding through concepts, their inter-relationships and their connections with experience.

- *Coherence* refers to holistic integrity or continuity in the meaning of concepts that form an interpretation or understanding.

- *Constitutionally open* refers to an inherent dependence in principle of an interpretation or understanding on something outside of a specific disipline's discourse or domain of inquiry (epistemic system). Interpretations that are constitutionally open are incomplete in themselves and open to responsive, interdisciplinary discourse and collaborative learning.

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[1] Lee Smolin, *The trouble with physics: The rise of string theory, the fall of a science, what comes next.* (Boston: Houghton Mifflin, 2006)

Peace I leave with you, my peace I give unto you

[John 14.27]

Peace means union, interrelation

[I Ching, 11]

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For whatsoever doth make manifest is light.
[Ephesians 6.13]

1.0 Prologue

This paper involves a poetically attuned[2] reflection on *light* and *word* as that which forms *in the beginning* [Genesis 1.1-4; John 1.1-4]. The goal of the writing is to explore manifest interrelations of physics (and mathematics), philosophy and theology in order to come to an understanding of the formative role of light for space, time, embodiment, exteriority (objectivity) and interiority (towards subjectivity).

The core problem, to which this paper is a response, is the totalizing construct of Absolute Space. This problem is to be understood both literally, in the case of physics, and metaphorically, in the case of philosophy. Absolute Space is the presumptive theatre in which a deterministic worldview unfolds in lawful regularity without creation or surprise or freedom. It is Newtown's *Globe*—the stage for Principia Mathematica. The audience for Absolute Space is the Ideal Observer—an individual ego alone with himself[3], disengaged from the drama of life and its ethical calling, able to capture the totality of "being" all-at-once, as if heaven and earth were one and his thoughts were God's thoughts.

The course of the response comes from deeply troubling the *aloneness* of man[4] [Genesis 2.18]. The abstract indefinite for the exploration—the star to steer our journey—is the notion of One [Deuteronomy 6.4-5; Mark 12.29-13]. Methodologically, "Unity" plays the role that is played by "the Absolute" or "Being" or "Essence" in other philosophical investigations. If the course is well steered, it should remain momentarily perched on the edge of the horizon, guiding us forward in our thinking yet always just beyond our grasp.

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[2] The characterization of a "poetically attuned" reflection comes from Jan Zwicky, *Wisdom & Metaphor* (Kentville, Nova Scotia: Gaspereau Press. 2003).

[3] The Ideal Observer presents as male insofar as he has no bodily knowledge of the mystery of birth.

[4] That is to say, man cut off from the Other which, in the story of Genesis, is woman. The term "man" in this context refers to an image of individuality or humanity that is self-contained and sterile in-itself.

The exploration unfolds within three interwoven and resonant levels or harmonies, which loosely might be characterized as *ontological*, *ethical* and *theological.* It grows out of and refers back to a series of *études* on light and word that I have engaged with over two decades[5]. The full bodied resonance of this paper with source material—from the domains of science, philosophy and theology—reverberates and is documented in these previous undertakings.

1.1 Ontology (Thirdness)

The ontological level is concerned with the "stuff" of our world. It is the place where we might seek an answer to the question: What do the terms in our theories of physics refer to *in the world out there*? The ontological level is external, lawful and deceptively familiar. It is the level that is engaged most often in the philosophy of physics, and it is also the most readily apparent level of discourse in the current exploration.

The focal insight that I hope to illuminate is that we need to *break through* the ontological level in order to appreciate the significance or *meaning* of relativity theory and that, if we are successful in making this breakthrough, we will discover that quantum mechanics is its proper ontological form. Pragmatically, this insight comes from relinquishing Newton's presumption of Absolute Space as a closed theoretical ground and redirecting our gaze towards light as an open window to the Infinite.

In this paper, I attempt to use the formalism of number theory to enact the breakthrough. I take mathematical form to be an abstract expression of ontological form. Natural numbers express the form of discrete *things in-themselves*. Real Numbers express the background continuum from which discrete things-in-themselves are abducted or brought into view. Complex numbers express the reflexive form of light which creatively enables and sustains the formative principles of Natural and Real numbers. Section 2 of the paper successively explores these three mathematical forms. Section 3 then applies what is learned in Section 2 to the question of the ontological form of matter in relativity theory.

The breakthrough is seen to involve a change in perspective. The Newtonian or *classical* worldview rests upon the postulation of a timeless, **finite** Self as the abstract foundational form; for example, the form of elementary particles or Euclidean points. The finite Self is the formal basis of analyticity. However,

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[5] The most relevant études can be found in the list of references at the end of the paper; see also
https://utoronto.academia.edu/TimothyRogers

this postulation is self-contradicting in the sense that *the finite Self is the violation of the law of the excluded middle of binary logic[6]*. The contradiction—the formative principle of the finite Self—can be overcome in recognizing that the finite Self is neither timeless nor context-independent. Rather, it is a *sign* that is nothing *in-itself*, yet the bearer of signification *in-itself-for-another*. The triadic logic of the sign—*semiotics*—brings into play asymmetry or agapé as an opening towards "patterned resonances in the world"[7]. It provides a new perspective on ontology that is evolutionary and emergent.

But the perspective is not entirely new. It is the hidden depth that is obscured in the classical worldview precisely to the extent that the wordview is intended to reflect a closed totality that is cut off from the Divine.

1.2 Ethics (Secondness)

The ethical level is experience, action and re-action. It is concerned with engagement, relationship and belonging. The ethical level is *intentional*.

In this paper I enter into the ethical level by exploring the *phenomenology* of triadic logic[8]. By phenomenology I mean an exploration of the direct conscious experience of triadic logic. This

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[6] An example of the formal problem of self-contradiction that I intend here can be found in Whitehead and Russell's *Principia Mathematica*. Somers-Hall provides a very accessible discussion of self-contradiction and the formal role of "systematic ambiguity" as a formal underwriting of the logic of *Principia Mathematica*. Systematic ambiguity arises from the possibility of self-referentiality and introduces logical (binary) paradoxes, such as Russell's paradox. Quoting Whitehead and Russell, Somers-Hall writes "The vicious circles [of self-reference] in question arise from supposing that a collection of objects may contain members which can only be defined by means of the **collection as a whole**" [Bolding added]. As a result of this formal circularity, the logic under question is not able to include a notion of totality—it is incomplete in principle. This logical incompleteness of Number theory is also disclosed through Godel's incompleteness theorem which is similarly based on self-referential circularity. The "whole" as a form of "self" is incomplete or "open" and, by extension, the parts that reflect the whole are open. As Somers-Hall discusses, Russell attempts to circumvent the incompleteness through the development of a totalizing hierarchical ordering, but this ordering is itself incomplete and cannot be ascended to the highest level. The totalizing move Russell makes is the type of move that I am trying to challenge or oppose in this investigation. Godel, by contrast, sees incompleteness as an opening and he enters into this opening by explicitly invoking the triadic logic of the sign. Henry Somers-Hall, "Heidegger, Ontotheology and the Foundations of Formal Logic" [draft]. Accessed September 28, 2016
https://www.academia.edu/28442778/Heidegger_Ontotheology_and_The_Foundations_of_Formal_Logic .
[7] "One might say: ontological understanding is rooted in the perception of patterned resonances in the world", Zwicky, *Wisdom & Metaphor*, 7.
[8] Bitbol provides a cogent argument for a phenomenological approach to formal logic in which he takes formal logic to be the "doctrine of the object". He argues that because logic has a reflexive orientation, the connection between logical grammar and reality cannot be described in terms of a correspondence. However, through a phenomenological approach such connection can be *shown*. Bitbol's argument applies to and situates the

exploration involves first tracing the internal form of the logic in Section 2. Section 3 then involves an interpretation of the *grammar* of light in the theory of relativity as a particular articulation of triadic logic. By grammar I mean the system, structures and processes of the theoretical form as manifested in reflective tracings of the phenomenon as figures. It involves the external form of the logic.

Attunement to the ethical level requires particular attention to process and form. The strategy used in this paper to maintain such attention is to attempt to reflexively enter into *the narrative of thinking that is number theory*. This strategy involves differentiating the structural aspects of number theory (the spatial aspects) from the processional aspects (the temporal aspects). It also involves differentiating the author from the reader. Having enacted this differentiation, it then becomes possible to explore the gap between space and time by exploring the gap between text and reader. Although the rhetorical style may be off-putting to some, if successful there should be at least the inkling of the spontaneity and immediacy of discovery.

My treatment of the ethical level in this paper is inspired by Levinas[9]. It is intended to be an exploration of identity, difference and return. Through the exploration, *signifyingness* emerges as a collective phenomenon that involves the irreducible interplay of the Same, the Other and the Third Party. The whole is found to be embedded in a system that forms an Umwelt. An Umwelt is an interpreted world that has particular significance for the collective or ensemble. Parts give themselves up to the whole and the whole grants identity to the parts. The systemic process is synchronized through signs that mediate the internalization of exteriority (interpretation) and the exteriorization of interiority (representation).

The emergent formalism—a relational theory of generality—is applied to the concept of "spin" in the theory of relativity.

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approach I take in this paper. Michel Bitbol, "Does Quantum Mechanics Require New Forms of Though? Towards Formal Epistemology," in *Quantum Mechanics, Mathematics, Cognition and Action: Proposals for a Formalized Epistemology*, ed. M. Mugur-Schächter and A. Van der Merwe (Vol. 129. Springer Science & Business Media, 2003).
[9] Emmanuel Levinas, *Otherwise than Being or Beyond Essence*, trans. Alfonso Lingis (Pittsburgh: Duquesne University Press, 2002).

1.3 Theology (Firstness)

The paper originates in the theological level. It comes as an answer to a question.

In a previous work, I attempted an interpretation of the opening chapters of Genesis using the archetypal duality of I Ching[10]. The focus was on humanity created the image of God:

> *So God created man in his own image,*
>
> *In the image of God created he him;*
>
> *Male and female created he them.* [Genesis 1.27]

In that attempt I arrived at the corruption of the image in the form of an autonomous Self—man and woman—cut off from the Divine. The question for me was: *How are we to understand the image of God in which we are created*?

In *I and Thou*, Martin Buber[11] opened a way forward. God's relation to his Creation is asymmetrical. For me as a Christian, this asymmetry is experienced as love, agapé, the Passion of Jesus. In this paper, I try to trace contours of asymmetry as creative origin and eschatological completion. The Alpha and the Omega whose unity is found in the Word of God.

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[10] Timothy Rogers, "Darkening of the Light: A reading of Genesis through archetypes from I Ching" (unpublished, 2009). Accessed September 10, 2016. https://www.academia.edu/15633524/Darkening_of_the_Light_A_reading_of_Genesis_through_archetypes_from_I_Ching .

[11] Martin Buber, *I and Thou,* trans. Walter Kaufmann (New York: Touchstone, 1970).

2.0 Phenomenology of the discrete, the continuous and the reflexive

In this investigation, "Triadic Logic" is taken to refer to a general formalism that is common to several different philosophical approaches, including those of Augustine[12], Hegel[13], Peirce[14] and Levinas[15]. The purpose of Section 2 of the investigation is to articulate some primary formal aspects of triadic logic. This formalism will then be used to explore quantum indeterminacy in Section 3. In addition to articulating *generalized* formal aspects of triadic logic, Section 2 of the investigation will also *use* triadic logic to bring about the articulation. In other words, this section of the investigation is an attempt to both describe and demonstrate "Triadic Logic".

The following method is used in this section to bring into view or abstract triadic logic.

I begin with the assumption that there is something called "triadic logic" that is a *common referent* for several particular philosophical approaches and that can be *abstracted* from any particular philosophical system.

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[12] Augustine, *Confessions*, trans. H Chadwick (Oxford: Oxford University Press, 2008). Augustine, *The Trinity,* second edition. trans.Edmund Hill, ed. John E. Rotelle (New York: New City Press, 2012). The way in which I am interpreting Augustine is presented in Timothy Rogers, "Beyond Space and Time: Unity and form in Augustine's Confessions", (unpublished, 2014). Accessed September 10, 2016. https://www.academia.edu/6047338/Beyond_Space_and_Time_Unity_and_form_in_Augustines_Confessions .

[13] GWF Hegel, *Phenomenology of Spirit*, trans. AV Miller (Oxford: Oxford University Press, 1977). The way in which I am interpreting Hegel is presented in the following two papers: Timothy Rogers, "A physicist's guide to [Hegel's] Phenomenology of Spirit: Resonance, disambiguation and the genesis of spatial orientation" (unpublished, 2013). Accessed September 10, 2016. https://www.academia.edu/3547178/A_physicists_guide_to_Hegels_Phenomenology_of_Spirit_Resonance_disambiguation_and_the_genesis_of_spatial_orientation . And Timothy Rogers, "A Cautionary Note Regarding Hegel's Approach to Absolute Knowing" (unpublished,2012). Accessed September 10, https://www.academia.edu/5973750/A_Cautionary_Note_Concerning_Hegels_Approach_to_Absolute_Knowing .

[14] Charles Sanders Peirce, "Evolutionary love," *Monist* III(1) (1892). Charles Sanders Peirce, "Law of Mind*," Monist* II (1891). Charles Sanders Peirce, "The Architecture of Theories*," Monist* I(2) (1891). Charles Sanders Peirce, "A Guess at the Riddle", (1887-8). Accessed January 10, 2015. http://www.iupui.edu/~arisbe/menu/library/bycsp/guess/guess.htm . The way in which I am interpreting Peirce is presented in Timothy Rogers, "Light Signifying Form: Musings with Peirce on creativity, responsiveness and emergence in quantum, biological and linguistic systems," (unpublished, 2015). Accessed September 10, 2016. https://www.academia.edu/10842047/Light_Signifying_Form_Musings_with_Peirce_on_creativity_responsiveness_and_emergence_in_quantum_biological_and_linguistic_systems .

[15] Levinas, *Otherwise than Being*. Emmanuel Levinas, *Totality and Infinity: an essay on exteriority*, trans, Alfonso Lingis (Pittsburgh: Duquesne University Press, 1969). The way in which I am interpreting Levinas is presented in Timothy Rogers, "The Proximity of Light: a deconstruction of space", (unpublished, 2004). Accessed September 10, 2016. https://www.academia.edu/2139836/The_Proximity_of_Light_a_deconstruction_of_space .

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I then use what I will call the "classical worldview" as a familiar ground *away from which we must move* to approach triadic logic. Within the classical worldview, classical or binary logic becomes the touchstone through which triadic logic can be differentiated as something novel. Throughout the investigation, these two open terms—"classical worldview" and "triadic logic" —inform one another in a process of determination and definition, such that triadic logic is the undercurrent of the worldview formed through classical logic. If all goes well, the classical worldview will lose its totalizing influence and a horizon will appear like a door beyond which triadic logic can be found. This breakthrough will also be a movement of *return* in which triadic logic becomes the fulfilment of, or the depth behind, the surface forms of the classical worldview.

A new concept—the system—emerges as a singular expansion of the (reduced) concept of "class" in the classical worldview. Classes are degenerate forms of systems. Binary logic is the logic of *synchronized classes*. Triadic logic is the logic of *sychronizing systems*. Systems, which are whole and embodied, reduce to classes in the limit of infinite synchronization.

At the completion of Section 2, a generalized symbolic representation of triadic logic will be introduced as the primary formalism for the rest of the investigation. This symbolism will be interpreted as *the forming of light*.

2.1 Asymmetry

2.1.1 Infinity and Nothingness

Before starting the discussion of triadic logic, it is important to set out some essential limitations of the exploration and the way in which I intend to address these limitations.

The whole investigation turns on the question: *What is the relationship between finitude and beyond [the finite]?* Throughout *Otherwise than Being*, Levinas[16] cautions us to be careful about how we think through this question because the second "term" in this relationship cannot be thematized or made into a common noun or in any way imagined as an entity. We cannot simply name what lies beyond finitude as "Infinity" or "the Idea" or "the Universe" or any other name among names. Such naming relativizes

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[16] Levinas, *Otherwise than Being*.

and implicitly makes the referent for the second term part of finitude, no longer beyond[17]. What needs to be recognized in the question is an asymmetry that is prior to any symmetry or equality. The question is *always* a theological question.

In this investigation we will use a traditional approach[18] [Mark 10.17-18] that involves thematizing the "beyond" in order to correct errors in our (or at least my) current understanding while at the same time recognizing that this thematization necessarily incurs different errors that can only be corrected by others. I will use the term "Infinity" to thematize the beyond of finitude. This speaks to an intention to bring mathematics into play in the investigation. Bear in mind, however, that Infinity should not be imagined as an "object" of the intellect; it is verb moreso than noun.

There are three aspects that inform the question: finitude, Infinity and relationship. Finitude is the familiar domain of objects or things—whether these be material objects or objects of thought we will leave undetermined for now. From within finitude, Infinity appears like a horizon, a progression *towards* that is never completed. Relationship is the asymmetric connector, which we will represent by the symbol →. Finitude flows towards Infinity in an asymmetric movement, like the set or class of Natural numbers {1,2,3 →}.

Because we have thematized the beyond of the finite as "Infinity", the shadowy Other of Infinity necessarily comes into play as that which gives finitude its name [Genesis 32]. I will use the term "Nothingness" to implicate this duality. Nothingness is negation, a flow *away from*. Nothingness is the *Origin* of finitude.

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[17] For further exploration of the significance of naming in relation to the beyond, see Emmanuel Levinas, "The name of God according to a few Talmudic texts," in *Beyond the verse: Talmudic readings and lectures*, trans. Gary D Mole (Bloomington: Indiana University Press, 1994).

[18] The form of this approach comes from combining cataphatic theology (*via positiva)* and apophatic theology (*via negativa)*. Cataphatic theology involves positive terminology to describe God according to what He has revealed of Himself; apophatic theology describes God by negation according to what it is believed he is not. For example, in Mark 10.17-18 someone refers to Jesus as Good (via positiva) but then, through a form of kenosis or self-emptying, Jesus negates this statement (via negativa) by saying "Why callest thou me good? There is none good but one, that is, God." Through this negation, Jesus defers Goodness beyond his own Self much like the word defers its significance beyond itself. Triadic logic involves a similar process in which thinking moves between exploring positive statements and then exploring their limits through negation. It is important to recognize that the negation here is intended to move the interlocutor towards a higher level of affirmation—it is not the same as the annihilating action of the operator "Not" in binary logic. For a more detailed discussion of this method as applied to the philosophy of logic, see BC Birchell, "Hegel's Notion of Aufheben," *Inquiry* 24(1) (1981): 75-102.

Nothingness   →   Finitude   →   Infinity

Nothingness, like a reflection in the mirror, is the abstract form of finitude *in-itself*. By this I mean, in relation to Infinity, nothingness and finitude are the *same* [Psalm 144.3-4; 1 Corinthians 13.12].

At this point you are hopefully objecting strongly to what I have written. I began with a question that involves primal asymmetry and, without adequate justification, have arrived at a thematization that places nothingness, finitude and infinity under the same relativizing gaze. To this I can only respond, "*Exactly!*" The thematization betrays Infinity (to use Levinas' language)[19]. But the claim is that this betrayal has already happened[20] and the intention of this investigation is to try to correct some consequences of this error as they relate to the interpretation of modern theories of physics.

The dangerous move that I will try to unpack is to rest on nothingness, equality and finitude as a basis for approaching Infinity. This move subverts the primacy of the asymmetrical relationship between God and creation. The way in which I will approach this task is to focus on how the trace of asymmetrical relatedness informs finitude. This trace can be found in the asymmetries of time, reference and agapé which, in turn, instantiate ontology, epistemology and ethics, respectively. The core insight to which I will continually return is that primal asymmetry is the excluded initiative of binary logic[21] [Genesis 3] and therefore a different form of logic—in our case triadic logic—is needed to bring into view this excluded initiative.

