

Spacetime as a Formal Semiotic Process

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Abstract: an exploration of the relational ontology of space, time and light.

1. Light (the Creative)

Space

The formative principle of space is *identity in difference*, or *Sameness*. Space *equalizes* difference by uniting given particulars through general forms. Space is *exteriority*.

Space, and more abstractly geometry, determines the structural foundation of *co-presence*. Space mediates the co-presence of individual bodies as discrete and separate individuals and brings them into relationships of sameness.

- Space is the ground of abstraction.
- Space is purely formal.
- Space underwrites embodiment.

Spatial mediation imparts *form* to individual bodies. Form is general; it equalizes individual bodies by constraining them within common patterns or structures and thereby sustains individual bodies in relationships of co-presence and sameness with one another.

- The spatialized patterns or structures are synchronous states or “*wholes*” that manifest as *gestalts* that are present “all at once”.
- A whole pattern or structure—a generalized form—never manifests as an abstracted body *in-itself*. Individual bodies—as whole forms—always exist through mutual relationships of embodiment within a system.
- There is no such thing as a body in-itself.

Natural law sustains the forms of bodies as *enduring* forms. Natural law determines the generalized patterns or structures and their relationships of co-presence and sameness.

- The foundation of natural law is the logic of the excluded middle. Geometry is an archetype for natural law.
- Natural law is necessary for bodies to have enduring form.
- Without enduring form a body cannot exist.

Natural law determines *form* but it cannot determine *existence*.

- Natural law determines the formal *nature* of a body but not its particular *mode* of existence or action.
- Form is general; action is particular.
- The determination of natural law is never complete.

Natural law *creates* formal symmetry or sameness. Formal symmetry is *broken* through embodied action.

- Form is general; embodiment is particular.
- A particular body breaks the symmetry of the general or common form by way of its particularity.
- Broken symmetry is relationship with Otherness.

General form is *exterior*.

- General form is the foundation of objectivity (and justice).
- Objectivity is a category of the collective or system of individual bodies. This category is called *Thirdness* by Peirce and others.
- General form is the *text*.

Space shapes the text of the cosmos.

Time

The formative principle of time is *difference in identity* or *Otherness*. Time is the *duration* of particular identity within systems of differentiation. Time is *interiority*.

Time *manifests* existence by way of action. Through time, a particular body is related to the Other which remains different.

- Time is particular.
- Time is repetition.
- Time is broken symmetry.

Time mediates *effective causation* through the mode of action/reaction.

- Effective causation is different from formal causation. (Space mediates formal causation).

- Through effective causation one particular body affects another particular body.
- Effective causation is asymmetrical: one body is the source of action and the other body is the receiver of action. (In contrast, formal causation is symmetrical)

The mode of action/reaction is *successive* and without end in itself.

- One body acts upon another body as source upon receiver. The second body then becomes the source for action on a third, and so on, and so on.
- The mode of action/reaction is movement.
- Movement never rests in itself.

Time is *intentional*. Time connects the interior of a particular body with the exterior of other bodies.

- Time relates interiority to exteriority through iteration.
- The interior of a body selects modes of action by way of which it comes into relationships of effective causation with other bodies external to it.
- The exterior of a body determines the possible modes of action as general forms of the system in which the body is embedded.

Time is the *measure of synchronization*.

- Bodies come into synchronization by way of their embodiment within a system which is itself a body of a higher order.
- The system establishes the temporal measure to which the constituent bodies are synchronized as parts within a whole.
- Synchronizing systems are hierarchically ordered as bodies within bodies within bodies of increasingly greater inclusion. For example, cells within organisms within communities or planets within solar systems within galaxies.

Time sustains *rhythm* and *harmony*

- Rhythm is a property of the interior of a particular body.
- Harmony comes from the processual inter-relatedness of bodies of the same order by way of their external, general forms.
- Rhythm and harmony manifest form within existence.

Time voices the music of the spheres.

Light

The formative principle of light is *return*. Light *presents*. Light is *transcendence*.

Light is *creative*.

- Light is immediate proximity, without spacetime interval.
- Light is presence.
- Light allows the cosmos.

Light *mediates* space and time, form and action.

- Mediation brings the particularity of interiority into dialogue with systemic, general forms.
- Mediation is processual.
- Mediation is formal.

Light is *return*.

- Through return, repeated cycles of action create systemic formal structures that have duration.
- Through return, systemic formal structures create enduring bodies that can act.
- Return is small, yet different from external things.

Light follows the *logic of three*.

- Light is word.
- Light is synchronicity.
- Light is whole.

Light is *word*.

- Through intentional actions, bodies manifest formal structures that can be interpreted by other bodies within a system.
- The interpretation of an action is a response. When a body responds to the action of another body, it generates a new action (a reaction) that can be interpreted by other bodies.
- All material action is reaction. The cosmos is in a continual state of responsiveness to light.

Light is *synchronicity*.

- The temporal unfolding of action and reaction is constrained, determined and harmonized by formal structures.
- Light synchronizes action and form such that form references action, and action indicates form.
- General form draws out the particular intentionality of action as its final cause. The final cause belongs to the synchronicity of the system and is deferred in the present moment.

Light is *whole*.

- Light brings particular bodies into unity through their mutual inter-actions within a formal system.
- Wholeness or unity is the synchronicity of interiority, exteriority and return.
- The wholeness of a body reflects the wholeness of the system in which it is embodied, as interior reflecting exterior. Return is the breath whereby interior and exterior are brought into synchronicity.

Light breathes life.

Further reading:

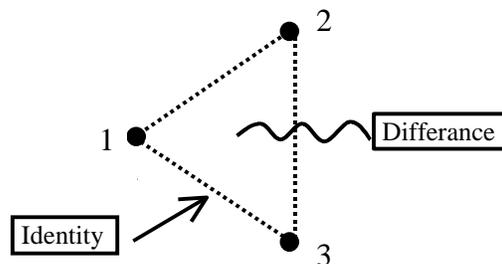
[A Possible Prologue for Interpreting Quantum Mechanics through Light.](#)

2. Form and Representation

Form

That which is exterior is formal. Exterior form is *represented* interiorly. The representation of form is interpretation. Interpretation is communal and lawful. Law stabilizes form as enduring presence; yet law remains open to the possibility of transcendence. Transcendence is the possibility of the impossible (according to law). Transcendence is light.

