More on Operators and Tense [*]

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Cappelen and Hawthorne's *Relativism and Monadic Truth* (2009) offers an extended defense of a thesis they call *simplicity*, which, in brief, holds that propositions are true or false simpliciter. Propositions are cast in their traditional roles as the contents of assertions, and as the semantic values of declarative sentences in contexts. Simplicity stands in sharp contrast to forms of *relativism* including, for instance, a form that hold that our claims are true or false only relative to a judge. This applies especially to claims of taste, which come out true or false only relative to the judge who finds things tasty (e.g. Glanzberg 2007, Lasersohn 2005). But simplicity also rejects the more widespread *temporalist* view that propositions are true or false only relative to a *time*, and it rejects the even more widely held view that propositions are true or false only relative to a world.

One reason that has been advanced for temporalism, e.g. by Kaplan (1989), is that our languages seem to contain non-trivial temporal operators. Hence, the argument goes, the semantic values of sentences need to be temporally neutral, i.e. vary for truth or falsehood with time. The same goes for possible worlds and modal operators. Hence, Kaplan and many others think of the semantic values of sentences as sets of world-time pairs. It has been tempting to apply this sort of argument much more widely, to see the semantic values of sentences as varying not just with world and time, but perhaps with location and other parameters as well. Kaplan

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feels this temptation, and at least at some moments Lewis (1980) seems to succumb to it. Such semantic values may well provide a foothold for more iconic forms of relativism, as Cappelen and Hawthorne discuss. Not all contemporary relativists put great weight on this kind of consideration (cf. MacFarlane 2005), but it clearly leads one far away from simplicity, and provides semantic values for sentences whose truth or falsehood is determined only relative to time, and perhaps other parameters.

In defense of simplicity, Cappelen and Hawthorne offer a critique of this sort of argument from operators. There is much in their discussion that I agree with, both in their reconstruction of the argument, and their reasons for thinking the argument fails. In this note, I shall suggest that stronger conclusions about its failure can be drawn than their far-ranging discussion advances. I shall focus on the case of tense and time, and endorse their claim that the premises of the operator argument never get off the ground. I shall show that this happens for some fundamental syntactic and semantic reasons. In doing so, I shall illustrate how language opts for a non-temporalist strategy for encoding tense and time. Even so, we can also see in the syntactic and semantic details ways language could have opted for temporalist strategies. Hence, when looking at the way language encodes information, we should see non-temporalism (eternalism) and other aspects of simplicity as fundamental features of the way language works, but also as contingent 'choices' our languages make, and not as conceptual truths.

In this brief discussion, I shall focus almost exclusively on tense and time, and how they are encoded in the semantic values of sentences in contexts. At the risk of ignoring some difficult issues in the philosophy of language, I shall assume these values correspond to the contents of assertions. For the special case of tense, that is probably innocuous. The morals I shall draw here, I believe, can be adapted to apply to a wider range of 'perspectival' information, such as

location. I believe they can also be brought to bear on some of the main issues of relativism proper, though I shall not be able to pursue this matter here.[1]

1. The Operator Argument

As originally presented by Kaplan (1989) and then Lewis (1980), the operator argument runs roughly as follows. We know that the semantic values of sentences must vary for truth or falsehood with possible world, because we have non-trivial modal operators. We know that they must vary for truth or falsehood with time, because we have non-trivial tense operators. Perhaps, the semantic values of sentence must vary with location, as we might have locative operators. Each of these conclusions is an anti-simplicity conclusion. We can make them vivid by thinking of the semantic values of sentences as sets of *indices*, as both Kaplan and Lewis do, following the tradition in intensional logic. Each index is an *n*-tuple, with coordinates for each axis on which we see the semantic values of sentences as independently varying for truth or falsehood. The operator argument can then be brought to bear to argue that these indices must include world and time coordinates, perhaps location coordinates, and so on. Hence, among things, the argument seeks to establish temporalism for the semantic values of sentences in contexts.[2]

One way to think of this argument is as an instance of a fairly common technique in semantics. We are interested in the properties of the semantic values of sentences, in particular, what the internal structure of indices is like. This can be hard to detect, as a great many semantic properties of sentences are insensitive to it. A good way to study it is to examine the behavior of

[1] I have discussed the issue of truth relative to a possible world in my (2009).
[2] Cappelen and Hawthorne themselves do not work with indices, as simplicity would make indices of length 0, i.e. truth-values. Presumably as a technical device in semantics they might accept this, but it is doubtful it would be an adequate analysis of their notion of proposition.

sentences under embeddings in larger linguistic constructions. The operator argument seeks to do just that, by considering what happens when sentences embed under sentential operators.