I will attempt to recast the linear relationship *nothingness→finitude→Infinity* as a broken or open circularity. Like Infinity, nothingness is a horizon. But whereas Infinity is a horizon of plentitude or fulfilling, towards which finitude is drawn, nothingness is a horizon of self-emptying and return to the source. The central metaphor of this investigation is that Infinity breaks into the finite through nothingness as a creative origin and then formatively draws created forms back towards itself through a process of return. This investigation is an attempt to turn our gaze away from nothingness *as an object in-itself* and towards the Beyond *as a destination*.

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[19] Levinas, *Otherwise than Being*.
[20] Levinas (*Ibid.*) makes this claim. The basis for my making the claim in the context of this investigation comes from a particular interpretation of the first three chapters of Genesis that I explore in "Darkening of the Light".
[21] For a discussion of the limitations of closed binary systems, see Rogers, "Darkening of the Light".

2.1.2 Objects and Signs

The domain of finitude is the world of things. Not surprisingly, in physics we tend to think of things as *physical* objects, although we might also think of them as intellectual objects or "ideas". Here I will use the term "object" to refer to finite *things* and remain purposefully ambivalent about whether objects are physical or intellectual. The reason for remaining ambiguous is that I want to draw attention to some formal assumptions we tend to make about finite things regardless of the disambiguation and that by examining those assumptions we might discover something important about why there is ambivalence in the first place.

I take the classical worldview[22] to be the worldview implicit in Newton's theory of Absolute Space, although it also refers to a particular way of thinking about "the furniture of the universe" that is common in physics, even in the context of non-Newtonian theories. In the classical worldview objects are given entities. An object simply *is* and the questions of classical logic swirl around the nature of the qualifiers that *define* one object as different from another object, as well as the relationships *between* objects. The classical worldview tends not to profoundly problematize the nature of *identity* as that which sets the object apart as an existent, finite entity. There is an assumption in this worldview about the formal nature of unity; namely that unity is like a finite monad[23]. I will represent this image of finitude by the symbol • . The object presents "all-at-once" under the gaze of an ideal observer; it appears to *rest in-itself* as a self-identical monad. For example, an elementary particle or a fundamental state or a point in spacetime would be increasingly abstract examples of classical objects. The archetypal form of this monad is the form of the number 1 in the class of Natural numbers. But what I want to point out here is that this image already presupposes a quantization that presents the archetypal form as a

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[22] What I mean by the classical worldview is discussed by Steven Rosen, *The Self-Evolving Cosmos: A phenomenological approach to nature's unity-in-diversity,* Series on Knots and Everything Vol 18 (Hackensack NJ, World Scientific Publishing Company, 2008). Rosen uses the descriptive phrase "object-in-space-before-subject". The classical worldview can be contrasted with the notion of Umwelt as discussed by John Deely, *Purely Objective Reality,* Semiotics, communication and cognition Vol 4 (New York: De Gruyter Mouton, 2009]. My treatment of the classical worldview in this investigation builds on several earlier investigations, including "The Proximity of Light" and "A Physicist's Guide".

[23] Recently Vassallo and Esfeld have investigated the ontology of monadic relationalism in the context of general relativity. Their monadic relationalism (which they call Leibnizian relationalism) is the form to which triadic logic reduces in the limit of "infinite synchronization". This singular limit reduces the ontology to a classical worldview (namely, Newton's Absolute Space of differential geometry) and in so doing obscures the quantum indeterminacy of systems that are synchronized by light in space and time. It is precisely this singular limit that I am trying to open up in this investigation by moving from an ontology of *space* to an ontology of *light*. Antonio Vassallo and Michael Esfeld. "Leibnizian Relationalism for General Relativistic Physics" (preprint, 2016). Accessed September 10, 2016. https://www.academia.edu/28019019/Leibnizian_relationalism_for_general_relativistic_physics .

monad. The number 1 is set apart as in-itself because of the binary logic of the excluded middle which takes each natural number as a distinct entity in-itself. The in-itself of each number is a consequence of the formal lawful structure of Number theory.

Actually, the finite monadic form does not rest in-itself. An object exists in relation to other objects and this relatedness is what gives the object its self-identical form[24]. In the case of Natural numbers, the lawful structure of number theory implicates a relationship between any given number and other numbers in the class. This relatedness emphasizes primal asymmetry as part of the finite monadic form—through an essential relatedness a particular member of the class is connected to other members of the class and to the whole class. Godel's demonstration of the incompleteness of number theory[25], for example, brings into view the asymmetry in this essential relationality. Finitude always references or points beyond itself as illustrated in Figure 1.

Figure 1: Relationality of the Finite Monadic Form

The finite monadic form exists by virtue of a formal system in which it is embedded, such as number theory. If we think of the numerical unit as in-itself, then the asymmetry is hidden from view. However, as Godel demonstrated, the asymmetry can be brought to the fore by recognizing that the numerical unit can also be a signifier of something else, such as a true theorem.

Augustine[26] gives us a way to speak of this formal asymmetry that is constitutional for physical as well as intellectual objects. *All objects are signs[27].* A sign exists in-itself-for-another[28]. Relationality enters into

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[24] An interesting exploration of relational aspects of monadic forms in the context of music can be found in Victor Zuckerkandl, *Sound and Symbol: Music and the external world* (New York: Princeton University Press, 1973). This exploration provides a helpful "ontological" view of the relational nature of quantization.
[25] Two particularly accessible discussions of the relational, reflexive form of Godel's approach are: Douglas Hofstadter, *Godel, Escher, Bach: an eternal golden braid* (New York. Vintage Books, 1980). And Rebecca Goldstein, *Incompleteness: The proof and paradox of Kurt Godel* (New York: WW Norton & Company, 2005).
[26] Augustine, *Trinity.*
[27] Peirce as interpreted in Rogers, "Light Signifying Form".

the essence of objects as signs—the finite object overflows itself towards another[29]. This relationality—

for-another—is a dynamic that is prior to or embedded within the static image of finitude *in-itself*. Space and time are inextricably interwoven through the sign.

Yet there is something quite misleading about the way I have represented the sign because the essential relationality of signs is *not a duality*. If we were to think of signs in terms of the dual relationship of signifier-signified, for example, we would return to classical logic and its objective worldview. We would have the signifier *in-itself* and the signified *in-itself* and the relationship of pointing from one realm (the realm of signifiers or the embodied world) to the other (the realm of signifieds or the intellectual world). What becomes excluded in this picture is the mediating act of pointing or referencing that establishes relationality between the two realms in the first place.

With triadic logic, the essence of the sign is *the potential to point*, that is to say the essence of the sign is primal asymmetry →. And the movement of this investigation is to turn away from the in-itself of the finite monadic form • towards the asymmetric pointing of relationality →, only to find ourselves returning back to finitude. However, we return with a new image of the form of unity. Namely, unity mediates a relationship between interiority and exteriority such that things in the world have *significance* for other things in the world. The significance is mediated by the exchange of in-formation which is a process of externalization of interiority and internalization of exteriority.

In the context of modern physics the image of unity plays itself out such that space is the architecture of exteriority, time is the process of interiority and light creatively mediates their relationality. Our movement of thinking in this investigation from objects to signs as the subject of physics can be traced in the movement of mathematical thinking that happens in the transition from the theory of Natural numbers to the theory of Complex numbers as illustrated in Figure 2 and explored throughout the rest of Section 2.

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[28] Hegel, *Phenomenology of Spirit*
[29] Levinas, *Otherwise than Being.*

Classical image of unity
(Eg. Natural Numbers)

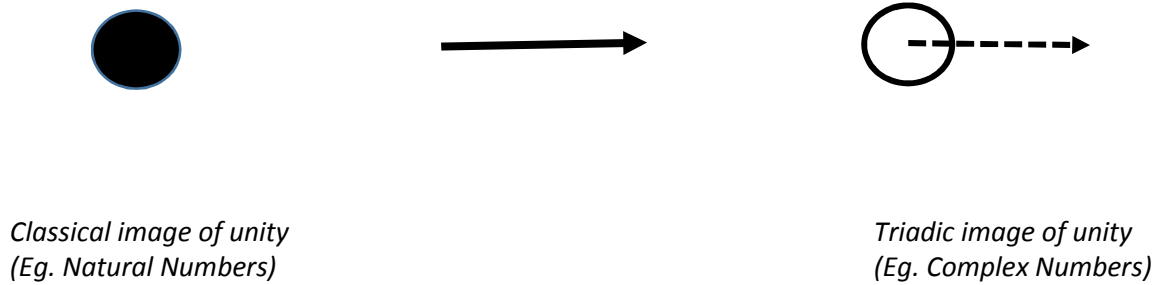Triadic image of unity
(Eg. Complex Numbers)

Figure 2: Movement from Object (in-itself) to Sign (in-itself-for-another)

*The object in-itself has identity by virtue of a formal system in which it is embedded (for example, the unit in number theory). When considering the object in-itself, the formal system (in our example, the theory of Natural numbers) plays the role of an Absolute background of determination. This background can be interrogated by focusing on the relationality that connects objects in the formal system. The finite thing that was formerly totalized under our gaze as an object in-itself is seen to be a sign within the system that has the **potential to reference beyond**. The potential to reference beyond is the essence of the Limit that underwrites the theory of the continuum for Real numbers but in this theory the identity of the unit becomes ambivalent because proximate numbers blur into each other. In the theory of Complex numbers, the finite unit is an infinitely repetitive circular encompassing of the origin of the complex plane (like a collapsed helix); its interior reflects the exterior plane; and the origin of the complex plane is asymmetrically connected to the Infinite horizon through a branch cut.*

2.1.3 Being and Categories

The classical worldview might be described as an "externalized" worldview, where externalization is often synonymous with objectivity[30]. Things, as objects, exist simultaneously in a container that is called Absolute space and objects are perfectly synchronized at each point in Absolute time. Euclidean geometry is the archetypal form for the spatial container in the classical theory of Newtonian mechanics, to which time can be added as a fourth (externalized) dimension to create a four-dimensional spacetime manifold[31]. The Euclidean form of spacetime embeds what physicists call a "block universe" as a totality that is background dependent where the background is the four dimensional spacetime manifold.

This background is a totalizing structure of lawful regularity that completely determines the past, present and future, without rupture or surprise or freedom. If we were to speak of the *being* of objects in this wordview, we would say that it is pre-structured by space and time. However, when we say this, we don't mean "time" in the sense of our experience of time as an asymmetric movement from the past towards future, we mean time as *space*. Since Euclidean space is perfect synchronicity or timelessness, we are left to conclude that time—as the asymmetric *passing* of time—does not exist in the classical worldview. Similar forms of reasoning are often carried over to modern physics. Namely, there is a unifying category to all being and that is space; time is just an example or manifestation of space[32]. (For the rest of the investigation, the term *space* refers to any spacetime manifold in which time is interpreted as merely a fourth spatialized dimension.)

If we were to think differently (and thinking differently is the goal of this exploration), we might ask: *To what is space external* [Genesis 3.8-10]*?* That is we might ask about what lies beyond space as a category of finitude. If we are working under the assumption that *all is space* then even posing this question becomes challenging. To take on this challenge, we will use a type thinking, common in Eastern

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[30] Deely, *Purely Objective Reality.*

[31] I have explored the classical form of Newtonian space and time in greater depth in "The Proximity of Light".

[32] Julian Barbour, *The End of Time: The next revolution in our understanding of the universe* (New York: Oxford University Press, 1999), exemplifies the approach in physics that continues to privilege space over time. Lee Smolin, *Time Reborn: From the crisis in physics to the future of the universe* (New York: Houghton Mifflin Harcourt, 2013), claims that the elimination of time in modern theoretical physics has led to an impasse to advancement in the field and argues that time is fundamental for theoretical physics, particularly in cosmology. Rosen, *The Self-Evolving Cosmos,* provides a clear and approachable critique of the classical assumption of "object-in-space-before-subject" that permeates modern physics. For further investigation of space as a category, see Rogers, "Beyond Space and Time" and "Light Signifying Form".

philosophy[33] and popularized in the West by Hegel, that is *dialectical*. Dialectical thinking—a form of triadic logic—involves the recognition that whenever we place Being or Totality under a single category, an Other to that category will manifest as something that frustrates or *opposes* the generalization. Our application of the method of triadic logic in this investigation involves repeatedly tracing this opposition within the classical worldview in order to find the still point around which the duality revolves. Since the Other cannot enter into the wordview directly (it is the excluded initiative of the worldview, namely time), the opposition can only be abstracted as something definable by relinquishing the privileged pole of the duality—namely space—and refocusing on the mediating still point around which the dialectic turns—namely light[34]. This shifting in perspective is an example of what Hegel calls *Aufheben*[35]. It is a movement beyond the classical worldview or a transcendental "lifting up" out of the totalizing system of Absolute space in which the classical worldview is embedded [Romans 12.2]. From the new perspective, space and time become relativized under a unifying Presence (such a Presence was impossible within the Totalizing system). In a nutshell, from this new perspective: space is exteriority and it is the formal cause of bodies (an example of a formal cause is symmetry); time is interiority and it is the effective cause of bodies (an example of an effective cause is action-reaction); light is the process through which bodies are creatively formed and brought into relationship.

At the risk of oversimplification, the classical worldview might be represented by Figure 3 below.

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[33] For example: "The Great Treatise", in *I Ching*, trans. Richard Wilhelm, rendered into English Cary Baynes (Princeton: Princeton University Press, 1990).
[34] I have explored this method in the context of physics in two previous papers: "The proximity of Light" and "A Physicist's Guide".
[35] BIrchall, "Hegel's Notion of Aufheben".

(REAL) SPACE

Euclidean-like manifold of lawful regularity

"Spacetime manifold" or "Wavefunction of the Uni-verse" or "Theory of Every-Thing"

Ideal observer

(IMAGINARY) TIME

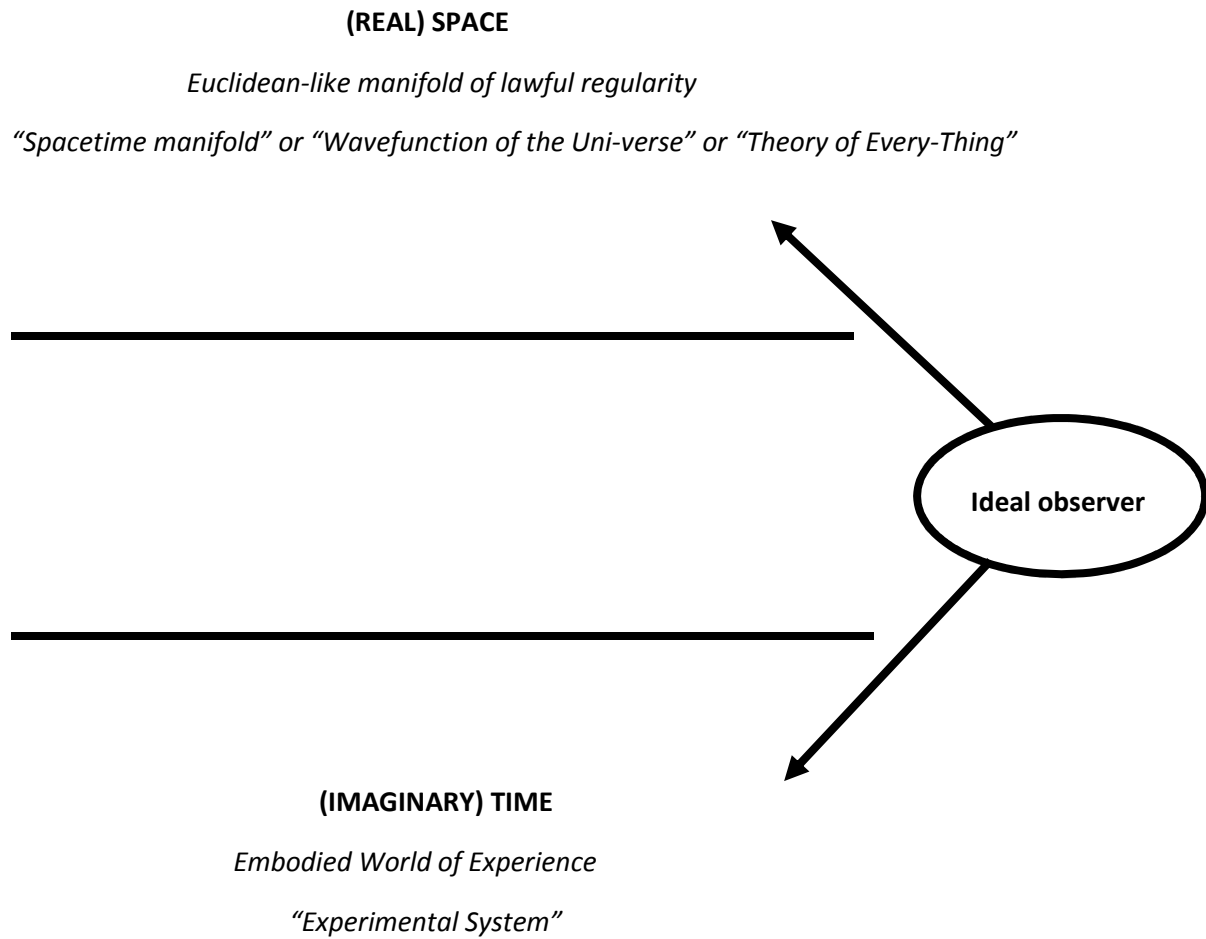*Embodied World of Experience*

"Experimental System"

Figure 3: Classical Worldview

In the classical worldview, space is Absolute and defines or determines what is Real. The Ideal observer is a transcendental vantage that is both spatial and non-spatial. The embodied world of experience is what is determined by the Real. The experience of temporality as the passing of time is considered an illusion.

The Ideal Observer mediates between the embodied world of experimentation and the intellectual world of Absolute (to be renamed Real) Space or *Principia Mathematica*. The classical worldview imposes three assumptions that I hope to trouble in this investigation:

1. Space is Absolute so that the lawful regularity completely determines the embodied world of experience. This results in a univocal correspondence between "objects" of the theory and "objects" in the embodied world.
2. The Ideal Observer is a null point of mutual exclusion between the embodied world of experience and the lawful regularity of Space. This is the Cartesian duality of mind and body.
3. Nothingness—the excluded middle—is eternal absence. Imaginary time is the same as real space.

Peirce[36] provides us with a way to reframe this picture in order to avoid the totalizing assumption of Absolute space. This reframing provides a meta-physical model of triadic formalism that we will use throughout the investigation. Elsewhere I have discussed how this framework might be applied to physics[37]. Here I want to provide a crude narrative of how we might think of this model as a singular expansion of the classical worldview.

In the classical worldview there is only one category—Real space. Real space is the lawful basis for abstracting finite objects into distinct members of generalized classes. It is the purveyor of identity (and difference). With Peirce, this category of "laws" becomes *Thirdness* which is one of three interwoven categories. Thirdness is the category of generalization. It involves the mediation of lawful regularity in relatedness. However, with Peirce laws are not absolute, they are formed through a process of repetition or habit. Laws have a specific significance or impact upon the bodies that form them.

In the classical worldview, Real space obeys the binary logic of the law of the excluded middle. The Ideal observer is a transcendental vantage on Real space that mediates between the Absolute of space and the experience of time. In some sense the Ideal observer violates the law of the excluded middle because s/he is both Spatial and temporal (non-spatial), General and particular, Absolute and relative, External and internal, Physical and intellectual. With Peirce the Ideal observer becomes a community of interpreters. Interpreters are embodied entities that collectively re-present aspects of their

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[36] This section is based on an interpretation of Peirce that is developed in Rogers, "Light Signifying Form".
[37]Ibid.

environment as internal forms or *in-formation*. A community of interpreters can exchange information through signs.

A sign is an entity that stands for an object to which a response can be made by an interpreter. The semiotic process of information exchange is the creative process through which a community of interpreters continually formulate their objective worldview where the "objects" of this worldview come from internal re-presentations that have pragmatic significance for the interpreters. Interpreters might be a community of humans, or amoebas, or electrons. Interpreters are always embodied in their world. This embodiment or brute actuality of existence is called *Secondness*. Secondness is the basis of relationality.

