Quantifiers and Temporal Ontology*

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1. Skepticism about temporal ontology

Presentists and eternalists make competing claims about temporal ontology. According to presentism, only present things exist. According to eternalism, past and future things, such as dinosaurs and human outposts on Mars, exist as well.[1] These are theories about what there is, just like actualism, possibilism, Platonism, nominalism, Meinongianism, idealism, materialism, theism, atheism, the atomic theory of matter, and the belief in extra-terrestrials.

Presentists and eternalists *seem* to disagree, for instance over whether:[2]

(1) There exist dinosaurs

$\exists x \mathrm{D}x$

But according to a certain sort of skeptic — my opponent in this paper — the disagreement is merely verbal, and as a result, inquiry into temporal ontology is fundamentally misguided. The skeptic argues as follows:[3]

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[1]See Sider (2001*b*, chapter 2). These claims about temporal ontology are usually intended with some modal force. And there are other points of disagreement; presentists "take tense seriously" while eternalists (typically) do not. Another view on temporal ontology is the growing block hypothesis, according to which past and present objects, but not future objects, exist; see Broad (1923, chapter II) and Tooley (1997).

[2]I will take the locus of the dispute to be particular existence-claims like (1). General statements of presentism — viz., "everything is present" — raise further issues — viz., how should we understand 'present'? — that I want to sidestep. See Zimmerman (2002).

[3]Though this sort of skepticism is often expressed in discussion, it has received little defense in print, although see Lombard (1999) (especially pp. 254–255) and Savitt (MS). The genuineness of the presentism/eternalism dispute is discussed in Crisp (2003, 2004) and Ludlow (2004).

> Even the presentist agrees that there *once existed* dinosaurs. So if 'exists' in (1) means 'once existed', then everyone agrees that (1) is true. And even the eternalist agrees that there do not *now* exist dinosaurs. So if 'exists' in (1) means 'exists now', then everyone agrees that (1) is false. Under neither of these two meanings for 'exists' can there be controversy over (1). What else could 'exists' mean?

Well, 'exists' could mean *exists*. Eternalists think that dinosaurs exist — exist simpliciter. Presentists disagree. No quantifier, no matter how wide-open, ranges over dinosaurs. But more must be said.

2. Genuine vs. merely verbal disputes

Our skeptic says that the dispute between presentists and eternalists is "merely verbal". What, exactly, does that mean?

To say that an apparent dispute over sentence ϕ is merely verbal is to say that the disputants do not mean the same thing by the sentence ϕ, and that what one says by uttering ϕ is consistent with what the other says by uttering $\sim\phi$. Imagine an American and a Briton debating whether a certain quantity of water has volume one "gallon". In fact, the American has in mind an American gallon, and the Briton has in mind an imperial gallon. This debate is pointless. The disputants agree on the volume of the water; they simply need to settle on whether to speak in the British or American way about the agreed-upon facts. The question of which way to speak is "just bookkeeping".

After a dispute is conceded to be verbal, certain related genuine disputes might linger. One might argue over what sentence ϕ means in a certain natural language, or over what it would be best to mean by ϕ. But it would make little sense to pursue the original dispute in the original terms.

A philosophical dispute typically involves, not just one sentence, but a class of sentences, C. Suppose philosopher X accepts the sentences in C, and philosopher Y denies them. To make her case that the dispute is merely verbal, a skeptic may put forward a function, f, mapping sentences in C that X accepts to sentences that Y accepts. Call $f(\phi)$ the "translation" of sentence ϕ according to f, and call f a "translation function". X and Y do not genuinely disagree, according to the skeptic, because X's assertions may be translated into assertions that Y, too, accepts. To fully make her case, the skeptic will want a translation

function that is defined on all the members of C, but in order to partially make her case, she may rest content with a partial function.

What must translation functions preserve? At the very least, truth value. But that is obviously not enough: the claims of *any* two disagreeing parties can be mapped one-one preserving truth value if their languages have the same cardinality. Verificationists would require mere empirical equivalence, but nonverificationists will require more.

The skeptic must claim that the translation function f in some sense preserves *meaning*. A dispute is merely verbal when neither side disagrees with what the other side *means*. This opens a can of worms, for there are many things one can mean by "meaning". I will avoid opening the can of worms by proposing in the next section one necessary condition for having the same meaning — and thus a necessary condition on translation functions. The necessary condition, I think, must be obeyed by any sense of 'meaning' for which the skeptic's claims have bite.

3. To quantify or not to quantify

Why think that the claims made by presentists and eternalists are intertranslatable? Let us set out the prima facie case that they are not, and thereby force the skeptic to show her hand.

Opening salvo. Presentists and eternalists agree on the truth values of many natural language tensed claims, for instance

(2) Dinosaurs once existed

That is what breeds skepticism about temporal ontology. But they disagree over what makes tensed claims like (2) true.

For the eternalist, past- and future-tensed claims are ultimately made true by claims that quantify over past and future times and entities. For instance, an assertion of ⌜It was the case that ϕ⌝ is true iff ϕ is true at some time located before that assertion.[4] Construing (2) (somewhat artificially) as having this form, the eternalist thinks of (2) as amounting to:

[4]See Goodman (1951, chapter XI); Mellor (1998); Quine (1960, section 36); Russell (1915); Smart (1949). Caveat: strictly speaking, not all eternalists accept this reduction of tense. Defenders of the so-called "moving spotlight theory of time" are eternalists but reject the reduction of tense.

(2_E) There exist dinosaurs, located temporally before us.

$\exists x(\mathrm{D}x \& \mathrm{B}x\mathrm{u})$

Note that (2_E) entails that there exist dinosaurs ($\exists x \mathrm{D}x$).

Presentists, on the other hand, deny that past-tense statements give way to statements quantifying over past entities. Rather, such statements involve primitive, unanalyzeable tense operators. The presentist's rendition of (2) is this:

(2_P) It was the case that: there exist dinosaurs.

