Two-Dimensional Time

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Abstract

Philosophical views about the logical structure of time are typically divided between proponents of A and B theories, based on McTaggart's A and B series. Drawing on Paul Ricoeur's hermeneutic phenomenology, I develop and defend McTaggart's thesis that the C series and the A series working together give a consistent description of temporal experience, provided that the two series are regarded as distinct dimensions internal to time. In the proposed two-dimensional model, the C series expresses a nesting order of the constitutive states of a world, whereas ontological continuity and change are properties of the A series. This, I argue, allows for limited backward causation.

Keywords

1. Introduction

Since the publication of "The Unreality of Time" (McTaggart 1908) the debate about the logical structure of time was dominated by two vocal camps, one maintaining that time can be fully explained in terms of the A series (*future*, *present*, *past*), the other advocating the explanatory primacy of the B series (*before*, *after*), notwithstanding the lack of consensus on whether and how the A series and the B series overlap in their logical properties. Little attention was given to the C series ($a \subset b \subset c$ ...), signifying a nesting order (*included in*, *inclusive of*)[1], which McTaggart combined with the A series to give a logically complete description of time: "the A series, together with the C series, is sufficient to give us time." (1908, 463) McTaggart has promptly rejected this combination of series, believing that "the application of the A series to reality involves a contradiction" (1908, 470), but I will argue there are good reasons to accept his hypothetical schema, provided that the C series and the A series are treated as distinct dimensions internal to time.

A parallel but somewhat disconnected development of time-theory took place among proponents of hermeneutic phenomenology, led by Paul Ricoeur and Hayden White, attempting to understand time in terms of episodic and configurational dimensions associated with the process of communication and exemplified in the construction of narratives. I will attempt to show that hermeneutic phenomenology gives support to McTaggart's controversial view. I will then examine some phenomenological aspects of temporal experience and defend a new, two-dimensional formulation of the C+A schema against one-dimensional models and other combinations of McTaggart's series.

2. Two Dimensions of Time

It is a fundamental postulate of science that causes precede their effects. Nevertheless, "In all sciences, the ordinary approach is from the effects to the causes. The effect raises the problem (...) and the scientist tries to solve it by constructing an explanatory hypothesis." (Popper 1979, 115) This occurs in such a way

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[1] McTaggart (1908, 462) initially defined the C series as "not temporal, for it involves no change but only an order" and "while it determines the order [it] does not determine the direction." Later he adds: "Of any two terms in the C series, one is included in the other, which includes the first, and by means of these relations all the terms can be arranged in one definite order." (1927, §566) He subsequently argued that the C series based on the logic of inclusion has an intrinsic direction, but I will contest this conclusion.

that the identity of events or states of the past may be subject to future revisions. Such retroactive changes are then rationalised as corrections of past errors of identification, but this does not fully reinstate temporal consistency. A scientific view of the past may endure unchanged in regard to its theoretic content, but its relations and therefore identity may be retroactively altered by the shifting context of the present. Another way, the concepts we use to describe the past may be nominally, linguistically or formally identical to those we held in the past, but how those enduring concepts relate to the concepts developed later may alter their historical meaning. On this view, identity is not a fixed reference, not an invariant given, but is mind-dependent insofar as it must be meaningful in order to be anything at all. Without a framework of conscious identification the past has no temporal identity, therefore no reality; as the meaning-content of consciousness changes so does the historical identity of the content. I call this effect 'weak backward causation', in contrast to 'strong backward causation' associated with a past event P being altered by an event E occurring at a later time, in a world where alteration of P implies negation of E, therefore E implies negation of E; a situation which is paradoxical ($\exists E : E \neq E \to \perp$).[2]

Henri Bergson has famously argued that the cause of experience does not precede the experience but succeeds it, insofar as phenomena can be rationalised in terms of causes only retrospectively. "Backwards over the course of time a constant remodelling of the past by the present, of the cause by the effect, is being carried out." (Bergson 1946, 122) This, I argue, is not a paradox; the cause and the effect referred to in this description belong to different causal orders, physical and metaphysical. The distinction is roughly equivalent to the perception *that* something has happened in a particular order vs. the order in which the idea of *what* has happened evolves. Another way, the order of changes in things (object-level) is not the same as the order of changes in the ideas that refer to those things (meta-level). According to hermeneutic phenomenology, these two orders cannot be consistently integrated in one-dimensional time but require two mutually irreducible dimensions internal to time.

Ricoeur (1984, 66) identifies "two temporal dimensions, one chronological and the other not. The former constitutes the episodic dimension of narrative. It characterizes the story insofar as it is made up of events. The second is the configurational dimension properly speaking, thanks to which the plot transforms the events into a story. This configurational act consists of 'grasping together' the detailed actions or what I have called the story's incidents. It draws from this manifold of events the unity of one temporal whole."

The hypothesis of episodic and configurational dimensions internal to time neatly explains why information does not need to be arranged and revealed in a strictly chronological order for the unified course of time to be conveyed to the interlocutor. Experiences may be scattered, composed of temporally dispersed fragments, and yet if the information-content is logically consistent a unified temporal order of the story is bound to emerge. Our indisputable ability to "draw a configuration out of a simple succession" (Ricoeur 1984, 65), especially if the sequence of narration does not follow the narrated evental order, reveals that temporality is analysable as a mode of grasping the multiple in a unified context. We are thus able to meaningfully differentiate between the temporal order of communication – or what we call the 'real time' – and the temporal order *within* the narrative – the time we are conscious of when following a story. We experience phenomena happening in real time, but the identity of *events*, insofar as these are parts of a meaningful process, inescapably remains in the configurational dimension which does not follow the temporal logic of phenomena. An event might have only a brief duration in the first dimension but evolves indefinitely in the other, as a *mythical* split, a right angle divergence from the experiential axis. The meaning of phenomenal change can also change, in effect changing history, and this is a point where hermeneutic phenomenology resonates with McTaggart's argument against the reality of time.