The ability of interpreters to be both present to their external world (Secondness) and re-present that world internally (Thirdness) hinges on a paradox or ambiguity—the excluded middle of binary logic. The sign both is and is not itself. The sign is *in-itself-for-another* where, as Levinas emphasizes[38], this "for-another" ($\rightarrow$) is a process of proximity and substitution that is also self-emptying. There is a circularity to this paradox because the "in-itself" of the sign comes from the "for-another" of other signs but then is given up, in turn, "for-another". The nature of this circular paradox is like the nature of infinite self-referencing, as encountered for example in Godel's incompleteness theorems[39].

If we stay within the confines of binary logic we must stop now because we have encountered a contradiction. Triadic logic, however, provides a way forward. Here is how it works. *Don't try to dominate this paradox through your own understanding because it cannot be understood*. Instead, whenever we encounter this paradox of Infinite self-referencing we will take it as an encounter with the beyond or Infinity[40]. What we have encountered is a *limit* and we will call this limit an Origin. The category of origins is called *Firstness* by Peirce. Firstness is potentiality, immediacy, spontaneity, freedom, that which exists without reference to anything else.

One of the challenges in moving from the classical worldview to this new metaphysical perspective of triadic logic is that we have to think through the nature of limitation. Limits are essential to finitude. But

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[38] Levinas, *Otherwise than Being.*
[39] Hofstadter, *Godel, Escher, Bach*. And Goldstein, *Incompleteness*.
[40] Actually it will be taken as the trace of such an encounter. This trace points to but is different from Biblical accounts of encountering Firstness [Exodus 3; Matthew 14.22-33; John 19.30].

if we think of a limit as an Absolute barrier then we lose touch with the Beyond of finitude and we risk becoming embedded in a Totalizing system that is the empty reflection of the nothingness that finitude is *in-itself* [Psalm 115:4-8]. In triadic logic a limit is where Infinity overflows itself towards another and the limit must be included as part of the logic. Of course, taken at face value this seems absurd. But perhaps it seems absurd because we think of logic as *binary* logic and therefore as a synchronized, totalized structure of relationality that cannot tolerate the ambiguity of the excluded middle? Triadic logic, on the other hand, is a progressive evolutionary process of learning—it is about the *narrative of thinking*. The limit in triadic logic is like a transcendental moment of Aufheben in which a new *particular* pattern or thought is recognized as potentially iconic for a new *general* pattern or idea. The limit enables the *potential for generalization*.

Returning to Figure 2 and our example of number theory, we might begin to see that this figure also describes a movement in the way limits are portrayed. In the theory of Natural numbers, the limit is *excluded* from the theory—the discreteness of Natural numbers is an Absolute given. In the theory of Real numbers the limit is *approached* as an external horizon that is contained through the use of infinite summations but is never reached—the continuum. The limit *becomes included* in the theory of Complex numbers as a movement of Aufheben that unifies the discrete and the continuous through cycles of return. In the theory of Complex numbers the limit is *ex*-cluded through the discrete numbering of cycles of return (temporality) and it is *in*-cluded through the reflection or mapping between exterior and interior representational forms (spatiality).

I have tried to provide a heuristic narrative to move our thinking from the classical worldview to the metaphysical model of Peirce's three categories. Figure 4 below is a representation of this model and I think the value of this representation comes from comparing it with the picture of the classical worldview in Figure 3 above.

THIRDNESS

Generality: Laws, Symmetries, Mediation

(Formerly called **Real space** and includes the "Ideal" of the observer)

FIRSTNESS

Potentiality: Indeterminacy, Choice, Originality

(**Excluded initiative** of the classical worldview)

SECONDNESS

Actuality: Embodiment, Event, Effect, Force

(Formally called **Imaginary time** and includes the experience of the observer)

Figure 4: Peirce's Three Categories

In the metaphysical model of Peirce's three categories, Firstness is "that whose being is simply in itself, not referring to anything nor lying behind anything". Secondness is "that which is by force of something to which it is second". Thirdness is "that which is what it is owing to things between which it mediates and which it brings into relation to each other"[41].

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[41] Peirce, "A Guess at the Riddle". For further discussion of Peirce's three categories and additional references, see Rogers, "Light Signifying Form".

Although I have represented the three categories graphically as something spatial and accessible to our totalizing gaze, they are actually inter-related in a more primal, non-spatial way. There is a unity that weaves them together such that each category can only be identified by virtue of its relationship to the others[42]. This is another manifestation of the paradox that we are simply going to call a limit. That the categories can be differentiated as three and yet remain united is a mystery that lies beyond the model itself. Of course this means that the model is limited too. Using the language of Levinas, Infinity overflows itself into the finitude of the model but the model as a model necessarily betrays the Infinite. Despite the limitation, in this investigation I hope to explore what this model might tell us about Finitude.

To that end, let's consider a particular representational form of inter-relationality for the three categories, namely the light cone of the Special Theory of Relativity[43]. I will call this representation *the Present Moment*.

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[42] In this sense the model might be said to explore "traces of Trinity" in creation as discussed by Augustine. For further exploration of this approach, see Rogers, "Beyond Space and Time".

[43] The form of the light cone is explored in further detail in Rogers, "The Proximity of Light".
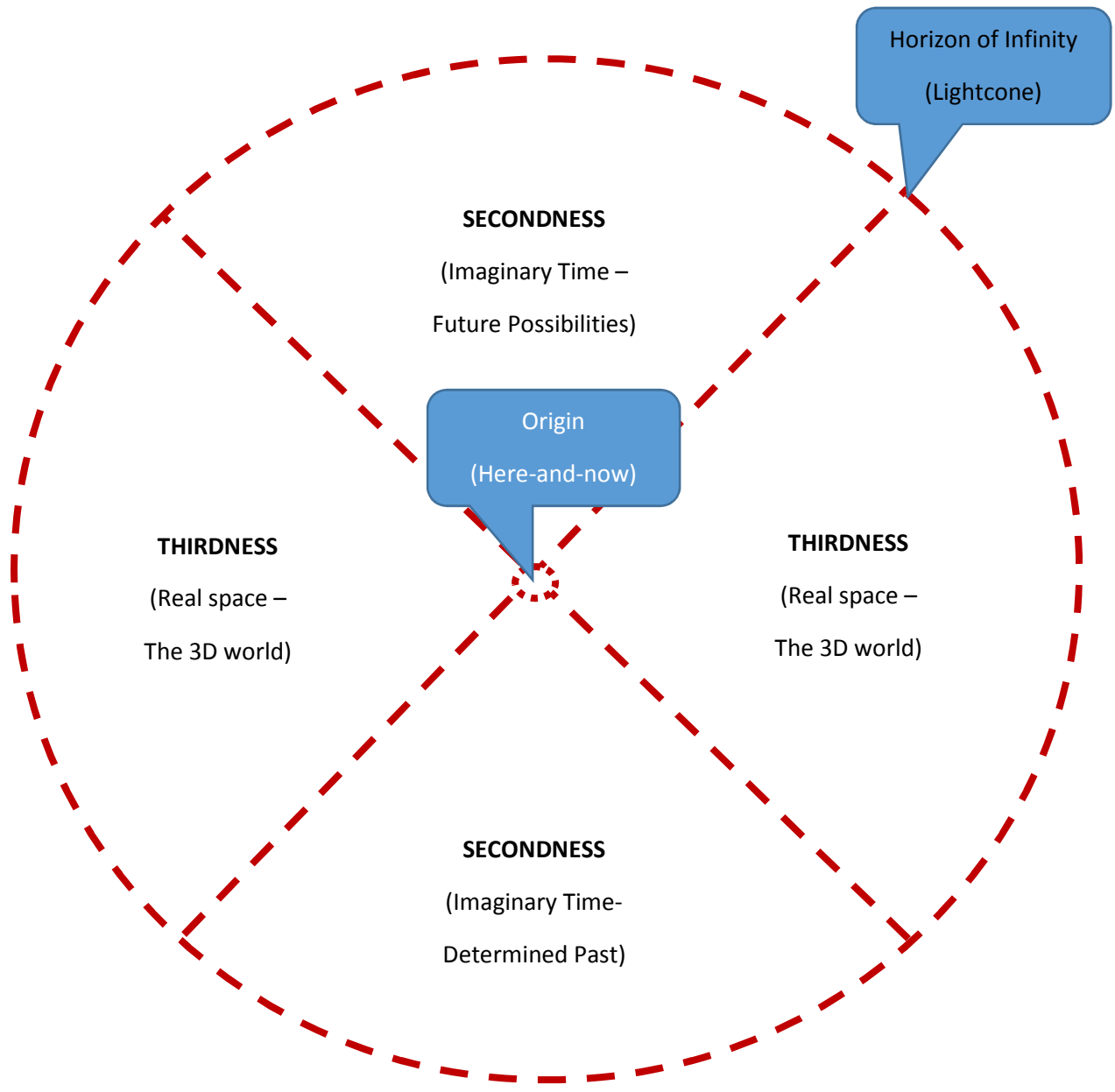
Figure 5: The Present Moment--Peirce's Three Categories Represented by the Light Cone

Thirdness is the continuum of three-dimensional space. Secondness is time that is asymmetrically divided into past and future by the embodied here-and-now. The dashed lines represent the lightcone that connects the origin of the frame of reference to the Infinite horizon. Light is Firstness. Light internalizes the (externalized) past into the here-and-now and then externalizes the here-and-now into the future. This action-reaction involves indeterminacy, spontaneity, choice.

Now I can state the original claim of this investigation: The Present Moment is the essence of the *particular*; Relativity Theory is a theory of *generalization*; and Light is the *creative source* for Finitude.

2.2 Generalization

2.2.1 Increase and the Form of Determinacy

Recall that in this investigation we are trying to think differently about nothingness, finitude and Infinity and by differently we mean differently than classical logic. The archetypal form we are using for classical logic is the theory of Natural numbers. In the classical worldview, we used the iconic image • to represent the finite monadic form, the number one, the *unit*. We then looked at how Infinity is represented in the theory of Natural Numbers. We identified a fundamental asymmetry or horizon in that representation of the Infinite → that we recognized also belongs to the unit by virtue of its embeddedness in a lawful structure.

But what about nothingness?

In the classical worldview the form of nothingness is absence. It is the operator *zero* of number theory. We come to an understanding of zero through a process of negation that involves subtracting units until *no thing* remains. But this absence should not be thought of as another thing. It is more like the expectation of something that isn't there, an expectation that only has significance because things were present before[44]. This "expectation" is a formal consequence of the lawful structure of number theory and zero is *the potential for something to be present that is not actually present*. I will call it the Origin of Natural Numbers. Zero, like Infinity, is an asymmetric movement. However, whereas Infinity is a movement towards, zero is a movement away.

If we say that zero is the potential for there to be something that is not present, the "something" is pre-structured by the generalizing system (eg the theory of Natural numbers) and zero involves a movement from potential to actual. Unlike all of the other Natural Numbers, zero is not fully generalized within the formal structure of number theory—it is not completely *defined* by the theory. Zero is a number in some ways (for example, it can be added to or subtracted from another number), but in other ways it is not a

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[44] For a more complete discussion of negation, see Rogers, "Beyond Space and Time".

number (for example, another number cannot be divided by zero). We might say it both is and is not a number. It is this ambiguous identity that forces us to pay attention to the *context* in which zero is used in order to avoid formal errors in the theory[45].

Zero is absence. Zero is also the form of *proximity* or relationship of nearest neighbours in the classical worldview—the between of two contiguous things. The boundary between two contiguous things is an absence of things, nothing, zero. The Excluded Middle. If we apply this description of relationship to Natural numbers, we might say that between any two consecutive Natural numbers, there is no number and this absence of number we might also call zero.

Suppose we dig deeper into the nature of this relationality. The sequence of Natural numbers is {1,2,3, …}. Between any two numbers, say the numbers 1 and 2, there is an absence of numbers. It is important to recognize that this absence is an asymmetry. The way we traditionally understand this asymmetry is that we say any number in the sequence can become the Origin for the next number in the sequence. This process of induction is part of the definition of Natural numbers and is called the "unary representation"[46]. It involves the postulate of the self-identical unit, the number one. Subsequent numbers are then defined iteratively and recursively through the process of adding the unit to the last number defined. This method of induction is irreversible in the sense that it moves successively forward in an ordered way towards infinity. The relationship of proximity between successive numbers has the form of *increase*. For Natural numbers, this *increase* is called addition. Zero—the potential for something to be present that is not actually present—is the origin of addition.

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[45] In this exploration, I will take the Natural number one as the postulated unit-in-itself that forms the basis for the inductive definition of successive numbers. Some formal treatments of Natural numbers start from 0 or the empty set, rather than 1. In triadic logic, it is problematic to attempt to "start" with a sign that points to nothingness because nothingness is the absence of unity.

[46] This discussion of the formal structure of Natural numbers is based on the Peano axioms. The Peano axioms involve the unary representation and the equality relation.

- The unary representation is the inductive process that starts with the givenness of 1 and then defines successive Natural numbers through a recursive function or process of induction. The successor function maintains the *distinctness* of the numbers. The unary representation is formally similar to the notion of temporality in that it establishes particular difference between successive instances in the sequence.
- The equality relation is formally similar to spatiality in that it establishes sameness. Equality is self-identical (x=x) and equality is symmetric (if x=y, then y=x); equality is also transitive and closed. The equality relation forms the "logic" or grammar of the generalizing system.

For further discussion of the formal structure of Natural numbers, see "Peano Axioms" in *Wikipedia*. Accessed September 10, 2016. https://en.wikipedia.org/wiki/Peano_axioms .

But zero is also the operator that defines equality because when the difference between any two numbers is zero, they are the same number.

Surely you are objecting now that the way I am thinking is absurd. Am I not just playing loosely with a contradiction? First I say zero is inequality between two things; then I say zero is equality between two things. How can both be true **at once**? To this objection I can only respond, "*Exactly!*" Zero is *ambiguous*. And what I really want to draw your attention to is the formal structure of ambiguity.

The formal definition of Natural numbers begins with the postulation of the discrete unit as a self-identical form. Consecutive numbers are defined inductively by adding the unit to the last previously defined number. For example: 2 is 1 added to itself; 3 is 1 added to 2; 4 is 1 added to 3; and so on. The formal definition of Natural numbers is progressive, asymmetrically moving from the unit towards infinity. The formalism, in some sense, "pushes us" from one number to the next in the sequence. I will call this inductive pushing *temporality*. The formalism of number theory enables and structures temporality and temporality is *increase*.

The postulate or *givenenss* of the self-identical unit is the basis for a theory of Natural numbers—this giveness *grounds* the inductive process of defining Natural numbers. But this unit is not true unity or Oneness. It is only an image of unity. We can see that it is only an image by looking at the starting definition of addition. Two is the unit *added to itself.* In the definition of two, the unit is co-present with itself and therefore not one. Two involves self-reflection of the unit. Zero, as equality, provides the basis for this self-reflection. 1=1 and the difference between 1 and 1 is zero. Equality establishes the logical framework of a formal theory of Natural numbers as a synchronized structure that can be explored generally—the formalism of Natural numbers is a theory of equality. The synchronized logic of equalities can be taken as a form of *spatiality*, where spatiality is co-presence or synchronicity. The overall (synchronized) structure of equalities I will call the *grammar* of Number theory.

We have considered Natural numbers from the perspective of temporality—as a linear progression—and from the perspective of spatiality—as co-present equalities. Zero was the turning point around which these two perspectives revolve. Now let's look more carefully at this still point. The defining moment of number theory is 1+1=2. What I want to show is that there is an implicit triadic logic in this moment. When looked at as a temporal progression forward, equality actually involves an operation of

differentiation—two is *different* from one. Addition is the action that contains this difference and brings it into finitude. However if we look backward on this progression, 2=1+1, we discover that equality is also based on a pre-determined sameness of the unit with itself. The determination of sameness comes into view in this backward glance, much like the past is determined for the present moment.

What we are trying to do here is to *de-synchronize* the formalism of number theory (that is to say, we are trying to break through the totalizing system). When we make this attempt, we discover that zero includes an asymmetric relationship between a determined past and future yet to be determined (through the iterative, inductive process of addition). This relationship might be called "causal" because each number in the sequence *causes* the next number in the sequence through an asymmetric dependency. Zero also includes a symmetric relationship in the past that is a consequence of co-presence, where co-presence is the result of the determination. Co-presence is the basis for generalization because it allows for the creation of a *generalized* structure of lawful relatedness. Finally, zero is the ambiguous indeterminate. It is the origin of the asymmetry of temporal progression (causality), the origin of the symmetry of spatial structure (generality) and it relates asymmetry and symmetry *by turning back on itself*. This is the essence of triadic logic. It is the kind of logic Godel used to prove the incompleteness of Number theory[47]. And the novel aspect, the part that is excluded in the traditional treatment of number theory, is the mysterious way in which the system can be seen to turn back on itself through a process of return.

In our thinking about zero, we identified three movements: asymmetric increase, symmetric equalization and return. Yet the context for each movement was different. By existing both inside and outside of the generalizing system, zero is able to relate different contexts that are not otherwise related through the fixed relational structures of the general formalism. Our thinking about zero offers us the potential for a new form of relationality. I will call this form the Limit. The Limit unites the three movements described above as shown in Figure 6.

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[47] Hofstadter, *Godel, Escher, Bach*. And Goldstein, *Incompleteness*.

Thirdness

0   **1**   **2**   (Symbol)

- -

Firstness

(Notion)

Secondness

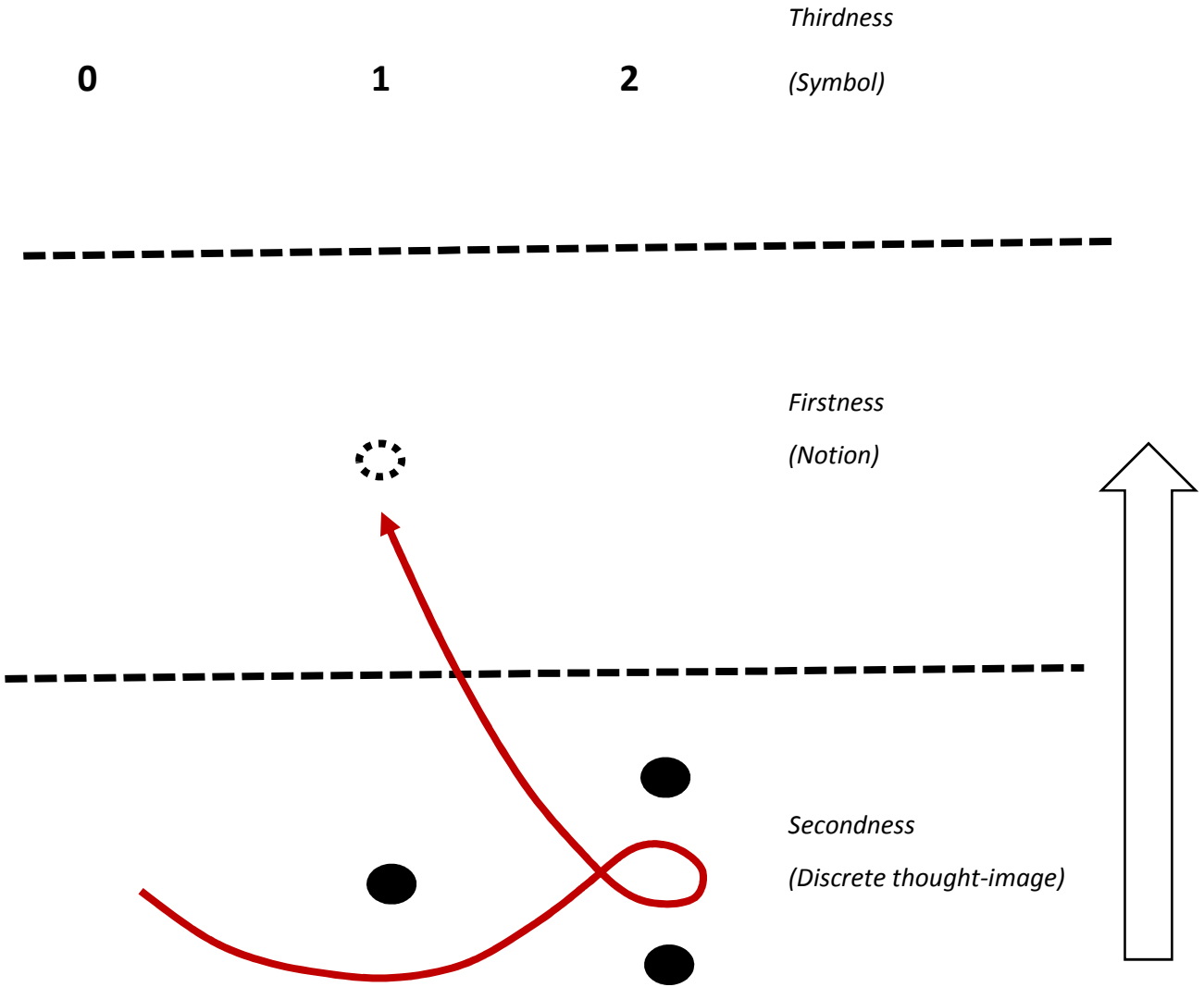(Discrete thought-image)

Figure 6: The Limit as a Triadic Form

The Limit is the form of finitude for the unit in the theory of Natural numbers. This limit can be traced in the definition 1+1=2. At the level of iconic representation (Secondness), there is an asymmetric forward movement from 0 through 1 towards 2. The iconic representation of 2 involves repetition or self-reflection of the unit. Looking backward from 2 to 1, the bifurcation opens up a thetic break whereby the unit is not oneness in-itself because it has been repeated. The former image of the unit, • , becomes an iconic representation of something that can now be abstracted from the particular context of 1+1=2. This abstracted entity is the "Notion" of Unity (Firstness). The notion of a number can be represented by an arbitrary symbol whose significance comes from the generalized system of numbers as a whole (Thirdness). Thus the Limit is the triadic form of pointing at "something" that can be abstracted from many particular contexts into a generalizing determinate. It is neither spatial (within a completely synchronized structure of generality) nor temporal (wholly dependent on context) or, perhaps, both spatial and temporal.