The logic of light is the logic of three: the Same, the Other and the Third Party, each of which is another to the others and none of which is the same to another. Each of the three is in immediate proximity with its neighbor—one-for-another in a continual process of substitution. Proximity is more near than neighbours. Substitution is kenosis—the giving up of self for the other. Proximity and substitution is the formative principle of *intensionality*. Each of the three is *in-itself-for-another*. Consider the diagram below:



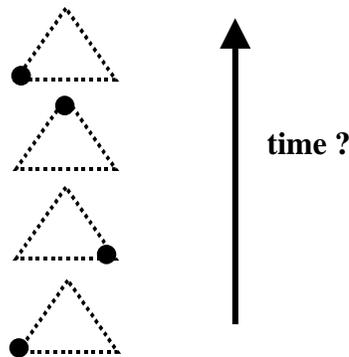
This diagram is a trope that represents three in proximity. There are three distinct indices, or origins, labeled “1”, “2” and “3” in the diagram. These three indices correspond to three distinct instantiations.

To see the working of this trope, suppose we establish “1” as the instantiated index, the *origin*. Then “1” is in a relation of proximity with the two others (here

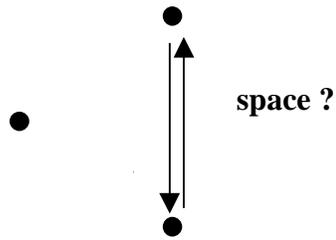
called “2” and “3”). This relation of proximity we call *identity*. “1” is identical to “2” and “3”, substituting itself for each. However, between “2” and “3”, there is a proximity that is inaccessible to “1” and we can call this *difference*. In the distinct instantiation of the three, there is both identity and difference.

This trope frames interiority through a process of *return*. In return, “1” substitutes for “2” which in turn substitutes for “3” which finally substitutes for “1”. In return there is a traversing of the inaccessible difference that is the proximity of “2” and “3” according to “1”. This gap becomes the gap or clearing in which creation manifests—the *synchronicity* of light and word. Moreover, because “2” and “3” can substitute one-for-the-other in the inaccessible gap, there is an indeterminateness at the core of this threefold relatedness.

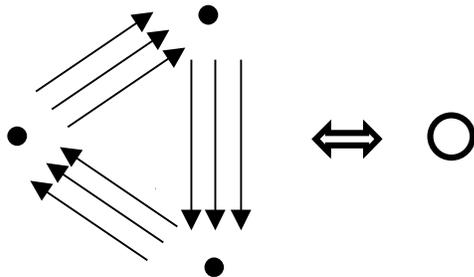
Time is *iteration*. Iteration is the circular movement around the three, which returns through difference to a different same. Iteration is particular. There is change in the loss and return of proximity, which we postulate as temporal.



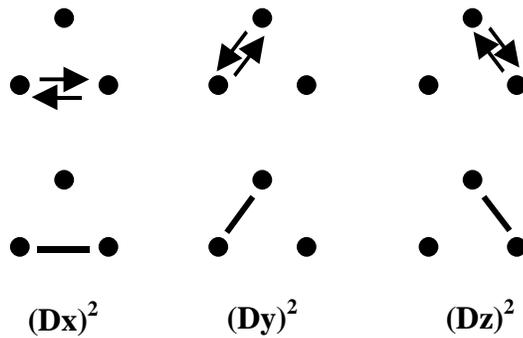
Resonance is equalizing, the identity in difference through back-and-forth. Unlike the particularity of iteration, resonance is "whole" or "at-once", the same difference, which we postulate as spatial.



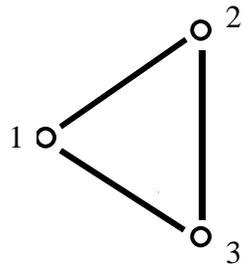
From the infinite iterability of return we might define a temporal element $(Dt)^2$, which we represent as an open circle



Likewise, the infinite back-and-forth of resonance brings a connector between two places, which we might call $(Dx)^2$ and represent by a solid line. Resonance is the formative principle of *extensionality*. There are three different resonances corresponding to proximity between the Same, the Other and the Third Party, which we might label as $(Dx)^2$, $(Dy)^2$ and $(Dz)^2$.



Together these connectors form a 3-space. By postulating an equivalence between the resonance of 3-space and the iteration of temporality, we arrive at the figuration of a lightcone.



Consider the following two ways to complete a loop, which we might postulate as the same difference. In the first way we pause at circle 1 (infinite iterability), then jump (in a finite number of back-and-forth motions) to circle 2 where we pause, then we jump to circle 3 where we pause, and finally back to circle 1. Another way is to infinitely resonate between 1 and 2, then, without pausing, infinitely resonate between 2 and 3 and finally, without pausing, infinitely resonate between 3 and 1. This is a method of combining connectors (resonances, space?) with pauses (return, time?). We might represent this equivalence as the fundamental equation of the light cone:

$$(Dx)^2 + (Dy)^2 + (Dz)^2 = (Dt)^2$$

Of course we have been anticipating the solution from the beginning so this is not a derivation as much as a heuristic argument.

Yet something quite interesting has happened. We have postulated 3-space as a system of connectors (or line elements) but these connectors do not have directionality. So we have extension but we have no orientation. This is captured by representing the finite element as a squared quantity. What is missing is the spontaneous symmetry breaking that might establish direction (and therefore orientation). If we are to arrive at a model spacetime we need to *disambiguate* the temporal and spatial elements. Notice, however, that this disambiguation is prefigured within an overarching threefold relatedness. And the form of that relatedness is each-for-the-other and *not* each-for-itself.

