

## Exclusive Disjunctivism – Presentness without Simultaneity in Special Relativity

(Early Draft)

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### Abstract

A-theoretic presentness is commonly regarded as non-solipsist and non-relative. The non-solipsism of a non-relative, A-theoretic presentness requires at least two space-like separated things to be present *simpliciter* together – this co-presentness further implies the global, non-relative, non-conventional simultaneity of them. Yet, this implication clashes with the general view that there is no global, non-relative, non-conventional simultaneity in Minkowski space-time. In order to resolve this conflict, this paper explores the possibility that the non-solipsism of a non-relative, A-theoretic presentness does not require at least two space-like separated things to be present *simpliciter* together. This can be done by holding *exclusive disjunctivism* – that mutually space-like separated things are present *simpliciter* exclusively disjunctively, and each one of them gets to be present *simpliciter* in a *non-successive* way (just like mutually time-like related things are present *simpliciter* exclusively disjunctively, and each one of them gets to be present *simpliciter*, but in a *successive* way).

**Keywords:** presentness, temporal passage, special relativity, Minkowski space-time, simultaneity, tense, A-facts, A-theory, B-theory

## 1 Preliminaries

*Hardcore* A-theories share a central idea: certain facts, such as “you are *now* reading this sentence,” are temporary and non-relative to a time or an event etc.<sup>1</sup> These non-relative, temporary facts, if any, are not supervenient upon eternal facts such as “you read this sentence sometime after 2015.” Hence, a general form of hardcore A-theories is this:

**The A-Theory:** There are non-supervenient *A-facts*, which are non-relative and temporary.<sup>2</sup>

An understanding of A-facts, which I think yields the best formulation of the concerns of this paper, is to think that the essential constituents of non-supervenient A-facts are monadic, temporary *A-properties* (while the exemplification of A-properties itself remains neutral, i.e., tenseless).<sup>3</sup> A-properties include presentness, pastness, futurity, derived properties such as being 10 days from now, and the underlying properties such as being lit by the moving spotlight, etc.<sup>4</sup> Among A-properties, presentness is deemed by most A-theories metaphysically special and privileged, and, thus, past, present, and future things don’t have equal metaphysical status.<sup>5</sup> A-properties are applicable to *things*, including *events* (regarded as either temporally

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<sup>1</sup> This characterization of A-theories is borrowed from Zimmerman (2005: 433) and Skow (2012: 223).

<sup>2</sup> For any instant, the states of affairs such as “you *have* read this footnote,” “you are *now* reading the footnote,” and “you *will* read the footnote,” cannot obtain all together, because A-facts obtain temporarily. Hence, McTaggart’s paradox doesn’t arise (but, unfortunately, this shall be explained elsewhere).

<sup>3</sup> On a par with many philosophers of time, this paper takes *events* to be *particulars*, assumes “truth-maker theory,” and adopts a “standard view of facts,” which holds that a *fact*, being an obtaining state of affairs, consists of objects and the properties or relations the objects (tenselessly) exemplify. However, the paper can be reformulated under different assumptions without hurting its points.

<sup>4</sup> A property like “being 10 days from now” is grounded in an A-property, presentness, without any relation to a particular time or event, so it is also an A-property.

<sup>5</sup> Advocates of the A-theory can further assert one of the followings: presentism (holding that *only* present things exist), or growing block theory (holding that *both* present and past things exist), or eternalism (holding that *all* future, present, and past things exist). For the sake of convenience, this paper is composed as if eternalism is correct, but no serious commitment to eternalism has to be made after all.

non-extended or, more precisely, instantaneous parts of temporally extended events), or *objects* that are located at a particular space-time point, or even substantialist times or *space-time points* (depending on one's ontology of space-time points). Hence, a general form of a non-supervenient A-fact about a thing, *e*, is this: *e* is present *simpliciter*.

Presentness or the now's moving is commonly thought to be non-solipsist and non-relative (i.e., not dependent on a frame of reference). Events happening to me or on my world-line are not the only things that get to be present *simpliciter*, and all what there presently is does not vary according to perspective. This common idea of non-solipsist, non-relative presentness is naturally taken as assuming a classical notion of simultaneity – global, non-relative, non-conventional simultaneity. However, A-theories, while in accordance with our everyday conception of time, have been challenged by the widely agreed idea that there is no global, non-relative, non-conventional simultaneity in Minkowski space-time.<sup>6</sup> This challenge can be formulized as follows:

- |                         |   |
|-------------------------|---|
| <b>(Objectivity)</b>    | A-theoretic presentness is non-solipsist and non-relative.  |
| <b>(Co-Presentness)</b> | Non-solipsist, non-relative, A-theoretic presentness requires at least two space-like separated things to be present <i>simpliciter</i> together. |
| <b>(Link)</b>           | Non-relative, A-theoretic co-presentness of two space-like separated things implies their global, non-relative, non-conventional simultaneity.    |

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<sup>6</sup> The distant simultaneity in question is the one that holds between *space-like* separated things. Hence, light-like relations, which constitute light cone structure, are excluded.

