The Proximity of Light

In the beginning God created the heaven and the earth.
And the earth was without form, and void; and darkness was upon the face of the deep.
And the Spirit of God moved upon the face of the waters.
And God said, Let there be light: and there was light.
Genesis 1

In the beginning was the Word, and the Word was with God, and the Word was God.
The same was in the beginning with God. All things were made by him;
and without him was not any thing made that was made.
John 1

1. Introduction

This paper is the script of a performance—an *étude*. Using fragments of Newton's text, cited and recited in a common discourse, a specific and appropriated picture of the ontological structure of classical physics is presented. Another voice, separate and proximate, interrupts this discourse, scintillating language and resonating metaphor. Tropes and figures push from a classical ontology embedded in reciprocal duality towards a promised Otherwise within an irreducibly threefold relatedness. Drawing from Levinas' postmodernism, the paper intimates the rupture of spatiality in the proximity of light—a deconstruction of the entrenched notion of spatiality in the movement from a geometry of being (ontology) to a grammar of signifyingness (ethics). Drawing from Einstein's physics, the paper intimates a specific way in which universality is manifested in subjective relativism through the absolute nature of the trace.

2. The spatiality of space

Let our starting point be Newton's concept of Absolute space[1]. This concept grounds classical physics and is the traditional place from which the leap to Einstein's special relativity theory is taken. In its concreteness, this concept can also function metaphorically as a *trope* for approaching Levinas' critique of ontology.

[1] This paper is not intended to be a careful study of Newton's concept of Absolute space. Rather a common reading of Newton is appropriated to motivate the deconstruction of the notion of spatiality.

For Newton, space is an entity in itself**:** the distinct container of what is real [Huggett p 126-133]. Newton's Absolute space is a literal Euclidean structure in which the spatial points are possible locations for material objects (bodies). No body can exist without space. Spatial points, on the other hand, exist whether or not they are occupied by bodies. Eternal in duration, immutable in nature, Newton's Absolute space situates an ontological structure for the universe. In *De Gravitatione* Newton writes, "Space is a disposition of being *qua* being. No being exists or can exist which is not related to space in some way. God is everywhere, created minds are somewhere, and body is in the space that it occupies; and whatever is neither everywhere nor anywhere does not exist. And hence it follows that space is an effect arising from the first existence of being, because when any being is postulated, space is postulated." [cited by Huggett, p112]

> *"But then no transcendence other than the factitious transcendence of worlds behind the scenes, of the Heavenly City gravitating in the skies over the terrestrial city, would have meaning. The Being of beings and of worlds, however different among themselves they may be, weaves among incomparables a common fate; it puts them in conjunction, even if the unity of Being that assembles them is but an analogical unity. Every attempt to disjoin the conjunction and the conjuncture but emphasizes them. The* there is *fills the void left by the negation of Being." [Levinas (a), p4]*

Newton's approach offers some insight into the nature, the figure, the *spatiality,* of space. Let us trace some of its characteristics.

Sameness — Newton's space is homogenous**:** every point in space is exactly like every other point. Leibniz, for example, describes Newton's space as "something absolutely uniform and, without the things placed in it, one point of space does not absolutely differ in any respect whatsoever from another point of space" [cited by Huggett, p147]. Space thus plays the role of an ubiquitous field of uniformity or sameness upon which reality is

inscribed. There is no radical alterity in space. Within this homogeneity, Newton theorizes acceleration, force, power, as primary thematizations of motion and change.

> *"A philosophy of power, ontology is, as first philosophy which does not call into question the same, a philosophy of injustice* … Being *before the* existent, *ontology before metaphysics, is freedom (be it the freedom of theory) before justice. It is a movement within the same before obligation to the other." [Levinas (b), p47]*

Contiguity — Newton's space is a continuum. As he writes in *De Gravitatione*, "… spaces are everywhere contiguous to spaces, and extension is everywhere placed next to extension, and so there are everywhere common boundaries to contiguous parts…" [cited by Huggett, p111]. There is no apparent rupture in space. This imparts upon space, as container, an affinity for analysis, for analyticity, for invoking an excluded middle to differentiate and bring together again without loss or excess. Upon this assumption of contiguity, Newton brings forth a calculus of differentiation.

> *"But then the term proximity would have a relative meaning and, in the space inhabited by Euclidean geometry, a derivative sense. Its absolute and proper meaning presupposes 'humanity' " [Levinas (a), p81]*

Simultaneity — For Newton, the universe is a totality: an assemblage of bodies in instantaneous and simultaneous relationship. Like the metaphor of a rigid body, like the earth as fixed correlation, the universe is a *state* in space. Space is the rigidity, the instantaneous infinite correlation, the assemblage of simultaneity. Time is added separately, so the universe is seen as a continuous succession of states in space. Newton writes: "… for we do not ascribe various durations to the different parts of space, but say that all endure together. The moment of duration is the same at Rome and at London, on the Earth and on the stars, and througout all the heavens. And just as we understand any moment of duration to be diffused throughout all spaces, according to its kind, without any thought of its parts, so it is no more contradictory that Mind also, according to its kind, can be diffused through space without any thought of its parts." [in *De*

Gravitatione, cited by Huggett, p113]. Newton imagines the universe as a totality in a succession of simultaneous existences. This metaphorical *picture* informs ontology. What is real, what exists, what *is* … is the state. Space is the container of this totality and Newton's universe ontologically privileges space.

> *"The beings remain always assembled, present, in a present that is extended, by memory and history, to the totality determined like matter, a present without fissures or surprises, from which becoming is expelled, a present largely made up of re-presentations, due to memory and history." [Levinas (a), 5]*

We will have more to say of spatiality, but before we move on, we need to unpack the temporal dimension, the nature of change.

3. Limits of spatiality

Change is a tricky concept in physics, and Newton's theories are no exception. To Absolute space, he adds Absolute time, keeping the two always orthogonal and unmixed. The question of change is enfolded into the question of motion.

> *"It is the verbalness of the verb that resounds in the predicative proposition; the dynamism of entities is designated and expressed by verbs secondarily, by reason of its privileged exposure in time. The effort to reduce verbs to functions of signs naïvely presupposes the division of entities into substances and events, into statics and dynamics, to be original." [Levinas (a), p39]*

In order to address the foundations of Newton's space-time, it is helpful to go farther back, to a pre-citation of the problem of motion, to the earlier Greeks, to the paradoxes of Zeno. Two such paradoxes are presented below[2]:

The Dichotomy — Motion is impossible. Consider the case of an arrow launched from a bow, for example. In order to reach the target, the arrow must first travel half the distance

[2] This discussion of Zeno's paradoxes is taken from Huggett.

to the target, then half the remaining distance, and so on eternally. The target can never be reached because this requires traversing an infinite number of finite distances—a task that should take an infinite amount of time. Yet arrows do reach targets.

The Arrow — Time is a succession of instants, which are themselves indivisible points. Consider the arrow described above. At any instant of time the arrow must be at rest, because if it were to move during the instant, time must pass. For time to pass it must be divisible into before and after, and therefore it is not an indivisible instant. But if the arrow is at rest at every instant in time, there is no motion. Yet the arrow moves.

Modern analysis resolves these apparent contradictions through a mathematical limiting procedure. Roughly interpreted, the arrow successfully reaches the target because increasingly smaller distances are traversed in increasingly smaller times such that the sum of the distances and the times both remain finite, *even in the limit of infinite division*.

> *"The idea of the infinite is not an intentionality for which the Infinite would be the object. Intentionality is a movement of the mind adjusted to being. It takes aim and moves towards a theme … The idea of the infinite consists precisely and paradoxically in thinking more than what is thought while nevertheless conserving it in its excessive relation to thought. " [Levinas (c), p19]*

The underlying construct for analysis of motion is the notion of a trajectory, or function. The arrow is described as tracing out a *path* in space as a *function* of time — *x(t)*. The functional relation, *x(t)*, connects the specific point in space, x_i, where the arrow is found at each specific instant of time, t_i. Motion occurs "if *at* every instant during the journey the arrow is *at* the appropriate place along the trajectory" [Huggett, p50].

Huggett calls this the "at-at theory of motion". In this construct, instants are point-like and have no parts. As with Zeno's paradox, motion during any instant is impossible, because if the arrow moves during an instant, say t_i , then t_i has before and after parts and therefore is not an instant [Huggett, pp48-9]. Although motion does not occur at any

instant, there is motion by virtue of the whole trajectory, which describes the arrow at successive positions during successive times.

An *average* velocity can be defined for the arrow as the ratio of distance traveled to time taken. This definition requires *two* distinct points in space and time [Bell (a), p9]. The average velocity is a property of the trajectory and is a construct that invokes both sameness and simultaneity, since the two reciprocal points must, in some sense, exist together. The *instantaneous* velocity then becomes the limit of the average velocity over increasingly closer space-time points. As Huggett writes: "An arrow is moving if its instantaneous velocity is nonzero, given by:

$$\frac{dx}{dt} \equiv \lim_{\Delta t \to 0} \frac{x(t+\Delta t) - x(t)}{\Delta t} \qquad \textit{Equation (1)}$$

Thus the arrow is moving at time *t* as long as it is at an appropriate series of points at the series of subsequent times $t+\Delta t$." [Huggett, p50].