Representation

The disclosure of orientation requires surfacing a richer understanding of difference—specifically symmetry creation—as the basis of spatiality along with identity—specifically the indexing of broken symmetry—as the basis of temporality. Orientation *discloses* broken symmetry.

Orientation comes from the disambiguation of pair symmetry. Pair symmetry is prefigured in the circularity of the temporal element which has two-fold equivalence – clockwise and counterclockwise traversal (1-2-3-1 or 1-3-2-1). Let's represent the breaking or disambiguation of pair symmetry by two oppositely pointing arrows as shown in the diagram below.



This diagram represents a fundamental connector that *mediates* an emergent twofold relatedness *through broken symmetry*. The connector involves reflection. By way of extension or space, the two are similar in their general form (same type) but different according to particular instances (different tokens or objects). By way of intension or time, the two are different in their embeddedness in general form (different instances of past and future) but identical in their particularity (same index or subject). The extensive general form through its (pair) symmetry allows for *abstraction* of the Other by the Same through *likeness*, where the Other refers to brokenness or particularity of common symmetry or form. The intensive particularity allows the enduring identity of the Same to index or mark a particular Other as distinct by way of opposition in synchronicity.

The Same and the Other share *likeness* of individual form and *distinctness* of particular embeddedness within the common formal system. The likeness of individual form *foregrounds* them to be of the same type *resonantly* co-existing within a spatial embedding. The distinctness of particular embeddedness synchronizes their action as oppositional to one another. Therefore, the connector can be taken as an *indexical relation* that points from one to the other such that one can be taken as a *sign* of the other. The connector between the Same and the Other within the formal system can mediate external form by representing it internally in time such that *the Same is an indexical sign of the coupled Other*. In this way broken symmetry indexes exterior forms to interior forms as relational *re-presentations*.

As a concrete example, we might consider orientation of binary quantum spin (spin $\frac{1}{2}$). As exterior form, spin involves an object that takes on one of two possible orientations in relation to another different object (of the same type)

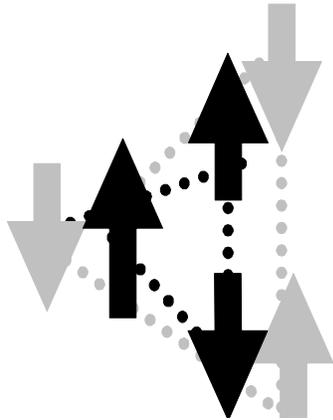
that has the opposite orientation. Interiorly, spin oscillates back-and-forth in time within a subject that remains identical. The interior form (which is temporal) represents or interprets the exterior form (which is spatial) when two spins are synchronously coupled. Whatever indeterminate spin one has, the other has the opposite. Therefore the interior of one spin, taken as the Same, *represents* the exterior of the Other spin by way of synchronicity. This representation will manifest when the Same is embedded in a formal system that can measure or *interpret* the spin. For the formal system that interprets the spin of the Same, it is the case that the spin of the coupled Other (which is a limit for the interpreting formal (general) system by way of its particularity) is the opposite. For closed systems that are instantaneously synchronized this may not seem extraordinary¹. However, for open systems that are in the process of coming into synchronization with one another, such as found in quantum theory, *measurement is interpretation*.

Grammar

While we have postulated 3-space as a system of connectors and we have identified broken symmetry of the connectors as the basis for representation, our formal system lacks an *origin* that can place processes in space and time. The notion of origin is correlated with the sign of self.

The *self*-synchronization of spin comes about through return. However, with the emergence of pair symmetry, return is now frustrated such that two cycles are needed to recapture identity.

¹ Actually it is extraordinary because in order for a classical system to be fully synchronized *in toto*, the symmetry must already have been broken globally and one orientation arbitrarily chosen for the whole system. The broken symmetry of handedness in Euclidean geometry is an example. Quantum theory does not allow for formal systems *in toto*.



The structure of return now has the form of a *spinor* or knot. The figure folds in on itself, as it were, to disclose a deeper interior structure to origin. The inward folding generates the fundamental unit of action – a single rotation or cycle of return – which we have called spin. *Spin is an emergent property of spacetime that comes from the disambiguation of light.*

Suppose, now, that we synchronize an origin within a frame of reference with a specific spin orientation. This will simultaneously index one of the three axes; let's call the indexed axis the z-axis. There is a two-fold symmetry which is also broken in choosing a specific spin orientation and this enables us to label the *direction* of spin along the z-axis. For example, we might call it spin up and label it as

$$| \uparrow \rangle_z$$

It is important to recognize that the broken symmetry, namely orientation, comes from a three-body process of synchronization. We—the observers as it were—are imagined to be in phase with the specific spin orientation that has been indexed. Of course, instead of we-as-observers, it may be some other interpretative system which is brought into phase with the indexed spin orientation – this process is one of interaction not cognition. What is interesting now is that, for the other two axes, *the spin is mixed.*

$|\uparrow\rangle_x$ and $|\downarrow\rangle_y$

$|\downarrow\rangle_x$ and $|\uparrow\rangle_y$

Synchronizing spin-up along the z-axis at the same time causes mixing of spin along the remaining two axes (let's call them x and y). Synchronization of spin along another index axis (eg. x or y) would at the same time de-synchronize the spin along the z axis. The apparent collapse of spin along the x-axis might rather be seen as re-phasing of three-body interactions. Because of its threefold essence, the disambiguation of light automatically generates the quantum properties of spin and this can be seen to come from the ontology of relativistic spacetime rather than a property of an individual or isolated particle. Spin is an emergent interiorization of light from which the fundamental unit of *in-formation* is created.

Yet a spin cannot exist *in-itself* as an isolated abstract object. Quantum spins exist through formal **grammars** of relatedness such that the "self" of the spin is formed, manifested and sustained by the way in which the spin is coupled to other spins in an interpretative system that reflects back upon the spin through return.

