Change We Can Believe In (and Assert)

MEGHAN SULLIVAN
University of Notre Dame

Speak what you think now in hard words, and to-morrow speak what to-morrow thinks in hard words again, though it contradict everything you said to-day.

—Ralph Waldo Emerson ("Self Reliance", 1841)

Propositional temporalists hold that some propositions change their truth-value over time. In this paper, I describe a serious problem for temporalists who think such propositions can serve as the contents of beliefs and assertions, and then I evaluate strategies for responding to the problem. In the process, I offer a theory of how we ought to reason and communicate about a changing world.

The first half of the paper diagnoses the problem. First I explain some metaphysics-based motivations for propositional temporalism and contrast it with propositional eternalism. Then in Section 2, I introduce the content problem for temporalism, tracing the origin of the problem to independent arguments given by Gareth Evans and Mark Richard. In Sections 3 and 4, I argue that the content problem runs even deeper than Evans, Richard or their recent supporters suspect. A version of the content problem arises for any temporalist who accepts the popular Stalnakerian model of rational conversations and investigations and three related assumptions about assertoric and doxastic norms. The first norm dictates that speakers and believers aim to contribute truths to the context sets for their conversations and investigations. The second norm dictates that speakers and believers aim at completeness in their contributions to conversations and investigations. And the third norm dictates that speakers and believers aim for their contributions to make a lasting change to the context set. I will show that these three norms are incompatible if agents believe and assert temporalist contents.

So can propositional temporalists offer a model for rational conversations and investigations? I think they can. In the second half of the paper, I develop and evaluate three different temporalist strategies for addressing the content problem. The response I favor requires a new understanding of how temporalist propositions interact with context sets. In Section 5, I explain and motivate this theory. A second strategy proposes that we ascribe *both* temporalist and eternalist contents to agents but only update the context set using eternalist contents. In Section 6, I develop this "double-content" view and show that there are important cases of cross-time updating which it cannot accommodate. The final kind of response–inspired by John MacFarlane's work on relativism–insists that temporalists should reject the

truth norm for belief and assertion. In Section 7, I outline this response and argue that it requires too radical departure from the intuitive Stalnakerian framework.

1. Propositional Temporalism and Eternalism

The arguments of this paper will depend on two widely-held principles about propositions. First, I assume:

CONTENT: Propositions are the contents of our beliefs and assertions.

According to the content assumption, when an agent believes or asserts that ϕ, she stands in a relation to some abstract object ϕ, a proposition. In what follows, I intend to stay neutral on whether propositions are structured Russellian entities or sets of abstract possible worlds. The arguments should work on either approach. (Centered worlds pose somewhat more difficult problems, which I will not consider in any detail here.)

Second, I assume:

ACCURACY: A proposition is true if and only if it accurately represents reality.

This should be fairly uncontroversial: if the proposition *that Obama is President* is true, that is because Obama has the property *is President*. I don't mean to suggest any stronger thesis, for example that all propositions have truthmakers. Some propositions can accurately reflect reality without being made true by any particular entity or entities. The proposition *that there are no ghosts* is true, it accurately reflects the dearth of ghosts in our world, but it is reasonable to suppose that nothing in particular makes this proposition true. I will make one slightly more controversial claim about how propositions represent–I assume they do it compositionally. Negation, conjunction, disjunction, conditionals, modals and other operators join simpler propositions to yield more complex ones, representing more complex ways that reality might be. And if a true proposition represents a property using a predicate of more than one argument place, then that property is a relation. Here I'll follow the convention of bracketing a proposition when I intend to be explicit about its compositional structure (i.e. $[\phi \vee \varphi]$ and $[\phi \wedge \varphi]$).

If we are serious about propositions in the ways indicated above, then our underlying metaphysics will inform our views about what we believe and assert. To illustrate the connection, consider two views one might have with respect to propositions and the metaphysics of time. *Propositional temporalists* think that there is at least one proposition about a temporary event that changes truth-value over time. *Propositional eternalists* deny this–they think that all propositions abut temporary events have a stable truth-value over time. For example, as I write this sentence, London is cloudy. Some temporalists think that a proposition of the form [*Cloudy*(*london*)] best expresses this state of affairs, because London has this property *simpliciter*. This proposition is now true, but it was false in the past and it will be false as soon as the weather clears up. The eternalist thinks that a proposition

of the form [*Cloudy*(*london*, *t*)] best expresses the state of affairs, where *t* rigidly designates the time when I am writing that sentence.[1] London only has the property of being cloudy *with respect to a particular time*. Here is a more structural way to draw the distinction: eternalists think that all propositions about temporary events have "time slots" that need to be completed by particular times (like London is cloudy *at 3:17pm on March 25th, 2011*). If the proposition does not represent a time, it is incomplete and so unfit to serve as a content. In contrast, temporalists think that at least some propositions about temporary events lack time slots, but nevertheless are believable, assertable contents.

Temporalists and eternalists likewise differ on the structure of propositions about the past or future. Most temporalists think that some past or future events are best represented by complex propositions with tense operators. A tense operator is a logical device for qualifying when a proposition is true. The two most useful such tense operators for present purposes are $\mathcal{P}$ ("it was the case that") and $\mathcal{F}$ ("it will be the case that"). For example, that London will be cloudy is represented as [$\mathcal{F}$*Cloudy*(*london*)]. That McCain has never been President is [$\neg\mathcal{P}$*Pres*(*mccain*)]. Eternalists have no need for tense operators; they think that past or future events are best represented with past or future times or time variables in a proposition's time slot. That Nixon was President in 1970 is represented as [*Pres*(*nixon*, 1970)]. That it will be cloudy in London is represented with quantification over times. Where *t* rigidly designates the present time and $>$ abbreviates "is later than": [$\exists x(x > t \wedge Cloudy(london, x))$]. Propositions like this never change truth-value. Indeed, the eternalists think that there is one maximal, eternally true proposition that describes the world as it is at every time. This feature of eternalism will be a sticking point in the argument to come.

Why prefer one view over the other? As I mentioned, some of us get involved in this debate by way of metaphysics. Propositional temporalism finds support from adherents to the A-theory of time.[2] A-theorists draw a sharp metaphysical distinction between the present and other times. There are many characteristic features of A-theory metaphysics, but the most important for our purposes is the A-theory view of change. A-theorists think some objects can undergo change without having temporal parts or multiple time relations; more metaphorically, they think an object can change without being "spread out" in time. Here is how an A-theorist might describe the temporariness of the Obama administration. Obama has the non-time-relational property *is President*. (Call this an *A-property.*) And Obama does not have multiple temporal parts. The proposition representing Obama's current state should not have a time slot, because if it did, it would mischaracterize the A-property. So we must represent Obama's current state as [*Pres*(*obama*)]. But this proposition had better be able to change truth-values, because–barring some major Constitutional revision–within eight years [$\neg$*Pres*(*obama*)] will be true.