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The Limit opens up for us three levels of thinking about unity that are distinguishable yet interwoven. At the upper level (Thirdness) there is the sign or symbol 1 which is the sign that we are intending to interpret as signifying unity. In our exploration of Natural numbers, this sign is the unifying Origin for a thought-image about unity. When we explore the formal structure of the theory of Natural numbers, we create for ourselves a "thought-image" of 1. This thought-image comes from our encounter with the sign "1" as we explore the theory of Natural numbers, both the temporal aspects of induction and the spatial aspects of logical grammar (deduction). In binary logic, the story ends here – there is the symbol of the Natural number one and the thought-image it signifies, where the thought-image is an *object* that terminates in itself. But the challenge with binary logic is that the thought-image is never completed because the formal structure through which it is contained is infinite. So an assumption must be made in order to proceed; namely, it must be assumed that the theory of Natural numbers describes a perfectly synchronized logical structure of objects-in-themselves. As we will see throughout this exploration, such an assumption implicitly contains Infinity (and it's shadow image zero), such that Infinity is bounded by the lawful structure of the theory. A bounded infinity is no longer beyond, no longer Infinity; rather it is a thought-image that becomes a sign of Infinity.

Triadic logic involves the recognition that the "thought-image" of 1 that comes from exploring the theory of Natural numbers *can also be taken as a sign*. We have been using the symbol • to represent this sign. The thought-image of 1 in the theory of Natural numbers is the image of a discrete, *quantized* unit. It comes from the actual encounter with the symbol 1 in the process of thinking about Natural numbers (Secondness). Let's take this thought-image as a sign of Unity. That is to say, this thought-image refers to or points to something else and that something else we will call the notion of Unity or Firstness. The thought-image • is an iconic sign of Firstness which means that it bears a likeness to the notion of Unity. This likeness is the *givenness* of Firstness. But the thought-image is also unlike Firstness in that it is discrete and bounded by the lawful structure of the theory of Natural numbers.

Triadic logic involves a movement in the *depth* of thought-images. Depth comes from the realization that the symbols that are manipulated in the lawful structure of a theory (Thirdness) create internal images or *interpretants* (in our case the interpretants are mental images or thought-images) such that a given interpretant can then be taken as a sign for another interpretant. The first level interpretant is bounded by the lawful structure of the theory. However, the second level interpretant can potentially transcend the lawful structure of the theory insofar as it can be brought into a different and potentially

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more generalizing structure of lawful regularity (abduction). In our exploration, depth will be explored by moving from the thought-image of 1 of that comes from the theory of Natural numbers (the discrete or quantized unit), to the thought-image of 1 that comes from the more expansive generalizing system of Real numbers (the "point number" one in the theory of the Real number line or continuum), to the thought-image of a unifying system that comes from Complex numbers. This exploration of depth is fashioned according to Augustine's reflection that the symbol (or name) draws the image to the notion[48].

2.2.2 Limitation and the Form of Inertia

By focusing our attention on the unit in the class of Natural numbers we identified the Limit of (numerical) finitude as an asymmetric movement forward followed by a reversal backward into a symmetric reflection in which the re-presented image signifies beyond itself. This movement brought us to the triadic logic of the sign—the Limit is an iconic instance of the more general form of the sign. And what I want to say is: *Through limitation objects are formed as signs* [Luke 10:22].

The narrative of our thinking in the previous section was cast in a particular way in order to prepare for another cycle of increase: from zero to limit to whole. Let's recap that narrative. In the classical worldview, the formalism of Natural numbers is considered a perfectly synchronized structure, a totalized system, such as described or contained by the Peano axioms. We attempted to embed ourselves within this structure by differentiating two types of thinking implicit in the structure. *Inductive* thinking, or the forward law of increase, was presented as a "causal" process in which any given number in the sequence of Natural numbers is the effect of its predecessor and the cause of its successor. This process is an asymmetric increase from 1 to infinity. We differentiated this asymmetry of nearest neighbour relationality from the generalizing structure of equalities through which the true theorems of number theory can be represented and proven. The latter was presented as a "grammar" that determines true sign relations *deductively*. Causal processes were called *temporal* (eg. **0 → 1 → 2**) and grammatical structures were called *spatial* (eg. **1 = 1**). The process and the structure were brought together in a moment of Return. This moment involved a reversal which bifurcated the movement of our thinking:

- equalities kept us within the system or grammar of number theory, while

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[48] For a discussion of Augustine's reflection on names, see Rogers, "Beyond Space and Time".

- asymmetric reference drew our attention to the fact that number theory is a system of symbols that reference something other than themselves.

These two movements, like a harmonic dyad, operate resonantly. The bifurcation was always with us, even before we became aware of it. The Limit was the sign-making process through which this bifurcation was externalized for us.

Now let's explore the limiting process itself. We will do this by abstracting the Limit in order re-present it iconically in a new context and begin to bring it into a generalizing system[49]. Figure 7 illustrates our working image of the Limit as an abstraction from Figure 6.

Limit as sign-vehicle

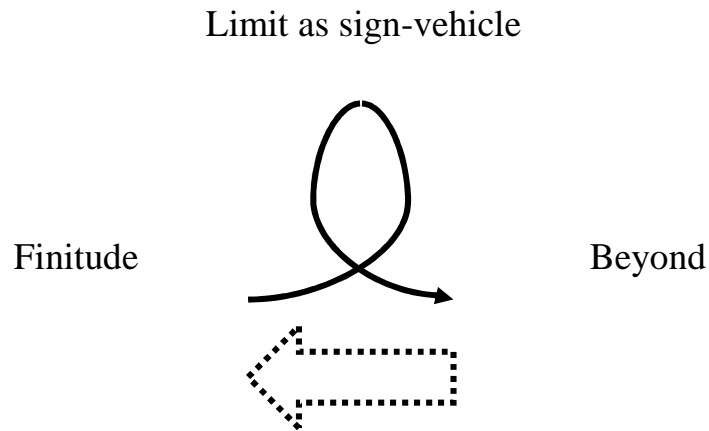Finitude   Beyond

Figure 7: Abstracted Limit

The Limit stands for the relationship between Finitude and Beyond. It is an asymmetric relationship. From Beyond to Finitude is a direct relation that is the creative source of Finitude. The forward relationship from Finitude to Beyond, however, involves a process of reversal or self-reflection, such that finite objects become signs.

Successive repetitions of the limit create a continuous movement that I will take to be an iconic form of temporality. Through this creative movement future possibilities become past determinations as illustrated in Figure 8.

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[49] For a more complete discussion of the formal aspects of the sign that are presented here, see Rogers, "Light Signifying Form".

Thirdness

(Spatiality as Re-presentation)
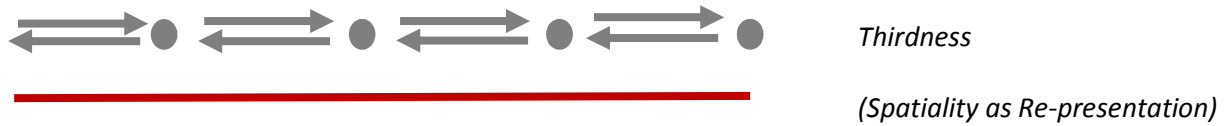
Generalized Determinateness (The Real Number Line)

Firstness

(Temporality as Potential)
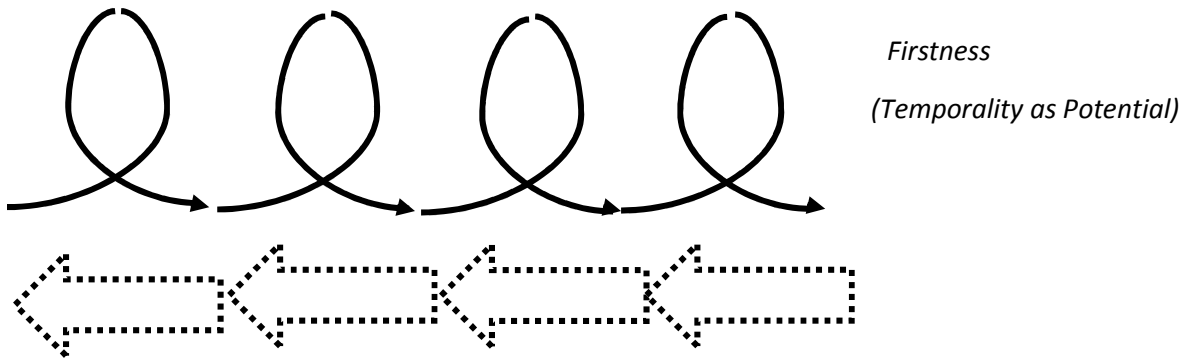
Past Determinations   **Future Possibilities**
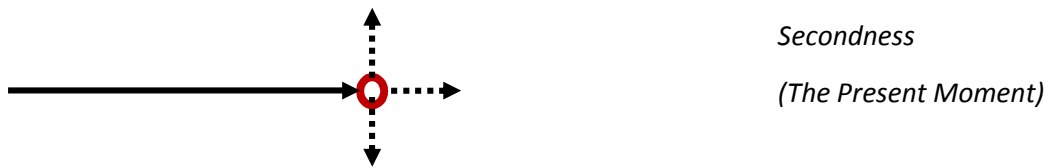
Secondness

(The Present Moment)

Figure 8: The Form of the Continuum of Real Numbers

The upper level (Thirdness) represents the Real Number line as a generalized system of equalities between neighbouring points on a line where each point continuously merges with the previous and next points to form a one-dimensional continuum (in Red). The middle level (Firstness) represents the repetition of the iconic limit as potentiality. This potentiality is determined in the upper level as the Real Number line. The lower level (Secondness) represents the drawing of a line as a temporal process. Here the past is determined, the present moment is opened to an indeterminate choice which selects a future from specific possibilities that are contingent on the past determinations.

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To understand what I am trying to represent through Figure 8, we need to move our perspective from an external observation of a continuous line as a synchronized object that is totally present under our gaze, to the act of drawing a continuous line. As we draw a line, we are moving from past determination (the part of the line that has already been drawn) into a future possibility (the part of the line that has yet to be drawn). This act (Secondness) is represented in the lower level of the figure and is called "The Present Moment".

Now, let's consider the determined past for this line we are drawing. The determined past is a continuum of repeated (equalized) images of present moments (from the past)—namely, Euclidean-like points—that flow into one another as points on a line. If we assume the line we are drawing is a straight line, these images can be brought into a system of generalization called Real Number Theory, such that each equivalent point is the sign of a Real number. This generalizing system can be (imaginatively) extended into the future to determine the future possibilities as possible points on the continuous straight line after the completion of the Present Moment.

But suppose we now invert this whole way of thinking. Let's say that the generalizing system, namely Real Number Theory, formally causes the creation of a straight line as a progressive movement in time. This formal cause I will call *Inertia*. Inertia is the result of a relationship between the particular present moment (Secondness), the generalizing system (Thirdness) and the creative potential of the beyond (Firstness). Inertia is a form of temporal symmetry in which future determinations will be repetitions of equivalent past determinations. In this way of thinking, the present moment is the moment at which the potential becomes actual. I will call the present moment, the Origin. Within the symmetry of the generalizing system, this particular moment becomes determined as the creation of the next point on the Real number line.

However, the potentiality of Firstness, namely the potential of the present moment in time, opens up the possibility for something else to happen, something other than a deterministic repetition of the past. This potentiality belongs to triadic logic and cannot be adequately understood within the classical worldview. The Origin of the present moment opens up the possibility for movement *in a different direction*. Such movement is non-inertial. It is a symmetry creating operation. This movement can be brought back into a system of generalization by *mapping the whole system back upon itself* as a two-dimensional manifold.

Thus the Origin becomes an origin for the mapping of the Real Number Line back onto itself. This mapping is called coordination. And the new system is a Cartesian coordinate system that iteratively repeats or reflects the generalizing system (the Real Number Line) back onto itself, such that each instance of the generalizing system can be separately named as an axis of coordination. That is to say, the Real number line (say, the x-axis) is coordinated with an image of itself (say, the y-axis). The one dimensional line becomes a two dimensional space.

But now we can see that this symmetry creation has always already happened. The potential for multi-dimensional coordination was always there. And we might equally say that inertial motion is a *symmetry breaking* operation in which a multidimensional *potential* (the potential for spatiality) is reduced to an *actual* one-dimensional trajectory. Inertial motion is a formal consequence of broken symmetry in the system of generalization, where broken symmetry is the Origin of the particular from the general (in our example, motion in a *particular* direction).

Similar to the way we looked at Natural numbers, our exploration of the Limit of the continuum--that is to say the Limit defining the relationship of proximity between neighbouring Real numbers—has disclosed an ambiguous dyadic process. The disclosure opened up when we de-synchronized the system by moving from the (spatial) perspective of the generalizing system (Thirdness)—namely the totalized Real Number Line—to the (temporal) perspective of actualizing or drawing or moving in a Real number line (Secondness). One aspect of the dyadic process was the habitual increasing movement in which the determined past inductively projects into the future. We called this inertia. Inertia is the result of an asymmetrical relationship between nearest-neighbour points on the line such that one point *continuously merges* into the next point. The other aspect of the dyadic process is the spontaneous movement in a new direction. This movement involves recognizing that the generalizing system (the Real Number line) can be self-reflected to create a new system of two orthogonal generalizing systems that are coordinated with one another (Eg. two orthogonal axes of a Cartesian coordination). This dyadic process, which is a form of *increase*, is represented in Figure 9.

Y - axis

X - axis
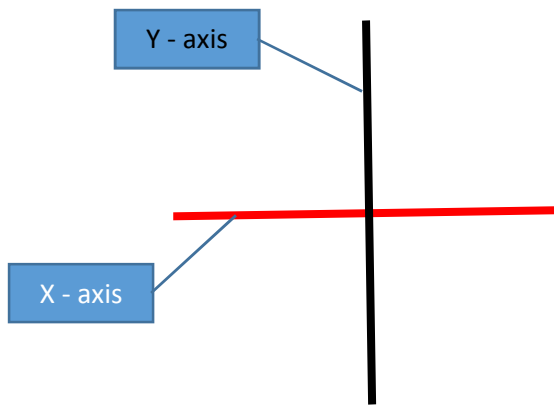
Thirdness

(Real Number line (Red)

coordinated with its

image (Black))
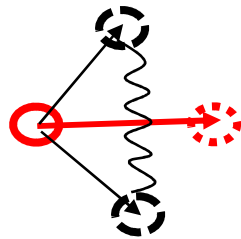
Firstness

(Increase through parity)
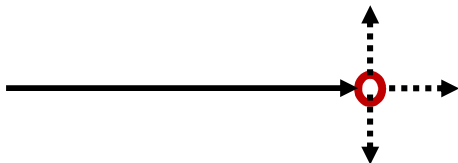
Secondness

(The Present Moment)

Figure 9: Inertia and Parity

*The lower diagram (Secondness) represents the present moment in the drawing of a straight line (Real Number Line.) The upper diagram (Thirdness) represents the coordination of two Real Number lines where the Origin is the present moment. The middle diagram (Firstness) represents the two dyadic potentials in the present moment. Either the line can by asymmetrically extended to the next point in the Real Number Line (Red) or a new dimension may be opened up (Black). The asymmetric extension or **inertial movement** involves a broken symmetry that distinguishes past from future or left from right (Red arrow). The new dimension represents the creation of a new symmetry (Black squiggle). In order for there to be movement in the new dimension, the new symmetry must be broken (i.e. up must be distinguished from down). This symmetry is called **parity**. Inertial movement is the formal consequence of breaking parity.*

Undoubtedly you are objecting now to the tenor of our exploration of the Real Number Line (and if you are not objecting yet, then this sentence will hopefully open up the possibility of objection). We have been speaking of an embodied line as if it were the same as the abstract notion of a Real Number Line, even though the two are not the same. What this allows, however, is for us to trace thought-images involved in the process of thinking about the generalizing system of Real number theory. Three foundational thought-images we encountered were

- the present moment, or point;
- the co-presence or symmetric relation between two distinct points;
- the broken symmetry or the asymmetric operator that connects proximate points

The thought-image of the point we called the Origin. It belongs to the category of Firstness. That is to say, it is an iconic sign of the notion of Unity. The likeness between this sign and Firstness is found in its *potentiality*. In this particular instance of the sign •, the thought-image-of-the-original-point is the potential to be the generative origin of the Real Number Line. The relation of symmetry between two distinct points is the equality relation for the logical grammar of the Real Number Line. This thought-image ⌁⌁⌁ is the basis of the generalizing system, where the generalizing system of the Real Number Line is a form of Euclidean spatiality. We will take this thought-image as a sign of the relational basis of spatial symmetry.

The thought-image of broken symmetry → came from the temporal action of our drawing an embodied line[50]. At first blush it does not appear to be part of the generalizing system of the theory of Real numbers. But we might probe more deeply into this image of broken symmetry by recognizing that Real numbers form a continuum and a continuum involves continuous flow. That recognition confronts us with a difficult problem. We have been speaking of a discrete, isolated number as a *given* thought-image. But how is it possible to isolate a single point, a single number, as an entity within a continuum? When we were exploring Natural numbers, we took the distinctness of the Natural numbers as given—it was a given quality of the thought-image of the quantized unit. In order to speak of the distinctness of a particular Real number, such as the Real number one, we need to find a way to isolate that particular thought-image from the rest of the generalizing system. We need to find a way to *foreground the particular point* from the continuous line of Real numbers.

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[50] Actually it came from an imaginative reflection on that potential action. This is where the connection with subjectivity becomes clear.