Quantum spin exists *in-itself-for-another* as a relational image or sign. The spin as the Same is coupled to the Other through indexed relations that are indeterminate in them-selves. Both the Same and the Other are entangled with an ensemble of spins such that the whole ensemble provides the formal grammatical basis for the same-other relationality. The Same is Firstness. The Other is Secondness. And the formal (general) grammar is Thirdness.

The Same becomes an origin for a system of formal representation and meaning formation that is internally synchronized with and indexed to the Same. The Other is the origin of a different system for formal representation and meaning formation that is internally synchronized with and indexed to the Other. The common grammar of the ensemble of entangled spins brings the Same and the Other into communal processes of interpretative action and response that limits and determines by way of structure and rules yet remains indeterminate and

random by way of particularity and agency. Each of the two systems of representation is a **context**. Only one context can be presently operative as the active frame of reference for which the Same is an original index (a subject). The Other becomes, for that context, an objective image for the Same that possesses particular indeterminacy (an object). The Other has particular indeterminacy for the Same because it is an agentic origin for a different context of interpretation. The processes whereby these two contexts might be brought into synchronization through determination or measurement is the subject of quantum theory.

For example, the archetypal process through which orientation (an interior structure) is externalized and represents rotational symmetry is the mediation of correlated photon pairs. Correlated photons provide a connector between two origins in spacetime which brings their orientations into synchronous relationship. When the correlated photons (which are a unified entity) interact with the external “world”, symmetry is *created*. This symmetry brings two origins (potential centres for formal processes of action and interpretation) in spacetime into a particular, synchronous relatedness of space-like resonance and time-like iteration such that they can enter into a common or general grammar of interpretation for the “world”. These relational processes manifest measurement, collapse, determination through randomness (indetermination) and (delimited) agentic freedom by way of a common interpretative grammar of the whole.

Further reading:

[*The Proximity of Light: a deconstruction of space.*](#)

3. Matter (the Receptive)

Matter is embodied.

That which is embodied has both exteriority and interiority, form and action. Bodies are both extensional and intensional, spatial and temporal.

Bodies only exist in relation to one another as multiplicity; they dynamically participate in unity through their formal interactions such that interior forms or patterns represent exterior forms or patterns. Bodily relations are mediated by Light.

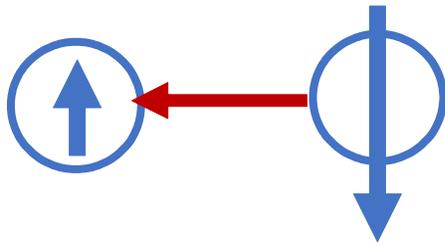
Bodies are receptive. That which is receptive is capable of responding to the action of another as source. Receptivity is interpretative.

Bodies interpret one another. Interpretation is communal and formal. The basis for interpretation comes from the system in which bodies are embedded. Such a system is itself a body of a higher order.

Matter is hierarchical.

Signs

Representation is mediation. Mediation is word. Word holds together in unity the interior representation of exterior form. The fundamental connector presented above discloses the mediation of the sign.



Two in opposition, such as coupled photons, manifest a semiotic relation as their principle of unity. One is the *interpretant* of the Other, where an interpretant represents the Other inasmuch as it refers to the Other as a potential sign. The spin of one of the coupled photons is an interpretant of the spin of the other-of-the-same by way of the rule that if one spin is “down” then the Other must be its opposite or “up”. Therefore, each spin can represent the Other even though the coupled spins remain *indeterminate in themselves*. For example, if the interpretant’s spin is “down”, then it represents the “up” spin of the Other.

If the interpretant enters into a semiotic system of interpretation, such as happens through measurement, then its spin will become a *sign* of the spin of its coupled Other for that semiotic system. If measurement determines that the interpretant has spin “down”, then this spin acts within the semiotic system of interpretation as a sign of the spin of the coupled Other. The entrance of an interpretant into a semiotic system of interpretation is the quantum mechanical process of “collapse”. Collapse is the action whereby a potential semiotic relation becomes actualized within a system of interpretation.

Collapse brings two distinct contexts into immediate proximity. The spacetime location of one of the photons is immediately proximate to the spacetime location of the other coupled photon (because for light there is no spacetime interval). This immediate proximity of contexts also involves substitution such that the spin of one photon substitutes for the spin of its Other by way of opposition. Proximity and substitution allows orientation to be abstracted from the spacetime continuum. Orientation is both an interior representation of spin and its exterior expression or sign within a formal semiotic system of interpretation.

Contexts

Suppose one photon of the coupled pair collapses into a semiotic system of interpretation by way of measurement. Lets say this photon has spin “down” as measured in that semiotic system. That spin becomes, for the semiotic system, a sign of orientation that represents the spin of the Other photon of the coupled pair. Now suppose the Other-of-the-same enters into a second semiotic system of interpretation by way of a different measurement. The result would be two disjointed contexts:

- Context A: the semiotic system in which the first photon (the same) has spin “down”.
- Context C: the semiotic system in which the second photon (the Other) has spin “up”.

However, since the two photons are coupled, their unity yields a semiotic connection between Context A and Context C. Namely, that which is oriented “up” in Context A is oriented “down” in Context C. This semiotic relationship allows Context A and Context C to become synchronized by way of a Third. The Third is an overarching CONTEXT that unites (sub)-context A and (sub)-context C by way of synchronization such that what is “up” in sub-context A is “down” in sub-context C and vice versa. Such synchronization comes about because all signs in sub-context A and sub-context C are connected by semiotic relationships. Both sub-context A and sub-context C were created in the past through prior collapses, that is to say, prior determinations of semiotic connections. The Third is the formal system of generalization that consistently interprets all photons in both sub-contexts. By way of the Third, all photons obey formal rules that ensure consistent synchronization of all orientations.

If the speed of light were infinite, this formal system would be a Euclidean *geometry*. An infinite speed of light means that synchronization has always already happened. It means that everything is always already determined. It is only possible if the primal symmetry of orientation has somehow been broken by a formative action in the past.