I am driven to temporalism because I endorse the A-theory of time and change, and some metaphysically accurate propositions about objects with A-properties will have to be temporalist propositions. Others may be drawn to temporalism because they think there is an important sense in which the future is open. Incompatibilists about the open future think that indeterminacy about the future entails that future

contingent propositions are neither true nor false. So perhaps the proposition expressed by "In 2025, a woman will be President" has no truth-value now, but it will acquire one when 2025 comes to pass. This way of understanding the metaphysical openness of the future also entails there are propositions that change truth-value, though in this case propositions change from having no truth-value to having a particular truth-value (rather than changing from true to false or false to true). We'll discuss applications of temporalism to the open future more in Section 7. Finally note that there are non-metaphysical defenses of temporalism. For example, Ludlow, Brogaard, Hawthorne and Cappelan are attracted to the view because they argue it provides a better model for how we speak and reason about time.[3]

Alternative starting points motivate others to propositional eternalism. B-theorists of time do not think there an important metaphysical distinction between the present and other times.[4] Rather, they treat time as a dimension akin to the way we ordinarily think of the spatial dimensions. B-theorists typically hold that objects are part of a multi-dimensional manifold and all change requires objects to have either temporal parts or time-relational properties. Change is always explained as some kind of variation in the spatiotemporal manifold. If temporalism is true, then propositions undergo change; they gain or lose truth. But it would be very strange to think that propositions have temporal parts or that truth is a relation between a proposition and a region of the spatiotemporal manifold. So assuming that propositions do not have temporal parts and that truth and falsity are not time-relational properties, there is no way for propositions to change given the B-theory–the B-theory entails propositional eternalism.[5] It is also worth noting that eternalism is favored by a growing number of metaphysically neutral semanticists. These semanticists argue that quantification over times provides a superior framework for explaining phenomena like anaphoric reference in tensed expressions.[6]

Metaphysically-driven propositional temporalism and eternalism will be the focus of this paper. Before we move into the main arguments, two important terminological cautions are in order. First, it is easy to confuse propositional eternalism with a cognate view: ontological eternalism. Ontological eternalists maintain that wholly past or future objects like dinosaurs or the 65th President of the United States exist, in the same sense that present objects exist. Metaphysically serious propositional eternalism entails ontological eternalism, because if an existential claim like "There is a dinosaur"—$[\exists x\, Dinosaur(x)]$—is ever true, then it is always true. But not all ontological eternalists are committed to metaphysically serious propositional eternalism, because not all ontological eternalists think that eternalist propositions are the objects of our attitudes.[7] Second, it is easy to confuse propositional temporalism with a related view in tense logic: semantic temporalism. Semantic temporalists deny there is any interesting eliminative analysis of tense operators.[8] Barring additional assumptions, semantic temporalism and propositional temporalism are independent views. Some semantic temporalists may deny that there are propositions. Others may doubt there is a coherent notion of "reductive" semantic clauses. These issues need not especially concern us here. Throughout this paper, I use "temporalism" and "eternalism" to mean propositional temporalism and eternalism and not these other views.

2. Temporalists Have a Propositional Attitude Problem

Some arguments have gained prominence in the past few decades that attempt to embarrass temporalists who assume that such propositions can serve as contents for beliefs and assertions. Chronologically, the first such argument comes from Gareth Evans. In "Does Tense Logic Rest on a Mistake?" he questions temporalist accounts of assertion:

> (Temporalism) is such a strange position that it is difficult to believe anyone has ever held it... we use the term "correct" to make a *once-and-for-all* assessment of speech acts... if a theory of reference permits a subject to deduce merely that a particular utterance is now correct but later will be incorrect, it cannot assist the subject in deciding what to say, nor in interpreting the remarks of others. What should he aim at?... Maximum correctness? [9]

And a bit further he elaborates:

> Utterances have to be evaluated according to what they rule out, and so different utterances of the same tensed sentence made at different times may have to be evaluated differently. They therefore cannot be assigned the same semantic value.[10]

Evans uses the more general "utterance" here, but his point applies most directly to assertions. (It is not clear that every utterance is meant to rule out information—sometimes we speak with no aim.) As I read it, Evans's argument works like this. Temporalism assigns the same semantic value to "London is cloudy" no matter when the assertion is made: it assigns the proposition [*Cloudy*(*london*)]. Suppose the weather in London frequently changes. And suppose I want to comment on our current overcast condition. In an idealized sense, the point of making an assertion is to share information with my conversation partners, so that by the end of the conversation, we all know more than we started. Therefore, I should say something true that will be evaluated by everyone as such at least until the end of the conversation. But if what I say is [*Cloudy*(*london*)], this will likely be *false* by the end of the conversation. And considering my assertion retrospectively, I will have botched it by contributing a false content. As Evans sarcastically notes, I can't dodge the problem by asserting that it is not cloudy, just because I think [¬*Cloudy*(*london*)] will be true for most of the conversation. But then I am out of options for temporalist contents to contribute. So if temporalism is true, it is not clear what we should aim for in making assertions and how we should judge speakers that end up speaking falsely. Evans thinks that communication without norms to decide these matters isn't communication. So he concludes that temporalism is mistaken.

The problem does not merely affect accurate communication. In his 1981 "Temporalism and Eternalism" paper, Mark Richard raises a similar problem for temporalist accounts of belief. Here is Richard's argument, simplified and updated for modern times. Suppose in 2002 someone told Mary, "Bush is President" and Mary believed it. Mary still believes everything she ever believed. What does Mary

believe in 2011? The temporalist seems committed to the validity of the following argument:

(1) Mary believed that [$Pres(bush)$].
(2) Everything Mary ever believed, she still believes.
(C) Mary believes that [$Pres(bush)$].

Premise (1) follows from temporalism and the content assumption explained in Section 1. Premise (2) is meant to uncontroversially capture what it is for Mary to retain a belief. But the conclusion is absurd; Obama is President now, not Bush. Or so Richard complains: "This argument is not a valid argument in English... it would not only be uncharitable, but incorrect to infer (the conclusion)." [11] As a similar argument could be run for any temporalist proposition, Richard concludes that only eternalist propositions are fit to be ascribed as contents for beliefs about temporary events.

It is important that we distinguish two of Richard's charges. First and most directly, he claims that the Mary argument is not "valid in English." In other words, while Richard thinks it is natural for Mary to report "I believed that Bush was President, and I still believe that", it is not natural to conclude that Mary believes a proposition of the form [$Pres(bush)$]. Richard thinks the temporalist is committed to the following formalization of the Mary argument:

(1) $\mathcal{P}B(m, \phi)$
(2) $\forall x(\mathcal{P}B(m, x) \rightarrow B(m, x))$
(C) $B(m, \phi)$

This argument is valid with respect to even very weak tense logics. So if the temporalist concedes that this captures the structure of the informal Mary argument, she should insist the argument is valid. But in addressing this point, the temporalist has options. [12] First, she might deny that premise (2) captures the appropriate logical form of "Everything Mary ever believed, she still believes" and insist on a different formal regimentation that makes the argument invalid. Second, the temporalist might insist that the informal argument is valid, but maintain that we judge it invalid because we mistakenly judge to (2) be true in cases where ordinary agents retain a belief over time. I will be primarily concerned with this second kind of response here. And we'll return to this question of whether (2) captures belief retention in detail in Sections 5 and 6, when we consider in more detail what it is for a rational agent to maintain an attitude towards a content.

Set aside Richard's first objection momentarily. His second, related charge is a complaint that Evans shares. If we ascribe temporalist propositions to agents, it seems we are being deeply uncharitable: temporalism forces us to interpret them as constantly failing. Over time, I do not successfully communicate the state of the weather and Mary develops an inaccurate view of domestic politics, because the contents of our beliefs and assertions cease to accurately represent reality. This simple but important point can be made into an argument:

THE EVANS-RICHARD ARGUMENT:

(P1) Eternalist propositions can make a lasting contribution to conversations and investigations while temporalist propositions cannot.