McTaggart's (1908, 468) (1927, §329-333) argument that all events possess contradictory properties of being past, present and future implies that events happen at a particular time but also persist indefinitely and change in their temporal properties, but this leads to an obvious contradiction if time is one-dimensional. To solve McTaggart's paradox we can posit two temporal dimensions, one applicable to the experiential order of changes in things (phenomena) signified by ideas and the other to the order of changes in ideas signifying those things. I will develop this argument in the subsequent sections, but from the outset I want to address one possible objection, namely, that we can know things only in terms of

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[2] There may be other types of backwards causation which are not paradoxical, in addition to what I call *weak* and *strong* types. In any case, the proposed theory of time can model *weak* backward causation only.

ideas, which are objects of thought, therefore we need only one-dimensional time: the *timeline of thought*. This would certainly account for the direction and the order of the subjective thought process, but the sense of having ideas, their *meaning*, is precisely that they signify something more than just thoughts. It is immaterial whether what we call 'objective reality' has existence independent of ideas or whether it is composed only of ideas that are grounded in a special way, because what matters to us is the distinction between the objective and the subjective which is indispensible to thought. Conversely, the objection that time is real independently of the mind and that temporality of thought is only a representation of this non-mental reality would be entirely missing its mark, as the present study is concerned with the logical structure of temporal experience insofar as we are conscious of it, irrespective of whether 'objective reality' has existence independent of consciousness.

The takeaway from this section is that our experience of time, or rather, our conscious experience *in* time, seems to proceed along two temporal dimensions. This twofold structure of time, consisting of the timeline of phenomenal experience (episodic dimension) and the timeline of historical identity-formation (configurational dimension) can be described within the theoretic limits of McTaggart's model, whose A series coordinates the historical dimension in terms of past, present and future; the B series defines the sequence of evental succession in terms of before and after; and the C series signifies a nesting order. I will present further reasons why a two-dimensional model of time is necessary and argue that no other combination of McTaggart's series can consistently describe how phenomena are integrated in time.

3. A and B Series are Not Time

In the previous section I have argued that phenomena and the process of identifying those phenomena as meaningful events in the historical process involve two temporal dimensions: the timeline of phenomenal experience and the timeline of historical identity-formation. The first timeline corresponds to the order of changes from one phenomenal state to another; the second timeline corresponds to the order of changes in the historical identities of things undergoing the changes of state. These two dimensions can be plausibly defined within the theoretic limits of McTaggart's (1908) model. I consider whether A and B series can accomplish this task, either independently or in combination. The following discussion is by no means a comprehensive account of A and B theories. I focus on only those implications of the A and B series that I consider particularly problematic or helpful in justifying my decision to pursue the C+A schema.

In the wake of McTaggart, numerous attempts have been made to account for the A series in terms of the B series or for the B series in terms of the A series in order to demonstrate superiority of one theoretic approach over the other. Mellor (1998), a proponent of the B-theory of time, defines the meaning of *past*, *present* and *future* according to the following B-theoretic formula:

'<e> is past' is true at any time <t> iff <e> is earlier than <t>

The proposed expression appears problematic as it attempts to define the terms of a time series in terms of time *per se*. In defence of Mellor, the apparent circularity is not necessarily vicious and can be (at least superficially) eliminated by assuming that <t> does not signify time *per se* but, following Heidegger on 'datability' (1988, 262), another event standing-in as a quasi-temporal, contextual reference:

'<e> is past' is true at any event <e'> iff <e> is earlier than <e'>

The preposition 'at' in the above statement signifies simultaneity, which can be approximated in strictly B-theoretic terms as 'is (true), but not before and not after', but for simplicity I will assume that 'at' signifies just that. Despite the above adjustments the present formula is still too general to define the *actual* past, that is, the past which is relative to the present moment of lived experience, since it allows us to assign the quality of being 'now' to any event in the B series. The term 'now', which signifies the primitive 'present' of the A series, does not have a direct counterpart in the B series but, following Mellor (as reformulated above), can be expressed as follows:

'<e> is present' is true at any event <e'> iff <e> is at <e'>

The event <e> is thus defined as present if and only if it is simultaneous with <e'>, but there is no indication whether the two events are simultaneous 'now'. Mellor (1998, 5) suggests that <e'> can be made coincidental with the present *by definition*, while Zimmerman (2005, 451-452) suggest that being present in B-theory is a primitive monadic property of being *self-simultaneous*. According to Zimmerman, being present is trivially true and what matters is being *presently* present: "To be *presently* present a time must both *be* present (a monadic feature that tenselessly applies to each time) and also *be* located in the moment that is being picked out by uses of 'now'". Assuming that Zimmerman does not imply that the 'now' can be picked arbitrarily, being *presently* present is revealed as a synonym for the immanent 'now' of lived experience and thus implicates a primitive element from the A series as the truth-maker, thereby exceeding the scope of the B-theory. In the case of Mellor, to assign the 'now' to an arbitrary event *by definition* would be as nonsensical as identifying myself with an arbitrary object by definition (a proposition which Mellor *op. cit.* explicitly denies), because insofar as the present is the temporal locus of being it is equivalent to the sense of 'I am': "What occurs now is any event that is contemporaneous with the moment when I speak; reduced to itself, the self-reference of the moment of speech is simply the tautology of the living present." (Ricoeur 1992, 53) Without a purely B-theoretic means of identifying the immanent 'now' of lived experience (be it called the present or *presently* present) there can be no purely B-theoretic account of change, because change takes place exclusively *as* the present, and coincides with the contextually unique consciousness of the event. Mellor (1998, 47) concedes that "we cannot do without A-beliefs", but this raises a serious doubt whether the B series alone can satisfy the practical demands of lived experience. It seems that the problem of the present has not been satisfactorily resolved by proponents of the B-theory and I doubt whether it can be consistently resolved.