While modern analysis may formally resolve Zeno's Dichotomy paradox, it presents new challenges regarding the interpretation motion. These challenges relate to the concept of infinitesimal and the notion of an instantaneous rate of change of a varying quantity [Bell (a)].

The arrow doesn't move at any instant, yet there is motion. The discrete picture above presents motion as successive snapshots in time. Intuitively we have a different sense of motion that involves the idea of continuous variation or flow, for example through space and time. I will call this intuitive notion "motion proper". In motion proper there is continuous change, passing, *diachrony*. In some sense, motion proper is *excluded* by the analytic construct, which, in fact, does not allow motion at any instant. Differential calculus circumscribes this exclusion through a limiting procedure.

In the presentation above, the issue of exclusion comes from the fact that instants are represented as points, whereas velocity is represented as a two-point relation[3]. Motion proper is marginalized to the "gaps" connecting the discrete instants of time. In the limit that these gaps become infinitesimally close, the motion "occurs" by virtue of the spatio-temporal correlation *x(t)*. Equation (1) defines a differential operator, *dx/dt*, through such a limiting process. This differential operator, in some sense, marks the *trace* of the exclusion of motion proper. By this I mean, the differential operator is a signifier of motion proper, but this motion is, in fact, *outside* of the [discrete] description. Of course, the limiting procedure closes the gaps and recasts the description of motion as a continuous trajectory. We might think of the temporal trajectory in the metaphor of a thread: the differential operator then represents the cutting and re-tying of the thread. In this limit, Huggett argues, it no longer makes sense to speak of the motion as occurring in the "gaps" (or knots[4] of the thread) since there are no gaps. He writes: "One might feel that motion occurs if from one instant to the next the arrow flows from one place to the next, but this would be misleading, because space and time are dense and so there is no 'next' point. Instead, objects move simply by being at a continuous series of locations over a continuous interval of instances." [Huggett, p50].

> *"… the intervals are not recuperated. The discourse which suppresses the interruptions of discourse in relating them together, does it not maintain the discontinuity behind the knots where the thread is retied? … The interruptions of discourse, recovered and related within the immanence of the said, are conserved as the knots in a retied thread, the tracing of a diachrony which does not enter into the present, refusing itself to simultaneity" [Levinas (a), p170, as excerpted by Derrida (b), p21]*

I would like to argue that the exclusion of motion proper remains relevant because it establishes limits to the meaning of the analytic construct vis à vis motion. Like with

[3] This discussion is based on a particular reading of differential calculus which is not the only reading, nor the most rigorous. Other readings, however, are expected to manifest similar problems of spatial embedding.
[4] Nots? Naughts? See also Derrida (a) and (b).

spatiality, there is an assumption that motion is occuring in a spatio-temporal field of sameness, contiguity and simultaneity (totality). The possibility remains that actual motion does not fit within the construct—a possibility to be explored in this paper. As Bergson writes in *The Creative Mind*: "If it is a question of movement, all the intelligence retains is a series of positions: first one point reached, then another, then still another. But should something happen between these points, immediately the understanding intercalates new positions, and so on indefinitely. It refuses to consider transition; if we insist, it so manages that mobility, pushed back into more and more narrow intervals as the number of considered positions increases—recedes, withdraws and finally disappears into the infinitely small … It is only a step from there to seeing in movement just a series of positions; the duration of movement will then break up into 'moments' corresponding to each of the positions. But the moments of time and the positions of the mobile are only snapshots which our understanding has taken of the continuity of movement and duration. In these juxtaposed views one has a practical substitute for time and movement which conforms to the exigencies of language until such time as language lends itself to the exigencies of computation; but one has only an artificial means of recomposing: time and movement are something else … " [Bergson, p15-6].

Let us examine the situation more closely. The analytic construct above represents motion as successive binary relations between spatio-temporal points as in Figure 1.

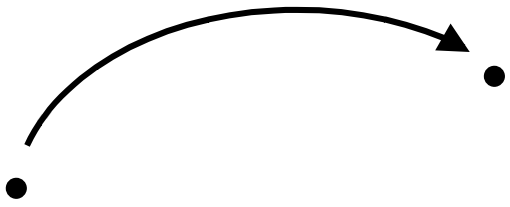

Figure 1 : Binary relation between successive points on a trajectory—reciprocity obtains in the sense that adjacent spatial points "exist" simultaneously.

There is an embedded structure in this representation, which implicates the spatio-temporal structure (space-time) in which motion occurs—the structure of contiguity. The infinitesimal—infinite dividing—is constrained and limited to the immanent field of spatiality embedding the points and represented as the arrow in Figure 1.

> *"They appear in opposition to a synoptic gaze that encompasses them; they already form a totality which, by integrating the metaphysical transcendence expressed by the idea of infinity, relativizes it." [Levinas (b), p53]*

Since we began with an assumed spatio-temporal structure in speaking of motion, namely, Absolute space and Absolute time, the structural underpinnings can be easily forgotten or ignored. The possibility remains, however, that the motion of the arrow is incompatible with the assumed spatio-temporal structure (space-time). For example, a passing, or diachrony, inherent to motion may haunt the representation in surprising ways.

> *"Nearly always with him, this is how he sets his work in the fabric: by interrupting the weaving of our language and then by weaving together the interruptions themselves, another language comes to disturb the first." [Derrida (b), p18].*

The Newtonian agenda is to continue operating on time by cutting and re-tying the thread. For example, acceleration is defined by the action of the differential operator on velocity; forces are theorized to account for its presence. In this way—through Absolute space—smoothness and analyticity are inscribed into the temporal.

But suppose, as diligent postmodernists, we invert the whole construct.

Suppose, instead of taking the spatio-temporal structure and the existence of trajectories as foundational, we begin with the differential operator as the trace of motion itself

(motion proper?). Recall that the differential operator relates two distinct space-time points that are infinitesimally close. Let us think of this as a *cutting function* that differentiates points in space-time. Immediately we are confronted with the fact that it is also a *joining function* that merges distinct space-time points. In the differentiation, the difference inherent in two distinct space-time points is deferred.

Suppose, instead of starting with a given space-time structure, we take this cutting-joining operator as a priori. Through this differential operator space-time points are differentiated and therefore come into representation. And through this operator, space-time points are joined and therefore brought into a particular spatio-temporal relation or structure in which the motion occurs.

How does this work? The differential operator cuts the fabric of spacetime. This is the primal act of differentiation. In this cutting, the set of space-time points comes into representation as discrete and static entities. But not entirely. The operator also joins what has been cut, bringing the space-time points into continuous relation, deferring their separate identity. A tearing of the fabric brings forth spacetime in a particular structural representation. This *means* motion—motion as the exploration and articulation of space-time.

But now the foundation gives way. The spatio-temporal structure is articulated by virtue of the discreteness of space-time points, which obey the law of the excluded middle—the position of the arrow is either (x_i,t_i) or not (x_i,t_i). But the differential operator is precisely an Other of this discreteness. The in-between. The blurring of separate identity. Therefore, the differential operator, which allows the spatio-temporal structure obeying the law of the excluded middle, is the trace of the violation of this law. It privileges distinct point-like structure by deferring ambiguity. The meaning and articulation of motion arises from the way in which the differential operator continually represents and undermines the structural foundation of space-time[5].

[5] Bell has developed an interesting alternative to the usual formalism of calculus in terms of limits. He calls this "smooth infinitesimal analysis". In this formalism, he recasts the analysis in terms of a nilsquare infinitesimal, δx, which is so *small* (but not demonstrably equivalent to *0*) that $(\delta x)^2 = 0$. He claims to

> *"In re-presentation, the Infinite would be belied without ambiguity, as though it were an infinite object which subjectivity tries to approach but misses." [Levinas (a), p154]*.

But here is the rub. As we are presenting it, the differential operator still embeds *spatiality*. In the description above, the space-time points are Euclidean, partaking of sameness, contiguity and simultaneity (although here simultaneity means assembled totality in space *and* time). In speaking of their differentiation, points must be represented contemporaneously and therefore in reciprocal relation. The embedded structure partakes of a *reciprocal duality*, which is the assumed relatedness of two contiguous points in space-time. Much like the operator AND, this reciprocal duality assembles points in time, just as it does in space.

> *"The reversibility of a relation where the terms are indifferently read from left to right and from right to left would couple them the* one *to the* other*; they would complete one another in a system visible from the outside. The intended transcendence would be thus reabsorbed into the unity of the system, destroying the radical alterity of the other. Irreversibility does not only mean that the same goes unto the other differently than the other unto the same. That eventuality does not enter into account: the radical separation between the same and the other means precisely that it is impossible to place oneself outside of the correlation between the same and the other so as to record the correspondence or non-correspondence of this going with this return. Otherwise the same and the other would be reunited under one gaze, and the absolute distance that separates them filled in." [Levinas (b), p36]*.

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derive the same results as calculus; however, the postulates of smooth infinitesimal analysis are incompatible with the law of the excluded middle of classical logic. [Bell (b), (c)].