(P2) When agents make an assertion or form a belief, they intend for the content to make a lasting contribution to the conversation or investigation.

(C) So the intended content of beliefs and assertions must be eternalist propositions.

The argument especially stings any A-theorist who believes the same propositions both accurately represent reality *and* play a central role in explaining our beliefs and the beliefs we cause in others.[13] The Evans-Richard argument gives rise to what I will call the *content problem of temporalism*: temporalist propositions seem unfit to be the contents of our beliefs and assertions.

Evans and Richard laid the groundwork for the content problem, and in subsequent decades their work has featured prominently in arguments for diverse positions in metaphysics and the philosophy of language. For example, Josh Parsons thinks that Evans's argument ought to motivate A-theorists to reformulate their view using modal primitives.[14] Francois Recanati takes the Evans argument to motivate his moderate relativism.[15] Jeffrey King cites Richard's argument as evidence for why we should ascribe structured eternalist propositions as contents.[16] And Jonathan Schaffer relies on the Richard argument to motivate his parallelism defense of necessatarian propositions.[17] These are just four very recent examples of philosophers who take the content problem to pose a grave challenge for temporalists.

In the second half of this paper, I will argue for solutions to the content problem for temporalism. In particular, I will dispute the first premise of the Evans-Richard argument—the claim that temporalist propositions cannot make a lasting contribution to conversations and investigations. But we cannot hope to cure the content problem until we have first arrived at a proper diagnosis of it, and to my knowledge, nobody so far has taken care to explain the second premise of the Evans-Richard argument. In the next section, I will show how it follows from a broadly Stalnakerian theory of content. As we will see, the problem for temporalism is more general than Evans, Richard or their recent supporters suspect; it is latent in one of the best theories of belief and assertion available.

3. Updating and the Goal of Belief and Assertion

Our beliefs and assertions have a teleology—they aim at something. A theory of communication should identify the goal of assertion and show how rational agents realize that goal. Likewise, a theory of investigation should identify the goal of belief and show how rational agents realize that goal. I assume that the proper aim of a belief system is a complete and accurate representation of reality. The proper aim of assertion is to share beliefs in order to aid conversation partners in forming their complete and accurate representations of reality. But how exactly

do we construct these representations? Robert Stalnaker offers perhaps the most elegant model of this process in his "Assertion". Here is the view in a nutshell:

> A CONTEXT SET is the set of possible worlds recognized by the speaker to be the "live options" relevant to the conversation... To engage in conversation is, essentially, to distinguish among alternative possible ways that things may be. The purpose of expressing propositions is to make such distinctions.[18]

Stalnaker generalizes this model of information-as-context-set-restriction to other attitudes in *Inquiry*.[19] In his account, Stalnaker treats propositions as functions from possible worlds to truth-values rather than as structured Russellian entities. This distinction is a matter of some controversy, but it will not matter for our purposes. The main assumption we need for generating the problem is that at least some context sets can represent A-theory worlds—worlds where there is an objective fact about which times are present, past and future.

An example clarifies how the Stalnakerian model works. Suppose you and I have a short conversation about Abraham Lincoln. At the start of the conversation, I have only one relevant belief, namely that Lincoln was a President. One way to represent this is that I have distinguished the worlds where Lincoln was President from the worlds where he wasn't, and I believe the actual world is in the first category. Another way to represent this is that I believe the structured proposition, $[\mathcal{P}\,Pres(l)]$. (I'll use the temporalist form since that is the form that gives rise to our problem.) Since this is my only Lincoln belief, I am open with respect to a wide range of Lincoln's other properties. Let's further suppose that you have only one relevant belief, namely that Lincoln was a Midwesterner: $[\mathcal{P}\,Midwestern(l)]$. I assert, "Lincoln was a U.S. President" and you reply, "And he was from the Midwest." We both update our beliefs to include the proposition $[\mathcal{P}\,Pres(l) \wedge \mathcal{P}\,Midwestern(l)]$. Or, put another way, we've both ruled out all of the possible worlds where Lincoln is either not a past President or not a past Midwesterner. A few seconds into our conversation, progress has been made. Whereas before it was an open question for the conversation whether Lincoln was from Massachusetts or New Jersey or what his precise occupation was, we have now each ruled out some possibilities. And our individual beliefs about Lincoln are the better for it. A parallel model works for investigations, except in investigations only a single agent is updating a context set over time.

In conversations and investigations, our idealized goal is to believe and cause others to believe the proposition that picks out exactly one possibility—the actual world.[20] Call this the *goal proposition*. Norms for assertion and belief steer us in the direction of this goal. We measure assertoric and doxastic success in terms of how much closer or further our assertions and beliefs take us from this goal. If we are always ruling non-actual possibilities out of the context set, we are doing well. If we can't rule out anything, we've stalled. If our assertions or beliefs rule out the actual world, we've failed. The best assertoric and doxastic agents move most efficiently to the propositions most similar to the actual world. Bad agents move away from the actual world, eliminate it from the context set quickly, or eliminate every possible

world by introducing inconsistent contents. Conversations and investigations begin because agents haven't identified the goal proposition. And in the perfect situation, they end when only the goal proposition remains in the field of live possibilities. I take this to be the broadly Stalnakerian model of communication and investigation.

The norms for forming beliefs and making assertions should follow from this goal of an accurate representation of reality. And it seems they do. For example, consider the most widespread norm:

TRUTH: Do not assert or believe false propositions.[21]

Necessarily, if you believe or assert a false proposition, then you do not believe or assert any component of the goal proposition. So asserting or believing such propositions moves agents further from the goal.

Less often discussed, but just as important is:

QUANTITY: Believe and assert the most precise, maximal propositions you can.

Aim to have detailed beliefs about the world. Draw as many legitimate distinctions and eliminate as many live possibilities as possible. QUANTITY is also entailed by the nature of the goal. The goal is to represent actuality. The actual world is described by a maximal, consistent proposition: for every simple proposition that exists, either it or its negation is a conjunct of the complex proposition. If we do not at least aim for maximality, we won't "zero-in" on the goal proposition, distinguishing it from alternatives.

A third, far less-discussed norm is also in the background of the Stalnaker model and the Evans-Richard argument:

PERSIST: Intend for the propositions you contribute to make a persisting change to the context set and to be relied upon in the future (at least until the end of the investigation or conversation).

We see some evidence of this assumed norm in Evans' claim that assertions are to be evaluated according to what they rule out "once and for all." And PERSIST seems to be a natural extension of the Stalnakerian model When we begin a conversation or investigation, we are entertaining a high number of live possibilities. We wish to incrementally reduce this number without eliminating the goal proposition. If our contents did not make a persisting change to the context set, we wouldn't be able to reduce live possibilities.

Of course conversations and investigations are ruled by other, more pragmatic norms. Don't go on for too long, obey standards of contextual relevance, and so on. And if we follow the Bayesians and assign numerical credences to beliefs, there will be additional norms for updating these. Set aside pragmatic and Bayesian concerns for our purposes and focus on just the idealized model of belief and assertion. If we endorse the broadly Stalnakerian picture of communication and investigation—and I think we should—it seems natural to believe that TRUTH, QUANTITY, and PERSIST

form the basis for deciding what to believe and assert and for evaluating the beliefs and assertions of others. If this is right, we should expect the three norms to be compatible: a very effective agent could adhere to all three. We can now show with a quick reductio argument that if the three norms are compatible, then temporalism is false.