In modern analysis, this foregrounding is accomplished through the use of convergent infinite series. A convergent infinite series has an asymptotic form that is similar to a horizon. The infinite series is a process that continuously approaches an isolated point without every actually reaching that point. The "limit" of the convergent series is the isolated or foregrounded point. As a thought-image, the limit is an infinite process that *points to a terminus point*. This is an asymmetric pointing that approaches the point from one side. Thus we might say that the limit of modern analysis is a thought-image and this thought-image is an indexical sign. In fact, it is a sign of the essence of indexicality—*the act of pointing*.

The Limit—as a thought-image—is a sign that selects a particular point as a terminus. Through the limit, a particular point can be marked or *named*. That selected point can then be taken as an indexical origin to which other points may be ordered to actualize the generalizing system. But we can only isolate *one point at a time*. When we name a point in this way, we abstract it from the continuous background. We cannot isolate two immediately proximate points at the same time; this is the reason why the notion of proximity for a continuum is so elusive[51].

When we think about Real numbers in this way, we must always be careful to distinguish the terminus and the origin. There is a gap of potentiality, as it were, when a terminus point to an initial origin is then taken as the indexical origin for selecting another terminus point. For example, the original moment *now*, as a present point, is different from a terminus moment *later* as a point that may become a present point in the future. Likewise, the point *here*, as the indexical locus of my system of coordination, is different from the point *there* that is the terminus for a potential system of coordination for someone else[52].

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[51] For further discussion, see Rogers, "The Proximity of Light".

[52] The asymmetrical nature of the limit has implications for the underlying logical structure of the system. For a discussion of the logic of asymmetrical connectors, see David Foster Wallace, "Richard Taylor's 'Fatalism' and the Semantics of Physical Modality," in *Fate, Time, and Language: An essay on free will*, eds. Stephen Cahn and Maureen Eckert (Columbia University Press, 2011) ,142-216. And Kevin Knuth and Newshaw Bahreyni, "A Potential Foundation for Emergent Space-Time," *Journal Math Phys* 55 (2014) : 112501. Accessed September 10, 2016 http://scitation.aip.org/content/aip/journal/jmp/55/11/10.1063/1.4899081

The limit (as a thought-image) is an archetypal sign of the act of pointing or referencing or naming. Pointing opens up the possibility to foreground an object from the continuum and give it significance. This is the essence of Secondness. It is the essence of *intentionality*. It involves an encounter with the Other.

2.2.3 Resonance and the Form of Generality

From the inductive law of increase for Natural numbers we inferred the law of inertia for the continuum of Real numbers. From the reflection of the unit with itself in the theory of Natural numbers we inferred the reflection of the generalizing system with itself for Real numbers. By de-synchronizing the Real Number Line (i.e. The Generalizing System) we abducted the potential for any point on the line to be the origin of one (or many) new dimensions that can be coordinated with the original line as images in order to create multidimensional space. However, this potential can only be actualized by breaking the symmetry of parity—the ambiguous potential to move one-way or the other along the new dimension must be disambiguated, either as a result of something external impinging on the system (such as an external force) or as a result of *choice*.

Now it gets interesting. The generalizing system causes an inertia, such that the past is habitually repeated into the future. Each moment in time gives itself over to the next successive moment. But at each moment in time, the potential exists to break out of the generalizing system because the whole system is potentially present in that moment as a reflection of itself. This dyadic form is represented by the parity operator in Figure 9. The parity operator is the finite monadic form reflected back upon itself. It is the form of ambiguity.

So far in this investigation, we have been speaking of proximate points on a line or proximate moments in time as if they were discrete and differentiated monads, like the Natural numbers. But now, through the parity operator, we are encountering the challenge that proximate points of a continuum *may not be fully disambiguated*. The principle at work here is the identity of indiscernibles. The parity operator brings together two mutually exclusive perspectives on relationality (which, incidentally, underwrite the great divide between Analytical philosophy and Continental philosophy).

As *potential,* proximate points are *equivalent*. This unbroken symmetry is represented by the black squiggle in Figure 9. The perspective of equivalence can be called *external* because the points exist together under a single gaze to which they are external. The external perspective is the essence of spatiality as we have been discussing.

As *actual*, proximate points are *different* because of the irreversible relationship between them. This asymmetry is represented by the red arrow in Figure 9. The perspective of différance can be called *internal* because it comes from within the narrative of how the line was created—each point in the line gives itself over to the next proximate point in an irreversible process of substitution (to use Levinas' language). The internal perspective is the essence of temporality.

With the external perspective, proximate points are co-present and appear under the same gaze. With the internal perspective, proximate points are never co-present and never appear under the same gaze (they only become co-present *after the fact of having been drawn*, like memory*)*.

The external perspective is the privileged perspective in theories of physics. It is the category of Thirdness or generality. But notice that there is a bit of a problem here. Each point is the same as every other point. So if proximate points are equivalent, then shouldn't they also be identical? How can one point be differentiated from the other? Don't we have to conclude that they are the same point? The difficulty in resolving the problem of the identity of indiscernibles has been discussed by Gaskin[53]. From the external perspective, proximate points can be differentiated if we can somehow mark or *name* one point as an indexical point to which the other point (and indeed any other point) is asymmetrically related. Through the limiting process we identified how the generalizing system might be made to point to particular points. But they also need to be given a particular mark or name. This naming—a symmetry

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[53] Richard Gaskin. "Identity and Reference in a Black Universe." Accessed February 13, 2016.
https://www.academia.edu/19755831/Identity_and_Reference_in_a_Black_Universe .

breaking action—comes from outside of the generalizing system. Said another way, the external perspective *lacks an origin*. Once an origin has been named, however, then all points can be differentiated by their asymmetrical relatedness to that indexical point.

The internal perspective provides a means of differentiating proximate points because of the asymmetry of proximity/substitution as each point gives itself over to the next. One point is the cause and the other point is the effect, so to speak. However, this perspective also has a bit of a problem. Since each point gives itself up to the next proximate point, no point ever rests in itself. Like the progression of time, there is no actuality to any particular point; as soon as it appears it is gone. Pure flow without sameness or identity. From the internal perspective *there are no points* to speak of.

If we continue the tradition in physics of privileging the external perspective we will remain perpetually mystified by the Origin of our generalizing system that can and must be named although that naming can never enter into the generalization. More importantly, we will miss the fact that the Origin is actually the door through which we can break free of the totalizing influence of the system itself in order to see the generalization for what it actually represents.

Suppose, instead of privileging exteriority or space and then trying to deduce interiority or time as an epiphenomenon, we try to bring these two perspectives together in an abductive leap as represented in Figure 10.

Thirdness/General

(Sameness; spatiality)
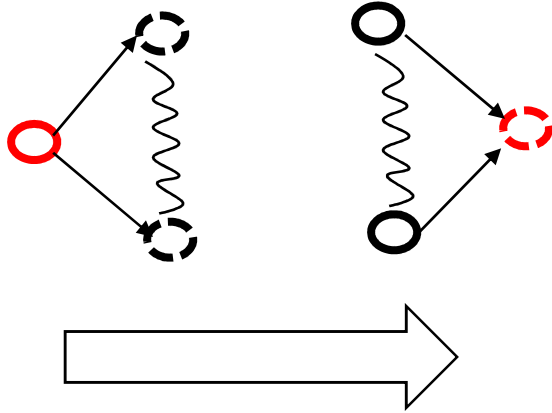
Firstness/Return

(*Reflection)*

Secondness/Particular

(Difference, temporality)

Figure 10: Disambiguation and Return

The upper diagram represents sameness or spatiality or resonance between two proximate points (Thirdness). The lower diagram (Secondness) represents difference or temporality or actuality of two proximate points. The middle diagram (Firstness) represents the first stage of a process intended to unify the two other diagrams. Here the image of parity from Figure 9 has been reflected back upon itself *as a reversal. This reversal implicates the irreducible triadic form of return.*

Notice that the ambiguity of relationality is the pivot around which the interior and exterior perspectives revolve[54]. Proximate points are *the same* in an exterior or general or abstract way and they are *different* in an actual or particular or experienced way. Now—and this is the key to triadic logic—let's invert our habitual way of thinking. Rather than deductively moving from the general to the particular, let's inductively move from the particular to the general. And presto! The ambiguity of relationality pops out as the process by which the particular becomes generalized. ***Rather than seeking a general theory of relativity, we are now seeking a relational theory of generality***.

Precisely because relationality can pivot between particular difference and general identity, it is possible to move from the particular (temporal) context to the general (spatial) system. I will call this process *disambiguation*. Starting from an Origin, points on the Real number line can be disambiguated through a generalizing system. But disambiguated points have the curious property that they are the same in a general way yet different in a particular way.

What is the nature of disambiguation? It is like the movement from metaphor to iconicity to parable [Mark 4.13]. It is when two things are said to be the same even though they are actually not the same. The double movement—*is and is not the same*—allows for abstraction from the particular to the general. Consider, for example, the metaphor "Joseph is a fruitful bough"[55]. Because Joseph is actually not a plant, the metaphor compels us to seek an abstract aspect of a fruitful bough that would also be a characteristic of Joseph. In that moment of intentionality, the fruitful bough becomes iconic because the bough is itself but it also represents a generalized characteristic that might be replicated elsewhere (for example, in Joseph). It becomes a sign. We have already encountered this double movement when we recognized that our starting image of unity, namely • , was actually an iconic sign for something that was beyond the image itself, namely the idea of One.

The double movement is the act of pointing or referencing. It is pure intentionality. It is also formative. Through the double movement the particular is given a generalized form. And at the same time, the particular points beyond itself to its *significance* within the generalizing system.

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[54] This "pivoting" is related to the pivoting between *ens reale* and *ens rationis* discussed by Deely in *Purely Objective Reality*.

[55] This discussion of metaphor draws on Northrop Frye, *Words with Power: Being a Second Study of "The Bible and Literature"* (Toronto: Penguin Books, 1990). And Zwicky, *Wisdom & Metaphor*.

What we are speaking about here is pattern formation. It begins in the particular or, as a poet might say, in the *suchness* of an experienced object-image. The abstract quality or pattern becomes manifest by repeated comparison of the object-image with other object-images that also possess the quality or pattern. The object-image can then become an icon for the pattern. Finally, through the act of naming or marking, the abstract pattern breaks free of its embodied representations and becomes its own abstract object-image—the meaning or significance of the name. This process might happen with sensory images in our embodied world, as is often the case with poetry. It might also happen with thought-images in our minds, as we have been exploring in this investigation[56].

And it also might happen for other entities in the world that are capable of internally re-presenting an external form, such as electrons.

2.3. Return and the Form of the Whole

In spiraling around Firstness, our exploration of unity has lead us from *absence*, to *idea*, to *potential*, to *increase*, to *reflection*. At the same time, the givenness of the quantized monad—the unit or the Natural number one—lost its grounding. We discovered that the unit is only present in self-reflection and therefore actually represents something other than itself. And this discovery revealed that the whole system through which the unit is defined also contains the potential for self-replication. The unit is defined by and contained within a system, and the system *as a whole* reflects back the form of the unit. Moreover, the system as a whole is present in the unit as the general *possibility* of replication (dimensionality) and the particular *actuality* of symmetry breaking (inertia).

Ambiguity is the pivoting dynamic of the spiral. Ambiguity opens up for us a double movement or *resonance* between particular difference and general identity. How is this possible? The trick we have used is to break the synchronicity of binary logic by allowing the excluded middle into our thinking. When we do this, we momentarily lose touch with the nature of identity because ambiguity blurs identity and difference. However, the process remains unified insofar as the double movement is held fast and brought together in my, and possibly your, imagination. We have internalized the paradox of

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[56] For further exploration of this process, see Rogers, "Light Signifying Form".

ambiguity, so that now we can externalize it back into the system. Figure 10 represents this intended final stage.

The unifying process involved here is a form of *interpretation*. Interpretation is the logical process through which the double movement of ambiguity is held fast by interior representations and then fixed or relationally embedded into a generalizing system. It is the process of generalizing.

How is the interpretive process of triadic logic different from the definitional structure of binary logic?

Recall that the defining moment of binary logic is the law of the excluded middle: for any given A, both A and not-A cannot be *simultaneously* true, where A represents some state of affairs, some *thing*. The defining moment of binary logic is also the defining moment of what a "thing" is in the classical worldview; namely, a thing is an object and that object's identity rests eternally in its general or universal form. It is the "given-ness" we mean by saying "for any given A". The general form, in turn, rests eternally in the totalizing *structure* in which that general form is defined, where a structure is an infinitely synchronized (i.e. spatialized) system of relations, a system of *equalities*, such as found in the theory of Natural numbers.

But the theory of relativity is forged from the premise that simultaneity may be relative and not absolute[57].

Therefore, we cannot assume that binary logic provides an appropriate logical paradigm for understanding the theory of relativity. And we cannot assume that classical objectivity is the right fit for interpreting the relationship between theory and experience. In our earlier exploration, when we let go of the assumption of simultaneity or absolute synchronicity, we moved from speaking about *objects* to speaking about *signs*. Signs are different from objects because they do not rest in themselves; they refer to something other than themselves; they have significance. We also moved from thinking about a generalizing system as an absolutely synchronized structure of relational equalities, to thinking of the system as a process of generalizing. This movement involved embedding our own subjective viewpoint into the system; it involved moving from the perspective of an Ideal observer of logic standing outside of

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[57] Here I am referring to the simultaneity of *two* events or states. In triadic logic, the simultaneity of *two* events or states is relative, but the simultaneity of *three* may be invariant.

the logic, to the perspective of our engaging in a logical process by moving within the system of logical relations—the narrative of thinking. What we discovered from within the system was the importance of an Origin as the particular around which the generalizing system is indexed or coordinated. Using the image of "drawing a line" we took our own subjectivity as this index for the objectivity of the generalizing system of Real numbers. But this particular Origin/index remained unrelated to the generalizing system. The Origin was arbitrarily chosen through an act of naming.

In the third and final mo(ve)ment of this Section, we will try to weave the Origin back into the system. The formal process we will follow has already been introduced. At the beginning of our exploration, we introduced the figure • as an image of the finite monad. We then found that this image could become an iconic representation of the "idea" of one through repetition. First we applied this iconic sign to the "natural number" one. Then we applied this indexical sign to the Euclidean point as the generalizing form of the "real number" one. Now we will take up this image as a symbol of the indexical origin for the "complex number" one. With each iteration, our notion of unity becomes enriched and expanded through the systemic forms of unity-in-diversity we encounter.

What is this starting figure of One, this figure of the in-dividual, this thought-image of the unit or the dimensionless point? In the classical worldview, it is called the fundamental particle and it is the basis upon which all objects are constituted, or equivalently, we might say all objects reduce to fundamental particles. But, and this key, *a fundamental particle in-itself is irreducible.* We called this the "givenness" of self-identity. As Rosen argues[58], we must therefore recognize that there is a categorical difference between objects and the fundamental particles from which they are constituted. We can analyze objects, but particles or points are indivisible and unanalyzable. The fundamental particle is the Other of the object; it belongs to the subject; it belongs to us. "The fundamental particle to which an object is reduced is the element upon which the subject's analysis of that object is built"[59]. We the interpreters have imposed the givenness of self-identity and that givenness reflects back to us what we take to be our own self-identity[60].

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[58] Rosen, *Self-Evolving Cosmos*.
[59] Ibid.
[60] For an exploration of the challenge of self-identity in the classical worldview, see Timothy Rogers, "Identity and Paradox in Habermas' Approach to Critical Reflection: Metaphor as necessary other to rational discourse" (unpublished, 2012). Accessed September 10, 2106. https://www.academia.edu/4032696/Identity_and_Paradox_in_Habermas_Approach_to_Critical_Reflection_Metaphor_as_necessary_other_to_rational_discourse .

Why is this point troubling us? Surely we are taking our direction from "out there", either from the experimentation in the real world or from exploration of the mathematical world of numbers. Yet what we are finding now is that our generalizations require a particular indexical origin in order for the logical system of conceptual analysis to hold together. This indexical origin is the unique point of reference to which all else is related—*the origin of the frame of reference*. If we continue to remain within the classical worldview, then this origin or index is achieved by arbitrarily marking one individual, finite monad as special and different from the rest and taking it to be the locus for all relationality. But this marking or naming is categorically related to our own subjectivity. To move beyond the classical worldview, not only do we have to understand unity in objects differently, we also have to understand the unity of subjects differently. Specifically, we must relinquish the discrete finite monad—the thought-image of *identity-resting-in-the-finite-self*—as the formative basis for objects *and* subjects. We must come to a different understanding of how objects and subjects are related to each other and to infinity. What we might hold on to, however, is the intuition that the unity-in-diversity of objects somehow reflects the unity-in-diversity of subjects.

Now comes the difficult turning point for the whole exploration.

Just as we recognized that the image of the finite monad • is not one-in-itself, but is an iconic representation or sign of one, so can we recognize that the origin of a reference frame—which until now comes from our subjectivity—is not one-in-itself. Rather it is a sign of unity. And if we want to explore the meaning of this sign—the Idea of an origin—we need to find a way to externalize the sign back into a system. But we have already been doing this all along insofar as we have introduced and worked with a new symbolic language, the language of the "figures" or diagrams that have interrupted the flow of the text.

In our new symbolic language, we have taken the iconic figure • to be a sign of the thought-image of the number one. In our exploration of the continuum, we arrived at the insight that the unity or "one-ness" of the Real number one is dependent on the whole system of Real numbers in which it is embedded (similar to the case with the Natural number one). Now, let's postulate an image to this Real number one, just as we postulated an image to the iconic form of the Natural number one. Let's call this image *the Imaginary number one*. The Imaginary number one does not refer to any actual Real number, it is a

sign of the potential for the iteration or replication of the Real number one and its system of generalization. The Real number one exists within the system of the Real number line and the Imaginary number one exists within the system of the Imaginary number line, such that the Imaginary number line is a complete reflection of the Real number line. The Imaginary number system is an iconic reflection of the Real number system.

In Euclidean geometry, we found that the Real number line could be coordinated with its own image by creating a system of Cartesian coordination. Cartesian coordination, however, is an externally imposed system of coordination that comes from our subjective and totalizing gaze upon the represented spatiality. The Origin of Cartesian coordination is a featureless, dimensionless point—the assumed image of our subjectivity. The Cartesian Origin exists in-itself as a bounded and singular vantage that is cut off from the Infinite horizon. This is the vantage that we are trying to relinquish in our exploration because, as I hope we will see, it is an arbitrary, closed, and false image of subjectivity and, therefore, objectivity as well.