Against the A-theoretic view, McTaggart (1908, 468) (1927, §329-333) has famously argued that we cannot define time in terms of past, present and future while also defining these as properties of events at different times, as that would lead to vicious infinite regress.[3] The common objection to this charge is that nobody claims that the same event can have all these temporal properties with respect to any another event, and the dispute is rather about how to express this resolution within the theoretic limits of McTaggart's model. There is nonetheless a valid secondary implication to McTaggart's argument; we can justifiably claim that an event is exclusively past, or present, or future with respect to some other event, but not that the present event *becomes* a past event, because *becoming* indeed does imply the passage of time which is yet to be defined. This gives rise to the question whether any future event 'becoming' a present event and then 'becoming' a past event can be justifiably regarded as *the same* event. Clearly there is a logical difference between events imagined as the future, remembered from the past, and experienced in the present, even if all these scenarios are associated with the same nominal identity. When we objectify an event with an identity *E*, we are arguably equivocating between the event of thinking about *E* as an anticipation of its occurrence, the event of experiencing *E* as it happens, and the event of remembering *E* as it has happened, each event involving a different situation.

Another objection to the A-theoretic account of time relates to the evental order *within* the past or the future. Working on the premise that the A series is directional, progressing from the future, to the present, to the past, it evidently has a basic order. On the other hand, statements which assert that an event 'will be present' or 'was future' may already involve both A and B series. Any tensed expressions applied to the past, present or future resemble the logic of the B series: 'will be' is equivalent to '*after* the present', while 'was' is equivalent to '*before* the present'. Were we to remain adamant to interpret tensed expressions in strictly A-theoretic terms by formulating them as 'of the future' and 'of the past', we would end up with a duplicitous set of temporal propositions in the same sentence, for example, 'will be present' would become 'of the future of the present', or, taking the logical reduction even further, 'of the not-present of the present'. The problematic effect of applying tensed expressions to the primary terms of the A series has been emphasised by Mellor (1998, 73) by formulating barely comprehensible statements containing two or more tensed propositions stacked together, for example: "*e* will have been present". I understand this as either a case of combining two different ordering principles (A and B series, for example), or a case of circular reasoning consisting in application of an ordering principle to itself. The latter view is evidently untenable for reasons just discussed, but the former view seems consistent. If second-order ordering terms were applied to the first-order terms {(less → more) future → present → (less → more) past} we would end up with either a hybrid BA series, on one-dimension, or B+A theory on two dimensions.

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[3] I have referred to this argument in the previous section for different reasons.

The takeaway here is that neither the A series nor the B series alone gives us a complete model of temporality. On the other hand, the A series cannot be dispensed with because it is the only series which stipulates the primitive present as the temporal locus of our consciousness of change. Irrespective of any deficiencies of the A and B series as self-standing models of temporality, we are already committed to constructing a two-dimensional model in order to account for the timeline of phenomenal change (episodic dimension) and the timeline of historical identity-formation (configurational dimension), and to resolve the contradiction identified by McTaggart in relation to the A series. The B+A theory of time seems to offer everything that C+A theory has to offer and more, but there are in fact some important differences that make the C series more fitting for the task at hand. Critically, modelling time by means of B and A series can result in temporal inconsistencies. I will justify this claim in the following section.

4. Constitutive Order

An object is said to be the same object only if it endures through change over a non-zero duration, what presupposes its past, present and future being consolidated under one identity, but the same object must also be able to accommodate constitutive transformations, that is, it must include a plurality of constitutive states that are not only ordered sequentially in terms of 'before' and 'after' but express ontological continuity *from* the state 'before' *to* the state 'after'. Another way, "The 'laws' of temporality determine not only a general sequence of before and after but also *what* comes before and *what* after." (Lauer 1965, 115) That x is 'before' y expresses only a sequence of discrete, discontinuous states; it does not entail that x *becomes* y.[4] This deficiency is the most apparent when dealing with duration, which can be expressed in strictly B-theoretic terms as follows: there are n cyclical states of type c after state-a but before state-b, so the period of time between a and b is n cycles/units of c. Let us now consider a case where the states of type c were observed in a dream, a signifies the state of being awake just before dreaming, and b signifies the state of being awake just after dreaming. All the above states are perceived in a neat chronological order, and yet if arranged in the experiential sequence in terms of 'before' and 'after' they clearly lack either ontological continuity or temporal consistency. In order to preserve continuity *and* consistency, the B series associated with the states experienced in the dream could be nested inside a B series of states associated with being awake, but the ordering terms of the B series are not sufficient to make this second-order distinction. Alternatively, a single B series of objective, physiological states could be constructed, but such a series would conflict with the B series of the dreamer's experiential sequence. Either way, the decisive factor - ontological continuity - is not captured by the B series. The fact that we seamlessly detect ontological discontinuities in the phenomenal sequence of *awake*, *asleep*, *awake* suggests that the B series does not express the kind of relations that characterise how we integrate phenomena in time. In this regard the C series has a significant advantage over the B series, the former is already a hierarchy of structurally nested states and the latter is a flat, directional order of discrete states.