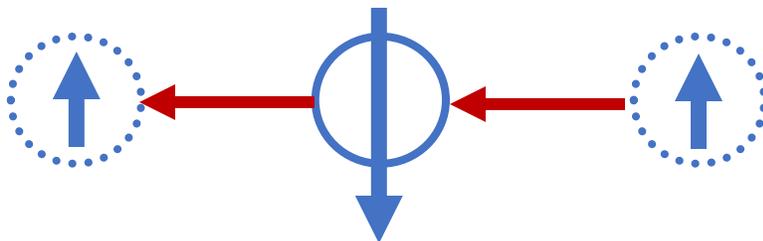
The logic of three, however, allows for another, much more interesting possibility. Namely, the possibility that contexts or semiotic systems of interpretation are *currently in the process of coming into synchronization with each other*.

Synchronicity

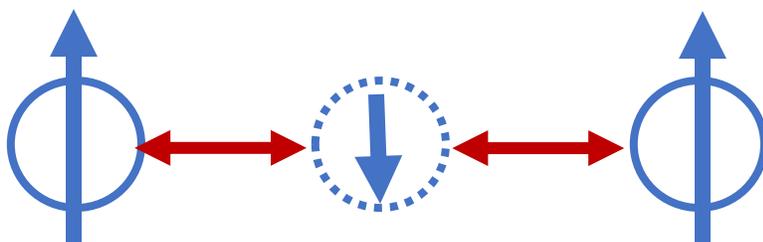
The synchronization of contexts presents an infinite regress. This infinite regress *is* the excluded initiative of the geometry of space, namely time. Another way to say this is that determinate space lacks origin. But without origin, space cannot be *actualized*; it cannot be real. At best it can only be an epiphenomenon that determines some sub-context within a larger indeterminate context. And it only determines that sub-context outside of or exterior to the limit of some sub-sub-context—an inner limit that reflects the outer limit.

In formal semiotic systems, an origin comes about by the inward enfolding of the semiotic relation of two through synchronicity with a third. An origin creates a context that is limited and formally indeterminate at its core.

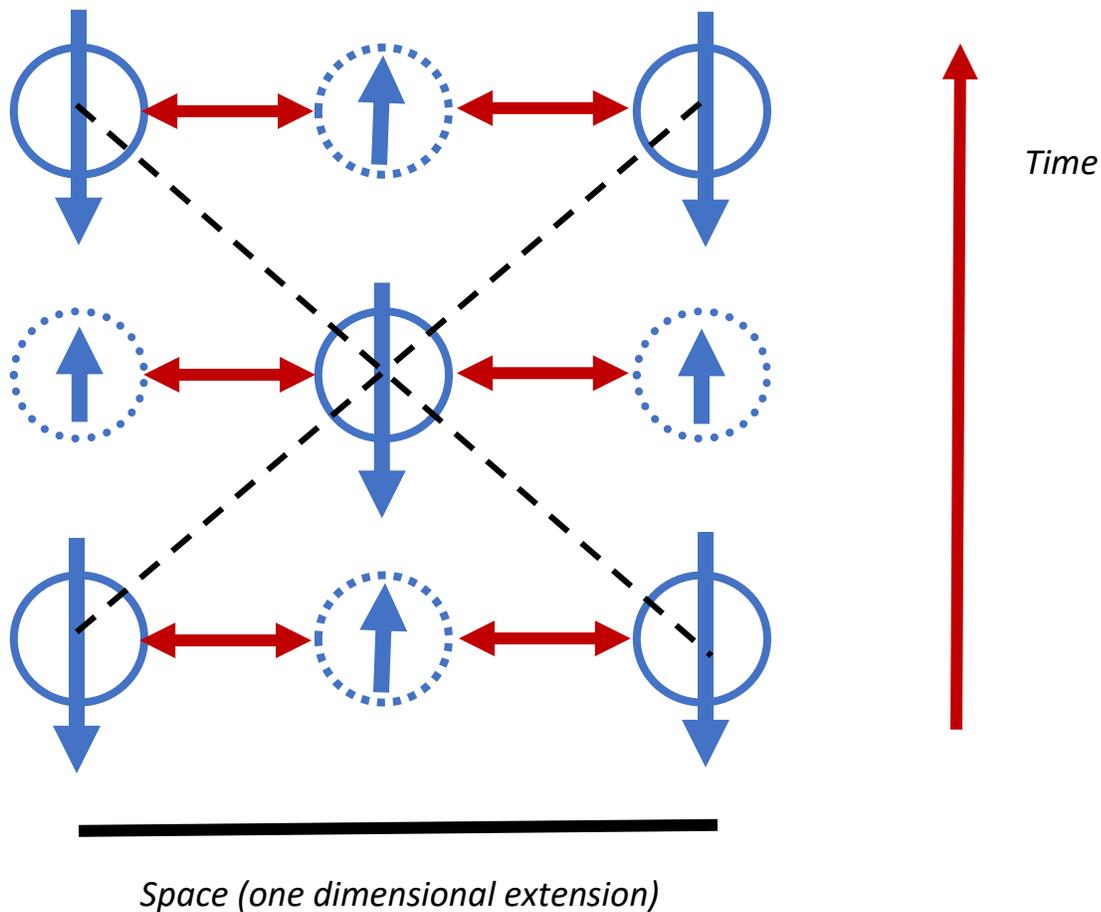
The temporal aspect is the successive iteration of substitution around the cycle of three as shown in the figure below:



The spatial aspect is the resonant structure of return:



The synchronization of temporal and spatial aspects results in a "breathing" manifold in which interior and exterior exchange according to the rhythm of the whole. The rhythm of the whole is determined by the invariant speed of light c , such that the temporal frequency of iterative succession f is proportional to the spatial "frequency" or inverse wavelength λ^{-1} of spatially extended resonance: $c = f * \lambda$.