Now, perhaps, we can see that there is betrayal of *diachrony* in this representation of time. We have assimilated time into space. We have excluded passing, becoming, changing. We have totalized space and time.

> *"The verb to be—field of sychronizable diachrony, of temporalization, that is, field of memory and historiography—becomes a quasi-structure and is thematized and shows itself like an entity" [Levinas (a), p42].*

4. Beyond spatiality

Let us return to Newton's Absolute space. Recall our starting point, namely, the way in which bodies are inscribed *literally* in Newton's Absolute space discloses the way in which beings are inscribed *figuratively* in Levinas' portrait of ontology.

Consider the Newtonian picture of space-time represented in Figure 2.

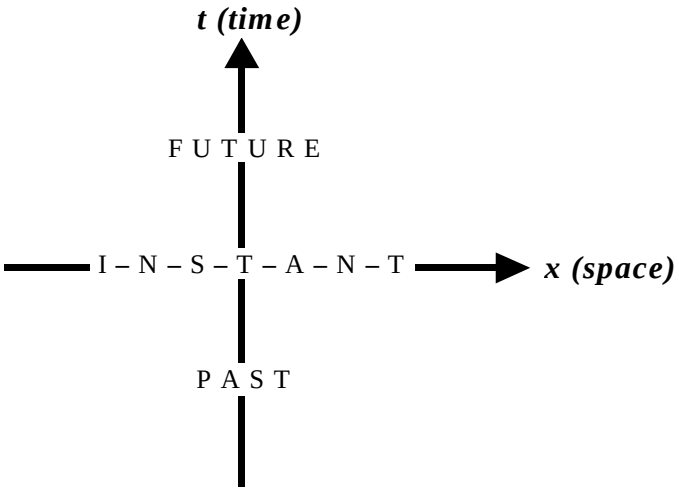


Figure 2 : Past, present (Instant) and future in Newtonian space-time. The Newtonian present is an Instant of absolute simultaneity (spatiality) at *t=0*.

In this picture, space and time are absolutely orthogonal, allowing us to envision time as a series of absolute Instants. In each Instant, space—the container of simultaneity—contains what exists in that Instant. Along with Newton, we have said what is simultaneous in the Instant is what is "real" in the Instant. Let us call this the Instantaneous Real. What exists in the Instant, exists for all observers in the Instant. The Instantaneous Real is objectively the same for all observers. An "ideal observer" could, in principle, take in the totality of the Instantaneous Real in a single Instant of time. From this can come an ontology of simultaneity—a spatially privileged ontology. Prior to the Instant is the past and after the Instant is the future. This picture is objective and universal.

But who observes this picture?

> *"… this leads us to surprise the Who that is looking, the identical subject, allegedly placed in the openness of Being, as the crux of a diachronic plot (which remains to be determined) between the same and the other." [Levinas (a), p25].*

In discussing the Absolute nature of space and time, Newton crafts what we might now call thought experiments. In Huggett's citing of Newton, these experiments typically begin with empirical, embodied observers interacting with a physical system, like a rotating bucket or two rotating globes, all within the physical universe of observers, observed system, earth, stars and everything else. He then imaginatively transports the observed system outside of the physical universe into a vacuum that is Absolute space. In his thought experiments, it is unclear where the observers stand in this vacuum, but it seems as if they are imagined to be "outside" of the finite universe which is now the observed system, yet connected spatially to it, and able to interact with it. In some sense, the empirical, embodied observers are continuously transported, *without rupture*, into ideal observers who take in the whole universe at once and as separate from themselves. This is the metaphorical trope of Newton's objectivity. It can be seen as an *effacing* of the physical embodiment of the observer. In this trope, there is the assumption that embodied experience is identical with an ideal observer who can, in some sense, be

outside of the universe, grasping its totality at once. Newton's Absolute space is the medium that enables this identity by connecting the ideal observer to the metaphorically finite (whole, total) universe at an Instant. Newton postulates that an ideal observer grasping the totality of the universe would be embodied in the same substantival space as empirical observers, such as ourselves, who are bound in the physical universe. Or, put another way, Newton's Absolute space is the transcendent continuum that connects embodied empirical existence with ideal observation of totality. Absolute space can play this role because of its indifference to the physical universe. Because, as Newton writes in *Principia Mathematica*, "Absolute space, in its own nature, without relation to anything external, remains always similar and unmovable." [as cited by Huggett, p118].

> *"There is indifference, a purely negative reference, of the system to what comes to pass outside the system. In fact outside the system there takes place the extraordinary event of knowing, which could not affect the system it thematizes. Subjectivity qua knowing is thus subordinated to the sense of objectivity." [Levinas (a), pp131-2]*

Absolute space *functions* in Newton's thinking to bridge ideal totality with empirical experience. Of course, the legitimacy of this movement can be brought into question. For example, Mach has objected on the grounds that it is purely imaginative. Given our discussion so far, we might object on the grounds that it places the empirical observer and the ideal observer in a relation of reciprocal duality. As a counter example to be explored later in this paper, in Special Relativity it may be more reasonable to postulate the transcendent as non-spatial and differently related to the space-time manifold. Here the metaphorical equivalent of Newton's ideal observer must stand outside of the embodied space *and time* manifold in order to grasp a totality to the relativistic universe, if such a metaphor even has meaning[6].

[6] Indeed, I hope this paper suggests that such exteriority is the *meaning* of the absolute nature of light and that this exteriority, which is otherwise than spatiality, invokes a new class of metaphors—language, signification and trace, for example.

> *"The subjectivity of the subject would always consist in effacing itself before being, letting it be by assembling structures into a signification, a global proposition in a said, a great present of synopsis in which being shines with all its radiance." [Levinas (a), p134]*.

With Newton's help, we have here crafted a figure of objectivity as the effacing of the subject in a transcendental perception presented through space either literally or, perhaps, figuratively. But what is the nature of this transcendental perception? Clarke writes, "Sir Isaac Newton doth not say, that space is the organ which God makes use of to perceive things by; nor that he has need of any medium at all whereby to perceive things: but on the contrary, that he, being omnipresent, perceives all things by his immediate presence to them, in all space wherever they are, without the intervention or assistance of any organ or medium whatsoever. In order to make this more intelligible, he illustrates it by a similitude: that as the mind of man, by its immediate presence to the pictures or images of things, form'd in the brain by the means of the organs of sensation, sees those pictures as if they were the things themselves; so God sees all things, by his immediate presence to them; he being actually present to the things themselves, to all things in the universe; as the mind of man is present to all the pictures of things formed in his brain." [excerpted by Huggett, p144].

> *"The veracity of the subject would have no other signification than this effacing before presence, this representation." [Levinas (a), p134]*.

In Newton's metaphysic, the subject, as empirical observer, gives itself over to the system, in this case the physical Universe in Absolute space. As a result, there is no *interiority* to subjectivity. You might recall here a previous citation of Newton, " … so it is no more contradictory that Mind also, according to its kind, can be diffused through space without any thought of its parts". Following Levinas, as an isolated element outside of the totalizing system (embodied subjectivity in Absolute space), Newton's proposed subjectivity is obscured by its *nonsignifyingness* [Levinas (a), p133] and, as Mach has objected, the thought experiments, which involve removing the observing

subject from all context, verge on *meaninglessness*. Pushed further, Newton's metaphysic is faced with an ethical challenge, when Mind manifests *two* observers. For, although one observer might, in some sense, observe the physical universe and all that it contains, in what sense can he observe the observation of the second? In what sense can he know the mind of another? As Levinas re-iterates, the classical route through transcendental (ap)perception is prone to invoking the authority of the same and therefore violating the sanctity of the Other. For Levinas, movement beyond objectivity, which happens through *rupture* in the idea of the Infinite, maintains the same-other alterity.

> *"Eschatology institutes a relation with being beyond the totality or beyond history, and not with being beyond the past and the present. Not with the void that would surround the totality and where one could, arbitrarily, think what ones likes, and thus promote the claims of a subjectivity free as the wind. It is a relationship with a surplus always exterior to the totality, as though the objective totality did not fill out the true measure of being, as though another concept, the concept of infinity, were needed to express this transcendence with regard to totality, non-encompassable within a totality and as primordial as totality." [Levinas (b), p23]*

5. Rupture

Let us return to Newton's Absolute space. Recall that this space is homogeneous and therefore invested with symmetry. However, as Leibniz first pointed out, once the universe is placed within this space, the symmetry is broken, because the placing of the universe is unique. The Universe, for example, is *here* and not *there* in Absolute space. Huggett writes: "Imagine a second universe just like ours except that all the matter is located in (i.e., shifted to) another place in absolute space, without any change in the relations of one object to another. Since space is a Euclidean plane, the two places are exactly alike, and so no differences will be seen."[Huggett, p163]. The two universes would, however, differ in that they are located differently within Absolute space. Broken symmetry (in this case, translational symmetry) specifies a uniqueness in Absolute space, a "here it is" of the universe. For example, the centre of mass of the universe would point

to a specific point in Absolute space, to the *place* where the centre of mass is located[7]. Moreover, as Leibniz deplores, there is no accounting for the spontaneously broken symmetry that places the centre of mass of the universe uniquely "here" in Absolute space and not elsewhere. A priori, the placing of the universe is indeterminate. Absolute space lacks origin.