Cappelen and Hawthorne offer a very useful reconstruction of this rather dense piece of argumentation, primarily following Kaplan. Along the way, they also isolate four crucial premises: sententiality, parameter dependence, uniformity, and vacuity. Sententiality holds that some target construction, like a temporal or modal construction, is syntactically a combination of a sentence *S* and a sentential operator *E*. This is primarily a claim about syntactic structure, presumably at an appropriate level of logical form. Any such syntactic claim will carry implications for compositional semantics as well.

Parameter dependence posits that a sentence *S* cannot be evaluated for truth unless some parameter *m* is specified. A sentence cannot be evaluated for truth, for instance, unless a time is provided. The assumption of parameter dependence for time encodes our intuitive idea that temporal information is required to determine a true or false description of the world.

Uniformity is an assumption of the uniformity of semantic values. In Cappelen and Hawthorne's presentation, it is the weaker assumption that a sentence *S* is of the same semantic type when it occurs alone or in *ES*. (Some forms of compositionality imply uniformity.) Vacuity is the assumption that the operator *E* is semantically vacuous when applied to a sentence that supplies a value for *m*. A temporal operator is vacuous when applied to a sentence that specifies the time at which the described event is taking place, for instance. Though all these assumptions play a role in Cappelen and Hawthorne's reconstruction, it is sententiality that I shall discuss at the most length.

Putting these together, Cappelen and Hawthorne reconstruct the Kaplanian version of the operator argument. Suppose that a sentence *S* shows parameter dependence for some parameter

m. To take an example, let us suppose *S* can only be evaluated for truth at some *time*. We may take *S* to be something like *Max is alive*. We need to identify some non-trivial operator *E*, which applies to *S*. For example, we may take *E* to be a future tense, which we may suppose for the moment is an operator. Thus, *ES* is something like *In the future, Max will be alive*. This clearly has different truth conditions from the present tense form. We can also assume that *E* is vacuous when applied to sentences that are fully specific to time. Now, we can spell out the argument. We assume that a context in which *S* occurs is fixed.

1. By vacuity and the non-triviality of *E*, *S* does not supply a value for *m* when it combines with *E*. (*Max is alive* does not provide a time in *In the future, Max will be alive*.)

2. By uniformity and (1), *S* does not supply a value for *m* when it occurs alone. (*Max is alive* does not provide a time.)

3. By parameter dependence and (2), *S* cannot be evaluated for truth without specifying a time.

4. From (3) plus the assumption that the semantic values of sentences in contexts are sets of indices, we conclude that indices must have an *m* coordinate (e.g. a time coordinate).

(The final step (4) is not in Cappelen and Hawthorne's discussion, but combines their reconstruction with the set-up which models semantic values of sentences by indices.) As promised, the pay-off of finding an operator *E* and a parameter *m* is that we reach a conclusion

about the coordinates of indices. This is a sharper conclusion than simply that there is some parameter dependence for *m*.[3]

2. Sententiality

With Cappelen and Hawthorne, my own view is that sententiality is almost never satisfied, and so the operator argument never even gets off the ground. But I believe its failure is more thoroughgoing than Cappelen and Hawthorne indicate in their wide-ranging discussion.

Sententiality is a syntactic thesis (though one with semantic consequences). It requires certain constructions like tense to be syntactically of the form *ES* with a sentence *S* and an operator *E*. Cappelen and Hawthorne rightly note that in some of its applications, this syntax is implausible. For instance, it seems implausible for locative prepositional phrases like *in Boston*, even though both Lewis and Kaplan consider the possibility of treating these as sentential operators. Even so, it remains a common idea that sententiality does hold for important cases including tense (and modality). This, I shall argue, is a mistake.

We cannot work seriously with the sententiality thesis unless we take up the issue of what a sentence in natural language is. I shall only be able to scratch the surface of this difficult and much-explored issue, but a few ideas will be important. First, we should note that it is the clause, and not the sentence, that is really at issue. Whether or not a period appears between two clausal conjuncts is not an important issue for syntax.[4]

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[3] In Kaplan and Lewis's hands, the operator argument is used to support temporalism and other anti-simplicity conclusions. As such, it is taken as providing a sufficient condition for positing coordinates in indices. But it has also been employed in anti-relativist ways, as test or a necessary condition for positing coordinates (e.g. Stanley 2005).

[4] Not that there are no issues in sight. Whether two sequential assertions behave the same way as the assertion of a conjunction has been of interest, e.g. to dynamic semantics.

But what counts as a clause? You might recall from grammar lessons in school that it has something to do with having a subject and a predicate. More generally, a clause has one or more *arguments* meeting a *predicate*. These, broadly speaking, correspond to objects and properties (relations, events, etc.). A clause in this sense works to describe the world by predicating some property of some objects. In this way one of the main features of clauses is containing *predication structures*: grammatical structures where predicate meets arguments.