**(Lack)** There is no global, non-relative, non-conventional simultaneity in Minkowski space-time.

Following from **(Objectivity)** and **(Co-Presentness)**, there must be at least two distinct obtaining A-facts such as “ $e_1$  is present *simpliciter*” and “ $e_2$  is present *simpliciter*,” where  $e_1$  and  $e_2$  are space-like separated things. According to **(Link)**, if  $e_1$  is present *simpliciter* and  $e_2$  is present *simpliciter*, then  $e_1$  and  $e_2$  are non-relatively, non-conventionally simultaneous. Further with **(Lack)**, it follows from the three principles that there is no A-theoretic presentness in Minkowski space-time. This argument has led many to advocate B-theories of time, which can be generalized as follows:

**The B-Theory:** There are *no* non-supervenient A-facts.

For B-theorists, all fundamental facts are *B-facts*, which are eternal or atemporal. (I shall henceforth simply use “A-facts” as shorthand for non-supervenient A-facts.)

There have been attempts in the literature to defend presentness or temporal passage against lines of thoughts similar to the one formulated above. Some refute **(Objectivity)** by holding a *local* notion of presentness – these include, for example, Stein (1968, 1991), Dieks (1988, 2006), Clifton and Hogarth’s (1995), Arthur (2006), Savitt (2009), and, arguably, Skow (2009) and Pooley (2013). Some refute **(Objectivity)** by holding a *relativist* notion of presentness – these include, for example, McCall (1994), Dolev (2006), and, arguably, Fine (2006). Others refute **(Lack)** by adding or privileging a foliation – these include, for example, Bourne (2006); Zimmerman (2011), Rakić (1997), Peacock (2006), Forrest (2008), and Brogaard

& Marlow (2013).<sup>7</sup> This list does not exhaust all attempts there are. However, there hasn't been one that challenges **(Co-Presentness)**.

While refuting **(Co-Presentness)** may seem bold, this paper merely serves as an initial attempt to see whether or how it is possible. Hence, whether this approach is better than others on the table will not be covered in this paper. If **(Co-Presentness)** is blocked, then there can be non-solipsist, non-relative, A-theoretic presentness without there being global, non-relative, non-conventional simultaneity – i.e., **(Link)** has no effect here. Hence, the potential clash of non-solipsist, non-relative, A-theoretic presentness with **(Lack)** doesn't arise. In the next section, I show how it is possible that a non-relative, A-theoretic presentness can be both non-solipsist and not requiring that at least two space-like separated things are present *simpliciter* together.

## 2 Exclusive Disjunctivism

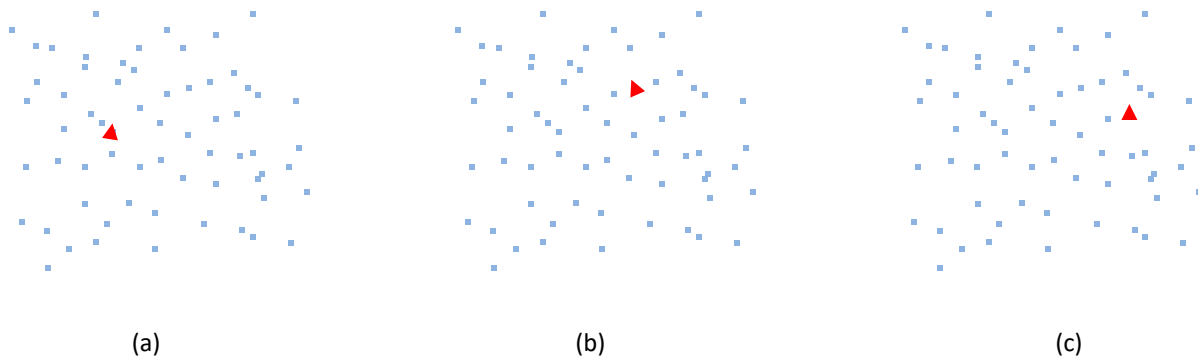
Simply put, **exclusive disjunctivism** (or **now-hereism**) maintains that although, according to non-solipsism, many mutually space-like separated things are present *simpliciter*, they are so *exclusively disjunctively*. That is, exclusive disjunctivism maintains that non-solipsism requires only (ED):

(ED) Mutually space-like separated things are present *simpliciter exclusively disjunctively*.

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<sup>7</sup> The additional foliations or hyperplanes in space-time is not considered as intrinsic space-time structures and are to be accounted for by certain laws rather than the Minkowski metric.