Assume temporalism and the Stalnakerian model of content outlined above. If the three norms listed above form the basis for rational conversation and investigation, then it ought to be possible for an agent to perfectly follow the three norms and believe and cause others to believe the goal proposition. Suppose they do and call such a possible perfect believer and asserter "God". At some time t_1 the goal proposition is ϕ. At t_1, God believes and asserts ϕ, since ϕ is true and maximal and God is following the first two norms. At some later time t_2, ϕ is false, since one of ϕ's conjuncts is a temporalist proposition and that proposition changes truth-value. Since ϕ is false at t_2, it cannot accurately represent reality. So at t_2, ϕ is not the goal proposition; some other proposition is. But at t_2, God intends to assert and believe ϕ rather than any other proposition, since God intended at t_1 for his content to make a persisting change in the context set. He followed the third norm too. So at t_2, God has followed the norms perfectly, but he does not currently believe the goal proposition, nor has he caused others to believe it. Contradiction.

As it stands, the broadly Stalnakerian theory of information as a restriction of a context set excludes temporalism. But the basic framework is very attractive as a theory of belief and assertion. So how much of it can be retained by temporalists? It seems strange to think that our best theory of content should limit our options for a metaphysics of time. So is there a theory of belief and assertion that fits the Stalnakerian model and but remains neutral with regards to the metaphysics of time? More generally, if one of the A-theories is true, how could we speak and reason about an ever-changing world?

There are at least four open lines of response for temporalists. First, one might reject TRUTH as a norm for belief and assertion. John MacFarlane has argued for this as a response to Evans's argument. In Section 7, I will consider this option and argue that it goes too far. Second, one might reject QUANTITY. I will not consider this option in any detail in this paper because I cannot see any non-pragmatic objection to the norm, and because we could reconstruct the perfect believer/asserter arguments with a weaker assumption—just suppose we have a perfect believer/asserter who believes or asserts *at least one* temporalist content.[22] Third, one might identify a different mechanism by which beliefs and assertions persist–one that avoids the reductios but upholds PERSIST. I will consider this option in Section 6 and argue that this strategy is too weak. Finally, one might deny PERSIST. This is the reply I favor, and it is the option to which we now turn.

4. An Initial Diagnosis

As we've seen, the norms governing assertion and belief depend crucially on how we characterize the goal proposition. Should the temporalist agree with the characterization that motivates the PERSIST norm? I think not. But first a helpful parable:

HAROLD AND KUMAR: Harold and Kumar are hungry and decide to eat at the White Castle restaurant in New Brunswick. They agree to do what it takes to get to White Castle: pooling gas money, sharing maps, and temporarily abandoning other, conflicting pursuits. When they depart on their journey at 3:00pm, White Castle is open. At 3:30pm, en route, they hear over the radio that citywide power outages have closed the restaurant.

At 3:30pm, does Kumar have any obligations to share White Castle-directed resources with Harold? He does not. As of 3:30pm there is no goal for their journey. Kumar might have a more general obligation to make sure Harold gets home safely. He might adopt new specific obligations if he and Harold decide to drive to the White Castle in Paramus instead. But as the specific goal is no longer attainable, it is now *pointless* for Kumar to share maps of New Brunswick with Harold or for them to continue driving on their current course. And pointless obligations aren't obligations at all.

Now suppose Harold and Kumar set out originally with only a more general goal in mind: to get to some open White Castle as efficiently as they can. In this case, their more specific, instrumental obligations will change whenever the environment changes. If New Brunswick is the closest open restaurant, they ought to head there. If the New Brunswick location closes, they should divert resources to Paramus. Their plans ought to track the location of the closest open White Castle. And their adventure ends either when they reach an open one or it becomes impossible to fulfill the goal.

How does the parable bear on temporalism? I am a temporalist because I am an A-theorist, and I am A-theorist because I think change is something beyond mere variation in a spacetime manifold. Some objects have temporary properties *simpliciter*, and when objects change with respect to these properties, then propositions change truth-value in step. The maximal, consistent proposition describing how the world is now will be false very soon. (Pause.) That proposition is false and another proposition is true. In other words, our goal proposition is a moving target. Changes in the goal proposition are not a problem if we limit our conversations and investigations to eliminating possibilities about the past. Past propositions won't change truth-value.[23] But if we wish to make a comment or form a belief about the present or future, we must recognize that our aims are ephemeral. Propositions about temporary events in the present or future cannot make an enduring contribution to a context set, because the goal proposition will inevitably undergo change with respect to these conjuncts. When we aim to eliminate present or future possibilities, temporalists should not follow PERSIST without qualification. It would be as pointless as Kumar setting out on a trip to White Castle and committing to spend his time and money on the journey *even if* the restaurant closes.

The observations helps us to more precisely diagnose the cases that give rise to the Evans-Richard argument. Recall the form of Richard's Mary argument:

(1) Mary believed that [$Pres(bush)$].
(2) Everything Mary ever believed, she still believes.
(C) Mary believes that [$Pres(bush)$].

The temporalist should view the argument as valid, assuming the logical form is as we represented it in Section 2. But the temporalist should also think it appropriate to criticize Mary. She should not believe everything she once believed if part of what she once believed was a temporalist proposition about the present. Mary is slavishly following the unqualified PERSIST norm. It is easier to see the problem when we plug a future-tensed proposition in place of $[Pres(bush)]$. Say Mary believed on Tuesday that a sea battle will be fought on Wednesday: $[\mathcal{F}Fought(battle, weds)]$. Wednesday comes and goes. On Thursday, Mary still believes everything she ever believed—namely that there *will* be a sea battle on Wednesday. Not only is Mary's belief false, it seems she is unresponsive to the passage of time. There is clearly some problem in Mary's temporal updating.

How should temporalists diagnose the Evans argument? Any time I make a present-tensed assertion like "London is cloudy," I am merely conditionally helping us get to the temporary goal. As soon as the weather changes, the proposition I originally asserted is false. But I have done nothing wrong, because the PERSIST norm is contingent on a relevant goal existing.

And what should we say about the perfect believer and asserter arguments? If epistemic mortals are not bound by unqualified PERSIST when they form present or future beliefs, then God is surely not bound by the norm. Still, we can say more about the case. The perfect believer or asserter has the distinction of being able to reach the goal proposition immediately. He already knows it. Should the perfect believer and asserter be bound by TRUTH and QUANTITY? Of course. Any belief or assertion that is sub-maximal or false would move God away from the goal proposition. TRUTH and QUANTITY are *constitutive* norms—they are entailed by what the goal proposition is, namely a true, maximal, consistent proposition. But PERSIST is justified not by the nature of the goal itself but rather by QUANTITY and the fact that imperfect believers and asserters cannot immediately reach the goal proposition. PERSIST is an instrumental norm—we follow it only to the extent that it takes multiple stages in an investigation or conversation to arrive at the goal proposition. So even the eternalist should agree that it is a norm which binds us *only to the extent that we fall short of following the constitutive norms*. In practice, this always happens. But dropping PERSIST could be consistent with an ideal Stalnakerian model of communication and investigation, while dropping TRUTH or QUANTITY could never be.