$\mathrm{P}\exists x \mathrm{D}x$

'P' symbolizes the past-tense operator *it was the case that*. (Other tense operators include *it will be the case that*, and *it is always the case that*.) Inside the scope of such a tense operator, the existential quantifier is not existentially committing; that is why the truth of (2_P) is consistent with presentism. Unlike (2_E), (2_P) does not imply that dinosaurs exist ($\exists x \mathrm{D}x$), just as

It might have been the case that: there exist unicorns

$\Diamond \exists x \mathrm{U}x$

does not imply that unicorns exist ($\exists x \mathrm{U}x$) — not if modal actualism is true, anyway.[5]

(2) does not wear its logical form on its sleeve. That makes room for presentists and eternalists to agree on its truth value, for they disagree on its logical form (or the logical form of what makes it true). It is therefore an

[5] A. N. Prior (1968, 1970) was the pioneer of this conception of tense. The presentists I have in mind are *conservative* in regimenting statements about time in the language of standard tense logic, without multiple indexing, and with only "slice" tense operators, which concern time only "one time at a time", so to speak. Liberals might employ "span" operators, such as "$\mathrm{P}_{\text{span}}\phi$", which (informally) would be true iff ϕ is true in some past extended segment of time, or worse, "$\mathrm{S}_{\text{span}}\phi$", which would be true iff ϕ is true in some extended span drawn anywhere from time. Worse still, they might speak tensedly about past and future entities, as we normally do in English, without feeling the need to regiment such talk using sentential operators to provide a safe zone in which quantifiers lack ontological commitment. Or they might employ multiple indexing (see Cresswell (1990)). These moves render presentism progressively harder to distinguish from eternalism. Whether, and if so why, presentists ought to be conservative is an important methodological question I cannot fully answer, although see Sider (2001*b*, pp. 26–27) on the use of span operators by the presentist. See also note 28.

unfit object for metaphysical dispute. (2_E), on the other hand, has an explicit logical form; on its one and only reading, the existential quantifier is its major connective. Unlike (2), it is a fit object for metaphysical dispute.[6] Eternalists think that (2_E) is true (and in addition think that it gives the truth conditions of (2)). Presentists think that (2_E) is false (and so deny that it gives the truth conditions for (2).)

Most ordinary uses of quantifiers are restricted in various ways, and one common restriction is to presently existing objects. In uttering (2_E) the eternalist intends to suspend that restriction. Likewise, when presentists reject (2_E), they too suspend this restriction (they do not intend their rejection of (2_E) to be be trivially correct.) No matter how unrestricted quantifiers become, the presentist thinks, they never range over dinosaurs.

Thus, when presentists and eternalists use (2_E), they agree on its logical form and they use its quantifier with the same degree of restrictedness. They appear, then, to mean the same thing by that sentence. Yet they disagree over its truth value. This is the prima facie case for the untranslateability of presentism and eternalism.

The skeptic's first reply. The skeptic must reply that presentists and eternalists do not mean the same thing by (2_E) after all. Presentists reject that sentence, according to the skeptic, only because they do not realize that it means the same thing as one of the sentences they accept. A likely candidate is (2_P). (2_P), the skeptic could claim, is just the presentist's way of saying what the eternalist means by (2_E). That is, the skeptic could claim that for some translation function, f, $f(($2_E$))=($2_P$).

Note that this commits the skeptic to the claim that presentists and eternalists mean different things by the existential quantifier, '$\exists$'. For the skeptic says that presentists and eternalists do not mean the same thing by (2_E); but they apparently mean the same thing by every other expression contained in that sentence.

Second salvo. I promised a necessary condition on meaning and translation. The necessary condition I propose is this: if sentence ϕ is a *genuinely quantified* claim and sentence ϕ' is not, then ϕ does not mean the same thing as ϕ' (in any sense of 'means' for which the skeptic's claims have bite), and so no translation function can map ϕ to ϕ'.

[6] Two versions of the "regimentation" (2_E) (and of (2_P) as well) were presented, one in a fragment of English with explicit indication of scope, one in a formal language. Either version could be taken to be the focus of the dispute.

The notion of a genuinely quantified claim will be explored further, but the basic idea is this. There is a notion of existence that is central to inquiry about the world. A claim is genuinely quantified iff it is expressed by some sentence whose major connective is a syntactic quantifier that means this notion of existence. Example: 'there are electrons'.

Some natural language quantifiers (or, more cautiously, expressions that superficially appear to be quantifiers) do not express this notion of existence, this notion that is so central to inquiry. Despite the appearance of quantification, it is reasonable to deny that the sentence 'She has a unique cast of mind' asserts the existence of casts of mind. All it means is that the person in question is intellectually unlike anyone else.

The quantifiers in genuinely quantified claims are often restricted. While I am enthusiastic about utterly unrestricted quantification[7], my arguments do not depend on its intelligibility. While the quantifiers in claims like (2_E) must not be restricted so as to exclude past or future objects, they need not range over the entire set-theoretic hierarchy.

Granting the notion of a genuinely quantified claim, the proposed necessary condition on translations is prima facie correct. One cannot reconcile a dispute between a theist and an atheist by translating the theist's 'God exists' into the atheist's 'according to certain legends, God exists'. This translation is wrong (in part) because it maps a genuinely existentially quantified claim to a claim that is not. Disagreement over what exists is, prima facie, as genuine and non-verbal as could be.

(2_E) is a genuine existential quantification. It is a claim that there exists something of a certain sort (a dinosaur, located temporally before us). The presentist's claim (2_P), on the other hand, appears not to be genuinely quantified. The logical form of (2_P) is very different from (2_E). The existential quantifier in (2_P) is inside the scope of the past-tense operator; it is the latter, not the quantifier, that is (2_P)'s major connective. So, given the necessary condition on translation just proposed, (2_P) does not translate (2_E), and the skeptic's attempt to deflate the debate over presentism fails.