In the process of coming into synchronization, the semiotic system *formulates* spacetime as a communal interpretive framework for spin. However, this structural framework is generic and lacks the particularity of embeddedness required for actualization. It is a framework for the process of *signification* through which embedded spins might become synchronized as a collective whole. In order for a spin to exist it must follow the habit or rules of the formal system of the manifold: the manifold provides the structural foundation for an enduring “self” entangled within the whole. The enduring “self” determines or delimits the self-identical form an actualized spin. This is a bootstrap process. Through the threefold nature of *Return*, a sign or image of spin is formulated by its relations to other signs or images of like spin within a wholistic formal grammar (manifold) in which each spin is mutually interpreting all the others. The entanglement relates interior to exterior self-consistently such that individual signs or images are distinct but not disjoint or separable.

The process of interpretation involves action and re-action. For example, a given spin would be receptive to the actions of the other spins within a whole ensemble of spins. This reception involves a formal relation to the external image or *face* of the other spins. The given spin is *indexed* to the other spins as signs by way of the manifold. In turn, the spin *reacts* interiorly to the received image(s). This reaction formulates the exterior image of the spin which is its face according to the other spins. Light is the mediator of the relational indexing.

Embodiment

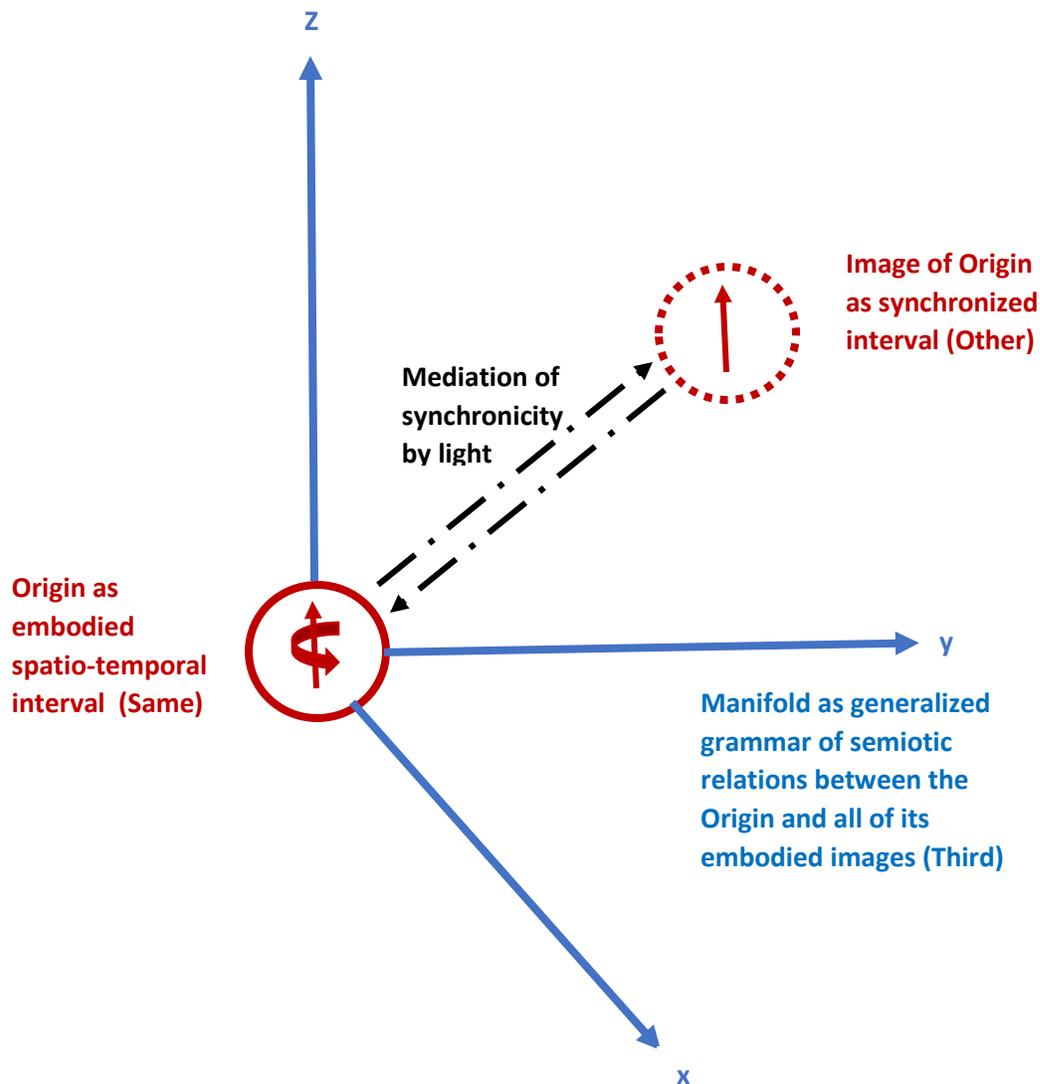
The breathing manifold opens up a grammar of signification. However, this grammar is general and lacks the particularity of real, actually embodied entities.

The embodiment of spin involves an inward folding of the breathing manifold to create a “knotted” spinor as described in section 2. The knotted spinor becomes an interior *re-presentation* of the external breathing manifold. The knotted spinor moves interiorly in synchronicity with the breathing manifold which is the general grammar of an exterior process for the knotted spinor. That exterior, general process is the entangled relational synchronicity of all the spins in the ensemble forming the system, each of which is an image of the original spin.

Embodiment is a symmetry breaking process. Only one embodied spin can be marked as the indexical origin for the entangled ensemble. This embodied spin undergoes a temporally iterative and open “breathing” process through which it is entangled with the collective ensemble by way of the generalized grammar of the manifold. It is because the embodied spin has an interiority that can represent the external breathing process of the manifold that it can be taken as an origin for an entangled ensemble of like bodies which are interpreted by the original embodied spin as signs.