We are here entering into a structure—a relation between the universe and Absolute space—that is like signification. That is to say, *the question of signification and the question of broken translational symmetry are metaphorically equivalent*. The location of the centre of mass of the universe in Absolute space is like a sign. The centre of mass of the universe is the material thing—like a signifier. It refers, or points, to a signified, namely, a unique position in Absolute space. And the sign-like entity, of which we are speaking here, is indexical. From this, we can build a case for any number of signifiers, like the centre of mass, which refer to positions in space[8]. These positions, or signifieds, in turn constitute the System, which is Absolute space. The signification of the relations, however, remains within the totality of the System. Everything is context dependent, where the context is Absolute space. A part of the structure cannot be isolated and still signify. The position of the centre of mass of the universe only signifies for the universe within Absolute space. As Levinas might say, any indexicality is at the service of the System (the Said).

> *"The intelligibility or systematic structure of the totality would allow the totality to appear and would protect it against any alternation that could come from the look. And this indifference to the subjective look is not ensured in the same way for the terms, the structures, and the system. For a shadow veils the terms taken outside of the relationship in which they are implicated, the relations and the structures taken or surprised outside of the system that locks them in at the moment, when, still isolated or already abstract, they have to search for or rejoin*

[7] Here I am using the "centre of mass of the universe" as a global index—notwithstanding the problems of existence and definition—to manifest the problem of systematic signification. Systematic signification remains within the arena of ontology, unlike *signifyingness*.

> *their system. An order is manifested in which the terms of the structures or the elements of the system hold together as an abstraction is still obscure and, despite its thematization, offers resistance to the light, that is, is not fully objective. A structure is precisely an intellligibility, a rationality or a signification whose terms by themselves do not have any signification (except through the already kerygmatic ideality of language)." [Levinas (a), p113]*

It is perhaps not surprising that we find ourselves trapped within a totalizing System, given that we began with what Newton said, namely: "Space is a disposition of being *qua* being. No being exists or can exist which is not related to space in some way." So far in this paper, we have explored a "transcendence" of the structure (the Universe) while remaining within the System of Absolute space. Where we are headed, however, is towards a transcendence of the totalizing System itself, a transcendence that manifests in *rupture*.

> *To conceive the otherwise than being we must try to articulate the breakup of a fate that reigns in essence, in that its fragments and modalities, despite their diversity, belong to one another, that is, do not escapte the same order, do not escape Order, as though the bits of the thread cut by the Parque were then knotted together again. This effort will look beyond freedom. Freedom, an interruption of the determinism of war and matter, does not escape the fate in essence and takes place in time and in the history which assembles events into an* epos *and synchronizes them, revealing their immanence and their order … The task is to conceive of the possibility of a break out of essence. To go where? Toward what region? To stay on what ontological plane? But the extraction from essence contests the unconditional privilege of the question 'where?'; it signifies a null-site [non-lieu]." [Levinas (a), p8]*

[8] The most interesting one, at least from the point of view of Levinas, is the one that locates the locator, the one that signifies the signifier. The "here I am".

While Levinas ultimately will find transcendence in subjectivity, leading to "Otherwise than Being", we will explore here a narrower aspect, and, with luck, we will encounter otherwise-than-spatiality. To get there, however, we must perform the postmodern trick and de-privilege the System. Following Levinas, we will do this by placing Relation before and prior to spacetime. And this we will attempt to accomplish very concretely.

> *"Space and nature cannot be posited in an initial geometrical and physical impassiveness and then receive from the presence of man, from his desires and passions, a cultural layer that would make them signifying and speaking. If this geometry and physics were at the beginning, the signifying attributes would never have anything but a subjective existence in the head of men, the customs and writings of peoples. Narcissism would then find in the granite of things but a surface that would refer to men the echoes and reflections of their humanity. Never could 'psychological' signification draw the infinite spaces out of their silence. The very presence of man in these spaces, alleged source of the signifying attributes, would be, outside of its strictly geometrical of physico-chemical sense, an interior fact of an absurd being cooked in his own juices. In fact, the impassiveness of space refers to the absolute co-existence, to the conjunction of all the points, being together at all points without any privilege, characteristic of words of a language before the mouth opens. It refers to a universal homogeneity derived from this assembling, from being's nonsubjective essence." [Levinas (a), p81].*

In *Otherwise than Being*, Levinas proposes that, outside of the subject-object correlation depicted in ontologies, infinite responsibility, through the proximity of the Same with the Other, becomes substitution—the one-for-the-other—signifying outside every system and therefore every system of entities and relations. He isolates *signifyingness*, in a radical alterity of the same and the Other, as the pre-original. Prior to any universe, the one-for-the-other in proximity is the condition for possibility. He establishes proximity/substitution as the "matrix of every thematizable relationship", a matrix which does not rest in being [Levinas (a), p136]. This "relation without relation" becomes like

an essentializing paradox, or ambiguity, which allows the being of beings to appear in intelligible structures.

What we are striving to approach is Relation *per se*, outside of any system of entities or relations. This Relation is signifyingness itself, which allows for the possibility of systems of significations—structures, spaces, languages, Saids.

> *" In a system signification is due to the definition of terms by one another in the synchrony of a totality, where the whole is the finality of the elements. It is due to the system of the language on the verge of being spoken. It is in this situation that universal synchrony is effected. In the said, to have meaning is for an element to be in such a way as to turn into references to other elements, and for the others to be evoked by it … The meaning of perception, hunger, sensation, etc. as notions signifies through the correlation of terms in the simultaneity of an linguistic system. It has to be distinguished from the signifyingness of the-one-for-the-other, the psyche that animates perception, hunger and sensation …. This signification in its very signifyingness, outside of every system, before any correlation, is an accord or peace between planes which, as soon as they are thematized, make an irreparable cleavage ... They then mark two Cartesian orders, the body and the soul, which have no common place where they can touch, and no logical* tropos *where they can form a whole. Yet they are in accord prior to thematization, …" [Levinas (a), p70].*

As Levinas warns repeatedly, however, what we are approaching cannot be depicted thematically, because thematization is already embedded in a structure of representations. With this betrayal in mind, suppose we were to continue the thematization of this paper and represent one-for-the-other spatially. We might use the figure of an arrow (Zeno's arrow?) to represent movement from-towards as in the representation of Figure 3.

Figure 3 : Spatial representation of the restlessness inherent in one-for-the-other.

From the figure of the arrow comes the idea of *one entity* in proximity with and substituting for *another entity* as in Figure 4.

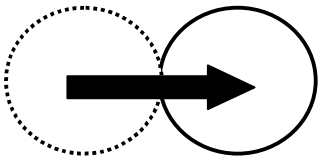


Figure 4 : Spatial representation of proximity/substitution—one circular figure is in proximity and substituting for the other without obtaining co-presence (simultaneity).

Unlike the binary relation underlying spatiality that we discussed earlier and that we likened to the operator AND, here the relation is a dynamic prior to entities. The entities are in proximity by not *spatial contiguous*. The one recedes as the other appears. They are never assembled in a single present. It might be helpful to think of the operator OR in which one entity is presented and then another *in succession*—in succession, but never under the same gaze, never as an assembled totality[9].

> *"It is then not enough to speak of proximity as a relationship between two terms, and as a relationship assured of the simultaneity of these terms … It is both a relation and the term of the relation. But it is as subject to an irreversible relation that the term of the relation becomes subject." [Levinas (a), p85].*

[9] Of course, immediately we bring the two together in our mind, assembled and therefore betraying the radical alterity we are trying to articulate.

The trope that is here figured is diachronous—never identical with itself—like the de-phasing of a moment in time, like a passing without meeting. Proximity is more like an approach than like contiguity, like an approach that overflows itself in substitution. This overflowing leads to irreversibility, such that the two entities are not symmetrically related as would be the case with spatiality.

> *"It is because in an approach, there is inscribed or written the trace of infinity, the trace of a departure, but trace of what is inordinate, does not enter into the present, and inverts the arche into anarchy, that there is forsakeness of the other, obsession by him, responsibility and a self." [Levinas (a), p117]*.

To apply these notions to space-time, let us consider **Light** *in a metaphorical relation of identity to Levinas' idea of one-for-the-other*. That is to say, let us use the concept of Light to concretize an image of proximity/substitution which can then substitute for Levinas' one-for-the-other (signification).

Why Light? Here is where we relinquish Newton's Absolute space and approach Einstein's Special Relativity. In Einstein's theory, Light is privileged in that its speed is universally invariant (for inertial frames), a proposition which is also observed empirically and which has no correlation in Newtonian theory. As Maudlin writes: "The Special Theory can be derived form one central postulate: Law of Light—every ray of light (in a vacuum) has the same speed c, in all inertial frames of reference.
The fundamental feature of the Special Theory is not what it makes relative but what it makes absolute. The speed of light is an invariant quantity under transformations between intertial frames." [Maudlin, pp43-4]. Like with Newton, with Special Relativity (SR) inertial frames move at constant velocity. However, whereas with Newton inertial frames are constructed from Absolute space and time, with SR space and time are constructed relatively from the absolute speed of light. The paradigm shift proposed in this paper involves relinquishing the passivity of an underlying spatiality in favour of the immediacy of light in connecting, for example, source and receiver. Such an immediacy,

for light, is a connector with no time or space interval. What we are attempting is explore the "frame of reference" of light, which, in fact, is not a frame at all, but rather, a restlessness deeper than the passivity of space [non-lieu].