5. The Cure: Tracking Norms

I think temporalists should abandon PERSIST, but they should not concede the first premise of the Evans-Richard argument. That is, they should not concede that temporalist propositions cannot make a lasting contribution to conversations and investigations. But what should go in the place of PERSIST? We are epistemic mortals, struggling to grasp the most accurate, true proposition describing the world. Our conversations and investigations take time to conduct. And temporalists think over time our goal will change, because the truth-values of present and future propositions keep changing. With this background picture, present and

future-tensed beliefs and assertions seem pointless—they are aimed at an elusive goal. So we still haven't met the burden of answering the content problem. How do we decide what to say about the present and future? And what role, if any, could temporalist propositions play in our belief systems?

To make the challenge even more stark, we might wonder how a temporalist could handle cases where conversations and investigations involve *only* temporalist contents. For example:

> *HORSE RACE*: Suppose Harry and Marv know all of the same eternalist propositions. They are watching a horse race together, each from a different vantage, sequentially narrating events as they occur. At the start of the race, Marv asserts "The gun fires, they're off, and all of the horses are evenly matched!" Second later, Harry asserts "Now Maverick takes the lead!" Marv adds: "But now Secretariat closes the gap!" A few seconds later, Marv: "Now Secretariat is ahead!" And a few second later, Harry: "Secretariat wins!"

Here are some beliefs the temporalist ought to have about the case: (1) —Harry and Marv are having a real time conversation about a horse race, (2) each is advancing the conversation with his assertions because each is contributing new content, and (3) the conversation lasts (at least) from the start of the race to Secretariat's victory. Now we see the trouble. The goal proposition changes at least four times in the course of the conversation. Are Marv and Harry's assertions distinguishing possibilities in one and the same context set? If not, they are not having a conversation, at least not on the Stalnakerian model. Does one conversation end and another begin each time the goal shifts? If so, then the conversation doesn't last as long as the race. So how precisely do the temporalist propositions engage with the context set?

The problems point us toward a solution. I assume conversations and investigations survive changes in the goal proposition. But Marv asserting "Secretariat closes the gap!" must prompt *some* kind of lasting change in the context set. So we require more sophisticated norms that ensure our beliefs and assertions both (1) respond to changes in the goal and (2) make appropriate changes to the context set. I suggest temporalist contents advance conversations and investigations only when the agents involved in the investigation or conversation intend to track these changes in truth-value. Here are two norms agents might follow to track changing goal propositions, one for present-directed contents and one for future-directed contents:

(1) PRESENT TRACK: if you form a belief or assert a proposition of the form $[\phi]$ about a present, temporary event, then intend for the content of your belief or assertion to make a persisting contribution to the context set with two qualifications:

   (i) intend for the content of your belief or assertion that $[\phi]$ to expire if $[\phi]$ is false; and

(ii) intend to believe and contribute a complex proposition of the form [$\mathcal{P}\phi$] if [ϕ] is false and you have no new evidence that [ϕ] was false when initially believed or asserted.

(2) FUTURE TRACK: if you form a belief or assert a proposition of the form [$\mathcal{F}\phi$] about a future, temporary event, then intend for the content of your belief or assertion to make a persisting contribution to the context set with two qualifications:

(i) intend for the content of your belief or assertion that [$\mathcal{F}\phi$] to expire if [$\mathcal{F}\phi$] is false; and

(ii) intend to believe and contribute a simpler proposition of the form [ϕ] if [$\mathcal{F}\phi$] is false *and* you have no new evidence that [$\mathcal{F}\phi$] was false when initially believed or asserted.[24]

It is essential that we distinguish content expiration from content falsification, and we do this by paying attention to the evidence that triggers an agent's updating. A content merely expires if the agent becomes aware that it is false and the only relevant evidence for its falsity is that time has passed. A content is falsified if an agent becomes aware that it is false and has relevant evidence that it was false when first contributed. So suppose it is Tuesday and Mary believes there will be a sea battle tomorrow. Wednesday comes, and Mary realizes that her belief is false. It may be that here belief has merely expired, the sea battle is presently occurring (assume it will last only a short time), and she should believe that it is presently occurring rather than that it is in the future. Or it may be that she was mistaken in her prediction, and that the belief is false because the battle was cancelled. In this second case, it would be incorrect for Mary to believe that a sea battle is presently occurring and Mary is at fault for forming the initial belief. In the former case, even though what she believed is now false, she was entirely justified in believing it. We can also distinguish expiration from falsification by considering the resulting context sets. If Mary merely tracks the passage of the sea battle, her Thursday context set will include the proposition that the sea battle occurred. If Mary's initial belief is falsified, her final context set ought to represent that there never was, is or will be a sea battle on Wednesday. Good temporalist theories of content distinguish between the kind of updating that is appropriate when a goal changes and the kind of updating that is appropriate because an agent's original belief or assertion was mistaken. By making this distinction, the tracking norms solve the charity problem for temporalist contents: there is nothing uncharitable in attributing temporalist propositions as long as agents follow (and reasonably expect others to follow) the tracking norms.

And the tracking norms have an added benefit. Our theory of content should be neutral with respect to which of the two metaphysics of time it requires. It would be strange to argue from considerations of content that we must be B-theorists rather than A-theorists. As we saw, the unmodified Stalnakerian model presupposes a B-theory. But the tracking norms are consistent with the A-theories without begging any questions against propositional eternalists. Eternalists are

never required to believe propositions with past or future tense operators, so the antecedent of FUTURE TRACK is never true on eternalism, and the consequent is never applied. The antecedent of PRESENT TRACK is always true on eternalism. But because the relevant $[\phi]$ cannot change truth-values, agents need never believe or assert propositions modified by tense operators. They need only intend to believe them *if* $[\phi]$ changes truth-value. And surely this is the right result; if $[\phi]$ changes truth-value than eternalism is false.

If the tracking norms are understood as implicit features of our framework for communication and investigation, then the Evans-Richard argument fails, because temporalist contents can make lasting contributions to the context set, albeit indirectly. Premise 1 of the argument is false. I think temporalists should adopt the tracking norms, but there at least two alternative proposals suggested in the literature. In the remainder of this paper, I'll outline these proposals and present my reasons for finding them less attractive than the tracking norm account of content.[25]

6. Reply 2: Double the Content?

Once again recall the Mary argument. Richard maintains the correct logical form of the argument is:

(1) $\mathcal{P}B(m, \phi)$
(2) $\forall x(\mathcal{P}B(m, x) \rightarrow B(m, x))$
(C) $B(m, \phi)$

where (2) is meant to capture "Mary still believes everything she ever believed." Some temporalists will reasonably deny that the logical form of belief persistence is so straightforward. They'll maintain that for the argument form to be valid, the quantifier in (2) must be tacitly restricted to propositions that will not change truth-value.[26] Which propositions can do the job? Some temporalists are *conciliatory*—they admit there are many propositions about temporary events that do not change truth-value, but they insist there is another layer of temporalist propositions on top of these.[27] So if Obama is President, there are two true propositions about the event: $[Pres(obama)]$ and $[Pres(obama, 2011)]$. For the conciliatory temporalist, assertions like "Obama is President" are ambiguous. They can pick out either of these propositions or even their conjunction. In contrast, *non-conciliatory* temporalists think that no propositions about temporary events are eternally true.