From this origin we can mark out a three dimensional space of synchronicity. But this synchronicity is not instantaneous simultaneity. It is a spatiotemporal process that relates the other spins, as images, to the indexed original spin. The embodied original spin cannot be conceived of as or represented by a Euclidean point. It is a spatiotemporal *interval* of repetition. Likewise all the other spins in the embodied ensemble are images of that spatiotemporal interval. The magnitude of the interval is the body’s *rest mass*, such that body’s rest mass is equivalent to the energy of a photon whose frequency is synchronized to both the external procession (breathing) of the manifold and the internal procession (breathing) of the original spin². The interval involves a fuzzy upper cut-off to spatial and temporal frequencies such that the *particular* embodied *instantiation* of the manifold cannot be considered as a totalized continuum in itself, although it might be considered as a stochastic, relational continuum for mediating the processual synchronization of intervals.

² The rest mass m_0 is related to the Compton wavelength λ_c of the embodied spin at rest :
 $m_0 = h / (c * \lambda_c)$.



The particular instantiated Origin can be taken as a subject to which all other spins are indexed by way of the relational manifold. The mediated relation between the subject (the Same) and an image (the Other) involves an inherent gap. The subject and the image-as-object are in immediate proximity by way of light for which there is no spatiotemporal interval. However, the processual motion of the spins forms a “pause” as each spin completes its cycle. A complete cycle of the subject creates, for the Other, an object-image to which the Other can respond. A complete cycle of the Other creates, for the subject, an object-

image to which the subject can respond. The complete cycle of an object-image is a *sign*. The two object-images are different because they have different contexts even though they both present the same formal, exterior object-image to one another. The subject is one indexical locus for coordination of the manifold. The image, *when considered as a subject*, is a second indexical locus for coordination of the manifold. These two contexts are mediated by the immediate proximity of light. What is transmitted through this mediation is the sign of spin, namely orientation. Each spin becomes synchronously oriented with the other inasmuch as they mutually exchange the same sign by way of *Return*. This sign represents what is happening interiorly for each spin; it communicates in-formation. Unlike the case with Euclidean geometry, however, the exchange of in-formation about spin is a spatiotemporal process whose frequency depends on the rest mass of the spins.

The differentiation of interior and exterior is crucial to the process of synchronization. Because each embodied spin can represent the mediating manifold interiorly and that interior representation can be communicated to another spin as an exterior image, an ensemble of spins can enter into a formal semiotic grammar of synchronization. However, unlike the case with Euclidean geometry, in the formal grammar mediating action and re-action is never fully externalized. Each embodied spin by way of its particularity breaks the symmetry of the manifold to form its own particular Origin. But an Origin, by way of its particular mode of broken symmetry, has some degree of indetermination which manifests to other “origins” as inherent randomness whose external signs can be “interpreted” through the formal grammar mediating relations. In the simple case we are considering, “interpretation” means the synchronization in space and time of particular actions and reactions according the grammar of the manifold.

What holds this process of synchronization of same-Other together is the manifold. The manifold (the Third) is the generalized grammar of the whole ensemble of spins of which the subject and each of its Others are parts. The manifold exists by way of a higher order process whereby the ensemble as a whole is synchronized by light. The synchronization of the manifold (Thirdness), the origin (Firstness) and the action/reaction of object-images (Secondness) involves the *Logic of Three* as described by Peirce and others.

More generally, any actualized manifold consists of spatiotemporal intervals that must be brought into synchronization. These intervals possess interiority that represents the exteriority of the manifold. The interiority gives to the embodied entities a degree of randomness, freedom or choice that cannot be subsumed into the manifold but remains external to it.

Semiotic processes do not manifest fully externalized objectivity. Through wholistic interpretative grammars, they synchronize images to an interpretative grammar or formal system which requires context to be actualized. The context has its origin in an embodied subject for which embodied Others are images or signs that possess some degree of interior randomness, freedom, or agency that reflects the randomness, freedom, or agency of the subject. The formal grammar is sustained through representational relations that connect interiority to exteriority and this formal grammar is actualized when the collective whole becomes embodied in the world as a whole system.

Further reading:

[On the Embodiment of Space and Time: Triadic logic, quantum indeterminacy and the metaphysics of relativity.](#)

References (see further readings for contexts)

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.

Barbour, Julian. *The End of Time: The next revolution in our understanding of the universe*, New York: Oxford University Press, 1999.

Bell, John. *A Primer of Infinitesimal Analysis*. Cambridge University Press, 1998.

Bergson, Henri. *Duration and Simultaneity with reference to Einstein's theory*, trans. Leon Jacobson, New York: The Bobbs-Merrill Company Inc., 1965.

Bergson, Henri. *The Creative Mind: an Introduction to Metaphysics*. Transl by Mabelle Andison. New York: Kensington Publishing Co. 1976.

Birchell, B.C. "Hegel's Notion of Aufheben," *Inquiry* 24(1) (1981): 75-102.

Bitbol, Michel. "Does Quantum Mechanics Require New Forms of Thought? 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.

Bohm, David. *The Special Theory of Relativity*. New York: Routledge, 1996.

Buber, Martin. *I and Thou*, trans. Walter Kaufman, New York: Touchstone, 1970.

Canales, Jimena. *The Physicist and the Philosopher: Einstein, Bergson and the debate that changed our understanding of time*, Princeton University Press, 2015.

Caputo, John. *Deconstruction in a Nutshell: a Conversation with Jacques Derrida*. New York: Fordham University Press, 1997.

De Chardin, Teilhard. *Phenomenon of Man*, trans. Bernard Wall, New York: Harper and Row, 1959.

Deely, John. *Purely Objective Reality*, Semiotics, communication and cognition Vol 4, New York: De Gruyter Mouton, 2009.

Derrida, Jacques. *Margins of Philosophy*. Transl Alan Bass. Chicago: University of Chicago Press, 1982.

Derrida, Jacques. "At this very moment in this work here I am," Transl Ruben Berezdivin. In *Re-reading Levinas*. Robert Bernasconi, ed. Bloomington: Indiana University Press, 1991.

Ekeson, Kigen William. "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_States_Individuation_and_the_Measurement_Problem .

Emmeche, Claus and Kull, Kalevi, eds. *Towards a Semiotic Biology: Life is the action of signs*, World Scientific, 2011.