But if that is all there is to a clause, then clauses are too easy to find. Linguists have uncovered clausal structure, especially in the sense of predication structure, all over language. Here are two examples. Many determiner phrases (DPs) show predication. Consider a widely discussed example of Chomsky (1970):

(1) Rome's destruction of Carthage.

This reveals argument structure, much as we find with a verb. *Rome* realizes an agent argument, while *Carthage* realizes a theme argument. They are arguments of a predicate *destroy*. Indeed, close similarities between structure in canonical clauses and in DPs has been an important discovery in syntactic theory, with many more consequences than this simple observation shows.

Another example, which I shall discuss more in a moment, is that of small clauses, such as:

(2) I consider Bill a good friend.

The embedded *Bill a good friend* is clause-like, at least in the sense of having an argument meeting a predicate, even though it contains two DP constituents.

Though predication structures, where predicate meets arguments, are a crucial aspect of the notion of clause, they are not all there is to it. When we think about describing the world, we can see that merely predicating a property of some objects will often not get up to the level of a

genuine description of what is happening. In most cases, you have to add *temporal* information as well. Assuming that properties are temporary and objects changing, you will usually have to say *when* something is happening, at least. In other cases, such as with properties like *left* and *right*, you have to add locative perspectival information too. Of course, for all of these, different views of the metaphysics might affect just where we see a need for additional information. But it seems safe enough to conclude that somehow, simply combining objects and properties requires the additional of temporal, and perhaps more, information to describe the world.

Syntax in many languages seems to reflect this situation. Though predication structures, the grammatical reflex of objects meeting properties, are to be found all through language, they are typically not able to function as matrix clauses: they are not the main or largest clauses in a well-formed syntactic tree. The small clause case makes this vivid. We find (e.g. Potts and Roeper 2006):

(3) a. I consider her a genius.

b. *Her/she a genius.

Correspondingly, we do not typically assert small clauses bare. Rather, we use them in embedded constructions, under a restricted range of verbs like the attitude verb *consider*.

We can say something similar about verb phrases (VPs) themselves. It is a common view in syntax these days that VPs come generated with all their arguments within the VP (actually, within a highly articulated structure of VPs, but we need not worry about that sort of detail). But VPs alone are typically not grammatical as root nodes of a syntactic tree, and we do not typically assert them.[5]

[5] This is what is known as the VP-internal subject hypothesis. References to the various ideas I have mentioned from syntax can be found in most any current syntax textbook in the 'Principles and Parameters' or more recent 'Minimalist' tradition.

Looking at the relation of VPs and small clauses to matrix clauses tells us something about how language goes about adding information beyond predicate meeting arguments. At a minimum, tense (and aspect, and a significant portion of modality and other inflectional elements) is added in a larger clause that includes a VP or small clause as a complement. The current view seems to be to separate out a number of distinct syntactic units providing these, singling out tense as the salient unit. Not long ago, a single inflectional position was assumed to combine them all. But regardless, the picture is that within a matrix clause a predication structure falls under a structure proving tense information, at least. The picture is something like:

(4) $[_{TP}$ tense plus … $[_{VP}$ predicate and arguments]]

We do not get a matrix clause, and do not get something we are able to assert, until we get up at least as high as TP, a *tense phrase*, according to current theories.[6] Such a structure grammatically encodes the idea that additional temporal information beyond objects meeting properties is needed to describe the world. Syntax provides a separate syntactic position for adding it, such as the T head (the main syntactic component of the T phrase).

Though this shows us a special syntactic position for tense, it gives no comfort to sententiality. If tense lives in the head of TP, or for that matter, anywhere outside of VP, small clauses, or related predication structures, then tense is not a sentential operator in any way that could support sententiality. First, T is not an operator position. It is the head of a larger clause, which takes an embedded predication structure as a complement. As such, it creates a new

[6] At least, current theories in the 'Principles and Parameters' tradition. Other syntactic theories, especially strong lexicalist ones like HPSG, will see matters differently. Such theories will not posit a distinct syntactic head for inflectional elements. But even so, I believe they do mark something like the difference between predicate meeting arguments and an inflected clause, for instance, via the difference between a verbal lexeme and an inflected word.

syntactic unit, rather than mapping a syntactic unit to another of the same type, or even of a closely related type. It does not map a sentence to another sentence; rather, it takes a predication structure and creates a TP. Second, the embedded constituent, a VP or a small clause, is not sentence-like. Though they count as clausal in being predication structures, these are not able to function as matrix clauses, and cannot be asserted. Hence, we do not have anything like an operator *E*, and what we do have does not apply to anything like a sentence *S*. Sententiality fails for tense.