The crux. I have said that (2_P) is not genuinely quantified and so does not translate (2_E). As I see it, the skeptic must reply that (2_P) *is* genuinely quantified. '$\mathrm{P}\exists x$' is just the presentist's way of writing the eternalist's existential quantifier over past entities. The skeptic must admit that (2_E) and (2_P) differ syntactically, but she will say that this difference is superficial, the result of an arbitrary

[7] See, for instance, Cartwright (1994); Williamson (2003).

choice to express the same claim in one vocabulary rather than another. Other than in this superficial respect, the skeptic will claim, (2_E) and (2_P) do not differ. They have the same inferential role, the skeptic will claim. Presentists use (2_P) in exactly the same situations in which eternalists use (2_E) (when not in the philosophy room, anyway).

The skeptic's challenge may be put thus: why *doesn't* the expression 'P$\exists x$' count as "a genuine quantifier"?

4. Resistance versus conversion

Before answering, I would like to clarify the dialectical situation. In my view, presentists and eternalists should regard their intellectual obligations to our skeptic the way we all regard our obligations to the more familiar skeptic about the external world. We take the latter skeptic to have the burden of proof: we are entitled to continue believing in the external world until the skeptic shows that reasons for doubt exist within what *we* believe. Rebutting the skeptic does *not* require supplying reasons that will compel the skeptic, from within what *he* believes, to embrace the external world. It merely requires resisting his attempts to show that skepticism arises from within *our* beliefs.

Our skeptic about temporal ontology tries to persuade presentists and eternalists that, *by their own lights*, there is nothing to fight over. To resist her, one needs only to rebut her arguments — which boiled down to the claim that (2_P) and similar claims are, despite appearances, genuinely existentially quantified. One does *not* need reasons that convince *her* that the dispute is genuine. Nor does one need a definition of the notion of a genuinely quantified claim that she would be forced to accept. One may legitimately *begin* with that notion, and go on to resist the skeptic's claims.

That resistance rather than conversion is the goal is particularly important to a response to the skeptic that I will mention only briefly. That response is based on an overtly metaphysical account of the notion of a genuinely quantified claim.

Many nowadays are prepared to be realists about natural kinds.[8] Not all groupings of objects are created equal: the set of electrons is special in a way that the set of electrons-or-fish is not. Nature is not an "amorphous blob"; it

[8]Work by David Armstrong (1978*a*; 1978*b*; 1989) and David Lewis (1983; 1986) has been particularly influential.

has distinguished "joints". The goal of inquiry is not just to express truths; it is to express truths in a language with predicates for the distinguished groupings.

In my view, this realism should extend to *logical* natural kinds. The world has distinguished "logical joints": candidate meanings for logical words that are special, just as distinguished groupings (for instance the electrons) are special. The language of an ideal inquirer must contain logical words for these logical joints, just as it must contain predicates for the more commonly recognized natural kinds. One of the distinguished logical joints is a distinguished meaning, call it **existence**, for the existential quantifier.[9]

Eternalists and presentists, being metaphysicians, intend to carve the world at its logical joints. In the mouths of each, then, the quantifiers 'there exists' and '$\exists$' express **existence**. This refutes the skeptic's claim that (2_P) is genuinely quantified: its major connective is not '$\exists$', but rather 'P', which does not express **existence** (clearly '$\exists$' and 'P' do not *both* express existence; 'P' doesn't even have the right grammar to do so.) In fact, we can argue directly that the dispute between presentists and eternalists is genuine. Since the eternalist and the presentist both mean **existence** by their existential quantifiers, they mean the same thing by their existential quantifiers, and so mean the same thing by sentences like (2_E).

Our skeptic will, no doubt, reject the metaphysics of logical natural kinds. That is why it is important that resistance rather than conversion is the appropriate goal. Anyone who believes in logical natural kinds can answer our skeptic.[10]

Still, the answer comes with baggage; it is available only to realists about logical natural kinds. In what follows I will pursue an alternate, "logical" response to the skeptic that does not appeal to logical natural kinds. But the theme of resistance versus conversion remains important. For unlike the natural kinds response, the logical response will provide no positive account of the notion of a genuinely quantified claim. It rather takes that notion for granted, as an unexplained notion to which the true believer in ontology is entitled. It then goes on to argue on purely logical grounds that (2_P) is *not* genuinely quantified.

[9]We may speak of a single distinguished meaning for the absolutely unrestricted quantifier if absolutely unrestricted quantification is intelligible; otherwise we must speak of a family of distinguished meanings of increasingly inclusive quantifiers.

[10]I defend this approach to ontology generally in Sider (2001*b*, introduction), Sider (2001*a*), Sider (2004), and Sider (2007).

5. Transtemporal facts

Before proceeding to the logical response, I want to consider a separate challenge to the skeptic. Presentists face well-known problems accounting for claims that concern multiple times taken together. These problems are often advanced by eternalists as objections to the *truth* of presentism[11], but they also pose a problem for our skeptic. Our skeptic claims that (2_P) translates (2_E) because P$\exists x$ is the presentist's way of expressing the eternalist's quantifier over past objects. But the general translation rule of replacing the eternalist quantifier 'there exists a past x such that' with 'P$\exists x$' is insufficiently general, for it incorrectly translates eternalist claims concerning multiple times taken together. In such cases, the rule maps sentences that eternalists accept to sentences that presentists reject. For example, eternalists accept:

> There existed two persons, x and y, such x invented modal realism and y invented the best-system theory of lawhood and x admires y

(since David Lewis admired Frank Ramsey), but presentists must arguably reject:

> P$\exists x$ (x invented modal realism and P$\exists y$(y invented the best-system theory of lawhood and x admires y))

since, informally, at no one time is the component open sentence 'x admires y' satisfied when x is assigned Lewis and y is assigned Ramsey. Further, consider set-theorists who agree that impure sets are ontologically dependent on their members. The eternalists in this group will accept:

> There existed a set containing a dinosaur and a Egyptian Pharaoh

whereas the presentists must arguably reject:

> P$\exists x$(x is a set and P$\exists y$(y is a Pharaoh and P$\exists z$(z is a dinosaur and $y \in x$ and $z \in x$)))

For, informally, since dinosaurs and Pharaohs never coexisted, there is no one time at which the open sentence '$y \in x$ and $z \in x$' is true, when y is assigned a Pharaoh and z is assigned a dinosaur and x is assigned a set.[12]

[11] See Sider (2001*b*, section 2.2) and Sider (1999).