Field, JH. "Space-time exchange invariance: special relativity as a symmetry principle," *American Journal of Physics*. Vol 69(5), pp 569-75, 2001.

Florensky, Pavel. *The Pillar and Ground of the Truth: An essay in orthodox theodicy in twelve letters*. Transl by Boris Jakim. New Jersey: Princeton University Press, 1997.

Frye, Northrop. *Words with Power: Being a Second Study of "The Bible and Literature"*, Toronto: Penguin Books, 1990.

Gaskin, Richard. "Identity and Reference in a Black Universe." Accessed February 13, 2016.

https://www.academia.edu/19755831/Identity_and_Reference_in_a_Black_Universe .

Gauthier, Richard. "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

Goldstein, Rebecca. *Incompleteness: The proof and paradox of Kurt Godel*. New York: WW Norton & Company, 2005.

Grandy, David. "The Otherness of Light: Einstein and Levinas," *Postmodern Culture*. Vol 12(1), September 2001.

Habermas, Jurgen. *The Theory of Communicative Action*, 1981.

https://en.wikipedia.org/wiki/The_Theory_of_Communicative_Action

Hegel, GWF. *Phenomenology of Spirit*. Trans. AV Miller, Oxford: Oxford University Press, 1977.

Heschel, Abraham Joshua and Schor, Ilya. *The Sabbath*. New York: Macmillan, 1951.

Hofstadter, Douglas. *Godel, Escher, Bach: an eternal golden braid*. New York. Vintage Books, 1980.

Huggett, Nick. *Space from Zeno to Einstein*. Cambridge: MIT Press, 2002.

Kerruish, Valerie and Petersen, Uwe. *Philosophical Sanity, Mysteries of the Understanding, and Dialectical Logic*. [Available Aug 8 2018:

https://www.academia.edu/20791477/Philosophical_Sanity_Mysteries_of_the_Understanding_and_Dialectical_Logic]

Knuth, Kevin and Bahreyni, Newshaw. "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>

Kruse, Felicia. "Is cosmic evolution semiosis?" In *From Time and Chance to Consciousness: Studies in the metaphysics of Charles Peirce*, Eds. Moore, Edward and Robin, Richard, 1994. [Available Aug 8 2018: https://www.academia.edu/7104060/Is_Cosmic_Evolution_Semiosis]

Levinas, Emmanuel. "Transcendence and Height," in *Emmanuel Levinas: Basic Philosophical Writings*. A Peperzak, S Critchley, and R Bernasconi, eds. Bloomington: Indiana University Press, 1962.

Levinas, Emmanuel. *Totality and Infinity: an essay on exteriority*. Trans. Alfonso Lingis, Pittsburgh: Duquesne University Press, 1969.

Levinas, Emmanuel. *Otherwise than Being, or Beyond Essence*, 1974. https://en.wikipedia.org/wiki/Otherwise_than_Being

Levinas, Emmanuel. "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.

Levinas, Emmanuel. *Otherwise than Being or Beyond Essence*. Trans. Alfonso Lingis, Pittsburgh: Duquesne University Press, 2002.

Marion, Jean-Luc. *Givenness and Revelation*. Transl by Stephen E Lewis. Oxford: Oxford University Press, 2016.

Marx, Karl. "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.

Maudlin, Tim. *Quantum Non-Locality and Relativity*, 2nd edition. Oxford: Blackwell Publishers, 2002.

Peirce, Charles Sanders. "Evolutionary love," *Monist* III(1) (1892).

Peirce, Charles Sanders. "Law of Mind," *Monist* II (1891).

Peirce, Charles Sanders. "The Architecture of Theories," *Monist* I(2) (1891).

Peirce, Charles Sanders. "A Guess at the Riddle", 1887-8. Accessed January 10, 2015. <http://www.iupui.edu/~arisbe/menu/library/bycsp/guess/guess.htm> .

Putnam, Hilary. "Time and physical geometry," *Journal of Philosophy*. Vol 64, pp240-7, 1967.

Rindler, Wolfgang. *Essential Relativity: Special, General and Cosmological*. revised 2nd edition. New York: Springer Verlag, 1977.

Rosen, Steven. *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.

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

Smolin, Lee. *Time Reborn: From the crisis in physics to the future of the universe*. New York: Houghton Mifflin Harcourt, 2013.

Somers-Hall, Henry. "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](https://www.academia.edu/28442778/Heidegger_Ontotheology_and_The_Foundations_of_Formal_Logic)

Stein, Howard. On Einstein-Minkowski Space-time. *Journal of Philosophy*. Vol 65(1), pp 5-23, 1968.

Unger, Roberto Mangabeira and Smolin, Lee. *The Singular Universe and the Reality of Time: A proposal in natural philosophy*, 2015.
https://en.wikipedia.org/wiki/The_Singular_Universe_and_the_Reality_of_Time

Vassallo, Antonio and Esfeld, Michael. "Leibnizian Relationalism for General Relativistic Physics", preprint, 2016. Accessed September 10, 2016.
[https://www.academia.edu/28019019/Leibnizian relationalism for general relativistic physics](https://www.academia.edu/28019019/Leibnizian_relationalism_for_general_relativistic_physics)

Wallace, David Foster. "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.

Whitehead, Alfred North and Russel, Bertrand. *Principia Mathematica*, 1910-13.
https://en.wikipedia.org/wiki/Principia_Mathematica

Wittgenstein, Ludwig. *Tractatus Logico-Philosophicus*, 1921.
https://en.wikipedia.org/wiki/Tractatus_Logico-Philosophicus

Zuckermandl, Victor. *Sound and Symbol: Music and the external world*, New York: Princeton University Press, 1973.

Zwicky, Jan. *Wisdom & Metaphor*, Kentville, Nova Scotia: Gaspereau Press, 2003.

[Anonymous]. *I Ching*, trans. Richard Wilhelm and rendered into English Cary Baynes, Princeton: Princeton University Press, 1990.