McTaggart has described the C series as akin to assembly of parts constituting a phenomenological whole: a mereological hierarchy "found in a substance which is spiritual" (1927, §656). First he posits the idea of substance as something having content and parts: "The parts of such a whole will necessarily have some relations to each other, and the fact that it has these related parts is what I mean by its having internal structure." (McTaggart 1921, §171) He then explains the kind of internal structure he has in mind in regard to the C series: "Of any two terms in the C series, one is included in the other, which includes the first, and by means of these relations all the terms can be arranged in one definite order." (1927, §566) For example, the circle is a kind of geometric shape defined on a plane, what presupposes the idea of the plane as a section of space. Similarly, the concept of the cart incorporates the concept of the wheel, while every natural process inevitably implicates the entire constitutive order of nature: "all that exists, both substances and characteristics, are bound together in one system of extrinsic determination." (McTaggart 1921, 151) Returning to the earlier example involving the transition from being awake to dreaming and to being awake again, we are acutely aware when something happening *now* does not constitutively follow from the immediately prior phenomenal conditions. Another way, we intuitively know when the prior experiential state is not constitutively nested in the present constitutive state.

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[4] Moreover, "The ordering of 'positions' via B-relations does *not* make a series *temporal*." (Pezet 2019); "...it is precisely the idea of change or transition *from* the one *to* the other that it [the B-series] fails to capture." (Rundle 2009, 32)

The C series construed as a nesting order does seem to possess an intrinsic direction, and in contrast to the 1908 paper in which the C series was introduced, late McTaggart (1927, §723) attempted to demonstrate this directionality on the basis of what he calls "the last, and most inclusive term" in the C series, coincidental with the present and the future combined. I consider this part of McTaggart's argument problematic. One may contend that the idea of the 'last term' is already temporally biased and does not follow from the relations *included in* and *inclusive of* that characterise the C series. Specifically, describing a term as *the last* presupposes rather than demonstrates that all the other terms are temporally prior to *this* term and may constitute an equivocation between 'the last' and 'the latest' (1927, §742, §827). It is also unclear why we should lump together the present state of the world and all the future states, when we do not do the same with respect to past states. Our temporal logic certainly does have a direction, we do think from conditions toward conditionals, from that which is presupposed toward that which presupposes, but this directionality does not seem to arise from the C series alone. In any case, this controversial feature is not necessary for the C+A model to work, assuming that the A-series is already directional, I will therefore continue to regard the C series as non-directional.[5]

At this point in the argument an important difference between the C+A model and Ricoeur's hermeneutic description should be apparent. The episodic dimension of time does not seem to resemble the C series but rather the B series, a *mere sequence*: "The events must not only be registered within the chronological framework of their original occurrence but narrated as well, that is to say, revealed as possessing a structure, an order of meaning, that they do not possess as a mere sequence." (White 1987, 5) There are reasons to suspect that this characterisation of the episodic dimension constitutes an explanatory oversight in the hermeneutic model. McTaggart (1927, §724) argued that we always only misperceive the C series as the B series: "in the C series, which is perceived as the B series, we had seen that its perception as a time-series, connected by the relations of earlier and later, is a misperception." To identify something as an episode there must already be a sense of ontological continuity between episodes. That is, episodes form a series only if they apply to the same world. For example, when we watch snippets of footage in a particular order we only perceive multiple states of the medium, not a sequence of prima facie *episodes* which would already presuppose a narrative, a story, which is yet to be configured. Before configuring *what* has happened (the story) across multiple episodes we must be aware *that* the multiple states of the medium we interpret *as* episodes are ontologically related in the right way. In essence, without ontological continuity underwriting the *mere sequence* of episodes there would be no sense in referring to information as composed of episodes, and ontological continuity is not a feature of the B series but only of the C series. If this is correct then the episodic dimension in the hermeneutic model is in fact the C series misinterpreted as the B series.

In order to efficiently account for ontological continuity and consistency (across a system of objects) I propose the following definition of the ontological structure of a world, configured by means of multiple, object-specific C series, instead of positing a single C series of unmanageable complexity for the entire world. This way of formulating ontological relations allows for analysis of small parts of a world or single objects, provided we can define their boundary conditions.

> *C-structure: an ontological hierarchy of a world, where every order of constitutive states of an object, a C series, can be situated with respect to other C series and assigned a unique historical identity that reflects its situation.*

The basic element of the C series is a constitutive state of an object, defined by the object's relations with all other objects (its *situation*). Every state in the constitutive sequence is ontologically conditional on prior states (ontological continuity), we can therefore say that the object *includes* all the states constitutive of its present state as its constitutive parts. The sequence is thus structurally ordered, doing all the ordering work of the B series, apart from defining the temporal direction, but also relating the present state of the object to all other objects in the same world (I take being-in-a-world as the *sense* of being an object). A simple C-structure can be modelled as follows:

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[5] An alternative approach would be to define the C series as directional and the A series as non-directional. The main consideration here is that directionality needs to be included in the model only once. Having two directional series in the same model could plausibly lead to temporal inconsistencies.