[12] See Sider (1999). The examples I am discussing here also raise problems like those that plague Skeptic 1 of the next section. The translation rule of Skeptic 3 solves these problems, but leaves untouched the problem I am discussing here.

If these arguments are correct, then P$\exists x$ is, at best, the presentist's substitute for only *some* of the eternalist's quantifiers over past objects. This weakens the skeptic's position. For now that her translation function is merely partial, the argument for skepticism cannot be based solely on its existence. The skeptic still owes us an argument that the remaining eternalist sentences can be translated by some other function.

But this is not a conclusive refutation of the skeptic. The arguments just given that the presentist translations are false are metaphysically controversial; they turn on the difficult issue of whether a presentist ought to be a "serious" presentist.[13] Moreover, one wants a stronger response to the skeptic: an argument that the proposed translation function does not work even in the core cases of sentences like (2_E). The next section offers such an argument (and does not make controversial metaphysical assumptions).

There is another challenge to the skeptic in the neighborhood. Suppose it could be argued that the totality of truths about the world that are stateable in eternalist terms does not even *supervene* on the totality of truths stateable in the presentist's tensed language. I have argued elsewhere, for instance, that eternalist truths about the fundamental spatiotemporal structure of the world do not supervene on the totality of the presentist's claims.[14] It would then follow that no *total* translation function maps the class of eternalist claims into the class of presentist claims, given the (plausible) requirement that translation functions must preserve truth value in all possible worlds.

Failure of supervenience would seem to refute skepticism about the eternalism versus presentism debate[15] (and would settle the debate in favor of eternalism). But establishing failure of supervenience requires controversial assumptions about what is *true* in the eternalist language. The argument of the following section makes no such assumptions.[16]

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[13] See Sider (1999, section 2, especially note 8).

[14] Sider (2001*b*, section 2.2).

[15] Could the skeptic admit failure of supervenience, and so admit that the presentist's language is poorer than the eternalist's language, but claim merely that the fragment of the eternalist's language that *does* supervene is translatable into the presentist's language? But the presentist appears to reject some of the untranslated sentences, and the skeptic cannot defuse the apparent disagreement by saying that the rejected eternalist sentences are translated by sentences that the presentist accepts. Could the skeptic say that the presentist simply does not understand the sentences he purports to reject?

[16] An intriguing but difficult to evaluate argument: regardless of what is *in fact* true in the eternalist language, a genuine difference between presentism and eternalism follows from the fact that supervenience fails according to *some views* about what is true in the eternalist

6. The logical response

On to the logical response to the skeptic. Our skeptic claims that 'P$\exists x$' is the presentist's way of writing the eternalist's quantifier over past objects, and therefore that sentences like (2_P) translate sentences like (2_E). Sentences beginning with P$\exists x$ *are* genuinely existentially quantified, she says. Why think that? The offered reason involved the claim that P$\exists x$ has the same inferential role as the eternalist's quantifier over past objects. But in fact, P$\exists x$ does *not* have the inferential role of a quantifier. Not only does this undermine the offered reason for accepting the translation scheme; it undermines the scheme itself. For surely a minimal condition on being a genuine quantifier is having an appropriate inferential role. The skeptic's challenge to the dispute between presentists and eternalists fails on purely logical grounds.[17]

For clarity's sake, let us reserve the quantifiers $\exists$ and $\forall$ for the presentist, and introduce distinct notation for the eternalist. Let Σ_P be the eternalist's unrestricted existential quantifier over past objects. And let us express restricted quantification over past things thus:

$(\Sigma_P x{:}\mathrm{K}x)\phi$ "Some past K is ϕ"

One feature of the inferential role of restricted existential quantifiers is that pairs of them commute:

$$(\Sigma_P x{:}\mathrm{K}x)(\Sigma_P y{:}\mathrm{L}y)\ \phi \quad \cong \quad (\Sigma_P y{:}\mathrm{L}y)(\Sigma_P x{:}\mathrm{K}x)\ \phi$$

($\cong$ stands for logical equivalence). Now, if P$\exists x$ is the presentist's translation of $\Sigma_P x$, then presumably the translation of $(\Sigma_P x{:}\mathrm{K}x)$ is P$(\exists x{:}\mathrm{K}x)$. But the presentist translation of the above equivalence does *not* hold:

$$\mathrm{P}(\exists x{:}\mathrm{K}x)\ \mathrm{P}(\exists y{:}\mathrm{L}y)\ \phi \quad \not\cong \quad \mathrm{P}(\exists y{:}\mathrm{L}y)\ \mathrm{P}(\exists x{:}\mathrm{K}x)\ \phi$$

Since the second occurrence of the past tense operator P is within the scope of the first, the left-hand formula can be thought of informally as saying that at some point in the past, there existed a K, and that *at some moment before that*,

language.

[17] In addition to claiming that 'P$\exists x$' is the presentist's way of writing the eternalist's quantifier over past objects, the skeptic would also claim that 'there is an object that is located at the present moment' is the eternalist's way of writing the presentist's quantifier. As far as I can see, this claim cannot be shown false simply on logical grounds; 'there is an object that is located at the present moment' is a restriction on a genuine quantifier and so itself has the inferential role appropriate to a quantifier.

there existed an L. The right-hand formula says that at some moment in the past there existed an L, and at some moment before that there existed a K. These claims are clearly not logically equivalent.

The point just made concerns the restricted existential quantifier ($\Sigma_P x$:Kx); an analogous point can be made about Σ_P. Whereas:

$$\Sigma_P x(\mathrm{K}x \& \Sigma_P y \mathrm{L}y) \quad \cong \quad \Sigma_P y(\mathrm{L}y \& \Sigma_P x \mathrm{K}x)$$

the presentist translation does not hold:

$$\mathrm{P}\exists x(\mathrm{K}x \& \mathrm{P}\exists y \mathrm{L}y) \quad \ncong \quad \mathrm{P}\exists y(\mathrm{L}y \& \mathrm{P}\exists x \mathrm{K}x)$$

$\mathrm{P}\exists x$ does not have the same logic as $\Sigma_P x$. It is not a quantifier. This can be seen merely by looking at its logical behavior, without bringing in heavy-duty metaphysics or controversial assumptions.