The conciliatory temporalist has a ready answer to the content problem, for this temporalist has a stock of unchanging propositions at hand. In 2002, when Mary forms the belief that Bush is President, she believes both $[Pres(bush)]$ and $[Pres(bush, 2002)]$. Her belief in the former explains her tendency to make assertions like "Bush is President *now*" and it explains her disposition to rush to Washington when she wants to see him. Her belief in the latter proposition explains how her attitude lasts through time. The conciliatory temporalist will claim that an agent's belief survives so long as the agent continues to believe the eternalist

proposition. And the conciliatory temporalist will claim that agents always contribute dual contents to conversations, but only eternalist propositions are meant to be believed until the end of the conversation. So the conciliatory temporalist agrees with the conclusion Evans-Richard argument, but carves out a separate role for temporalist contents.

Still there are difficulties for this conciliatory strategy. First, the content problem gets its force because we assume that a single kind of content *both* accurately represents the world (i.e. accurately represents the nature of non-relational temporary properties like *is President*) and is what our beliefs and assertions convey. Still the metaphysically serious conciliatory temporalist cannot save both the content and accuracy assumptions, at least not in their current forms. The eternalist propositions do the lion's share of the work in explaining what an agent aims to acquire in investigations and aims to impart in conversations. But the eternalist propositions do not accurately represent temporary properties because (by assumption) some are A-properties and non-time-relational. So the conciliatory temporalist can no longer maintain that what we rationally believe and assert over time is what most accurately represents the world.

Second, there are propositions that most temporalists think change truth-value over time but that do not have any eternalist proxy. For example, suppose Mary believes that Obama exists, but only temporarily. She thinks he will cease to exist when he dies. Mary believes $[\exists x(x = obama)]$. This proposition will change truth-value at some point in the future. But there is no eternalist proposition corresponding to this content, because existence and bare identity are not possibly time-relative (at least not on the usual neo-Quinean theory of existence and quantification).[28] So we'll need something other than the conciliatory strategy if we wish to account for agents updating beliefs about temporary existence.

Third, we might worry that the conciliatory strategy is vulnerable to a kind of information puzzle. Consider this case:

> *PRISON NEWS:* In 2000, Mary is locked in solitary confinement. As part of her punishment, she is not allowed to know any facts about the time. Occasionally she is given a copy of the *New York Times* with the dates blacked out. One day in 2003, on the basis of her newspaper, she forms the belief that Bush is President. When she is freed in 2009, Mark asks her what she was able to learn about the outside world during her long confinement. She reports, "I learned that Bush was President."

While in prison, Mary believed the temporalist proposition $[Pres(bush)]$. She was not able to form the corresponding eternalist belief $[Pres(bush, 2003)]$, because she didn't know what year it was. So the belief she retained throughout her captivity couldn't have been $[Pres(bush, 2003)]$. Still, it seems she faultlessly retained some belief about the Bush administration. We can explain this on the tracking theory. Mary didn't retain any single content. Rather, when she formed the belief in the first instance, she intended to update it to $[\mathcal{P}Pres(bush)]$. That is what she believes now, and it is the content she means to share when she reports what she learned during her incarceration. If Mark insists, "Mary surely you don't *still* believe Bush is

President!", then she will reasonably reply, "What I mean is that I (now) believe that Bush *was* President, and I believe this because I learned of the Bush administration back in captivity." The belief in the first temporalist proposition lead to belief in the second by way of the tracking norm. When did her belief shift? It probably happened gradually, as her credence that $[Pres(bush)]$ waned. What matters is the conciliatory account of belief retention cannot be the whole story, because it cannot account for belief retention in cases where the agents do not fix a particular time.

There is another option for replying to the *PRISON NEWS* case that might better support the conciliatory strategy. Suppose Mary develops a little ritual to help her manage the psychological torment of her captivity; she begins to name intervals of time that have elapsed. Sometime after her initial imprisonment, she performed the following speech act: "Let t_1 name the interval that elapsed between my initial imprisonment and now." On the morning she received the *New York Times*, Mary decreed "Let t_{1000} name the interval between t_{999} (my last time-baptism) and now."[29] Mary then formed the belief $[Pres(bush, t_{1000})]$. Could this kind of content explain the persistence of Mary's beliefs? Maybe. But contents like this will be of extraordinarily limited use in distinguishing possibilities from the context set. For instance, Mary will never know that t_{1000} is 2003. And if she tells Mark that she learned "that Bush was President in t_{1000}", this will not help him distinguish the possible world where Mary believes $[Pres(bush, 2003)]$ from the worlds where she believes $[Pres(bush, 2000)]$ or $[Pres(bush, 2008)]$. Believing and asserting these "private name" propositions will not aid Mary in conducting rational conversations and investigations outside of the confines of her prison.

So as it stands, eternalist propositions are of limited use in explaining how contents persist through time. I think any upshots of the conciliatory proposal are more easily accommodated by the tracking theory offered in Section 5.

7. Reply 3: Reject Truth as Norm of Belief and Assertion

There is yet a third option for responding to the Evans-Richard argument that deserves discussion: we might abandon the Stalnakerian model of content. John MacFarlane's account of future-tensed assertions faces a version of the content problem. And in addressing the problem, he argues that we should reject TRUTH as a norm for belief and assertion. If we reject the TRUTH norm, then the fact that temporalist propositions change truth-value is no reason to disqualify them as persisting contents. I'll close with some thoughts on MacFarlane's approach.

MacFarlane arrives at his version of the content problem through a circuitous path. Normally we only consider the time of utterance when evaluating the truth of an asserted proposition. If I assert "London is cloudy" at 3pm, what I assert is true if an only if $[Cloudy(london)]$ is true at 3pm. If I assert "London will be cloudy at 4pm" at 3pm, what I have asserted is true just in case some proposition like $[\mathcal{F}Cloudy(london, 4pm)]$ is true at 3pm. MacFarlane denies this simple picture of future-tensed assertions. In a series of papers, he builds a case that two contexts play a role in determining the truth-value of future-tensed assertions: the time when the assertion is made *and* the time when the assertion is evaluated.[30] According to

MacFarlane, at 3pm my assertion "London will be cloudy at 4pm" lacks a truth-value.[31] At 5pm it can be evaluated as true or false depending upon the weather at 4pm. Indeed, the content will only have a truth-value from 4pm onward. Call this theory *relativism about tensed contents.* Relativism is supposed to better capture intuitions about indeterminacy. Insofar as the open future is a component of many A-theories of time, relativism provides an attractive theory of content for some A-theorists.

But as MacFarlane realizes, relativism complicates the TRUTH norm. Any future-tensed assertion lacks a truth-value at the time it is made. Likewise, beliefs about the future lack truth-values when they are formed. So how does an agent decide what to believe or assert about the future and how should we evaluate the correctness of agents' future-tensed beliefs and assertions? None of the contents of such beliefs and assertions are false. So all of them trivially satisfy the TRUTH norm as I've stated it. But surely not *all* future-tensed assertions and beliefs are created equal. My belief that it will rain in an hour is appropriate, given the current overcast condition. My belief that a fair coin will very likely land heads on the next toss is incorrect. How do relativists distinguish good doxastic and assertoric agents from bad ones?