> *Why Light? Here is where we relinquish reliance on classical, spatio-temporal metaphors to approach the transcendence of the idea of the Infinite as "an irreversible divergency from the present, like that of a past that was never present" [Levinas(a), p154]. In the richer structure of special relativity, Light brings forth the possibility of trace as the working of truth.*

The connection offered by light in uniting Levinas' thought with relativity theory has already been explored in some detail by Grandy. From this we extract two key elements.

Substitution — Light allows seeing, but is not seen in itself. That is to say, what we see through light are qualities of distant objects (colour and spatial form, for example) which are revealed by the presence of light. However, we do not directly *see* light itself. In the eyes of the observer, light substitutes for the object. This is the idea of light as the "letting appear which does not itself appear". Grandy writes, " … the otherness or strangeness of light is bound up in its sublime capacity to announce *other* things visibly while itself remaining hidden from view. That hiddenness, moreover, is an openness or clarity that fosters the seeing, knowing experience" [Grandy, paragraph 47].

Proximity — The proximity of light comes from the postulate that the speed of light is invariant for all inertial frames. Stated somewhat obscurely, light has no proper time. While we observe light to travel at the speed c from object to observer, for light there is no passage of time in this movement. In a sense, light is beyond space and time, and, as such, it brings object and observer into proximity—the proximity of light. Grandy writes: "Light, in brief, has no space-time frame; it is an unframed window on the material world, an opening or a clearing in which that world is situated. This idea is made explicit by physical experiments that indicate light's indifference to space and time." [Grandy, paragraph 33].

6. Otherwise than spatiality

In the conceptual move from Newton's Absolute space to the space-time manifold implicit in SR, the first casualty is simultaneity. As Bohm writes: "Simultaneity is no longer an *immediate fact* corresponding to co-presence in our everyday experience. For it is now seen to depend, to a large extent, on a purely *conventional* means of taking into account the time of passage of a signal." [Bohm, p57]. In the Newtonian framework, Absolute space *is* a priori, establishing a container of co-presence or simultaneity, to which we earlier gave ontological status as the Instantaneous Real and from which we deduced concepts such as the State of the universe. In SR, the signalling, *Light*, has a priori status, undermining the absolute character of space. No signal can travel faster than the speed of light. Synchronization of distant events involves a lag, the time taken for a signal to travel from each event, and such a lag necessarily means that simultaneity is relative.

> *"It is then not enough to speak of proximity as a relationship between two terms, and as a relationship assured of the simultaneity of these terms. It is necessary to emphasize the breakup of this synchrony, of this whole, by the difference between the same and the other in the non-indifference of the obsession exercised by the other over the same." [Levinas (a), p85].*

Bohm writes: "… simultaneity is not an absolute quality of events whose significance is independent of the state of movement of the measuring apparatus. Rather the meaning of simultaneity must be understood as being *relative* to the observing instruments, in the sense that the observers carrying out equivalent procedures with equivalently constructed instruments moving at different speeds will ascribe the property of simultaneity to different sets of events" [Bohm, p57]. Put another way, in the Newtonian framework, signalling occurs with *infinite* velocity. Such instantaneous signalling establishes synchronous, simultaneous co-presence and is an essential characteristic of Absolute space. In SR, the speed of light is an absolute upper bound on the speed of signalling. The universe of SR is out-of-phase and signalling is the process through which

coordination can occur. Such coordination is relative to the unique frame of reference of the observer, although *the absolute nature of signalling establishes relationships of transformation between frames of reference*[10].

> *The meaning of this signalling will have to be clarified. Can it preserve a relationship across the break of the diachrony, without, however, restoring to representation this 'deep formerly' as a past that had flowed on, without signifying a 'modification' of the present and thus a commencement, a principle that would be thematizable, and therefore would be the origin of every historical or recallable past? Can it, on the contrary, remain foreign to every present, every representation, and thus signify a past more ancient than every representable origin, a pre-original and anarchical* passed*? The signalling of this pre-original past in the present would not again be an ontological relation. [Levinas (a), p9].*

The relativity of simultaneity similarly de-privileges Absolute or common time. In the Newtonian framework, Time is universal—a linear series of successive instants applying synchronously to all beings in space. Recall Newton's words: "The moment of duration is the same at Rome and at London, on the Earth and on the stars, and throughout all the heavens." *Now* is the common present of all beings.

> *"A linear regressive movement, a retrospective back along the temporal series toward a very remote past, would never be able to reach the absolute diachronous pre-original which cannot be recuperated by memory and history. But it may be that we have to unravel other intrigues of time than that of simple succession of presents" [Levinas (a), p10].*

In SR, there is no single thing, Time, which applies to all frames of reference. Instead, "time" means duration with respect to a particular reference frame. The present *now*, in

[10] The space-time manifold in which these relationships obtain, however, is radically different from Newton's Absolute space and time.

the sense of *at-the-same-time-as*, is local and relative. Stein writes: "… the Einstein-Minkowski structure gives us … *temporal relations*, but no 'time' *simpliciter*. In the context of special relativity, therefore, we cannot think of temporal evolution as the development of the world *in time*, but have to consider instead … the more complicated structure constituted by, so to speak, the 'chronological perspective' of each space-time point." [Stein, p16]

> *"The separation is radical only if each being has its own time, that is, its interiority, if each time is not absorbed into universal time." [Levinas (b), p57].*

In SR, space and time are not absolutely differentiated as they are for Newton. Instead they continuously interpenetrate in a space-time manifold. Relative to any specific inertial reference frame, a space-time articulation, or representation, is possible in which space and time *relative to the frame* are orthogonal. Each frame, however, has its own articulation. The absolute nature of light, combined with the equivalence principle of inertial frames of reference, provide a grammar of transformation relating the space-time articulation in one frame with that of another—an objectivity. There is relativity of space, time, present, past and yet beneath this, what we want to say is, the proximity of light, in a transcendental presenting or passing, makes possible the articulation of any relative frame of reference, makes possible time and space, interior and exterior, subject and object.

> *"Before this anarchy, this beginninglessness, the assembling of being fails. Its essence is undone in signification, in saying beyond being and its time, in the diachrony of transcendence. This transcendence is not convertible into immanence. What is beyond reminiscence, separated by the night of an interval from every present, is a time that does not enter into the unity of transcendental apperception. This book has exposed the signification of subjectivity in the extraordinary everydayness of my responsibility for other men … " [Levinas (a), p140].*

The Minkowski diagram, in Figure 5 below, graphically shows the representation of space-time in a single inertial frame according to SR.

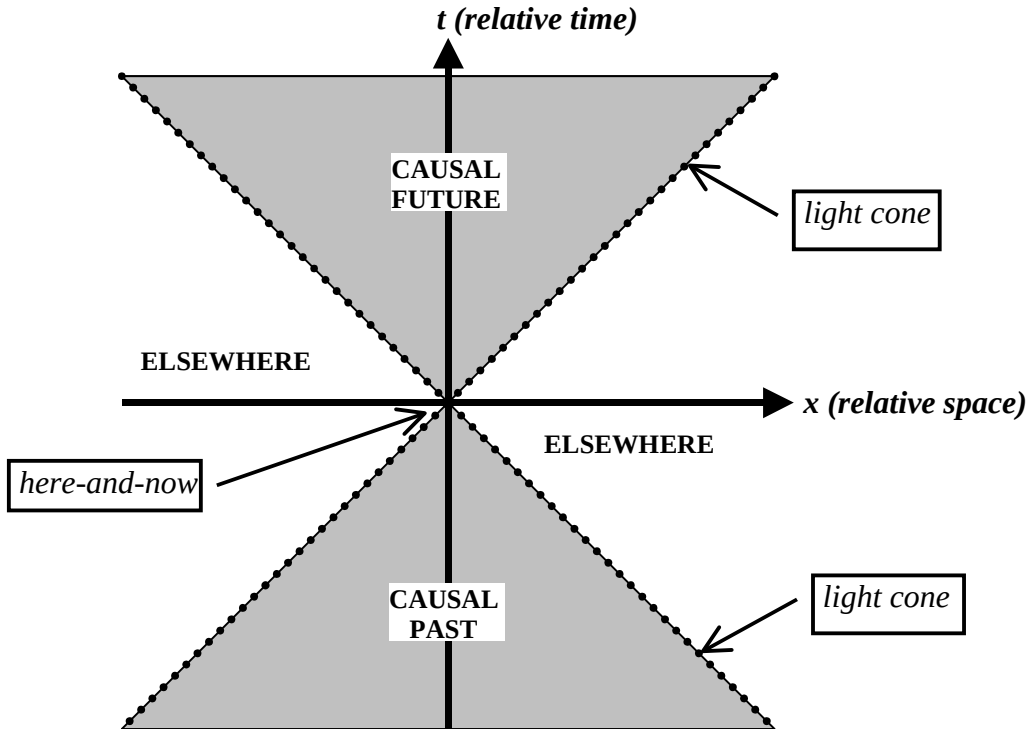


Figure 5 : Special Relativistic Space-Time (Minkowski Diagram).