Let H be the tense operator for *it has always been the case that*. Our skeptic would presumably say that $\mathrm{H}\forall x$ is the presentist's past-tense universal quantifier, analogous to the eternalist's universal quantifier over past things, which we may symbolize as Π_P. But reasoning like that of the previous two paragraphs refutes this claim. Unlike the presentist's replacements, pairs of genuine restricted universal quantifiers commute, and an analogous asymmetry exists for the unrestricted Π_P. On logical grounds alone, $\mathrm{H}\forall x$ is not a quantifier.

A related argument involves identity. $\Pi_P x \Sigma_P y \ x{=}y$ is a logical truth, but $\mathrm{H}\forall x \mathrm{P}\exists y \ x{=}y$ isn't (assuming the standard "actualist" construal of the quantifiers, according to which quantifiers range over the objects existing at the time of evaluation). The latter claims that for any object existing at any past moment, there is some time before then at which some object then existing is identical to the first. But this will be false if any object has a first moment of existence — a moment at which it exists but before which it does not. Again we have a difference in the logical behavior of the genuine quantifiers Σ_P and Π_P, on the one hand, and $\mathrm{P}\exists x$ and $\mathrm{H}\forall x$ on the other.

Call the skeptic we have been considering so far in this paper "Skeptic 1". Skeptic 1 proposed the following presentist translations of eternalist claims:

Skeptic 1

Eternalist claim	*Presentist translation*
$\Sigma_P x \phi$	$\mathrm{P}\exists x \phi$
$\Pi_P x \phi$	$\mathrm{H}\forall x \phi$

We have seen that the genuinely quantified eternalist claims do not have the same logical role as their alleged presentist translations. But instead of claiming that the presentist has quantifiers over *past* things, our skeptic might retreat to the claim that the presentist has quantifiers that range over *all* things, past, present, and future. When the eternalist claims that there exists a K somewhere in time, the presentist will claim that there either is, was, or will be a K.[18] And this disjunctive claim is, according to our retreating skeptic, a genuinely quantified claim; it fails to be quantified only in a syntactic, metaphysically insignificant sense.[19]

More carefully: let Σ and Π be the eternalist's existential and universal quantifiers over *all* things in time; let F be the tense operator for *it will be the case that*; and let G be the tense operator for *it is always going to be the case that*. Our second skeptic provides the following presentist translations for eternalist claims using Σ and Π:

Skeptic 2

Eternalist claim	*Presentist translation*
$\Sigma x\phi$	$\mathrm{P}\exists x\phi \vee \exists x\phi \vee \mathrm{F}\exists x\phi$
$\Pi x\phi$	$\mathrm{H}\forall x\phi \;\&\; \forall x\phi \;\&\; \mathrm{G}\forall x\phi$

Or, where S and A are tense operators for *sometimes* and *always*:

$\Sigma x\phi$	$\mathrm{S}\exists x\phi$
$\Pi x\phi$	$\mathrm{A}\forall x\phi$

Unlike Skeptic 1, Skeptic 2 has no trouble with commutation. For instance, the genuine quantifier Σ obeys the following equivalence:

$$\Sigma x(\mathrm{K}x\&\Sigma y\mathrm{L}y) \quad \cong \quad \Sigma y(\mathrm{L}y\&\Sigma x\mathrm{K}x)$$

[18] Compare Sellars (1962, p. 566).

[19] There are other ways to solve the problems for Skeptic 1, though they do not solve all the problems described below. One could invoke an analog of branching quantifiers for tense operators. Alternatively, as Joseph Melia and André Gallois pointed out, one could replace $\Sigma_P x\phi$ and $\Pi_P x\phi$ with, respectively, NOW $\mathrm{P}\exists x\phi$ and NOW $\mathrm{H}\forall x\phi$.

But the presentist translation holds as well (assuming a reasonable tense logic[20]):

$$\begin{array}{ll} \mathrm{P}\exists x[\mathrm{K}x\&(\mathrm{P}\exists y\mathrm{L}y \vee \exists y\mathrm{L}y \vee \mathrm{F}\exists y\mathrm{L}y)] & \vee \\ \exists x[\mathrm{K}x\&(\mathrm{P}\exists y\mathrm{L}y \vee \exists y\mathrm{L}y \vee \mathrm{F}\exists y\mathrm{L}y)] & \vee \\ \mathrm{F}\exists x[\mathrm{K}x\&(\mathrm{P}\exists y\mathrm{L}y \vee \exists y\mathrm{L}y \vee \mathrm{F}\exists y\mathrm{L}y)] & \\ \quad \cong & \\ \mathrm{P}\exists y[\mathrm{L}y\&(\mathrm{P}\exists x\mathrm{K}x \vee \exists x\mathrm{K}x \vee \mathrm{F}\exists x\mathrm{K}x)] & \vee \\ \exists y[\mathrm{L}y\&(\mathrm{P}\exists x\mathrm{K}x \vee \exists x\mathrm{K}x \vee \mathrm{F}\exists x\mathrm{K}x)] & \vee \\ \mathrm{F}\exists y[\mathrm{L}y\&(\mathrm{P}\exists x\mathrm{K}x \vee \exists x\mathrm{K}x \vee \mathrm{F}\exists x\mathrm{K}x)] & \end{array}$$

Likewise, the presentist's translation for $\Pi x \Sigma y\ x{=}y$ is also a logical truth.[21]