In the place of Cartesian coordination, we will explore the synchronicity of Complex numbers which are formed by combining Real numbers with Imaginary numbers through addition. In theory of Complex numbers, the Real number line can be synchronized with the Imaginary number line to form the Complex plane. This synchronization revolves around the Origin of the Complex plane as shown in Figure 11.
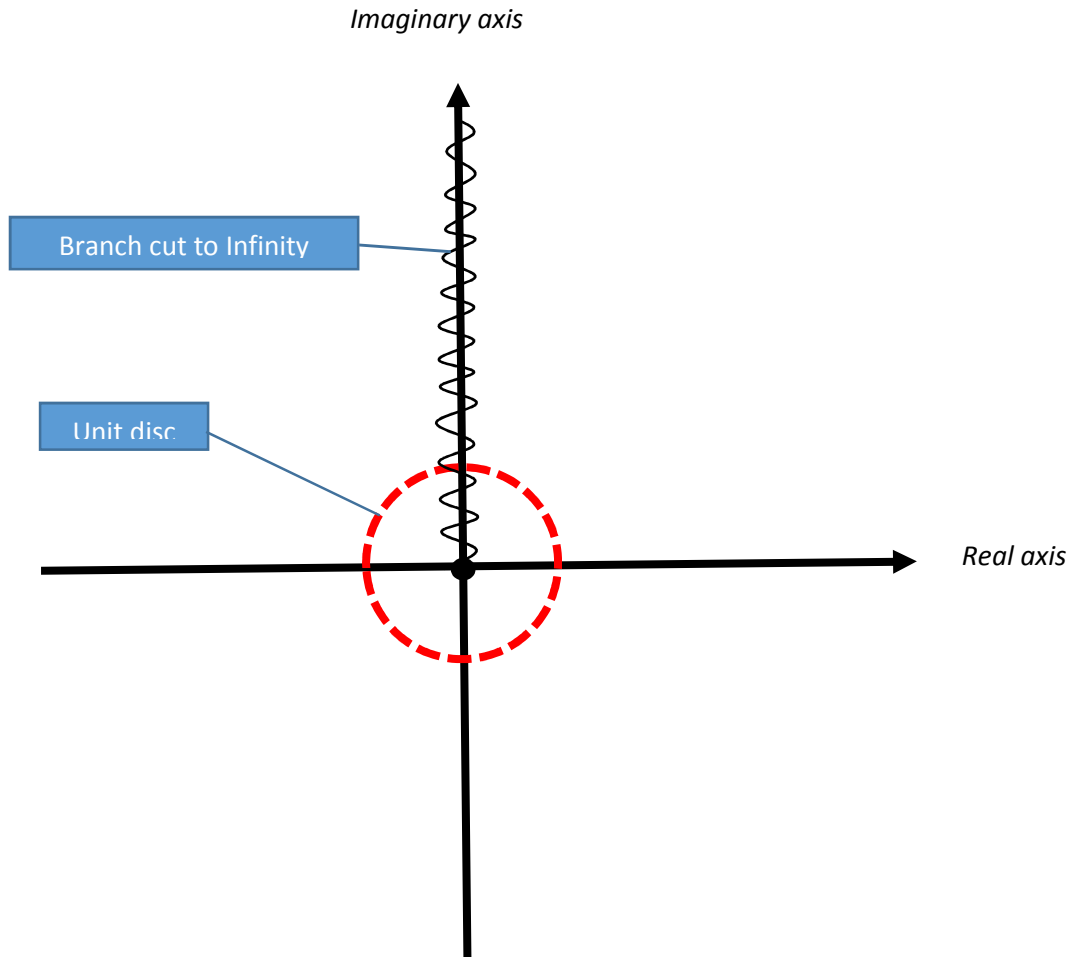
Imaginary axis

Branch cut to Infinity

Unit disc

Real axis

Figure 11: The Complex Plane

The Complex Plane is the coordination of the real axis with the imaginary axis. Unlike the Euclidean plane, the Complex Plane is self-synchronizing. The Complex Number One, $e^{i\theta}$, traces a unit circle around the Origin, where the phase angle θ marks out a circular movement that returns upon itself. The Complex Plane is like an Infinite spiral (out of the plane of the page) that has collapsed upon itself. The Origin of the Complex Plane is a branch point that remains in contact with Infinity by virtue of a branch cut—the branch cut differentiates different levels or planes or stages of the collapsed spiral. The exterior of the Unit disc can be mapped onto the interior through Inversion—the mapping involves a reflection.

Whereas the unity of the Natural numbers was "given" and the unity of Real numbers was foregrounded or "abstracted" by the Limit as intentionality or *point*-ing, the unity of the Complex plane involves "synchronization" as an iterative process of circling the Origin. The Origin, in turn, is a symbolic sign of the Idea of an origin as an indexical focal point for a complex system of individuation. However, to understand Complex numbers and their significance for objectivity (and subjectivity), our metaphors must change.

Let's replace the former image of the finite monad • with the image of an open circular boundary—a unit disc—that separates an exterior domain from an interior domain. We will no longer speak of the unit in-itself. Instead we will speak of a *unifying process*. And we will no longer speak of objects and subjects, instead we will speak of *exteriority* and *interiority*.

Within the system of the Complex plane of numbers we can relocate spatiality and temporality:

- Through inversion, the exterior domain can be mapped onto the interior domain as a reflected image or re-presentation. Thus we might say that the interior re-presents the exterior. Re-presentation has the relational form of spatiality.
- The boundary of the unit disc involves a process of circulation. The phase angle marks this circulation such that the circle repeats itself iteratively as the phase angle increases continuously. Thus we might say that the circle returns upon itself marking discrete points through continuous increase. The process of repeated return has the form of temporality.

The Origin of the Complex plane is called a branch point. It has no analogue in Euclidean geometry. The branch point—a new image of negation—is *the absence of unity*. The phase angle becomes indeterminate at the branch point. The branch point remains in immediate or proximate relation with Infinity through the branch cut. This relationship, which is represented by a squiggle arrow in Figure 11, I will call *rupture*. Rupture creates a branch cut that marks the repeated circular motion around the unit disc, such that Return can be identified as return to the place of rupture. In Figure 11, rupture is marked along the positive imaginary axis; however, this particular choice is not unique—the angular orientation of the branch cut can be chosen arbitrarily.

Repeated circulation around the unit disc—temporality—can be thought of as an Infinite spiraling motion. Each time the branch cut is traversed, a new "plane" or branch of the spiral is entered. In some

sense, it is like a three-dimensional spiral is collapsed upon itself to form the two-dimensional plane. Better said, the two-dimensional Complex plane has the potential to express a three dimensional spiraling form. This potential to express three dimensional form I will called *depth*. Unlike the Euclidean plane, the Complex plane has unexpressed or hidden depth. Through depth, space and time become interwoven.

What are we to make of Complex numbers? What form do they signify? Where have we arrived in our exploration of number theory?

Again three levels of thinking are opened up for us.

When we explored Natural numbers, we naturally assumed the discreteness of each number. Where did this assumption come from? I would suggest it came from our subjective experience of everyday objects that we use and manipulate and play with. We crafted for ourselves a thought-image of Unity that matched this discreteness and allowed us to use and manipulate and play with numbers as thought-images. This is the level of Thirdness. When we explored Real numbers, we came up against the background continuum from which individual numbers come into view as individuated thought-images. We found that Unity involves a creative process of naming and foregrounding or abstracting thought-images. It came from our subjective experience of thinking. This process is like the way in which bodies in the world are creatively formed and evolve in time, never fully isolated and discrete from their environment but rather continuously interacting, merging and emerging with one another. The background continuum—the being of the Real—is the ground for abstraction. This is the level of Secondness[61].

At the deepest level, the level of Firstness, we became aware our own subjectivity. We discovered that image formation—abstraction of discrete finite monadic thought-images from a continuous background—is rooted in our experiential encounter with the narrative of thinking. We then tried to

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[61] For an exploration of the abstraction of bodies from an undifferentiated background, see Timothy Rogers, "Is Dretsky's Theory of Information Naturalistically Grounded? How emergent communication channels reference an abstracted ontic framework", (unpublished, 2007). Accessed September 10, 2016. https://www.academia.edu/4188083/Is_Dretskes_Theory_of_Information_Naturalistically_Grounded_How_emergent_communication_channels_reference_an_abstracted_ontic_framework .

abstract image formation as process or system. Complex numbers came to us as a potential theoretical form for this abstraction.

Now for the abductive leap that will jettison us outward, beyond the frontier of Space.

What I want to suggest to you is this: whereas Natural numbers (quanta) represent the abstract form of *things*, and Real numbers (continuum) represent the abstracting ground of *experience*, Complex numbers represent the creative forming of *Light*.

0. Interlude

Our exploration of numbers has led us through a series of thought-images about unity, from the finite monad, through asymmetrical pointing or limit, to an indexical Origin of a Complex system. These thought-images were exteriorized through the narrative of our journey and brought into a relationship of similarity with concrete objects-in-the-word: things, ground and synchronized system. The view was always external.

Yet, we might appreciate that there is a corresponding movement of thought-images related to our own interiority or subjectivity. The finite monad has a correspondence to the interiority of an isolated individual, a particular ego consciousness. Our discovery that the finite monad is limited and that this limit is a relationship of intentionality with others corresponds to the realization that individual ego-consciousness comes into being through an asymmetrical relation to Others. Levinas calls this relationship *proximity*[62]. It is an asymmetric giving up of one-self to the neighbour with no expectation of return. An ethical relationship to the Other that is prior to my own being or identity. The prior ethical imperative foregrounds individual ego-consciousness through embedded relationality.

Within the Cartesian paradigm, this relationality is relativized as a symmetrical and reciprocal relationship of equality. Like Euclidean points of line, all individual egos might then be taken as identical and general, with no place for particularity to the ego, no Origin. Additionally, the finite ego-consciousness remains isolated and cut-off from the Infinite, such that the latter appears only as a distant horizon that is formed from a totalizing system that generalizes all (possible) ego-consciousnesses into a timeless state[63] rather than a living person. This is similar to the way in which the individual Euclidean point is cut-off from the Infinite horizon of space. In turn, the totalizing system becomes the determinate structure that constrains the individual ego and replaces the *actual* asymmetrical relationship of the individual with God by a *hypothetical* symmetrical relationship to a "generalized individual" [John 5.30-44] where the generalized individual has no particularity, no embodiment, no incarnation. Extending the metaphor, the ethical relation to one's neighbour becomes

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[62] Levinas, *Otherwise than Being.*

[63] I am using the term "timeless state" in order to directly connect with concepts from physics. The term "timeless universal" might also be used here. However, I am not intending to refute the existence of universals nor advocate for nominalism. My critique is focused on the qualifier *timeless* which I am taking to mean "spatialized". Timeless (which is defined in relation to space) is not the same as *eternal*. Eternal belongs to a higher level of categorization that includes light and word.

a deterministic system of mutual exchange, an economy in which the medium of interaction is a null or empty sign[64] [Matthew 22.17-22]. The freedom of the person is given over to the totality of the system of exchange in the same way that the individual point is determined by the system of Euclidean geometry.

To rediscover asymmetrical relatedness is to rediscover of the ethical basis of freedom and equality.

Our movement to complex numbers recasts the model of subjectivity just as it recasts the model of objectivity. Individuals maintain an ongoing relationship of proximity with the Infinite through *rupture*. This asymmetrical relationship has the form of self-giving or agapé. It is the origin of signification. Individuals are likewise asymmetrically related to the Other, to the neighbour. Through the Infinite, this asymmetrical relationship returns back upon the individual in an ongoing process of meaning formation. Meaning is not constructed by an individual; it is a collective and evolutionary process rooted in Love.

One of the strange things about triadic logic is that my thoughts no longer belong to me alone. Through words (signs) I participate in a collective process of which I am only partially aware. My individuality is not an isolated island, a self-made kingdom. It is a singular vantage that is sustained by the community in which I live and calls me into actual, ethical relationships with my neighbours. Firstness is the first person perspective, I am. Secondness is my loving relationship of proximity to the Other I encounter, to *You*. Thirdness is the generalizing world or text through which we live together.

Too poetic? Please don't take this interlude to be a theory of subjectivity, a topic that is far beyond the scope of our investigation. What I want to intimate here is that questions about the metaphysics of physical theories and mathematical formalisms are inextricably woven into questions of ethics and theology. And this is the intimation: ***The way in which we understand objectivity is directly related to, and can be determinate for, the way in which we understand subjectivity***.

Again we encounter the triadic form of return. The object asymmetrically points to the subject for which it is an object. But then, the subject can reflect back on the object as an image of itself. In this moment of return, the object becomes a *sign*. Further, the moment of return opens up the possibility for

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[64] A Peircean-like understanding of the coin as a sign within an economy of exchange can be found in Karl Marx, "Commodities and Money," in *Capital*. Great Books for the Western World Vol 50, ed. Friedrich Engels, trans, Samuel Moore and Edward Aveling (Chicago: University of Chicago, 1952).

something new to happen. A spontaneous increase. Through a deeper understanding of our own

subjectivity, we might be able to formulate a deeper understanding of objectivity.

3.0 Embodiment

Let's turn our attention now to the subject of the investigation. *Cogito*. Subject as object. The externalization of interiority.

In the previous section we traced a path of thinking about numbers that moved in a circular way between 0, 1 and infinity. Starting with Natural numbers we investigated the discrete; then through Real numbers we encountered the continuous; and finally through Complex numbers we entered into self-reflection or *Return*. From Potential through Presence towards Significance. Figure 12 is a visual representation of the course or narrative of this thinking.
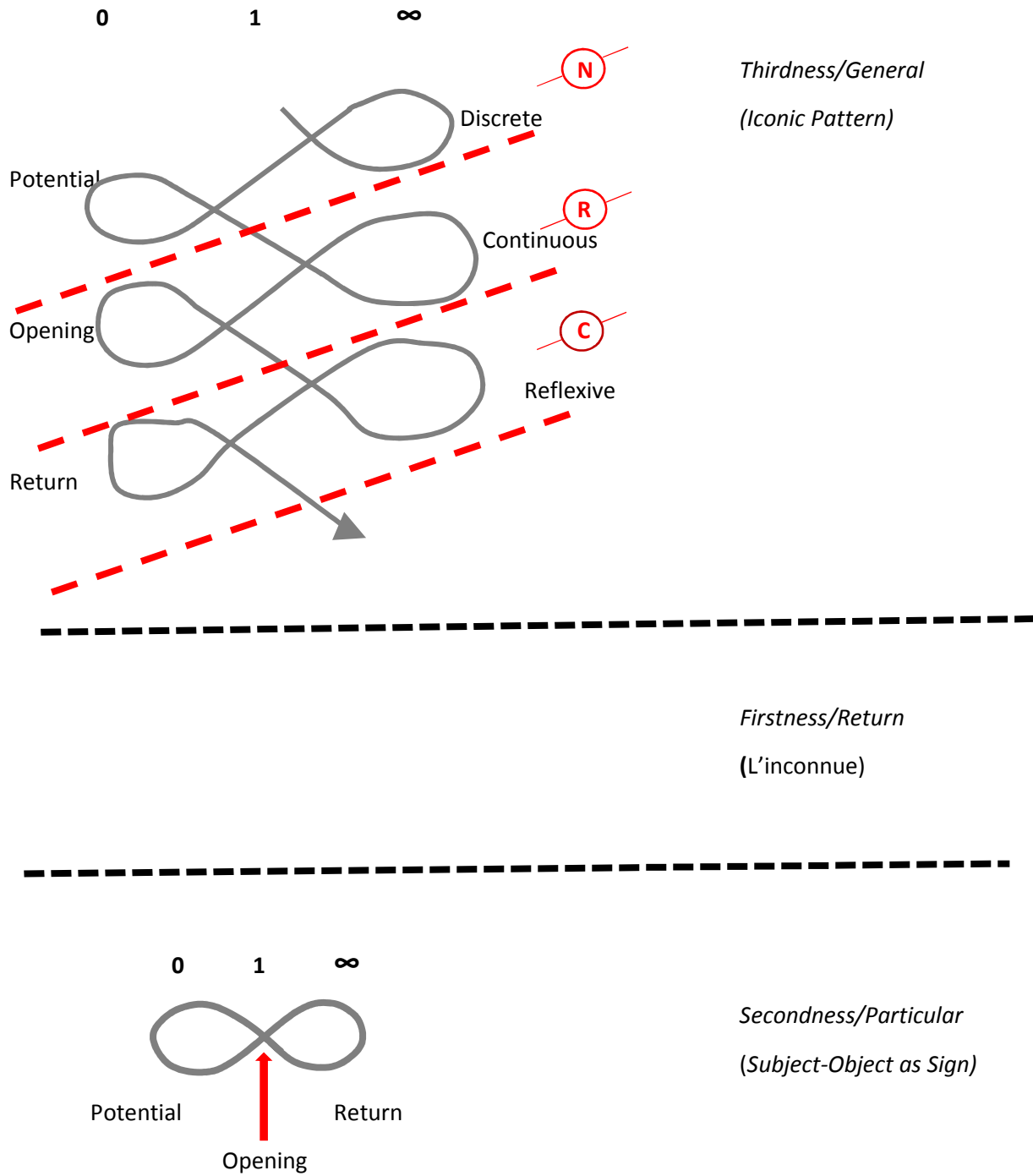
Figure 12: Cogito

A retracing of the narrative of Section 2—cf. Figure 3. Thirdness (generality) lays out the temporal path as a spatial structure—Natural (N), Real (R), and Complex (C) numbers. Secondness (particularity) re-presents this structure as a spatio-temporal process folding back upon itself to form a sign. Firstness (Return) is l'inconnue*. L'inconnue is the Other, the one to whom I am ethically bound, my neighbour. L'inconnue is you my friend, the Reader.*

Now let's try to weave our way back.

3.1 The Same, the Other and the Third Party (Identity, Difference and Return)

We will start with our found image of an open domain whose interiority is in relationship to an exteriority. The boundary of the domain is the reflexive door or gate between interior and exterior. The open domain is not a thing; it is a *process*, a *unifying action*.
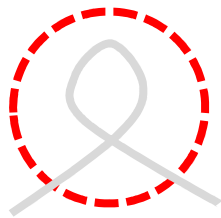
More accurately it is a unifying re/action because the interior action is contingent upon exterior action and vice versa. The simplest example, to which we will continually return, is *spin*. Spin involves a cycle (or multiple cycles) of return such that interior and exterior are differentiated and then brought back into original unity. For example, as the earth spins on its axis the positions of the stars are differentiated in time moving across the vault of heaven and sinking into the horizon and then they are re-aligned with the earth at the completion of a (sidereal) day. Through spin the interior (eg. earth) and exterior (eg. stars) are brought into synchrony as repeating cycles of return (see Figure 11). This unifying action is not like a finite monad. It doesn't exist in-itself. It only exists in an explicit and yet to be determined relationship with others and with infinity.

The open domain—as a process—can become an origin for a frame of reference, an index through which exteriority is brought into relationship (like the first person perspective in grammar). In the above example of the earth and the stars, the earth forms an open domain. The cyclical process of return creates an interior temporal unfolding that, along with Bergson[65], we will call *duration*. "Duration is

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[65] Henri Bergson, *Duration and Simultaneity with reference to Einstein's theory*. trans. Leon Jacobson (New York: The Bobbs-Merrill Company Inc., 1965). My treatment of time as duration follows Bergson. However, the notion of reciprocity that I use comes from Levinas and is different from Bergson's treatment of reciprocity as mutual exchange. In this difference, the problems with the interpretation of relativity theory for which Bergson is criticized might be resolved. For a discussion of the critique of Bergson's interpretation of relativity theory, see Jimena

essentially a continuation of what no longer exists into what does exist"[66]. It is what we mean by the word *passing* when we speak of the passing of time. Through cycles of return the open domain endures and this duration instantiates a form of identity. But this identity is particular and contingent on difference which manifests in the relationship between interior and exterior.

> *An image might be helpful here. Imagine we are in a spaceship far from earth. Our spaceship becomes the only index available to coordinate the starry skies that surround us. It becomes the origin for our frame of reference. Suppose our spaceship is rotating about an axis. As we look out we see the stars rotating about us. Who is rotating? Us or the stars? The rotation establishes a cycle of return and this cycle of return embodies temporality for us.[67]*

We will call the open domain an *interpreter*. The reason for this name may not be clear yet. But one might imagine that measured cycles of return create an iterative process and this iterative process can serve as the basis for marking the exterior in relation to the interior. For example, the spin of the earth creates a measured process for marking the day in relation to the revolution of the stars.

> *Perhaps you are objecting now, because I have just presented the open domain "in itself" and yet I am saying that it cannot be present in itself. To this objection I can only agree that the (triadic) logic I am using is circular. Only after we have discussed relationship will the (self) identity of the interpreter become manifest.*

The interpreter relates interior and exterior through a process of return. Action, re-action, re-re-action, and so on *ad infinitum*. The open domain is constitutionally dependent on relationship and is not like an

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Canales, *The Physicist and the Philosopher: Einstein, Bergson and the debate that changed our understanding of time* (Princeton University Press, 2015).
[66] Ibid., 9
[67] In a previous thought experiment, I have explored this image of indexicality and it might be helpful to consider that thought experiment before continuing with the current exploration: Timothy Rogers, "Light as the Origin of Origins: How the ontological form of quantum mechanics is consequent to the principles of relativity theory [a thought experiment]", (unpublished, 2014). Accessed September 10, 2016.
https://www.academia.edu/7144066/Light_as_the_Origin_of_Origins_How_the_ontological_form_of_quantum_mechanics_is_consequent_to_the_principles_of_relativity_theory_a_thought_experiment_ .

elementary particle, or a Euclidean point, or an ideal observer. The interpreter *in-itself* cannot be abstracted from context[68].