In this diagram, the origin is the centre of the frame—the local *here-and-now*. The vertical and horizontal lines represent locally constructed time and space coordinates that are mutually orthogonal in the inertial frame. The diagonal lines represent the invariant speed of light. The figure they form is called the *light cone*. The light cone is absolute in the sense that it is independent of any particular observer. The shaded area within the light cone corresponds to all events that are accessible to (are causally connected to) an observer at the local here-and-now. The domain of such events is divided, by the light cone, into the *causal past* and the *causal future* of the local here-and-now. All events that impact the local here-and-now (events in the causal past) and all events that the local here-and-now can impact (events in the causal future) must lie within the light cone. There is also a domain of causal indeterminacy—labelled *Elsewhere* in the diagram—

which is not accessible to the local here-and-now. It is not accessible in the sense that there is no causal signal that can link events in Elsewhere with the origin of the frame. No event in Elsewhere can causally affect the local here-and-now. Such events are non-causal events that can only impact the causal future of the frame, if at all. The local here-and-now cannot causally impact any event in Elsewhere[11].

It may be helpful to consider how the Newtonian space-time frame relates to the SR frame. The Newtonian frame is recaptured in the asymptotic limit that the speed of light becomes infinite. Figure 6 attempts to graphically represent this limiting process[12].

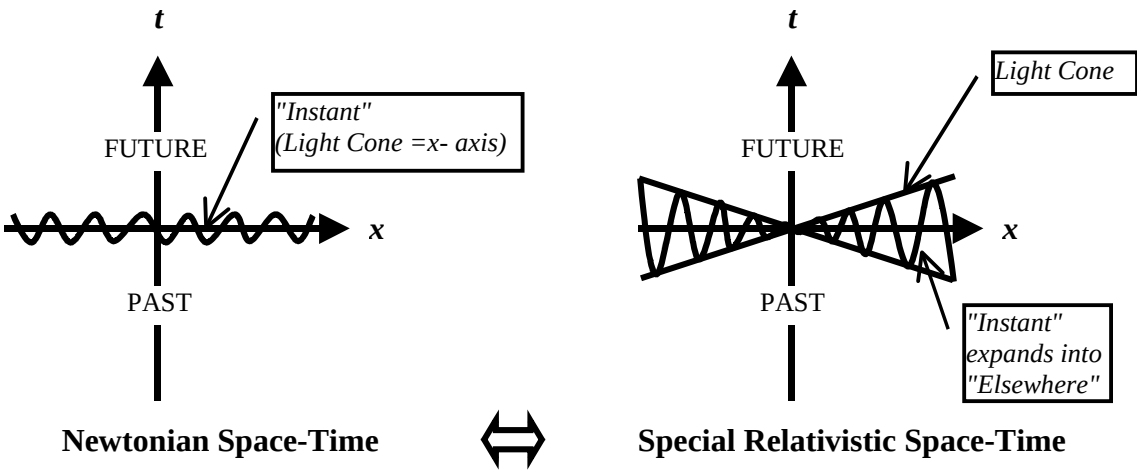


Figure 6 : Comparison of Newtonian and Special Relativistic reference frames with the speed of light as a singular limit.

In the limit that the speed of light becomes infinite, the causal future of the SR frame becomes identical with the Newtonian Future. Likewise, the causal past of the SR frame becomes identical with the Newtonian Past. It therefore seems reasonable to link causal future and causal past with the Newtonian concepts of Future and Past, although interpreted relative to the local here-and-now. On the other hand, the boundary of the

[11] For a more detailed discussion of the Minkowski diagram, see Rindler [p70-1].
[12] An interactive, graphical representation of this limiting process can be found in Salgado.

light cone and Elsewhere (the domain of causal indeterminacy) collapse into the Newtonian Instant—the *Now* of Absolute space. This asymptotic limit is singular. If we consider the opposite transformation (from Newtonian space-time to SR space-time) the Newtonian Instant expands into a domain of causal indeterminacy bounded by the light cone—Elsewhere. Elsewhere is radically other than the Newtonian Instant. It contains events which are neither future (since they cannot be altered by the here-and-now) nor past (since they cannot be shown to have already happened) and yet both future (since they are yet to be manifested) and past (since they may be said to have already happened according to other observers).

Recall that Newton's Instant is infinite co-presence, synchronicity, simultaneity, in Absolute space. What exists, what is real, what *is*, can be located in the Instant—what we have called the Instantaneous Real. For Newton, any inertial frame of reference therefore contains the possibility of ontological completeness in itself, because it partakes of the sameness of Absolute space. In the Newtonian picture, at each instant, observers are connected to the plane of simultaneity, Absolute space—the container of all that is in that instant. The instantaneous State of the universe can be said to have objective existence and an ideal observer is not limited in his capacity to construct complete knowledge of the State of the universe from a local reference frame. Such an ideal observer can be said to exist in Time and so we can speak of the instantaneous State of the universe. Universal totality can be constructed (in some asymptotic limit) from what is causally accessible in a single inertial frame.

In SR, instants are not absolute. Whereas with Newton, the Instant is an infinitesimal boundary between two well-defined states, namely the immediate past and the immediate future, with SR, elsewhere is a spatio-temporal domain of indeterminacy which does not constitute a state or totality in any classical sense. Elsewhere cannot be conceived as a single snapshot or picture and therefore is inaccessible, even in principle, to any "ideal observer" within spacetime. Moreover, spaces of simultaneity, which exist in the Elsewhere, are causally *inaccessible* to the local here-and-now. They are not simply an asymptotic limit of the past as with Newton. They are separated by a gap from the causal

past, a domain of indeterminacy. Elsewhere and spaces of simultaneity are constructions made possible, after the fact of the entire space-time manifold, through the ensemble of observations *from all inertial frames*[13]. Universal totality cannot be accessed from a single inertial frame. To illustrate, Bohm writes, "… projections from our absolute past to our absolute elsewhere are necessarily incomplete. There is … always much that is unknown in our absolute elsewhere; and, for this reason alone, predictions concerning the future will be subject to contingencies, arising from what is unknown at the moment when the prediction is made. Of course, we may come to know about these later (when they will have become a part of our absolute past), but then there will be a new absolute elsewhere, not known at the moment in question. So there will always be that which is unknown … It can be seen that all these considerations arise out of the need to take into account the important fact that *the observer is part of the universe* … As a result, because of the very form these laws of physics, which imply that no physical action can be transmitted faster than light, there are certain limitations on what can be known by such an observer at a given moment" [Bohm, p117]. He goes on to say, "Even if we have some fairly reliable knowledge about the general laws of nature, as abstracted from past experience, observation, and experiment, it seems clear that we cannot avoid contigencies, just because we cannot know completely and with certainty what is in the absolute elsewhere" [Bohm, p176].

> *"Here what is essential is a refusal to allow oneself to be tamed or domesticated by a theme. The movement going 'beyond' loses its own signifyingness and becomes an immanence as soon as logos interpellates, invests, presents and exposes it, whereas its adjacency in proximity is an absolute exteriority. Incommensurable with the present, unassemblable in it, it is always 'already in the past' behind which the present delays, over and beyond the 'now' which this exteriority disturbs or obsesses. This way of passing, disturbing the present … striating with its furrows the clarity of the ostensible, is what we have called a*

[13] For example, it is possible to construct, by convention, a "plane of simultaneity" for the local inertial frame that is orthogonal to the time axis, but this plane is only relatively simultaneous and cannot be interpreted as the boundary of the causal past.

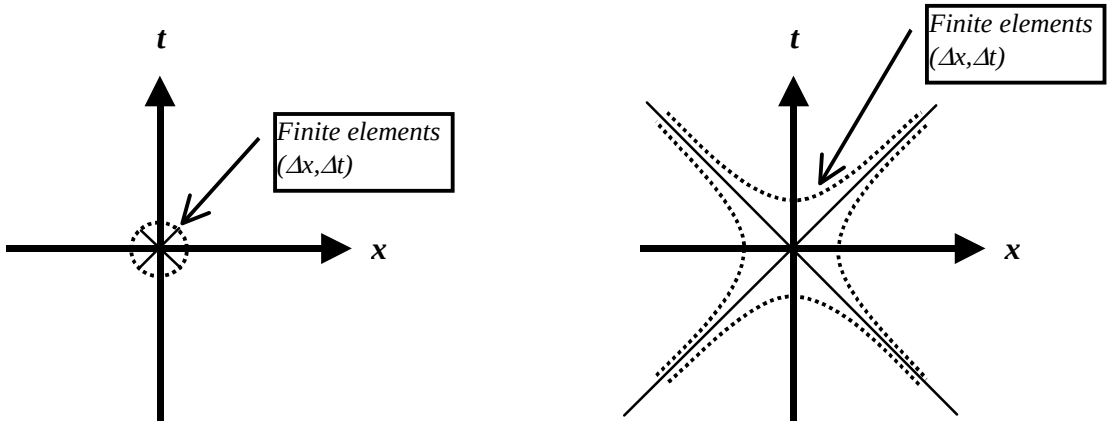
> *trace. Proximity is thus* anarchically *a relationship with a singularity without the mediation of any principle, any ideality." [Levinas (a), p100]*.