The translation scheme of Skeptic 2 is better than that of Skeptic 1, but is still inadequate. The following inference is valid for genuine quantifiers:

$$\Sigma x \Pi y \phi \vdash \Pi y \Sigma x \phi$$

But expanding the premise on the current proposal yields:

$$\mathrm{P}\exists x(\mathrm{H}\forall y\phi \ \&\ \forall y\phi \ \&\ \mathrm{G}\forall y\phi) \vee \exists x(\mathrm{H}\forall y\phi \ \&\ \forall y\phi \ \&\ \mathrm{G}\forall y\phi) \vee \mathrm{F}\exists x(\mathrm{H}\forall y\phi \ \&\ \forall y\phi \ \&\ \mathrm{G}\forall y\phi)$$

or, in terms of A and S:

$$\mathrm{S}\exists x\mathrm{A}\forall y\phi$$

whereas expanding the conclusion yields:

$$\mathrm{H}\forall y(\mathrm{P}\exists x\phi \vee \exists x\phi \vee \mathrm{F}\exists x\phi) \ \&\ \forall y(\mathrm{P}\exists x\phi \vee \exists x\phi \vee \mathrm{F}\exists x\phi) \ \&\ \mathrm{G}\forall y(\mathrm{P}\exists x\phi \vee \exists x\phi \vee \mathrm{F}\exists x\phi)$$

or, in terms of A and S:

$$\mathrm{A}\forall y\mathrm{S}\exists x\phi$$

The tense-logical premise does not logically imply the tense-logical conclusion. (Let ϕ = '$y{=}\mathrm{a} \vee {\sim}\exists z\ z{=}x$', and consider a Kripke model in which the referent of 'a' exists only at the present moment; only the referent of 'a' exists at the present moment; and some other object exists at some past time, but not at the present.

[20] "Reasonable" = the at-least-as-early-as relation, R, in the Kripke model is (i) transitive and (ii) such that if Rxz and Ryz then either $x = y$ or Rxy or Ryx. See Cresswell and Hughes (1996) on Kripke models for tense logic.

[21] In any normal tense logic whatsoever.

The premise is true but the conclusion is false. I assume "actualist" quantifiers.) Thus, we still have a mismatch in logical behavior between genuine quantifiers and their alleged presentist translations.

This last problem may be solved, while retaining the spirit of the proposal, by the following modification:

Skeptic 3

	Presentist translation			
Et. claim	$\mathrm{P}\exists x(\mathrm{P}\phi \vee \phi \vee \mathrm{F}\phi)$	$\vee$	$\exists x(\mathrm{P}\phi \vee \phi \vee \mathrm{F}\phi)$	$\vee$
$\Sigma x\phi$	$\mathrm{F}\exists x(\mathrm{P}\phi \vee \phi \vee \mathrm{F}\phi)$			
$\Pi x\phi$	$\mathrm{H}\forall x(\mathrm{H}\phi \& \phi \& \mathrm{G}\phi)$	&	$\forall x(\mathrm{H}\phi \& \phi \& \mathrm{G}\phi)$	&
	$\mathrm{G}\forall x(\mathrm{H}\phi \& \phi \& \mathrm{G}\phi)$			

Or, in terms of S and A:

$\Sigma x\phi$	$\mathrm{S}\exists x\mathrm{S}\phi$
$\Pi x\phi$	$\mathrm{A}\forall x\mathrm{A}\phi$

Thus, the presentist translation of the eternalist's "There is a K" is "Either i) there is something that is, was, or will be a K, or ii) there was something that was then a K, had been a K, or would be a K, or iii) there will be something that will then be a K, will have been a K, or will subsequently be a K."

Skeptic 3 comes still closer to simulating eternalist quantification in presentist terms. But the proposal still fails on logical grounds.

First example. The following implication holds:

$$(\Sigma x\phi \ \& \ \Sigma y\psi) \vdash \Sigma x\Sigma y(\phi \& \psi)$$

But its tense-logical translation does not (for brevity I consider only the simpler version, in terms of S and A):

$$(\mathrm{S}\exists x\mathrm{S}\phi \ \& \ \mathrm{S}\exists y\mathrm{S}\psi) \nvdash \mathrm{S}\exists x\mathrm{SS}\exists y\mathrm{S}(\phi \& \psi)$$

The premise says, very roughly, that ϕ holds of some x at some time, and ψ holds of some y at some perhaps different time, whereas the conclusion says that both ϕ and ψ hold of some x and y at some *one* time.

Example two, due to John Hawthorne, is similar to example one; again we have a quantificational implication whose presentist translation does not hold:

$$(\Sigma x \mathrm{K}x \ \& \ \Sigma y {\sim}\mathrm{K}y) \vdash \Sigma x \Sigma y \ x \neq y$$
$$(\mathrm{S}\exists x \mathrm{SK}x \ \& \ \mathrm{S}\exists y \mathrm{S}{\sim}\mathrm{K}y) \nvdash \mathrm{S}\exists x \mathrm{SS}\exists y \mathrm{S} \ x \neq y$$

The first, eternalist, implication holds in virtue of Leibniz's Law. But the presentist's translation fails, since its premise is true but its conclusion is false if there exists only one object in the world, which changes from being K to not being K. A presentist who believes in temporal parts[22] would reject this last claim, but not a presentist who rejects temporal parts; and the issue is whether the sentence is a logical truth.

It may be objected that the phenomenon of change refutes Leibniz's Law, and that the first claim of the pair does not hold, not even by the eternalist's lights. That would be a mistake. Think of Leibniz's Law as the following schema, where the schematic predicate letter 'K' may only be replaced by predicates for genuine properties (and not, for instance, by such predicates as 'Lois Lane believes that x = Superman'):

$$\mathrm{LL}: \ \Pi x \Pi y([\mathrm{K}x \& {\sim}\mathrm{K}y] \rightarrow x \neq y)$$

Now, either the eternalist accepts temporal parts or he does not. If he does then he will not regard LL as being undermined by change, since the incompatible properties in cases of change are had by distinct things. If he does not accept temporal parts then he will *index* property instantiation to times in some way; a poker, for example, will be said to be hot or cold *at* times, rather than being hot or cold simpliciter; *nothing* is hot or cold simpliciter.[23] But then cases of change again do not threaten LL. Consider a poker that changes from being hot at time t to not being hot at time t', and assign that poker to x and y in LL. Since nothing is hot simpliciter, the antecedent $\mathrm{K}x \& {\sim}\mathrm{K}y$ of the quantified conditional will not be true when we substitute 'is hot' for the predicate letter K. If we let K be 'is hot at t', then '${\sim}\mathrm{K}y$' is not true (since the poker *is* hot at t, despite not being hot at t'), so again the antecedent is not true. And finally, if we let K be 'is hot at t'', then '$\mathrm{K}x$' is not true (since the poker is *not* hot at t', despite being hot at t). So in none of these cases is LL falsified.