Situation   **C-structure**   Situation'
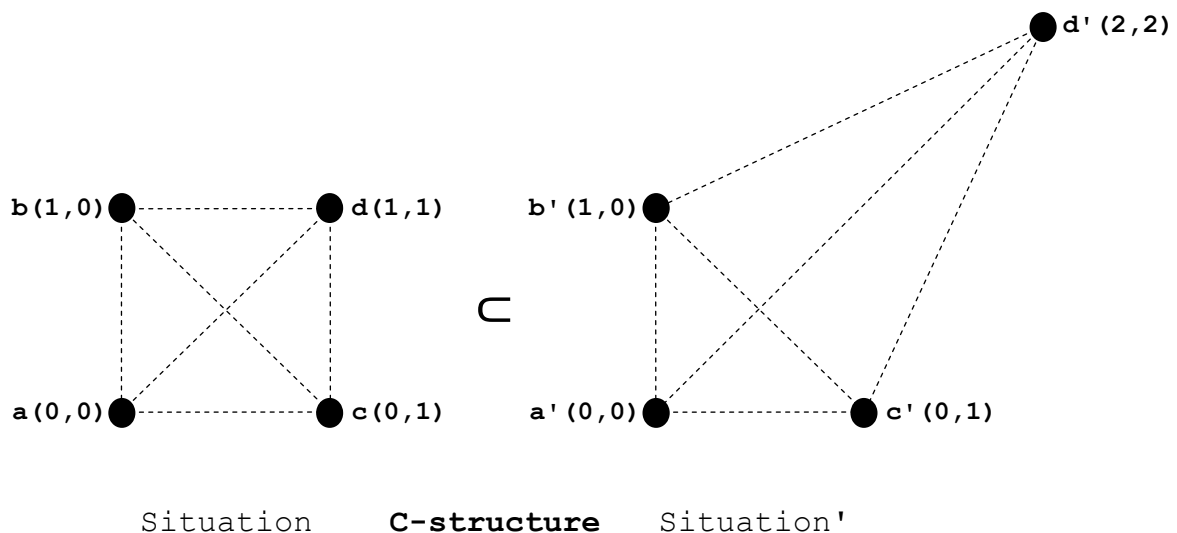
The C-structure consists of points *a, b, c, d* belonging in a world *abcd*, defined by their relative positions. In the above representation it is not immediately clear how the *situation* is included in the subsequent *situation'*; this aspect will be formalised in the last substantive section of this paper. Since all points (objects) are ontologically related (co-exist) in the C-structure there can be no ambiguity about temporal relations between their states in any situation (co-existence in a situation entails simultaneity), but before incorporating temporality into the model I will address some phenomenological worries about the *present moment*.

5. The Missing Present

Husserl (1991, 11-12) has famously argued that the temporal scope of conscious experience is not confined to an instant but is extended in time. For example, when we listen to music we do not perceive just the sound emitted in the present moment, but experience a sense of melody that necessarily implicates related sounds from the immediate past. Melody must therefore be experienced in a different temporal context to that of the physical sound. But the premise of apprehension of sound is further complicated by the fact that frequency, a distinct pitch, cannot be apprehended instantaneously, in zero duration, but requires at least one complete wave-cycle of the signal to physically convey the necessary information. Since it 'takes time' to first play and then to register the signal, the experience of physical sound (or any other signal) cannot possibly belong to any particular, objective present, insofar as the present has zero duration. If, on the other hand, the present had a finite duration, as the theory of specious present would have it, it would necessitate simultaneity of all the elements within that duration, but that is clearly not the case: we perceive melody as a sequence of tones and not as a single chord, we perceive progressive motion and not a static blur (Cf. Husserl, 1991, 11). Conversely, if the specious present had already contained motion, the end point of its movement would be in the present when the starting point had already elapsed and thus belonged (paradoxically) to a 'different present', therefore not *the* present.

Chuard (2011) argues that temporal continuity of consciousness may be sufficiently explained by partial overlapping of events, but this hypothesis ultimately faces the same logical impasse as the idea of specious present. Assuming two nominally consecutive events *A* (earlier) and *B* (later), if there is a part of *A* that is non-simultaneous with any part of *B*, then it is necessarily followed by another part of *A* which is simultaneous with a part of *B*, and then by a part of *B* that is non-simultaneous with any part of *A*. In effect, the two nominal events are broken up into *three* consecutive specious parts that are not overlapping: *A* alone, *A* and *B* occurring simultaneously, and B alone. Each of the consecutive parts must have positive information-content in order to be registered.

Husserl attempted to solve the problem of continuity of consciousness by positing the idea of temporal *retention*. "The *source-point* with which the *production* of the enduring object begins is a primal impression. (…) But when consciousness of the tone-now, the primal impression, passes into retention,

this retention itself is a now in turn, something actually existing." (Husserl 1991, 30-31) The thesis of retention has one critical problem: in order to *retain* information there must be a positive information-content to begin with, but if the *primal impression*, the source-point, has a positive information-content then it is already specious and we again face the explanatory burden associated with the idea of specious present. If, on the other hand, speciousness of the source-point associated with the "running-off modes of the object's duration" (like melody) were meant to be the result of retention rather than its cause, then the source-point would have no duration and therefore no objective content that could be retained.

Explaining continuity of consciousness in terms of specious present, partial overlapping of events or temporal retention may be interpreted as involving two distinct conceptions of time: the inner duration of the specious present which is measured with respect to a conventional time-reference, normally registered in terms of standardised, super-fine cycles of the atomic clock, while the experiential moment refers to the phenomenal *sense* of time, which is registered in terms of subjectively construed *meaningful events* and their internal, logically ordered relations. Since the atomic time-measure is cyclical, that is, it also consists of discrete specious moments, we must conclude that the finest detectable duration – the *signal quantum* of atomic radiation – can be defined only in terms of abstract, continuous time, which is in principle infinitely divisible.

A logical consequence of this brief examination of the alleged 'missing present' is that an object is apprehended neither in the objective present demarcated on a continuous dimension, where only infinitesimal and therefore empty instants can be consistently said to be present; nor in the *fait accompli* realm of the past, where experience is said to have expired; nor in the future, which lacks realisation. The infinitesimal instants of 'now' carry no meaningful content, no signal, which could be defined only across a finite duration. All experience is therefore left without a temporal home, without a place in time, and the logic of temporal succession taken to its limit demands that it ought not to appear, let alone change, but appearances persist nonetheless.