With the relinquishment of Newton's Absolute space, the former meaning of co-presence is lost. The question then arises: Within SR, how do we interpret what we see? Suppose, for example, we look out at night into the vast expanse of stars—our so-called physical universe. What are we seeing? We are *not* seeing the universe as it exists "now" in the Newtonian sense of at-the-same-time-as-us. The farther away the stars are, the older they are, because of the time it takes light to reach us. What are we seeing? We are seeing the universe as light presents it to us here-and-now—the edge of the light cone of our causal past. In fact, everything we see is the edge of the light cone, from the stars to the clouds to our fingertips. Light presents the universe to us[14]. In a similar way, light presents us to the universe. The edge of the light cone of the causal future.

Light presents : us and the universe. This is the light cone. Because the speed of light is absolute, the presenting of light partakes of the absolute. We can say that it is objectively real. But it is not like an Absolute spatial simultaneity. The presenting of light in a particular reference frame is different from Newton's Instant. It is only a partial slice of any possible ontology, partial because each local frame *by itself* is ontologically incomplete. There is no accessible ontological totality called "the Universe".

Let us further compare the origins in the Newtonian and SR reference frames of space-time, that is to say, lets us dig deeper into what is meant by here-and-now in the two frameworks.

[14] This "presenting" of light is very different from Absolute space. The co-presence does not occur simultaneously. However, for most phenomena we encounter on earth, the speed of light is so fast that we cannot detect this deviation from "spatiality". See also, Stafford.



Newtonian Space-Time **Special Relativistic Space-Time**

Figure 7 : Comparison of finite elements in Newtonian and SR reference frames.

As shown in Figure 7, For Newton, the origin is well-behaved. A finite element (Δx, Δt) can be uniformly and arbitrarily shrunk to zero. (This property was exploited in limiting procedures discussed in the third section of this paper.) The same is not true of the origin of the SR frame. The relativistic metric constrains the relation between space and time according to the invariant interval, Δs, which relates them.

$$(\Delta s)^2 = (\Delta x)^2 + (\Delta y)^2 + (\Delta z)^2 - c^2(\Delta t)^2 \qquad \textit{Equation}\ (2)$$

In the limit that the interval goes to zero, the finite element (Δx, Δt) *does not shrink to a point*. The origin of the SR frame is singular. The singularity comes from the fact that the speed of light is an asymptote for velocities. Even in the limit of vanishing intervals, the edge of the light cone absolutely divides space-time into causally connected and non-causally connected regions. The origin of the SR frame is not a *point* in space-time in the normal Euclidean sense of a point[15]. Suppose we interpret this as a puncture or gap of space-time. What I want to say is … this gap is a blurring of space-time into a wavelike patterns which comes from the *presenting* of light. It is the hole in space-time that allows

[15] Rindler calls this a grain, which he claims "has no analog in isotropic Euclidean space, but is somewhat reminiscent of crystal structure. Light travels along the grain, and particle world lines have to be within the null cone [Light Cone] at each of their points." [Rindler, p71].

the differentiated observer. It allows an event as momentarily set apart from the rest of the universe, but by virtue of being set apart, comes into a non-causal correlation with the universe through the absolute that is light. It is a hesitation, a flickering, a time for the structure to be packed in. An inertial frame is constructed around such a gap of momentary indeterminacy. This gap structurally brings the local, incompletely specifiable frame into continuous relationship with the "whole", punctured by the absence in the gap. What is represented in the structure of SR is the part in relationship with the momentary whole of which it is a part. And in the moment, the whole pushes the part, as it were, from the causal past to the causal future. In SR, we move beyond ontology; we move beyond a rigid body concept of correlation (Absolute space) to a concept built from the inter-dependence of the event of being-in-the-moment with Being—correlation as the momentary connection of the part with the whole. But all of space-time is filled with such punctures. And the "whole" is the ensemble of punctures. Light, then, produces a foam or crystal of interpenetrating light cones which allows the space-time structure to be. The space-time manifold itself becomes a web, or matrix, of contingencies, where all point-events have equal "reality" status (whether in the local past, present or future)—as argued by Putnam for example [Putnam, p240-7]—but where, I would like to suggest, this status in no longer an ontology, but rather *possibility*. Light becomes the Transcendent, replacing Newton's Absolute space. But the Transcendence of light is a frame of no space and no time—a *non-lieu* that establishes a structure of embedded contingencies for any possible world.

> *"A gaping open of an abyss in proximity, the infinite which blinks, refusing speculative audacities, is distinguishable from pure and simple nothingness by the committing of the neighbour to my responsibility." [Levinas (a), p93]*.

Precisely this prior initiative—this trace—brings forth world, subject and object. And in this light, truth obtains through the grammar of transformations between local frames of reference. "It is seen then that while relativity theory does emphasize the special role of each observer in a way that is different from what is done in earlier theories, it does not thereby fall into a kind of 'subjectivism' that would make physics refer only to what such

an observer finds convenient or chooses to think. Rather, its emphasis is on the hitherto almost ignored *fact* that each observer does have an inherent perspective, making his point of view in some way unique. But the recognition of this unique perspective serves, as it were, to clear the ground for a more realistic approach to finding out what is actually invariant and not dependent on the perspective of the observer." [Bohm, pp183-4].

> *"But in the totality of being temporally getting out of phase, which alone could be sufficient for truth, would the totality, diverging from itself, go 'beyond totality'? Yet totality should not leave anything outside. Then the transcendence of the totality thematized in truth is produced as a division of the totality into parts. How can these parts still be equivalent to the whole, as is implied when exposition is truth? By reflecting the whole. The whole is reflected in a part as an image. Truth then would be produced in the images of being. It is nonetheless true that time and reminiscence and the astonishing diastasis of identity and its rediscoveries, by which essence 'puts in its time' of being essence, is beyond essence and truth, even if in understanding and expounding it we say that they* are *beyond essence, that is, that beyond essence* they are. *Beyond essence, signification, an excluded middle between being and non-being, signifies." [Levinas (a), p29].*

What I will have wanted to have offered to you is an exploration of spacetime which does not lead to an ontology in the classical sense, but rather to a web of contingencies—the possibility of world and existence. And that the trope is otherwise than spatiality—a trace—which is light, word, inter-subjectivity.

> *"The tropes of ethical language are found to be adequate for certain structures of the description … then ethical language succeeds in expressing the paradox in which phenomenology finds itself abruptly thrown." [Levinas (a), pp120-1].*

APPENDIX : Epilogue

With Newton's Absolute space, the Universe is situated in a passive background, or container, which provides the structural framework for analysis, division, differentiation. Wholes are constructed entirely from their parts and the theoretical challenge is to understand how the state is animated—how change comes about—within this background passivity. How, for example, does the arrow move in Zeno's thought experiment?

Relinquishing Newton's Absolute space, the proximity of light places movement before stasis. Light is signifyingness, process, change. Through light, a web of contigencies, prior to any being or existence, interweaves the possibility of each for the other. Process animates existence and the theoretical challenge is to understand how anything becomes "fixed"—how does stasis and identity come about—within this background of change. How, for example, does the space-time manifold manifest around the moving arrow of light?

> *"Consciousness is born as the presence of a third party … Order, appearing, phenomenality, being are produced in signification, in proximity, starting with the third party. The apparition of a third party is the very origin of appearing, that is, the very origin of an origin." [Levinas (a), p160]*

Following Levinas, to arrive at the space-time manifold of SR [the Said], we consider three in proximity: 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. What we are attempting here is to move beyond the representation of space-time in terms of purely binary relations. We are attempting to introduce an irreducibly threefold relation[16]. We will represent the three in proximity by the triangular figure in Figure 8.

[16] We are trying to move beyond the differential operator of modern analysis, which tames Zeno's Dichotomy, to an Otherwise -- a different weaving of spacetime -- which re-invigorates Zeno's Arrow.

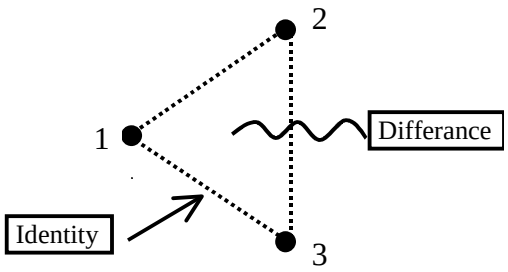


Figure 8 : Graphical representation of Three in proximity.