For example, supposing that  $e_1$  and  $e_2$  are two space-like separated things, (ED) says that  $e_1$  is present *simpliciter* or  $e_2$  is present *simpliciter* exclusively, without any unconditional commitment to which disjunct is the case. If (ED) holds, then no two or more space-like separated things are present *simpliciter together*. Hence there is no common ground for a global, non-relative, non-conventional simultaneity. (Moreover, there is also no common ground for *presentness-A-facts* – which are shorthand for the A-facts about which things are present *simpliciter* – about spatially non-local things. This way the epistemic problem – that *exactly* which space-like distant things are present *simpliciter* given that there is no causal connectibility between them and us – doesn't arise at all.)



**Figure 1. Exclusive disjunctivism:** (a), (b), and (c) together represent that many mutually space-like separated things are present *simpliciter exclusively disjunctively*. This figure has three dimensions (one vertical, temporal dimension and two horizontal, spatial dimensions), illustrating objects in 4D space-time, wherein (1) red arrowheads represent what is present *simpliciter*, and (2) scattered dots represent space-time points (non-exhaustively).

It may seem puzzling what the exclusive disjunction in (ED) amounts to. Below is how (ED) can be spelled out:

(ED1) Presentness-A-facts obtain *temporarily* as well as *spatially-locally*.

In other words, the obtainment of presentness-A-facts is restricted not only to a time but also to a place. For example, I read Stein's 'On Einstein-Minkowski Space-Time' some time in 2015, but if/when me-2016's writing this paper happens to be present *simpliciter*, there obtains no such A-fact as "me-2015's reading Stein's 'On Einstein-Minkowski Space-Time' is present *simpliciter*" – this is what it is for presentness-A-facts to obtain temporarily. Likewise, Curiosity-2016's processing something on Mars is space-like related to me-2016's writing this paper, but if/where Curiosity-2016's processing something on Mars happens to be present *simpliciter*, there obtains no such A-fact as "me-2016's writing this paper is present *simpliciter*" – this is what it is for presentness-A-facts to obtain spatially-locally. In sum, it follows from the two restrictions of the obtainment of presentness-A-facts that if a thing is present *simpliciter*, everything that is not co-located, whether inside its past or future light cones or outside both, cannot be present *simpliciter*. Hence, it cannot be the case that two particular, space-like separated things are both present *simpliciter*.

However, can exclusive disjunctivism preserve a sense of non-solipsism for presentness? There are two ways in which presentness is alleged to be non-solipsist: the time-like and the space-like.

In the time-like case, *each* member of a collection of mutually time-like related things (e.g., each thing on a world-line) gets to be present *simpliciter* temporarily in a *successive* way (i.e., in a one-dimensional order and arguably in one particular direction), and thereby establishes a temporal flow. For example, suppose that there are three mutually time-like related events, *p*, *q*, and *r*, where *p* is my starting the car, *q* is my driving at 40 mph shortly, and *r* is my arriving

home. If/when  $p$  is present *simpliciter*, there obtains no such A-fact as “ $q$  is present *simpliciter*” or “ $r$  is present *simpliciter*.” The same holds for  $q$  and  $r$ . In addition, each one of  $p$ ,  $q$ , and  $r$  gets to be present *simpliciter* temporarily: firstly  $p$  gets to be present *simpliciter* temporarily, secondly  $q$ , and lastly  $r$ . That is, in the time-like case, (1) reduces to (2) or (3) or (4) successively; or alternatively, (2), (3), or (4) is the case successively:

- (1) P (i.e.,  $p$  is present *simpliciter*), or Q (i.e.,  $q$  is present *simpliciter*), or R (i.e.,  $r$  is present *simpliciter*) obtains exclusively.
- (2) P obtains, but Q and R don't.
- (3) Q obtains, but P and R don't.
- (4) R obtains, but P and Q don't.

Given the above way of non-solipsism, hence, in the space-like case, exclusive disjunctivism can preserve non-solipsism for presentness in such a way:

- (ED2) Each member of a collection of mutually space-like related things gets to be present *simpliciter* spatially-locally in a *non-successive* way, and thereby lack temporality. (Note that there is no unique assignment of mutually space-like related things for such collection.)