I postulate that in the absence of information-content in the objective present, appearances must arise atemporally; not 'in' time but 'with' time. When we refer to the present we quantify over the existence of a unique relational configuration that presupposes the necessity of change from one configuration to another. In other words, we perceive events as tentative unities of meaning that presuppose internal alterity of states as well as the configurational qualities of being preceded, perceived and succeeded. Our subjective sense of time may then be indexed in terms of meaningful *moments*, as objectified 'instants' that are nonetheless characterised by inner duration because their meaning posits or necessitates duration. In the words of Husserl, "every act of apprehension is itself a constituted immanent duration-unity." (Husserl 1991, 123) Cf. "We either perceive nothing, or something already there in sensible amount. This fact is what in psychology is known as the law of the 'threshold'. Either your experience is of no content, of no change, or it is of a perceptible amount of content or change." (James 1916, 155)

Speciousness attributed to the moment is evidently not 'in the moment' in the physical sense, but 'in the meaning of the moment', and is interpolated between practically relevant reference points in the atemporal order of constitutive relations (the C-structure). When we perceive a flash of light, we ascribe a short duration to the moment of its apprehension; when we experience a single tone, the duration ascribed to it may be in the order of a second; when we hear a melody, the moment of its apprehension may last several seconds. It is irrelevant whether the flash of light, the single tone or the melody are perceived as something objectively present or are just imagined, because in either case we must interpolate a suitable duration for the event to be meaningfully assimilated into our intrinsically temporal system of meanings. By existentially quantifying over a particular evental identity we arguably invoke a window of time for the event to be realised *as* the present and this constitutes the characteristic duration of its phenomenal moment. "The existential now is determined by the present of preoccupation..." (Ricoeur 1984, 63) Another way: "Because the Dasein is expectant of itself by way of the feasible, that with which it is dealing at the moment is in its present." (Heidegger 1988, 290) As these quanta of duration are arranged in a sequence of logically emplotted phenomena, the sense of time becomes a continuous presence, a background pulse that can be disrupted only by unconsciousness, but then the existential narrative and its inner time are seamlessly re-established upon awakening, by relying on countless indexing references within the constitutive structure of resumed 'real' experience.

The takeaway here is that the present of lived experience is not a point in time but already a temporally extended, meaningful *event* ranging over multiple constitutive states which are in themselves atemporal.

The ideal point of the Present can nonetheless be inscribed as the metaphysical locus of phenomenal experience. In the next section I will attempt to formulate a C+A-theoretic account of time that incorporates a systemically consistent ontology of past, present and future change for a hypothetical observer whose conception of past changes can also change.

6. Ontology of Change

I have argued that McTaggart's paradox implies that events happen at some specific time in the sequence of events but also endure in time indefinitely, but this is an obvious contradiction if time is one-dimensional; therefore either the premises of McTaggart's argument are inconsistent or the 'momentary' happening and the 'indefinite' enduring of the same event are both true but in a different temporal sense. Understanding this difference is crucial to understanding why change, insofar as it relates to temporal phenomena, cannot be consistently modelled in one-dimensional time.

It is a presupposition of empirical science that the thing-itself and the idea of that thing can both change in time, independently of one another. For example, the idea of a thing can change when we conceive of something about things that we did not conceive of before, and this newly conceived of property necessitates a *new* idea of what that thing always *was* and how it related to other things in the past. In effect, a new historical identity of a thing retroactively replaces a former identity. The implicit ontological commitment associated with this substitution is that the new historical identity of the thing is *true*, therefore it *is* the thing of the past, and the former identity is *false*, therefore it *is not* the thing of the past. This intuitively makes sense because in one dimensional time a thing can have only one true identity, "for it is impossible to think of anything if we do not think of one thing" (Aristotle 1984b, 1006b), but if the past identity of the thing (x) is not the same as the present identity, then we have not merely changed our idea of what *that* thing always was but identified *different* things. This much is implied by the law of identity: $\forall x(x=x)$.

Since we can identify things only in terms of ideas, the idea of a thing and the thing-itself cannot be fully disentangled; despite being different logical types (of ideas), these are conceptually indispensable aspects of the same, ontologically continuous object-identity. The law of identity implies that change in the thing-itself makes sense only when conceived in terms of the same idea of a thing, and vice versa. This, I argue, requires two-dimensional time, or more specifically, two atemporal dimensions that only together constitute time. On the first dimension, the thing-itself undergoes changes of state; for every constitutive state, the idea of the thing is fixed for all of history (past, present and future) on the second dimension. Conversely, the thing-itself remains the same insofar as it is the *entire* sequence of the constitutive states, whereas the idea of the thing changes at every step of the constitutive sequence. The sequence grows when new constitutive states are added and the preceding state is included as a constitutive part of the new state, ensuring ontological continuity from state to state. On this account, even the ship of Theseus can be identified as the *same* ship despite its every part being replaced by a new part.

A possible objection to this line of reasoning is that the constitutive states of a thing are also identities of sorts, that is, they are ideas that refer to other ideas, *ad infinitum*, and as ideas they too can change. Does that mean that we need infinitely-dimensional time to accommodate the possibility of change in the identities of the referents of ideas? I contend that when we talk about higher-order identities we are already talking about different identities, with their own constitutive states. A change of focus from one identity to another within the same ontologically continuous space does not entail a different dimension of time but only a different *thing*. The crucial point is that every identity has its own aetiology and therefore its own constitutive sequence, but all identities and their constitutive states are ontologically grounded in the same phenomenal impressions, registered in terms of qualia characteristic of a species. I doubt whether the C-structure of a world could be effectively modelled just in terms of qualia because these seem to lack the kind of information-content that could capture ontological continuity of the series. In any case, the relational content associated with 'constitutive states' will allow for a more intuitively comprehensible model.