> *What action? Suppose we want to coordinate the starry skies surrounding us. This can happen through the mediation of light. Light comes to us as the vehicle through which we come into synchrony with the external world. But this mediation involves re/action. We receive light and we reflect it back again. A process of signaling. At this point, however, there seems to be no way to differentiate signal from self.*

Now imagine a second open domain, like the first. This domain can also become an origin for a frame of reference. It will also have duration and it can also become an interpreter. If we bring these two domains into relationship we can begin to speak of co-presence. Both domains endure together. Yet they are also separate and this separation we will call extension.
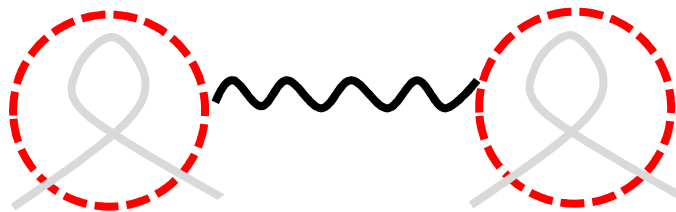
> *Hold on a minute! Now we have broken out of the first person perspective. If we are in the spaceship, we cannot also be outside of the spaceship looking at it as an exterior phenomenon. Where is the origin for the coordination of the two open domains **as equal**? At this point we can only say that from the frame of reference of the first domain, the second domain appears as an external phenomenon. And from the frame of reference of the second domain, the first domain appears as an exterior phenomenon.*

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[68] The nature of this relationality that is constituted through signs is explored in Rogers, "Light Signifying Form".
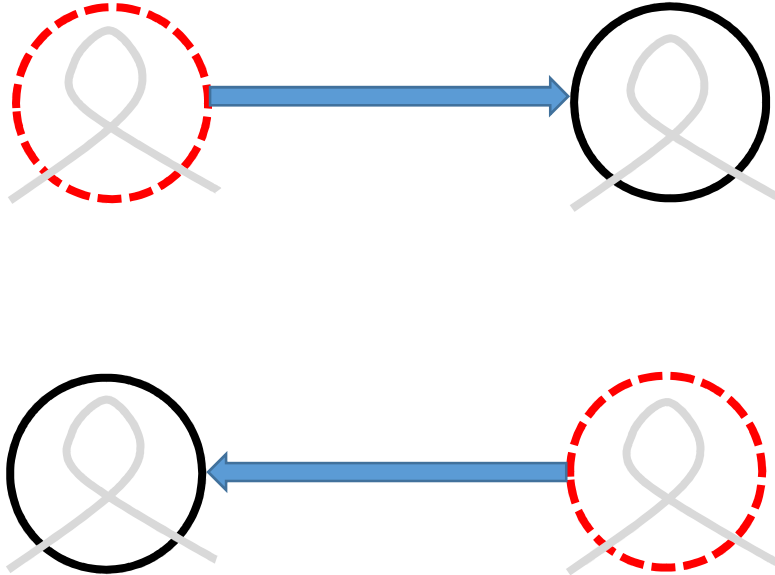
The relationship between two interpreters is asymmetrical. The Origin and the Terminus are not identical. The Origin is the indexical centre of a frame of reference. I will call this original frame the Same. Through signaling, the Same can give itself over to interpretation by an Other. However, the Other as Terminus is never fully subsumed into the frame of reference of the Same because it retains a proximate relation to infinity that is not directly accessible to the Same (i.e. it has interiority). The Other, likewise, is a potential index for another frame of reference. The interiority of this second frame of reference—its duration or temporality—is particular to that index. Through a process of equalization that has yet to be determined, the two frames might synchronize their interiority to create a spatio-temporal structure that defines their bond. Through this bond, the Other can *interpret* the Same.

> *What do I mean by interpretation? The Same is a perspective of interiority, like the first person perspective. The Other (according to the Same) is a perspective of a bond between this interiority and something exterior, like the second person perspective. From the frame of reference of the Same, the Other is seen only as an externalized phenomenon[69]. A phenomenon that is interpreted through the frame of reference of the Same. The Same cannot experience the interiority, the temporality, the duration of the Other. This means that time is always particular,*

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[69] In *Otherwise than Being*, Levinas calls this "the face of the other".

although it can be brought into a generalizing system through the bond between the Same and the Other in a process that has yet to be determined. But precisely because time is always particular it becomes the initiative for abstraction and generalization as explored in Section 2.

The open domain, the interpreter, is a processor. It can receive an input from an Other, interpret that input through an interior process and then react. The reaction of the open domain becomes an externalized phenomenon (an interpretant) that can be interpreted by another. But as an index the open domain is unique or particular. At the core of its interiority is an indeterminateness; we might call this indetermination *ambiguity*, *indecision*, or *choice*. Unlike the Euclidean point that can be both origin and terminus at the same time, the open domain is de-phased or de-synchronized and this desynchronization opens up a gap of indeterminacy. The indeterminateness can never be fully externalized for an Other because the Other can only interpret external form. External form manifests after the fact of making the indeterminate determinate, after the fact of selecting or choosing. That is to say the interpreter can only interpret *generalizing form* that emerges through the structure of ambiguity as discussed in Section 2. This generalizing form is the exterior surface or the *face* of the Other. Because the interior core cannot be determined by an Other, it cannot be determined by the Same either. It is a perpetual state of potential to select or choose. This indetermination, I hope to show, is the essence of the Principle of Uncertainty, as articulated by Heisenberg, for example.
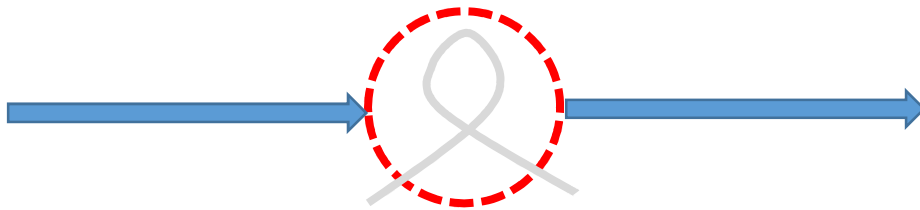
The interpreter is the terminus of a signal from an Other. But is it is also the Origin for a signal that can be received by an Other. In binary logic the Origin and the Terminus are identical. For example, the Euclidean point receives its neighbour and transmits to the next neighbour in a deterministic process that was called Interia in Section 2. The Euclidean point is fully synchronized and does not sustain a gap of indeterminacy. In triadic logic, the Origin and the Terminus always remain differentiated. Therefore

the interpreter contains an ambiguous indetermination which is the gap between being the Terminus of a signal from an Other and the Origin of a signal to a Third party. Something happens in this gap. Structures are assembled and brought into relationship[70]. We will call this gap *the present moment*. The present moment is constitutional for duration.

> *How might we think about this gap[71]? At this very moment I am writing these words in an attempt to understand triadic logic. They resonate and reverberate within systems of understanding that have their origin in my subjectivity* here-and-now*. But you are receiving these words elsewhere. You are receiving these words* then-and-there*, so to speak. You will (hopefully) try to draw these words—the trace of my thinking—into an intelligible structure in your frame of reference, for your subjectivity, for your here-*and-how*. However,* **your here-and-now is never actual for me** *(just as my here-and-now is never actual for you.)[72] Your interiority remains forever different from mine. For me, your here-and-now is a Terminus that is only a* **potential Origin** *for meaning that I might try to interpret but can never fully know. This is like the structure of time[73]. Now is the only actual. Some time in the future or the past might be interpreted as a potential now, but that interpretation never possesses the rich interiority that exists for me now. Only now is present. A future time might become present in the future, but there is a gap of indetermination between the actualization of that future presence and my interpretation now of a potential future presence that is not actual. There is an asymmetrical connection between the present moment and any determined past moment or any potential future moment. This logic of asymmetrical connectivity (of time) has been described elsewhere[74]. Note that in our exploration, we are applying the logic of asymmetrical connectivity to time* **and space**[75]. *Light mediates this relationality.*

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[70] In *Otherwise than Being*, Levinas relates this gap to the extraordinary event of knowing.

[71] For further investigation of the way in which light/text mediates this gap, see Timothy Rogers, "On the Relationship between the Concept of Text in Gadamer's Theory of Hermeneutics and the Concept of Light in Einstein's Theory of Relativity" (unpublished, 2014). Accessed September 10, 2016. https://www.academia.edu/3474047/On_the_relationship_between_the_concept_of_text_in_Gadamers_theory_of_hermeneutics_and_the_concept_of_light_in_Einsteins_theory_of_relativity .

[72] For further discussion of the particularity of duration, see Bergson, *Duration and Simultaneity*.

[73] For further discussion of the connection to time, see Rogers, "Beyond Space and Time".

[74] Wallace, "The Semantics of Physical Modality". And Knuth and Bahreyni, "Foundation for Emergent Space-Time".

[75] By applying the logic of asymmetrical connectivity to space, we are moving beyond Bergson's interpretation of relativity theory. This movement beyond involves relinquishing the unifying notion of "Duration" in order to encounter the special role of light in the theory of relativity.

Two interpreters are brought into mutual relationship through the Third Party. The first open domain we called the Same; we placed ourselves within its interiority to speak of duration; and from this vantage we created a indexical Origin for an interpretative frame of reference. The second open domain we called the Other. I suggested we imaginatively differentiate ourselves so that my here-and-now was the centre of the first open domain and your here-and-now was the centre of the second open domain. Yet each interpreter remained particular because an interpreter can only offer up interiority to avail the other. Each is the Same-for-another through an irreversible process represented by asymmetrical connectivity. The Other remains ***l'inconnue***. To bring about the possibility of exchange and mutuality, of give-and-take, of coming to an understanding, *of equality*, a Third Party must be constitutionally present[76]. The Third Party mediates the relationship between the Same and the Other, between I and You. The Third Party makes possible a process of return through which we can synchronize our interiorities and enter into mutuality. The Third Party forms the bond between us. This bond might be called love. It is ethical in the sense that it is the gift of response to my act of offering up myself, my interiority, for you [Mark 12:31]. Through the Third Party, you and I become neighbours, we become proximate, we become *equal*. But this proximity is different from the relationship of contiguity that defines neighbouring elements or "selves" in the classical worldview, it is different from the (non)relationship that defines spatiality through the null point.

Let's call this triadic form—the relational possibility for mutuality and equality—the proximity of light.

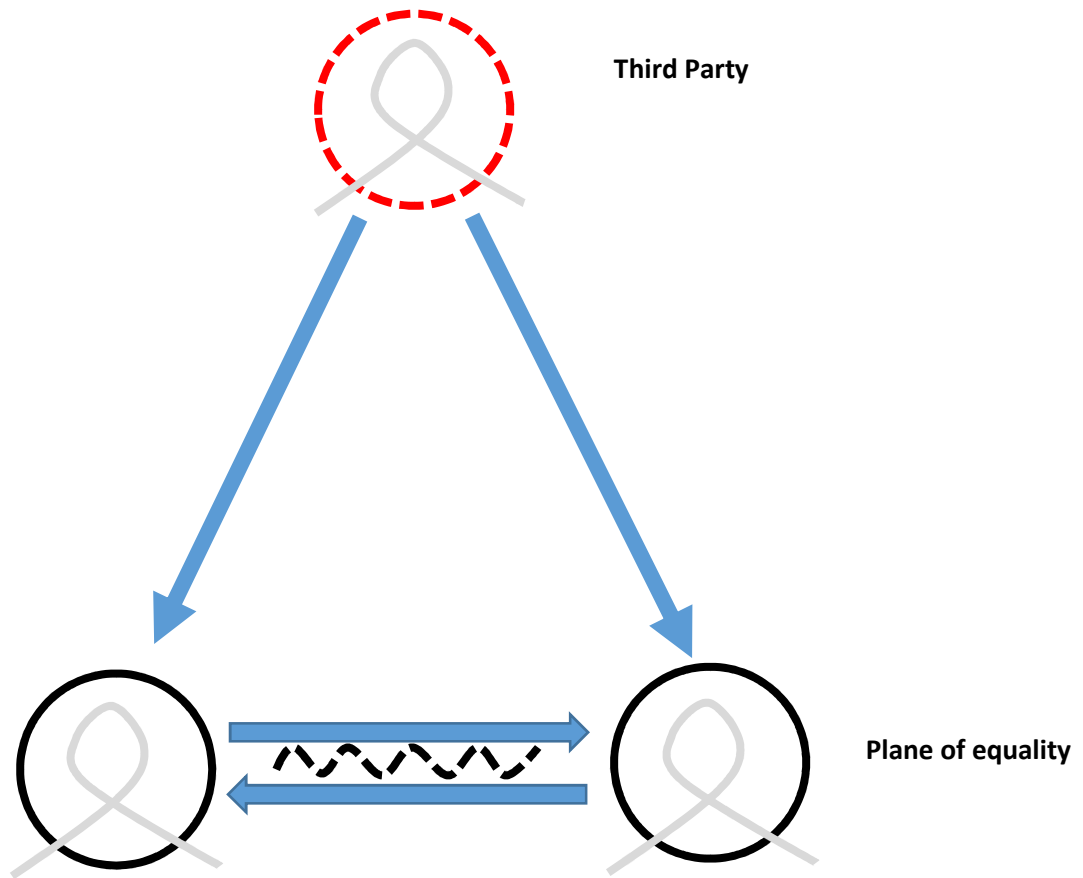[76] Levinas, *Otherwise than Being*.

Figure 14: Equality through the transcendent Third Party

The Same and the Other enter into mutuality through exchange, which is a process of interiorization of exteriority and exteriorization of interiority. Mutuality creates a resonant bond as indicated by the wavy line. The bond has the form of co-presence or spatiality within the plane of equality. The Third Party remains transcendent to this plane, like a hidden dimension or depth or potential for emergence. The Third Party holds together the two in their relationship of mutuality, and in this relationship of mutuality each of the two becomes the other to the same. That is to say, the Third Party constitutionally governs the manifestation of the Same (I) and the Other (You) as open domains of inter-relationality. The Same and the Other form "selves" through offering up their interiority to the other as a gift from the Third Party. All the relationships are immediately proximate—the proximity of light.

Interpreters complete one another. If we consider the bond of mutuality that joins the Same to the Other, we might recognize that it has the curious property of enacting both identity and difference. The Same and the Other are different in as much as we can speak of their co-presence. Yet they are the same in as much as we can speak of a mutual exchange. The bond has the structure of ambiguity that we explored in Section 2. The simplest manifestation of such a bond is *opposition*. Opposites become opposite by virtue of an identity—opposites are identical in every sense except the sense in which they are opposite. Perhaps complementarity is a better word here than opposition[77]. Opposites are *completed* through their mutual bond.

Interpreters mark their world as text. Suppose we return to our naïve image of spin as a cycle of return, a simple rotation through which interior and exterior are differentiated and brought into relationship. There are two possibilities for rotation—clockwise and counterclockwise—and these two possibilities create a binary opposition. The pair forming this opposition might be referred to as **+** and **–** (any symbolic representation of opposites will suffice here). In Figure 14 we presented the mutuality of the Same and the Other as a bond of exchange. For the pair of spins we might represent this bond in the following way: If the Same is + then the Other is –; likewise, if the Same is **–** then the Other is +. The pair are in a proximate relationship of resonance: each spin is differentiated from its complement by opposition, and yet neither spin is determined. **The pair exist in a state of potential disambiguation[78].** If they were to be disambiguated, then one of the pair would have a definite orientation and the other would be its opposite. Such disambiguation would be similar to naming or marking as discussed in Section 2.

> *Let's use this image of coupled spins as a model for exploring the emergence of spacetime from light. The coupled spins are coupled photons. They are in immediate proximity because they are light and, for light, the spatio-temporal separation (the metric) is null. The photons travel in opposite directions at the speed of light to create a straight line for us.*

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[77] Ekeson has developed a topological model for the interpretation of quantum reality based on the dialectic of opposing functions. The themes he explores are similar to the themes we are exploring in this paper. Kigen William Ekeson, "The Zen Interpretation: A general hypothesis concerning quantum states, individuation, and the measurement problem" (December 2015). Accessed September 10, 2016: https://www.academia.edu/19511948/The_Zen_Interpretation_A_General_Hypothesis_Concerning_Quantum_St ates_Individuation_and_the_Measurement_Problem .

[78] For a more expansive treatment of this state of disambiguation, see Rogers, "A Physicist's Guide".

+|− ⟷ x ⟶ −|+
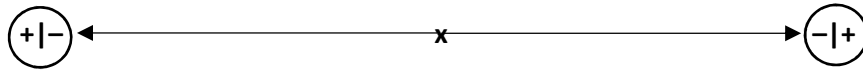
*The resonant exchange of spin between the coupled pair results in a cycle of return, a temporality. The differentiation of the photon pair creates extension as the gap between them. The gap of indetermination that belongs to the pair as their interiority. Through this gap spatial extension increases for us as external observers (interpreters). That is to say, coupled photons create spacetime and spacetime **increases**. The law of increase is the speed of light. The mid-point—the creative **source** of this coupled pair—is the opening through which the pair might interact with and become embedded within a whole system (the system to which we as interpreters belong). The mid-point implicates the rest of the world (the system); it represents our potential observation of the coupled pair. However, the pair remain potential until they interact with the system through a terminus event. In quantum mechanics, this interaction is called measurement. Through measurement, the indeterminate opposition becomes determined. The potential becomes actual. One photon becomes + and the other becomes —. The generality of orientation is particularized in the selection of a specific orientation. The event of disambiguation is the act through which the line becomes **oriented**—symmetry is broken (i.e. created) and left can be differentiated from right as discussed in Section 2. The choice becomes marked within the system as a trace of the event that has now passed. A sign. The sign avails of interpretation by others, like text[79].*

3.2 Rest [Sabbath[80]]

In the exploration above the Third Party seemed to become momentarily immanent as the mediating bond of binary opposition, as the excluded initiative of the principle of non-contradiction. The enacted opposition obeys the law of the excluded middle--once disambiguated or *determined* each spin is either

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[79] For further exploration of the relationship between text and light, see Rogers, "Text and Light".
[80] Abraham Joshua Heschel and Ilya Schor, *The Sabbath* (New York: Macmillan, 1951)

+ or − and the other spin is its negation. But this enacted opposition exists as the trace of the past because it only becomes actual after the fact of selection or determination.

Additionally, through the exploration we began to recognize that binary logic is embedded in a prior sameness or likeness when we realized that opposites are opposites by virtue of the fact that they are alike in every other way except the sense in which they are opposites. Opposites determine or select or abstract that sense through a process that we will call *abduction.* Abduction is the inference or actualization of an abstracted pattern that is potentially embedded in the particular; it involves a logical movement from the particular to the general. The Third Party became instantiated as a creative origin for the abduction of orientation and we spoke as if somehow this creative origin is a gateway into the general or the "rest of the world" or the *system* without really defining what we mean by that.