Consider, for example, three mutually space-like related events,  $x$ ,  $y$ , and  $z$ , where  $x$  is my taking a nap in my armchair,  $y$  is a cruise's docking at Port of Miami, and  $z$  is Curiosity's exploring on Mars. If/where  $x$  is present *simpliciter*, there obtains no such A-fact as “ $y$  is present *simpliciter*” or “ $z$  is present *simpliciter*.” The same holds for  $y$  and  $z$ . Just like each one of  $p$ ,  $q$ , and  $r$  gets to be present *simpliciter* temporarily, each one of  $x$ ,  $y$ , and  $z$  gets to be present *simpliciter* spatial-



locally, only that the successive obtainment of presentness-A-facts is lacking in the space-like case – the obtainment here is merely exclusively disjunctive. That is, (5) reduces to (6) or (7) or (8) non-successively; or alternatively, (6), (7), or (8) is the case non-successively:

- (5) X (i.e., x is present *simpliciter*), or Y (i.e., y is present *simpliciter*), or Z (i.e., z is present *simpliciter*) obtains exclusively.
- (6) X obtains, but Y and Z don't.
- (7) Y obtains, but X and Z don't.
- (8) Z obtains, but X and Y don't.

Spatiality, according to exclusive disjunctivism, is distinguished from temporality in the following respect. Since, in the time-like case, *each* member of a collection of mutually time-like related things gets to be present *simpliciter* temporarily in a *successive* way (i.e., in a one-dimensional order and arguably in one particular direction), we can determine a minimal sense of when a member, say *q*, of a collection of *p*, *q*, and *r* is present *simpliciter*: before *r* and after *p* (where *p*, *q*, and *r* are time-like ordered). In the space-like case, however, such successive acquisition of presentness *simpliciter* is lacking – i.e., the presentness-A-facts obtain without any specific order or direction. Hence, a minimal sense of temporality – a before-after series – cannot be established in the space-like case. The question of “when (in the minimal sense)” a member, say *y*, of a collection of *x*, *y*, and *z* is present *simpliciter* is inadequate (where *x*, *y*, and *z* are space-like related), because there is no before-after relationship among them. In other words, the obtainment shift in the space-like case does not occur in time. Rather, the correct question is “where” a member, say *y*, of a collection of *x*, *y*, and *z* is present *simpliciter*. And the

answer is where it is relatively located (at a spatiotemporal location in relation to other things). This answer is akin to that in the time-like case (e.g.,  $q$  is present *simpliciter* before  $r$  and after  $p$ ) – it is when  $q$  is relatively located. The difference between the two types of cases is only that in the space-like case, relative locations cannot be expressed in terms of before-after relations.

On the account of exclusive disjunctivism, spatiality is distinguished from temporality also in the following regard. Considering the above example, if  $q$  happens to be present *simpliciter*, then  $p$  is, though not present, past *simpliciter* and  $r$  is, though not present, future *simpliciter*, because  $p$  and  $r$  are in the past or future light cones of  $q$ . That is, although no presentness-A-facts obtain about  $p$  and  $r$  when there obtains a presentness-A-fact about  $q$ , a pastness-A-fact and a futurity-A-fact do obtain about  $p$  and  $r$  respectively. By contrast, the same does not hold for space-like non-local things: if  $y$  happens to be present *simpliciter*, then both  $x$  and  $z$  not only aren't present *simpliciter* but also aren't past *simpliciter* or future *simpliciter*, because neither  $x$  nor  $z$  is in the past or future light cones of  $y$  or, supposedly, of any other thing that is present *simpliciter*. That is, when there obtains presentness-A-fact about  $y$ , no A-facts at all obtain about  $x$  and  $z$ . In sum,

(ED3) if a thing happens to be present *simpliciter*, then there are A-facts of the matter about the A-properties of its time-like related things, but there just are *no* A-facts of the matter about the A-properties of its space-like related things.

Unlike what is shown in (ED2), world-lines are metaphysically special: they are where presentness-A-facts obtain successively. And then (ED3) makes a world-line like an independent A-theoretic world on top of the whole B-theoretic universe: a present thing comes with A-facts

about the A-properties of everything on its world-line, but there just are *no* A-facts of the matter about the A-properties of its space-like related things.

### 3 Conclusion

All in all, exclusive disjunctivism allows a non-solipsist, non-relative, A-theoretic presentness without simultaneity. Firstly, there is a non-solipsist, A-theoretic presentness because, according to (ED), *two or more* mutually space-like separated things are present *simpliciter* exclusively disjunctively. In other words, this non-solipsist presentness is metaphysically equal, because it is not just me but also many space-like distant things that get to be present *simpliciter* (according to (ED)). Secondly, (ED) does not challenge (**Objectivity**) in holding that A-theoretic presentness is non-relative. Lastly, there is no global, non-relative, non-conventional simultaneity that can be grounded in such non-solipsist, non-relative, A-theoretic presentness, because, according to (ED), there is no co-presentness of mutually space-like separated things, or alternatively according to (ED3), there just are *no* A-facts of the matter about space-like non-local things. Hence, the potential clash of non-solipsist, non-relative, A-theoretic presentness with Minkowski space-time doesn't arise.

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