[22] An oxymoron according to some, but see Sider (2001*b*, chapter 3, section 4).

[23] Exception: some eternalists who "take tense seriously" do not index; rather, all instantiation is instantiation at the present time. But even these eternalists do not think change undermines LL. Consider the case in the text, assign the poker to x and y in LL, and let t be the present time. Whether one lets K be 'is hot' or 'will be not-hot', there is no counter-instance; either way the antecedent of the quantified conditional is false.

A presentist who rejects temporal parts (as most presentists do) will be happy to say that changing objects have temporary properties simpliciter. (Some presentists regard this as one of presentism's great advantages.[24]) On this view, a world with a lone thing changing from being hot to being not hot *is* a counter-instance to $(S\exists xSKx \ \& \ S\exists xS{\sim}Kx) \vdash S\exists xSS\exists yS\ x{\neq}y$. The premise is true and the conclusion is false when K is 'is hot' — hot simpliciter, that is. And the issue is whether *by the presentist's lights*, $S\exists xS$ has the inferential role of a quantifier. The present example shows that it does not.

Third example, due to Brian Weatherson: where p is any sentence without free variables and Q is either the existential or universal quantifier (or even *for no*), the following implication holds:

$$p \ \& \ Qx Kx \vdash Qx(p \& Kx)$$

However, its alleged tense-logical translations do not hold:

$$p \ \& \ S\exists xSKx \nvdash S\exists xS(p \& Kx)$$
$$p \ \& \ A\forall xAKx \nvdash A\forall xA(p \& Kx)$$

Consider the first; let p be 'there exist computers' and let 'K' be 'is a dinosaur'. The presentist thinks that the premise $p \ \& \ S\exists xSKx$ in this case is true:

> There exist computers & at some time there exists something that is at some time a dinosaur

and that the conclusion $S\exists xS(p \& Kx)$ is false:

> At some time there exists something such that, at some time, it is then the case that there exist computers and it is a dinosaur

(since nothing is ever a dinosaur when computers exist). It may be objected that the present-tense 'there exist dinosaurs' is not an acceptable substitution for 'p' since it has an implicit free variable for the current time. While this may be true by eternalist lights, it will not be admitted by the presentist, since presentists "take tense seriously": present-tense sentences express complete propositions, which may be operated on by primitive tense-operators; the tense-operators are *not* variable-binding quantifiers over other times as they are for the eternalists.

[24] See Merricks (1994) and Hinchliff (1996).

What we are looking for is differences in logical behavior *by presentist lights* between Σ and Π and their alleged presentist translations.[25]

Fourth example. Consider any language containing the quantifiers 'most', 'few', and 'half'. If that language contains an expression, Q, that is a genuine quantifier, it ought to be a trivial matter to introduce corresponding quantifiers using 'most', 'few', and 'half' that range over the same domain as does Q. This is unproblematic for the eternalist's Σ and Π. These are quantifiers over all objects from all times, and one can easily introduce 'most of the objects from all of time', 'few of the objects from all of time', and 'half of the objects from all of time'.

Now, the presentist can (and should) admit the quantifiers:

(most x: Kx)	"most of the Ks"
(few x:Kx)	"few of the Ks"
(half x:Kx)	"half of the Ks"

ranging over only presently existing objects of course (since those are all the objects the presentist recognizes). So the presentist's language contains 'most', 'few' and 'half'. But now, if the skeptic is right that the presentist's expressions S$\exists x$S and A$\forall x$A are quantifiers over all objects from all times, the presentist ought to be able to easily introduce new corresponding 'most', 'few', and 'half' quantifiers that range over the same domain. But apparently the presentist cannot. At any rate, the obvious definitions are inadequate: "half the objects from all of time that are Ks are Ls" clearly does not mean either of the following:

S (half x: Kx) S Lx

A (half x: Kx) A Lx

The first says that at some time, half of the things that exist then that are Ks are, at some time, Ls; the second says that at every time, half of the things that exist then that are Ks are, at every other time, Ls. Clearly, neither means anything like "half the objects from all of time that are Ks are Ls". And it is not at all clear what else the presentist might say.[26]

[25] This problem (though not the others) could be solved by prefixing a 'NOW' operator to Skeptic 3's translations. Thanks to Zoltan Szabó.

[26] As Cian Dorr pointed out, it will not help to introduce tense operators like *most of the time it is the case that*. E.g., the eternalist's 'most Ks are Ls' does not mean 'most of the time, most Ks are Ls', 'most of the time, all Ks are Ls', etc.

Similarly, if a language contains a quantifier expression, Q, and contains plural quantifiers, then it ought to be a trivial matter to introduce corresponding plural quantifiers defined over the same domain as Q. So if the presentist's S$\exists x$S and A$\forall x$A are quantifiers over all objects, one ought to be able to introduce presentist plural quantifiers, and thereby translate such sentences as 'there have been at least two kings named Charles'. But, as David Lewis (2004) has argued, it is not clear that this can be done; at the very least, the introduction of such a quantifier is not a trivial extension of the language. Lewis used this to argue that presentism is false (since presentists cannot express all the claims we ordinarily take to be true[27]); I use it to argue that S$\exists x$S and A$\forall x$A are not quantifiers.