The paradox of the three is that if we establish one as the same (say the vertex marked 1 in the figure above) then, while 1 is in a relation of proximity with 2 and 3 (which we will call identity), the proximity between 2 and 3 is inaccessible to 1. This inaccessible proximity we will call ***Differance***[17]. The movement from 1 to 2 and back to 1 is *different* from the movement from 1 to 2 to 3 and back to 1. Differance is like a cut through the empty space on the paper. We are in the domain of *sameness* until the cut is traversed at which time *difference* emerges[18]. The triangle and the numbering become a guide to manifest differance, which is the proximity of the Other with the Third Party as experienced by the Same. Figure 9 shows the essence of this relatedness.

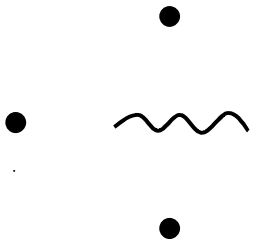


Figure 9 : Threefold relatedness.

[17] I am using a term intended to bring to mind Derrida's différance [Derrida, Caputo]
[18] Differance may be like a branch cut in the theory of complex variables.

Returning to our original triangular figure, we recall that traversing the loop 1-2-3-1 can be distinguished from the movements 1-2-1 and 1-3-1. In traversing the loop there is a loss of proximity and a return. We can distinguish a difference in the return, which we will call *iterability*. The return is to the same, which is different. Like an image or an echo or a reflection, as shown in Figure 10 below.

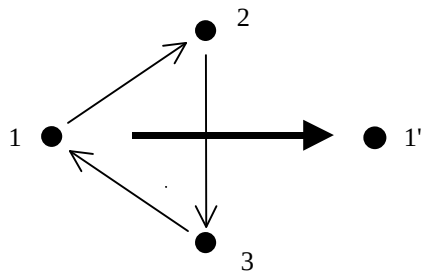


Figure 10 : Graphical representation of how iterability produces image

Through iterability, the same points, or substitutes for, its image, which brings identity in Differance. We represent this substitution by an arrow pointing from the Same to the *Other-of-the-Same*. Now, let us return to the triangular configuration, this time with the Other as an image of the Same (the other-of-the-same). We use arrows to show the substitution of the Same for the Other and for the Third Party. For the Same (1), the Other (1') and the Third Party (1'') are equivalent, so the arrows can point in both directions as in Figure 11 below. (That is to say, 1-1'-1''-1 is equivalent to 1-1''-1'-1)

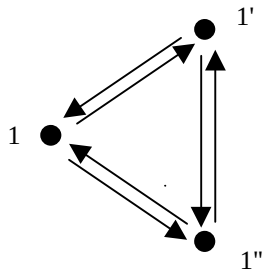


Figure 11 : Graphical representation of substitution among threefold images.

Now we see the emergence of an *undecidability*. The Same (1) substitutes for an Other (say 1'), but then the Other can substitute back and forth with the Third Party (1'') any number of times before returning to the Same (1). This back-and-forth movement in the inaccessible proximity of the Other and the Third Party is like a *resonance*. Resonance, like a gap or a hollow, occurs in the Differance.

Let us stop to reflect. Based on the paradoxical proximity of three, we have (postulated? suggested?) *iteration*, *resonance* and *undecidability*.

Iteration is the circular movement around the three, which returns through Differance to a different same. Iteration is particular. There is change in the loss and return of proximity, which we postulate as temporal, as in Figure 12.

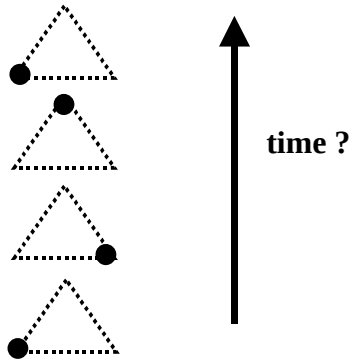


Figure 12 : The temporal nature of iteration

Resonance is equalizing, the identity in Differance through back-and-forth. Unlike the particularity of iteration, resonance is "whole" (synchronous?), the same difference, which we postulate as spatial, as in Figure 13.

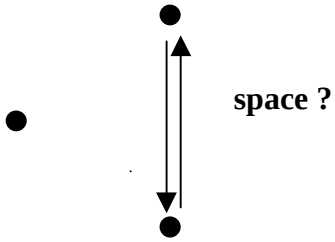


Figure 13 : The spatial nature of resonance.

Undecidability brings determination, as fixed patterns, and correlation, as connections (jumps?) between fixed patterns. For example, we can postulate the infinite iterability of return, which we will call $(Dt)^2$. This return is an infinite repetition of sequential substitution around the triangle, which will we represent by a circle as in Figure 14.

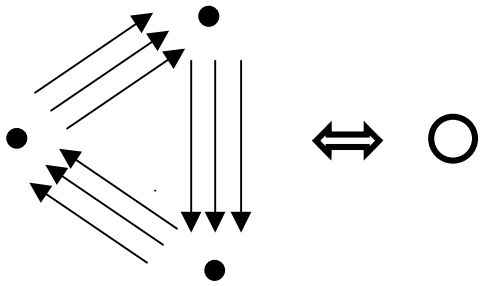


Figure 14 : Return as infinite iterability

Likewise, the infinite back-and-forth of resonance brings a connector between two points, which we will call $(Dx)^2$ and represent by a solid line. This connector is like the binary relation discussed in the third section of the paper. There are three different resonances corresponding to proximity between the Same, the Other and the Third Party, which we will label as $(Dx)^2$, $(Dy)^2$ and $(Dz)^2$ as in Figure 15.

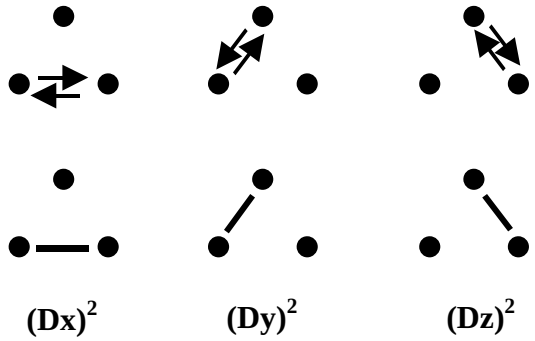


Figure 15 : Connector as infinite resonance

Notice, however, that each of the connectors is in proximity with the others by virtue of the third. (To understand this, imagine an infinite resonance $(Dx)^2$, between 1 and 2 followed by a *finite* set of iterations around the triangle ending at 2, and then a infinite resonance $(Dy)^2$ between 2 and 3, and so on around the triangle). This brings forth the

proximity of $(Dx)^2$, $(Dy)^2$, and $(Dz)^2$ as a difference in sameness that we can represent by a *three* dimensional orthogonal system. Here the three dimensionality is not arbitrary, but is a consequence of the three-fold nature of the Same, the Other and the Third Party as shown in Figure 16.

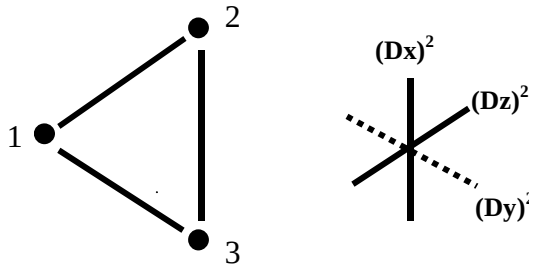


Figure 16 : Three dimensional spatial system of connectors

We can see measure in the system by a renormalization (a "finite-infinite" ?) in which we arbitrarily consider a complete iteration of fixed resonances around the triangle to be a constant (say, L^2).

$$(Dx)^2 + (Dy)^2 + (Dz)^2 = L^2 \qquad \textit{Equation (3)}$$

L^2 is an indicator of the magnitude of the resonance. We can postulate different strengths of resonance in terms of L^2, leading to a Cartesian coordinate system.

Now we combine our spatial system, with our temporal system. That is, we replace the points in our triangle with circles representing infinite iteration $(Dt)^2$ as in Figure 17 (Can this represent presence?).

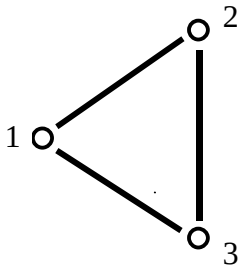


Figure 17 : Light Cone

We consider the following two ways to complete a loop, which we 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 represent this equivalence as:

$$(Dx)^2 + (Dy)^2 + (Dz)^2 = c^2 (Dt)^2 \qquad \textit{Equation (4)}$$

where c is a constant. In our Cartesian system, might this represent a light cone, where c represents the speed of light[19]?

We will stop here, noting that there is much more that might be discovered in this Said. We also note that there is a great deal of arbitrariness in the way we have worked with the

[19] Field has presented an interesting derivation of special relativity from a symmetry principle which he calls "space-time exchange invariance". Space-time exchange invariance involves the operation of substituting any of the three orthogonal spatial coordinates with the temporal variable, suitably normalized by the speed of light. Field writes: "the symmetry condition that restates the Special Relativity Principle is … the equations describing the laws of physics are invariant with respect to the exchange of space and time coordinates, or, more generally, to the exchange of the spatial and temporal components of four vectors." [Field, p569].

figures above, and it is not clear yet if we have arrived at anything beyond our own projections onto the figuring itself.

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