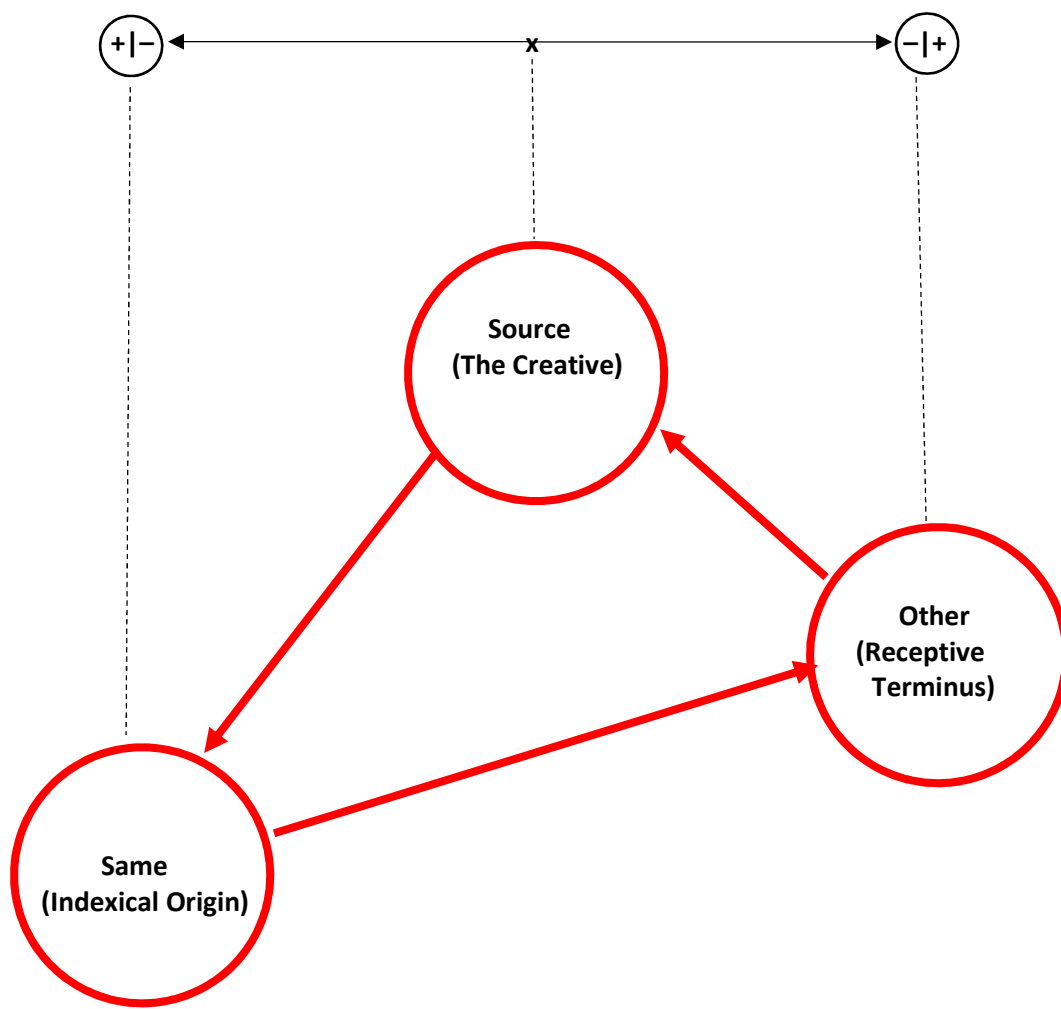Now let's focus our attention on origins using Figure 15.

Figure 15: The form of determination or measure

The coupled photon pair is presented at the top as if it were seen under a unifying gaze as three co-present centres or origins (black circles and cross). This "theoretically transcendent" vantage is never actual; it belongs to a classical worldview. The red circles and arrows show the actualization of coupled photons within an embedded frame of reference. This is the vantage of triadic logic. The "Same" is the chosen index or origin of the frame of reference and is connected with the measuring system. The "Other" is the centre or origin of the second coupled photon from the frame of reference of the Same. It is called a receptive origin because the Other is always determined as the opposite of the Same. The "Source" is the origin for the coupled pair and brings them into relationship with the generalizing system. The Source is the creative origin for the abduction of (the logic of) orientation.

So far we have been speaking of coupled photons as if we could imagine them as unified under a common gaze or frame of reference. This imaginative vantage belongs to our subjectivity and we have been speaking of this vantage as if we transcended the system of coupled photons in order to grasp them all-at-once as purely externalized phenomena. This "transcendental vantage" belongs to the classical worldview (of binary logic) and is the vantage that we are trying to deconstruct in our investigation. In triadic logic, whenever we want to speak of a system, such as the coupled photon pairs, *we must locate our vantage within the system.* That is to say, we must select an indexical origin to which everything else in the system is to be related.

If you are like me and working against deeply engrained habits of thinking, you might think that the most natural choice for an indexical origin would be the source (or the Creative) from which the two coupled photons emerge. However, this origin is not actual. It has no duration. It exists sometime in the past and was never observed; it is only inferred after the fact of observation or measurement. In fact, our indexical origin must be the photon that we intend to measure, the photon that interacts with our experimental apparatus, the photon that intersects with our actual subjectivity. Through the pair bond, this photon determines the orientation of the Other after the fact of observation or interaction. For that reason, I have called the other photon the "Receptive Terminus". Notice that, from the frame of reference of the Same, the receptive terminus is not an origin. However, it is a potential origin for another frame of reference for which it would be the index.

In the classical worldview there is no difference between an origin and a terminus. The same and the other are interchangeable. The assumption of interchangeability implies a transcendental vantage for our subjectivity in which the frame of reference centred on one photon is co-present with the frame of reference centred on the second photon. The two frames of reference can be compared without loss or gain from this transcendental vantage. The transcendental vantage is the mediating still point for the interchangeability of the two (identical) origins. In the classical worldview this vantage is *spatial.* This assumption of spatially mediated interchangeability negates the possibility of any interiority to the origin, any particularity to the origin, any differentiation of the origin. It is the paradoxical proclamation of a "general particular", of "discernable identicals", of "is" and "is not" as explored in section 2. The mediating still point is the undermining of the law of the excluded middle that defines the binary logic of the worldview. The mediating still point is the excluded initiative of binary logic.

With triadic logic, we can locate ourselves within the frame of reference of the Same. From that frame we can interpret the Other because of the relational bond between the two. It would also be possible to locate ourselves within the frame of reference of the Other (which would now become a new indexical origin, a new "Same"). From that vantage we could interpret the first. ***But we cannot locate ourselves within both frames of reference at the same time[81].*** In the back and forth between the two frames of reference there is a gap of indetermination, a give-and-take, a resonance. A cloud of unknowing. This gap of indetermination has no correlate in the classical worldview. We have been calling this gap "indeterminate opposition" or "ambiguation". This gap becomes the excluded initiative of binary logic. It is also the constitutional origin of the uncertainty principle of quantum mechanics.

But if we are to claim that there is a core of indetermination in the interchange between the Same and the Other, then how is it possible to speak of any determination at all?

It is through the Third Party, through the Source, through The Creative that determination becomes possible[82]. The Creative mediates the interchange and brings the Same and the Other into a process of equalization. The process of equalization is an abductive process in which the Same and the Other mutually interpret one another through the exchange of information. In the case of spin, the exchange involves the simplest unit of information, the binary bit. The interpretation involves externalizing information into a general system. Through the generalizing system the external form becomes the interpretation to which all members of the system can respond uniformly. For the case of spin, the external form is called orientation.

> *A coupled photon pair that are separating from one another at the speed of light exist on the edge of spacetime. Despite the fact that their spatial separation increases with time, they remain in immediate proximity because the metric for their separation is null. This is a paradox that binary logic cannot contain or tame, and more profoundly, it is the paradox that forms the creative source or origin of binary logic as the computational logic of "bits" of information. Within the more expansive framework of triadic logic (recall that triadic logic reduces to binary logic in the limit of infinitely fast synchronization), we discovered that there is no frame of*

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[81] Here is where my interpretation of synchronicity differs from Bergson's interpretation.
[82] Levinas, *Otherwise than Being.*

reference in which we can speak of the coupled photons as fully determined. Determination means determination with respect to a particular frame or indexical origin and within that frame one of the coupled pair remains an inferential reference to an "other" frame of reference that cannot be fully subsumed into the indexical frame. There is always a beyond to a particular frame that cannot be determined by that frame, although it can come into determination through the exchange of information with other frames of reference. This exchange of information is an interpretive process of signaling or communication that involves exteriorization of interiority and interiorization of exteriority. It is a process of response and counter-response that involves selection or choice.

Coupled photons separating from one another at the speed of light is an exterior image of triadic logic. But this exterior image can itself be internalized. Through the still point of the Creative or the source, we can imagine a coupled pair of spins that are held together in a dance in which each spin gives itself up to the other only to find it is returned again from the other. A mutual exchange of spin held together in the proximity of light.

This internalization would create a spinor which requires two cycles of return in order to synchronize with the generating spin, where each cycle corresponds to a branch of a lemniscate[83]. Such an internalization would present as if the coupled pair were a single entity with half the spin of a photon. Namely, a fermion such as an electron. What I want to suggest is that this interior form might be seen as the basis of matter, where matter is the formal process of stabilizing spatial structures in time. This formal process embodies the triadic logic of quantum spin. The electron exists in a state of "rest" where rest involves synchronicity with the Creative source. Unlike the classical notion of rest that invokes the

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[83] For further exploration of this internal form, see Rogers, "A Physicist's Guide" and "Light as the Origin of Origins". What I have described here as an internal form has also been explored as an external form by other authors. For example, Rosen, *Self-Evolving Cosmos*, explores this form as a topological (spatialized) form. Richard Gauthier explores this form as a helically circulating photon in several papers including *"The Electron is a Helically Circulating Spin-1/2 charged photon generating the de Broglie Wavelength"* (2015). Accessed August 10, 2016. https://www.academia.edu/15272484/The_electron_is_a_helically-circulating_spin-1_2_charged_photon_generating_the_de_Broglie_wavelength. However, with triadic logic the internal form is never fully externalized. See also Ekeson, "The Zen Interpretation".

image of an isolated relationship with self, in triadic logic rest involves a synchronous relationship of proximity with the Other and with Infinity.

Rest is like the relationship I might have with You in God [Acts 17.28].

3.3 Synchronicity

How are we to understand the worldview that comes from triadic logic?

The classical worldview ends in a totalizing system governed by deterministic laws. All is external, general, third person. In the classical worldview, the observed world has no duration, no freedom, no humanity, no love, no incarnation, no "I am" (see Figure 3).

Triadic logic arrives at a very different way of understanding creation[84]. Particular entities—be they persons or amoebas or electrons—have duration. Each is sustained through its relationship to others. By means of these relationships interior responses are communicated externally, responded to by others who in turn communicate externally to yet others. This wholistic, collective process of interpretation results in a generalizing system for those interpreters that is dynamic and evolving. The generalizing system creates an Umwelt[85]—a tentative worldview that has significance for the ensemble of interpreters. While general in form, the Umwelt is also particular to the ensemble of interpreters. The *Umwelt* of amoebas is different from the Umwelt of electrons. An Umwelt is not a world in the classical sense; it is a model or interpretation of duration or *experience*.

By virtue of duration, a singular entity within the ensemble of interpreters becomes the indexical origin for a frame of reference—the Same. The frame of reference brings the generalizing system into a particular context. However, unlike the case with the classical worldview, this frame of reference is partial and incomplete. ***A frame of reference never reduces to a transcendental vantage***. The frame of

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[84] This way of understanding creation is explored is more detail in Rogers, "Light Signifying Form".

[85] Umwelt is a term borrowed from the field of biosemiotics. For an introduction to triadic logic in biological systems, see Claus Emmeche and Kalevi Kull, eds. *Towards a semiotic biology: Life is the action of signs* (World Scientific, 2011). For a discussion of the philosophical pedigree of the concept of Umwelt, see Deely, *Purely Objective Reality*.

reference enters into completion because of the possibility of signaling or communication with other frames of reference. The generalizing system mediates this signaling or communication because it brings the particular into the general. Again unlike the case with the classical worldview, the generalizing system can evolve and expand and adapt as new interpretations become significant for the ensemble of interpreters. Triadic logic holds together the evolving Umwelt. The singular entity as the index or the Same is Firstness. The Other who responds to or interprets the Same is Secondness. And the generalizing system is Thirdness. Figure 16 represents this dynamical process for the simple case of electrons.
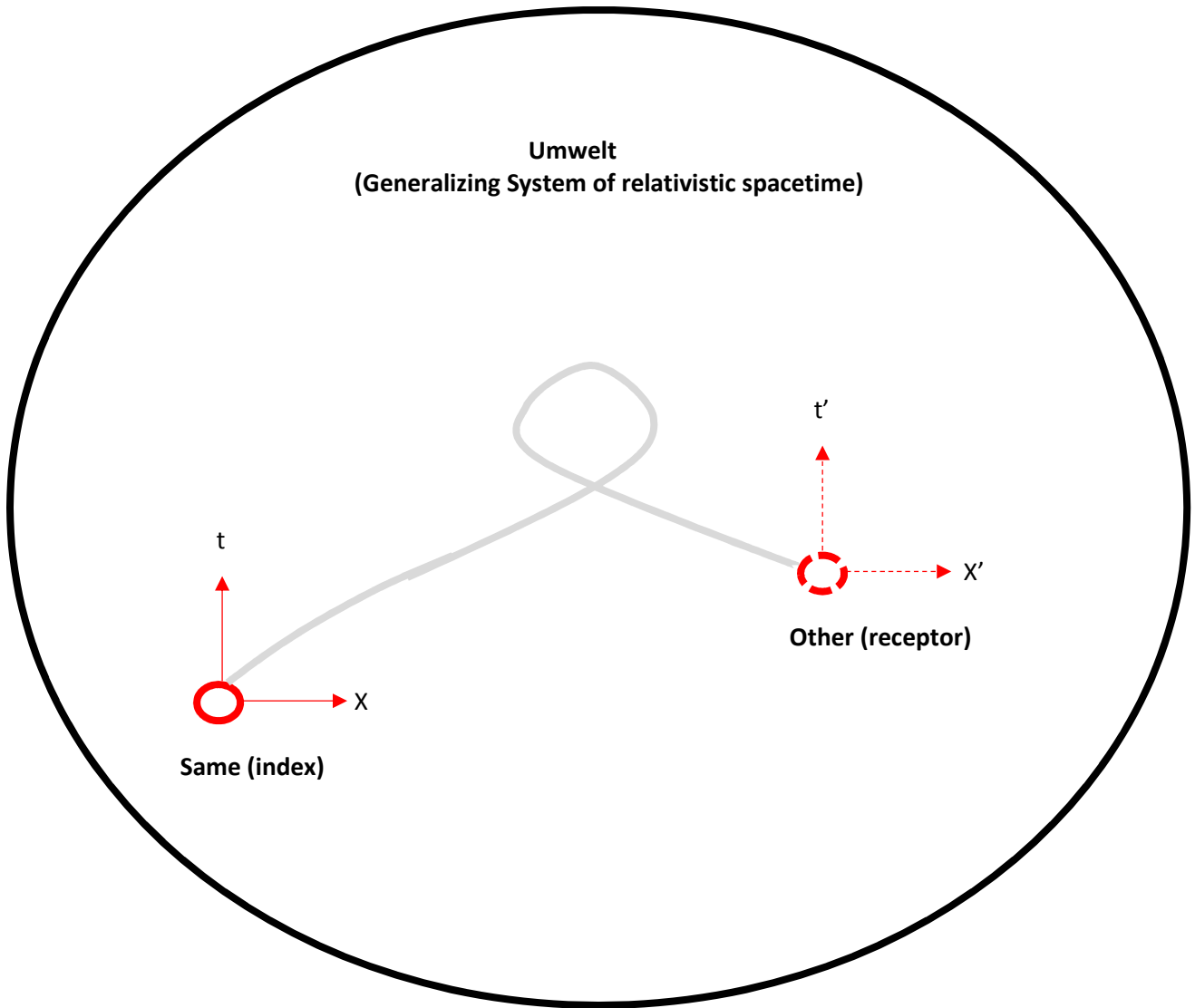
Figure 16: The Umwelt of Electrons

The frame of reference for an indexical electron (Same) instantiates the particular context. This frame is labelled with the axes x (space) and t (time). Another electron can respond to this indexical electron within the context of its own frame of reference (labelled x' and t'). This relationship of response and counter-response is mediated by the generalizing system which interprets the dynamical exchange. The generalizing system in this case is relativistic (Minkowski) spacetime. The generalizing system is an interpreted model; it is not an actualized substrate. There is always a beyond that infuses spacetime.

In Figure 16, the Same—by virtue of its interiority, its duration, its actualization—can interpret relativistic spacetime, where relativistic spacetime is the Umwelt or generalizing system of quantum spin. The Same is constitutionally in relationship with Others as particular instantiations. This relationship involves particular dualities represented by Other in the figure. The Other (as a different index) has its own frame of reference and this frame is not contained by or subsumed within the frame of reference of the Same. That is to say, the Other always maintains a proximate relationship with infinity (beyond) that is inaccessible to the Same. As a result of this incompleteness, the Other *draws out the Same* to express its interiority as external form. It is through this drawing out that the Umwelt is maintained. The Umwelt is the generalizing perspective that applies to all particulars in the ensemble.

Through the Umwelt, the Same and the Other can enter into a spatio-temporal relationship of give-and-take, of mutual exchange, of *resonance*. This resonance is a bond whose interiority is inaccessible to the generalizing system. The generalizing system only constrains or limits or determines external form. Therefore the bond between the Same and the Other allows the generalizing system to adapt and evolve—a situation that is impossible in the classical worldview.

Now for the abductive leap.

> *The generalizing system is not a totalizing system. Unlike the case with the classical worldview, the generalizing system is not unified through space-like structure. So in what way can we say that it has unity?*

The generalizing system is itself the interiority of a particular entity. Its duration creates a global temporality that is an *internal form* for the generalizing system but an *external form* for the particular entities who constitute the generalizing system. Through the duration of the generalizing system, the Same and the Other (within the system) can synchronize their particular durations or temporalities. This process of synchronization, in turn, is what sustains the generalizing system as a wholistic entity. The term used in quantum mechanics to describe this synchronicity is coherence. As long as the Same and the Other remain within the particular generalizing system they are coherent and mutually interpreting. However, because the generalizing system is a particular entity, it is also a "Same" that is in relationship with an "Other", although this relationship is formed at a higher level of abstraction.

The result is an embedded hierarchy of systems that involve interpretations at multiple levels[86]. (For example, electrons within molecules within cells within bodies within ecosystems.) As long as a particular entity remains synchronized within a particular system, it enters into an interpretive relationship with other entities in that system. However, it is possible for a particular entity to de-synchronize from a given system—a processes called de-coherence in quantum mechanics. And it might then become synchronized with another particular system. In this process, interpretation is ruptured. I will leave it as an exercise for the reader to apply this way of thinking to the problem of the twin paradox in relativity theory[87].

Depth manifests in embedded hierarchies. At each level of the hierarchy, systems unify their constituents to the extent that they are, in turn, unified by their bonds to the Other and to Infinity. Parts belong to the whole of which they are a part and wholes enable the individuation of parts. The processes of semiosis through which interiority (representation) is externalized and exteriority (embodiment) is internalized maintains the hierarchy. The body is unified through a process of identity formation in which the signifier of the whole is broken, shared and inwardly digested by each member of the collective.

This image, this central metaphor, brings us to the terminus of our investigation: An insight through which we might enter into a contemplation of the Christian mystery of the Body of Christ[88] [John 19], [John 6.32-35,50-51; Ephesians 4.1-16; Matthew 17.1-9].

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[86] For a further exploration of this hierarchical ordering, see Rogers, "Light Signifying Form".
[87] Along the lines of Bergson, *Duration and Simultaneity*.
[88] Teilhard de Chardin, *Phenomenon of Man*, trans. Bernard Wall (New York: Harper and Row, 1959).

Before completion

deep may
beneath the budding maples
snow

along the limestone path
a pale yellow flower
recedes with the sun

beneath moon-traced clouds
fingertips touching
petals of a trillium

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This thesis is the culmination of a long journey and I would like to thank the many people who have helped and supported me along the way, as well as a host of authors present and past.

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> *Thanks be to you, God, for your unspeakable gift.*
> *[II Corinthians 9.15]*

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