The inability of the presentist to introduce these further quantifiers has not presented an inference involving the eternalist's genuine quantifiers Σ and Π that fails for the presentist's S$\exists x$S and A$\forall x$A. Nevertheless, it still represents a divergence in inferential role, in a broad sense of 'inferential role', between these expressions, for it shows how S$\exists x$S and A$\forall x$A fail to behave like quantifiers in the presentist's language considered as a whole.[28]

7. Doing without "genuine quantification"

Our skeptic says that presentist tensed statements (e.g., (2_P)) "translate" eternalist statements that quantify over non-present things (e.g., (2_E)). But, I said, a translation of a "genuinely quantified" claim must itself be genuinely quantified, and so the skeptic needs to claim that the tensed translations are indeed genuinely quantified. I then opposed this latter claim in section 6.

As I see it, the true believer in the dispute over temporal ontology is entitled

[27] Recall the discussion in the previous section of the relation between skepticism and arguments from expressive power against presentism.

[28] Some of the problems of this section can be dodged by making use of multiple indexing (see Cresswell (1990)), especially if one uses in addition tense-logical analogs of the tricks from Forbes (1985, pp. 90–93). My announced intention in note 5 was to consider only "conservative" presentists who do *not* make use of such tricks, but what of the liberals? Some might concede to the skeptic that multiple indexing presentists really do not disagree with eternalists. (True believers in ontology need not rush to the defense of *every* apparent dispute.) However, the final problem of this section (involving 'most', etc.) apparently remains even given multiple indexing. Moreover, a realist about logical natural kinds (section 4) could still distinguish the positions, even if the logical argument of this section no longer applied. For even if tensed translations could be made to logically mimic genuinely quantified sentences, their major connectives would still fail to express **existence**.

to the notion of a genuinely quantified claim (whether or not that notion is cashed out in terms of logical natural kinds). But how much of my argument survives if one does not rely on that notion? What can one say against a skeptic who claims that, e.g., (2_P) translates (2_E), but makes no claim about the former being "genuinely quantified"?

In section 6 I argued that various proposed presentist translations of eternalist quantifiers did not behave logically like quantifiers. My arguments could be recast as arguments that the proposed translation schemes sometimes generate sentences with the wrong *truth values*. For instance, let K = 'is a dinosaur', and let L = 'is an Egyptian Pharaoh'; the eternalist's sentence $(\Sigma_P x{:}\mathrm{K}x)(\Sigma_P y{:}\mathrm{L}y)(x{=}x \;\&\; y{=}y)$ is true, but its presentist translation according to Skeptic 1, $\mathrm{P}(\exists x{:}\mathrm{K}x)\,\mathrm{P}(\exists y{:}\mathrm{L}y)(x{=}x \;\&\; y{=}y)$ is false (since no Pharaohs existed before any dinosaurs). Instead of relying on assumptions about the logical behavior of quantifiers, this argument rests on a nonlogical assumption: that the tensed translation is false. But the assumption is hardly controversial. (The other arguments of section 6 could similarly be translated into arguments that the translations of Skeptics 1, 2 and 3 sometimes have the wrong truth values.)

While this argument refutes the general translation proposal of Skeptic 1, it does not itself directly refute the more restricted claim that (2_P) translates (2_E). Why did I take the skeptic to be committed to a *general* translation function (of the sorts offered by Skeptics 1, 2 and 3), rather than a more restricted claim about sentences (2_P) and (2_E)? Pressure on the skeptic to generalize came in section 3 from the notion of a genuinely quantified claim: if the skeptic is right that (2_P) translates (2_E), I argued, then (2_P) must be genuinely quantified, and so '$\mathrm{P}\exists x$' must be the "presentist's way of writing the eternalist's quantifier over past things". Since we are now exploring what happens when one does *not* lean on the notion of a genuinely quantified claim, that pressure to generalize is currently unavailable.

But there are other sources of pressure. First, a skeptic who offered a few isolated translations would be unconvincing. Her ultimate goal of showing that presentists and eternalists do not genuinely disagree is achieved only if all of the eternalist's claims have presentist translations. She might rest content with a translation function that, while being partial, nevertheless translated a substantial fragment of the eternalist's claims. But translating a few isolated sentences would not accomplish even this. Thus, some reasonably general translation function must be produced. But the reasonably general translation functions one naturally thinks of were shown in section 6 not to work.

Second, recall from section 3 that a translation function must preserve

meaning. The only suggested constraint on the elusive notion of "meaning" was the principle that translations must preserve genuine quantifiedness, and we are currently not helping ourselves to the latter notion. But even with our hands thus tied, we can still say this. To convince us that (2_P) and (2_E) really mean the same thing, the skeptic must produce some compositional rule generating translations of whole sentences based on meaning equivalences between their parts. But the compositional translation functions one naturally thinks of have already been considered and rejected.

Thus, even without appealing to the notion of a genuinely quantified claim, we can still pressure the skeptic to generalize to the proposals of Skeptics 1, 2 and 3, which may then be refuted by the arguments of section 6, reconstrued as arguments that the proposals generate translations with the wrong truth values. Nevertheless, as I see it, the strongest pressure to generalize still comes from the notion of a genuinely quantified claim.

8. Conclusion

Eternalists say that we can quantify over nonpresent entities, for instance dinosaurs; presentist say that we cannot. The skeptic denies that the debate is genuine, for presentists simply represent quantifiers over non-present entities in different notation. But none of the leading candidate "presentist quantifiers" over non-present things has the inferential role of a quantifier. This sends the skeptic back to the drawing board. Absent some further argument, we may take the debate at face value. The dispute over whether nonpresent objects exist is as genuine and nonverbal as the dispute over whether there is life on other planets.

There is a more general moral. Like the debate between presentists and eternalists, other debates in ontology have their own skeptics, who say that the claims of the apparently disagreeing disputants are in fact intertranslatable.[29] But given the arguments of section 6, these skeptics cannot blithely assume that offhandedly proposed "quantificational meanings" have the inferential role of genuine quantifiers. Constructing translations with the right inferential roles is a non-trivial task.

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[29] See Carnap (1950); Hirsch (2002); Putnam (1987*a*, lectures I and II), Putnam (1987*b*). See Sosa (1993) for discussion.

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