MacFarlane responds by arguing against TRUTH as a norm of assertion. In "Future Contingents and Relative Truth" he directly addresses the Evans argument, writing:

> It is not obvious that 'aiming at the truth' should play any part in an account of assertion. If we aim at anything in making assertions, it is to have an effect on other people: to inform them, persuade them, amuse them, encourage them... Even if we limit ourselves to sincere assertions, truth is only our indirect aim: we aim to show others what we believe, and we aim to believe what is true.[32]

Elsewhere he extends his response to the case of belief:

> There are many dimensions along which beliefs can be assessed as correct or incorrect. If you have patiently gathered the evidence and it overwhelmingly favors not-p, then there is an important sense in which it would be wrong for you to believe p, even if p happens to be true.[33]

MacFarlane denies that the primary goal of investigations and conversations is providing a complete and accurate representation of reality. Surely he is right to note that there is more to being a good doxastic and epistemic agent than merely aiming at truth. But are these good enough reasons to abandon TRUTH as a norm of belief and assertion? MacFarlane suggests alternative norms that he thinks accommodate relativism while capturing the original motivations for aiming at truth. According to MacFarlane, we assess the correctness of belief and assertion based on a cluster of considerations; in particular we should evaluate agents on their willingness to withdraw false assertions, provide justification, and accept responsibility when they

mislead others.[34] For MacFarlane, we should aim at contributing contents that we can commit to justifying or responsibly withdrawing.

MacFarlane's relativism forces him into this more flexible account of the aim of assertion and belief. But as we've seen, non-relativist temporalists have other have other options in responding to the content problem. And I think non-relativist temporalists should be reluctant to follow his lead. First, we can answer MacFarlane's objections by adding norms to the original package rather than dropping TRUTH. Whatever the correct theory of justification is, there should likely be a norm guiding us to aim for justification in our beliefs and assertions. We may even go as as far as Timothy Williamson and replace TRUTH with a norm that explicitly entails both accuracy and justification.[35] Williamson thinks we ought to follow:

KNOW: Only assert or believe knowledge.

The knowledge norm of belief and assertion seems a harsh standard to anyone who does not agree with Williamson's knowledge-first epistemology, but it solves the problem of falsely attributing success to bumbling agents who just happen to arrive at the truth. And as knowledge is factive, KNOW entails that agents are still aiming at accuracy in their contributions to conversations and investigations. MacFarlane's counterexamples do not entail that we ought to abandon the TRUTH norm; they merely show that we need some kind of justificatory norm. So one may be convinced by MacFarlane's examples but not abandon the broadly Stalnakerian understanding of content.

Second, MacFarlane's system has difficulty accounting for some very natural ways in which we retrospectively assess others for their beliefs and assertions. Suppose in 2006 Mary predicts that Obama will be President in 2010 and she tells Mark her prediction. Now it is New Years Day 2010 and the Obama administration is in full-swing. It seems correct for Mark to assert, "What Mary said in 2006 was true." But on relativism, the proposition that Mary expressed was neither true nor false at any past time—it had no truth-value prior to Mark's assessment in 2010. So Mark's retrospective assessment is incorrect. The best he can claim is "What Mary said in 2006 *is* true." The tracking theory has no such difficulties. What Mary expressed in 2006 was true in 2006, namely $[\mathcal{F}Pres(obama, 2010)]$. That proposition is now false. But Mary was faultless in asserting it back in 2006, and there is no special reason for her to justify the assertion now. Why? It was true and informative, and she intended for this content to expire and be replaced with a new content in accord with the tracking norms. The tracking norms account for retrospective assessments better than relativism.

My final reason for resisting MacFarlane's account of belief and assertion is more blunt than the others, but to my mind also more forceful. I insist that rational agents in most circumstances are after the truth. It is a mitigating factor—an atypical cause for assigning blame—if an agent believes or asserts something on the basis of overwhelmingly misleading evidence. When we set out on investigations and conversations, we are not aiming merely to follow our evidence where it leads, we are aiming for it to lead us to the truth. To drop TRUTH entirely is to deny there is ever a

single mutual goal for our conversations and investigations. And I am not prepared to deny this if I can deny anything else. So I think non-relativist temporalists should preserve as much as possible of the Stalnaker model by adopting the tracking theory instead. But A-theorists who think the open-future requires relativism might find MacFarlane's answer to the Evans-Richard problem worth the extra cost.

8. Conclusions

Let's recap. Propositional temporalism goes hand-in-hand with the A-theoretic view of time and some very plausible assumptions about propositions. The Evans-Richard argument attempts to demonstrate that temporalist propositions cannot play one of their central alleged roles—namely, serving as contents for belief and assertion. But as we have seen, this problem only arises from a naive assumption about the goals of investigation and conversation. Once we realize that the goal of inquiry can undergo change, we should adopt conditional, tracking norms for contents rather than "once-and-for-all" contributions to investigations and conversations. This readily solves the content problem for temporalism and with fewer costs than alternative proposals.[36]

Notes

[1] Propositional eternalists who subscribe to a temporal parts theory of change will prefer a proposition of the form $[\exists p(Part(p, london) \land Cloudy(p) \land Located(p, t))]$. In English: London has a temporal part at t that is cloudy. These differences in formulation do not matter for present purposes.

[2] Some examples of explicitly temporalist A-theoretic views include Prior (1967), Zimmerman (2006).

[3] Ludlow (1999), Brogaard (2012), and Cappelen and Hawthorne (2009).

[4] Examples of B-theories include Quine (1950), Lewis (1986), Price (1996), and Sider (2001).

[5] Thanks to an anonymous referee for suggesting this way of framing the argument.

[6] See Kamp (1968), Partee (1973), Enc (1986), and King (2007).

[7] For example, David Lewis is an ontological eternalist who thinks that propositional attitudes are property ascriptions. See Lewis (1983). More on this in footnote 13.

[8] For example, see Prior and Fine (1977).

[9] Evans (2002, 349). Emphasis is mine.

[10] Evans (2002, 350).

[11] Richard (1981, 4).

[12] Chapter 2 of Brogaard (2012) has an expansive survey of options for formalizing the English version of the Mary argument.

[13] A-theorists are not the only party in this debate who face a problem explaining propositional attitudes. Propositional eternalists have long struggled to explain the difference in cognitive significance between temporalist and eternalist propositions. For example consider $[Leaving(bus)]$ and $[Leaving(bus, 9pm)]$. Mike might know that his bus is leaving at 9pm. But suppose he loses track of time and someone bursts into the room exclaiming, "The bus is leaving!" It seems that Mike learns something new that cannot be captured by just the eternalist proposition—Mike coming to learn the temporalist proposition might best explain why it is suddenly rational for him to leap up and run for the bus. To handle cases like this, many B-theorists turn to de se contents. They deny that all propositional attitudes are relations between an agent and a proposition. Rather, having an attitude is self-ascribing a property. Lewis is the most prominent advocate of this approach; see Lewis (1983). (In Lewis's case, we ascribe the property *is a temporal part in a world and time when the bus's temporal part is leaving*.) The

idea of belief as self-ascription is first formulated in Chisholm (1981), but Chisholm does not bring it to the aid of eternalism the way Lewis does.

[14] Parsons (2003).

[15] Recanati (2007, 38-40)

[16] See Chapter 7 of King (2007).

[17] Schaffer (Forthcoming).

[18] Stalnaker (2003, 85).

[19] Stalnaker (1987).

[20] Or perhaps the propositions that pick out a unique set of logically equivalent possibilities. This is closer to Stalnaker's view and it makes no difference for the arguments here. If you prefer the set view, simply substitute "unique set of maximal, consistent and true propositions" for "goal proposition" in everything to follow.