I will now focus on formalising a C+A-theoretic account of change subject to considerations discussed above.

When we say that *x* has changed we imply two things: first, a relative change of *x* with respect to not-*x* and, second, ontological continuity of *x* being unaffected by that change. In other words, the nominal identity *x* endures despite constitutive differences within the object identified as *x*: "change needs identity as well as difference." (Mellor 1998, 89) This, we can say, is the *sense* of change. The above description applies to total replacement of a thing as much as to partial change in the constitution of a thing, because replacement is meaningful only if there is an enduring placeholder or a functional identity that answers the question of *what* is being *re*-placed.
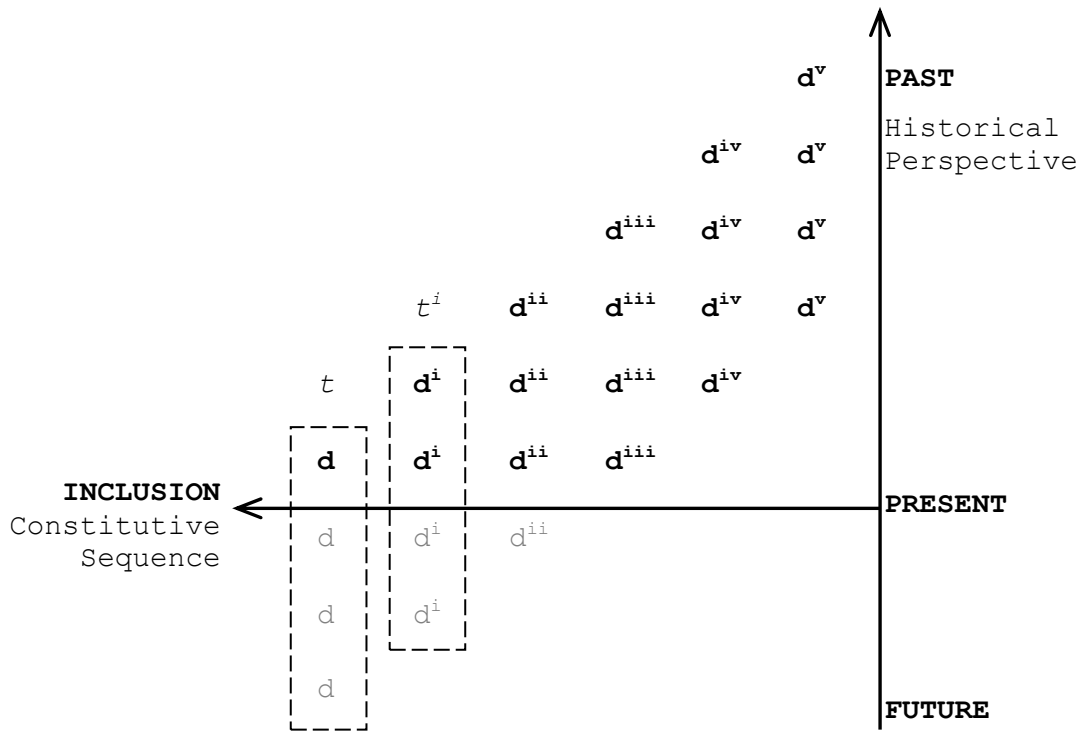
Insofar as we are committed to a temporal direction, change also implies that something is created in addition to that which existed prior to the change, a new constitutive part of the object (*x*) undergoing change: nominally, *x*+Δ*x* takes the identity of *x*. The content of change (Δ*x*), the pure difference between two constitutive states of *x*, had no existence prior to the change, but once realised it cannot be erased from the constitutive sequence of the object. Any subsequent change only adds to the sequence, but as the prior state in the sequence is no longer a feature of phenomenal experience, we can say that it is temporally *negated*. "By negating a concept, one only manages to create another *concept*." (Kojève 1980, 256)[6] The negated state is retained in the C-structure as a condition that gives meaning to its *subsequent* negation.

We can now temporalise the C-structure of the *abcd*-world by taking account of past (negated) constitutive states of objects (○), the content of change (Δ), and ontological continuity via inclusion (⊂). All objects (●) are simultaneously present in a given situation. The following diagram shows two consecutive situations, where *t* and *t*[i] signify, respectively, the *condition* included in its immediate *conditional*:

C-structure at t   **C-structure at t[i]**
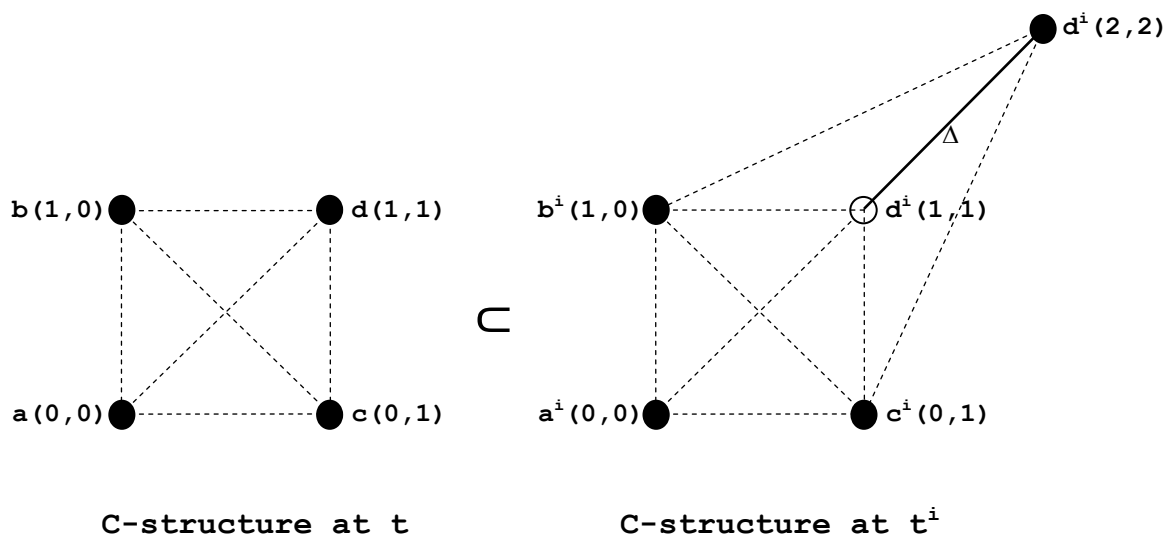
The above diagram represents ontological continuity between two consecutive states of the world, but in order to formally characterise this difference as change *from* one state *to* the other we must still integrate the A series with the atemporal C-structure. This is accomplished in the next diagram: a two-dimensional time-matrix for the object *d.* The constitutive sequence (horizontal axis) is a C series and signifies the *included in*, *inclusive of* order of states of the object. The object *d* is in continuous existence over a lifespan of four normalised increments (*t*) in the constitutive sequence. The historical dimension - vertical axis - represents the temporal relations of past, present and future states of the object (the A series). Every indexed state in the constitutive sequence marks a distinct historical conception of the object for an observer who is simultaneous with that state. For the reader, the correct historical conception is *d*[v], consisting of four negated constitutive states.

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[6] Cf. "There is no such thing as ceasing to exist (…). When we say that something has ceased to *exist* we only mean that it has ceased to be *present*; and this only means that the sum total of existence has increased." (Broad 1923, 69)

	t	t^i					
						d^v	**PAST**
					d^{iv}	d^v	Historical Perspective
				d^{iii}	d^{iv}	d^v	
		d^{ii}	d^{iii}	d^{iv}	d^v		
	d^i	d^{ii}	d^{iii}	d^{iv}			
d	d^i	d^{ii}	d^{iii}				

INCLUSION Constitutive Sequence ⟵ **PRESENT**

d	d^i	d^{ii}
d	d^i	
d		

FUTURE

The fenced-off areas in the time-matrix mark two distinct historical conceptions of *d* corresponding to the two least inclusive constitutive states in the C series: *{d, d^i...}*. The historical conception at *t* consists of the 'present' constitutive state only - *d* has no history at *t*; the historical conception at *t^i* consists of the 'present' constitutive state and includes a past constitutive state under historical conception *d^i*. The future situations are shown only to represent the range of expectations that would be true for an observer simultaneous with the relevant state in the constitutive sequence. In the proposed model, the future does not 'arrive' or 'become' the present; what we identify as a future state via expectation is always contextually different from the conception of a state that presently appears, and from any past state we can recall.

In summary, the C series (horizontal axis) corresponds to the differences between constitutive states of the object, whereas temporal continuity, the direction of change and the experiential locus of the present are all properties of the A series. Since the C-structure embodies external ontological relations at every step in the constitutive sequence it has a topological-coordinative effect that precludes temporal inconsistencies and, consequently, a compatible time-matrix can be constructed for any object in the same world.

In formulating the C+A theory of time I have relied on analytical insights of McTaggart and Ricoeur, but the underlying schema of the model may have been conceived by Hegel. The following fragment from "Phenomenology of Spirit" appears to describe the C series: "*individuality* is constituted by the shapes assumed by these moments. These (...) are distinguished from one another in Time, though in such a way that the later moment retains within it the preceding one." (1977, §679) Hegel then describes temporal perception as having two aspects: "it is from one side a shape of consciousness as such, and from the other side a number of such shapes which *we* bring together, in which the totality of the moments of the object and of the relation of consciousness to it can be indicated only as resolved into its moments." (1977, §789). From these we can plausibly infer that time, for Hegel, is a nested order of momentary *shapes* that can be attributed to a particular thing only in virtue of a totalised identity that nominally *endures* in those moments as they arise and pass away, but is also augmented by every passing moment. If this is right then Hegel deserves credit as the first proponent of the C+A schema.

7. Conclusion

McTaggart's argument that every event possesses contradictory qualities of being past, present and future implies that events happen at some specific time in the apparent sequence of events but also endure indefinitely in time and change in their temporal properties, but this leads to an obvious contradiction if time is one-dimensional. I have attempted to eliminate McTaggart's paradox by modelling time on two dimensions; the first dimension designating the states of things signified by ideas, and the second dimension designating changes in the ideas signifying those things. Maintaining this distinction also allows us to consistently accommodate the alleged backward causation in being able to non-paradoxically change history by changing our present ideas about the past.

The C+A model is ontologically grounded in the atemporal, nesting order of constitutive states of the world, the C-structure, composed of multiple C series, each signifying a unique object defined in relation to all other objects. This guarantees ontological continuity and temporal consistency of the model. The C-structure is then projected orthogonally in terms of McTaggart's A series, which configures the temporal relations between the constitutive states of objects and the observer. Every object *includes* all the states logically prior to its present state as its constitutive parts, but only the present state has phenomenal appearance. The phenomenal present is explained not as a point on a continuous dimension but a temporally extended *meaningful moment* whose duration is interpolated between practically relevant reference points in the C-structure. A continuous dimension is thus abstracted from discrete phenomena, allowing us to inscribe the ideal point of the Present as the metaphysical locus of phenomenal experience.

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