[21] I state the norm this way to avoid excluding open future incompatibilists at the outset. If it were stated as the stronger norm to only assert or believe truths, then open future incompatibilists would be forced to conclude that we cannot appropriately make assertions or form beliefs in future contingents.

[22] A perfect believer/asserter could technically follow TRUTH and PERSIST by believing and asserting nothing, and this would not trigger the problem.

[23] Assuming that there is no causally efficacious time travel and that there are no "soft" facts about the past. But there may be past propositions with dynamic truth-values. For example, suppose I believe the past proposition expressed by "Prince William was the only British royal to marry a commoner and retain his claim to the throne." Perhaps that is a proposition about the past which is true now, but will be false in a decade when Prince Harry marries a commoner. This would be a kind of non-fixed proposition about the past. If there are such propositions, then temporalists should add a rule for tracking changes in truth-values of past propositions. The rule will tell an agent to believe the negation of a past proposition when that proposition expires. I will not enter into the debate about soft facts here.

[24] These tracking norms can also be amended to accommodate different formalizations of tense. For example, many temporalists will make use of more fine-grained metrical tense operators like "It will be the case in two days that..." When an agent updates a proposition with a metrical tense operator like $[\mathcal{P}_n\phi]$, she should intend to believe $[\mathcal{P}_{n-1}\phi]$ when one unit of time has passed. I set aside this detail in implementation here, and when I discuss more precise past or future beliefs, I will make reference to times.

[25] It is worth noting that Richard considers and rejects a tracking account similar to PRESENT TRACK in Richard (1981, 6-8). He suggests temporalists might think of belief retention along the following lines. Suppose an agent retains a belief in ϕ from time t_1 to time t_2 just in case: (i) $t_2 > t_1$, (ii) the agent believes ϕ at t_1, and (iii) the agent believes $\mathcal{P}(\phi)$ at t_2. Richard then proposes a counterexample to the account. Lyndon Johnson won his Presidential race in 1964 but not in 1968. Let ϕ be the proposition that Johnson will be reelected: $[\mathcal{F}\,Reelected(j)]$. In 1964 Mary forms this belief and retains it (since he was re-elected in 1964). That is, at later times she believes $[\mathcal{PF}\,Reelected(j)]$ In 1966, Johnson is standing for an election and Mary believes p again. But she does not retain this belief in 1969, since Johnson lost the election. So it seems Mary both does and does not believe that $[\mathcal{PF}\,Reelected(j)]$, which is absurd. But the counterexample is misleading since it trades on an ambiguity in "Johnson will be reelected". The problem will dissolve if Mary forms the more fine-grained beliefs that Johnson will be elected *for the second time* and that Johnson will be elected *for the third time*. It will also dissolve if Mary updates using metrical tense operators. There is no need for temporalists to assume she forms exactly the same belief in 1964 and 1966. (And for that matter, Johnson was elected, not *reelected* in 1964. 1964 was the first time he stood a Presidential election).

[26] For example, Aronszajn (1996) discusses a solution along these lines.

[27] For an example of conciliatory temporalism, see the postscript to Zimmerman (2006).

[28] See the introduction to Sider (2001) or van Inwagen (1998) for some background on neo-Quineanism.

[29] Sarah Moss has an interesting and somewhat related proposal for explaining de se updating about times, see Moss (Forthcoming).

[30] MacFarlane (2003) and MacFarlane (2005).

[31] To be more precise, MacFarlane assigns truth-values directly to utterances. This feature of his theory prevents him from being a genuine temporalist by my account. But this doesn't matter for our purposes here.

[32] MacFarlane (2003, 334).

[33] MacFarlane (2005, 333).

[34] MacFarlane (2005, 334-338).

[35] Williamson (2000, 238-269).

[36] Thanks to Andy Egan, Jeff King, Karen Lewis, Mike Rea, Ted Sider, Jeff Speaks, Dean Zimmerman, two anonymous referees for *Noûs*, and audiences at Rutgers University, Calvin College, and the PERSP Workshop on the Open Future and the Northwest Time and Rationality Workshop for very helpful feedback on versions of this paper.

References

Aronszajn, Mark. (1996). "A Defense of Temporalism." *Philosophical Studies* 81: 71–95.

Brogaard, Berit. (2012). *Transient Truths: An Essay in the Metaphysics of Propositions*. Oxford: Oxford University Press.

Cappelen, Herman and Hawthorne, John. (2009). *Relativism and Monadic Truth*. Oxford: Oxford University Press.

Chisholm, Roderick. (1981). *The First Person*. Minneapolis: University of Minnesota Press.

Enc, Murvet. (1986). "Referential Analysis of Temporal Expressions." *Linguistics and Philosophy* 405–426.

Evans, Gareth. (2002). "Does Tense Logic Rest on a Mistake?" In *Collected Papers*, 343–363. Oxford: Oxford University Press.

Kamp, Hans. (1968). *Tense Logic and the Theory of Linear Orders*. Ph. D. thesis, UCLA.

King, Jeffrey C. (2007). *The Nature and Structure of Content*. Oxford: Oxford University Press.

Lewis, David. (1983). "Attitudes De Dicto and De Se." In *Philosophical Papers*, volume 1, 133–155. Oxford: Oxford University Press.

——. (1986). *On the Plurality of Worlds*. Oxford: Blackwell.

Ludlow, Peter. (1999). *Semantics, Time and Tense*. Boston: Massachusetts Institute of Technology.

MacFarlane, John. (2003). "Future contingents and relative truth." *Philosophical Quarterly*, 53.

——. (2005). "Making Sense of Relative Truth." *Proceedings of the Aristotelian Society* 321–339.

Moss, Sarah. Forthcoming. "Updating as Communication." *Philosophy and Phenomenological Research*.

Parsons, Josh. (2003). "A-theory for tense logicians." *Analysis* 63: 4–6.

Partee, Barbara. (1973). "Some Structural Analogies Between Tenses and Pronouns in English." *Journal of Philosophy* 70:601–607.

Price, Huw. (1996). *Time's Arrow and Archimedes' Point: New Directions for the Physics of Time*. Oxford: Oxford University Press.

Prior, A.N. (1967). *Past, Present, and Future*. Oxford: Clarendon Press.

Prior, A.N. and Fine, Kit. (1977). *Worlds, Times and Selves*. Amherst: University of Massachusetts Press.

Quine, W.V. (1950). "Identity, Ostension, and Hypostasis." *The Journal of Philosophy* 47:621–633.

Recanati, Francois. (2007). *Perspectival Thought*. Oxford: Oxford University Press.

Richard, Mark. (1981). "Temporalism and eternalism." *Philosophical Studies* 1–13.

Schaffer, Jonathan. Forthcoming. "Necessitarian Propositions." *Synthese*.

Sider, Theodore. (2001). *Four-Dimensionalism*. Oxford: Oxford University Press.

Stalnaker, Robert. (2003). "Assertion". In *Context and Content*. 78–95. Oxford: Oxford University Press.

Stalnaker, Robert C. (1987). *Inquiry*. The MIT Press.

van Inwagen, Peter. (1998). "Meta-ontology." *Erkenntnis* 48: 233–250.

Williamson, Timothy. (2000). *Knowledge and Its Limits*. Oxford: Oxford University Press.

Zimmerman, Dean W. (2006). "Temporary Intrinsics and Presentism." In Sally Haslanger and Roxanne Marie Kurtz (eds.), *Persistence: Contemporary Readings*, 393–424. Cambridge: MIT Press.