It is not clear whether the kind of sententiality needed by the operator argument can ever be found in the syntax of natural language. It does not appear to hold for modality either. Modal auxiliaries, verbal mood, etc. all live outside of VP, and appear to occupy heads around the T level. Like tense, they do not function syntactically as sentential operators. Perhaps some conditional or adverbial constructions might offer a syntax close to sententiality, but it is not at all clear.

Though sententiality fails for tense in a very fundamental way, it is not because there is no role for what in logic we often describe as tense operators. Quite the reverse. Already in syntax we see a crucial role for tense in creating matrix clauses. But language also encodes a distinction between 'predicate meets arguments' levels and tense-enriched matrix levels. Such a distinction is precisely what the operator argument is trying to undermine. In effect, the operator argument seeks to show that this distinction gets collapsed, but we have seen that syntax refuses to collapse it.

So far, we have seen that sententiality fails syntactically. But we should also pay due attention to parameter dependence. After all, in some way, sensitivity to time is a fact about most sentences. Syntax says tense information will enter via a T head, but is it possible that it still

gets treated as an operator in the semantics? If so, then there might still be a viable notion of sententiality to be found.

The consensus is that tenses in natural language should not be treated as operators. Indeed, one of the main themes in the study of tense in semantics, since the 1970s, has been that the treatment of tense via sentential operators is not empirically well-motivated. Instead, tenses are treated in one of two ways. Often they are treated as essentially like pronouns, picking up temporal values from context, and entering into co-reference or binding relations with other variables. Alternatively, they are treated as like contextually restricted quantifiers over times. This point has been widely discussed both in the semantics and philosophy literatures, so I shall simply assert it here.[7]

To fix ideas, I shall sketch a fairly simple quantificational treatment (though it is not my intention to really advocate for quantificational over pronominal theories):

(5) a. Sam was asleep.

b. $\exists t < t^*$ *asleep*(*Sam*, *t*)

The quantifier is restricted to an appropriate interval of time before the contextually determined t^*. In keeping with our brief discussion of syntax, the tense, corresponding to $\exists t < t^*$, interprets elements found around TP, while *asleep*(*Sam*, *t*) interprets elements found in VP. Thus, we have a fairly familiar pattern of variable binding, where the variable binder occupies something like the T position, and a variable is found in an appropriate lower position, in this case, in VP.

[7] Of course, the starting point for this literature is work of Partee (1973), and then many others. A philosophically oriented discussion of these ideas may be found in King (2003), and a survey of the linguistics literature in Kusumoto (1999). As is well known, the flexibility of operator systems makes it hard to conclusively rule out an operators-based account, as for instances Cresswell (1990) makes clear. But even so, the data suggests that a standard operators treatment is inadequate, and the preferred referential or quantificational analyses much more simply and directly capture the data.

This is hardly a full-fledged theory of tense. But it illustrates the important points for our purposes. The predication structure or VP contains variables, while something in the T position binds them. The need to specify a time to get from VP-located information about predicates and arguments to full contents of assertions is captured by the presence of the *t* variable in VP. Temporal information is added by binding. It might be via a restricted quantifier living in TP, or on other theories, it could be via something pronoun-like. The results, for our purposes, are close enough to the same.

We thus see that syntactically, language builds up more complex TPs over and above predication structures. Semantically, it does so by somehow binding temporal variables in the predication structures, thereby providing temporal information to build viable descriptions of eventualities. Sententiality fails because this process is neither syntactically nor semantically one of adding operators. It is a process of adding temporal information in a grammatically structured way, not one of mapping temporally neutral semantic values to one-another, via a sentential operator, as an operators view would have it.

We thus reach an anti-temporalist (i.e. eternalist) conclusion, and with Cappelen and Hawthorne, one that is amenable to simplicity. For tense, sententiality fails fundamentally. Indeed, as parameter dependence highlights and temporalists try to exploit, temporal information needs to be added over and above having objects meet properties. But language does not do this by producing temporalist semantic values for sentences. Rather, it does so by taking temporally neutral predication structures and enriching them by variable binding, thereby creating a new sort of clause that can function as a matrix clause and can be asserted. We thus have two layers, one impoverished for temporal information, and not apt for assertion, and the other adding to it, forming an assertible clause. As this is a strategy for adding information, which can be applied

more widely than just to times, let us call it the *grammatical enrichment* strategy. The reason the operator argument fails for tense is that language thoroughly builds in the grammatical enrichment strategy. The result is a non-temporalist one.

3. Other Possibilities?

The grammatical enrichment strategy for tense makes vivid how sententiality can fundamentally fail, and how language encodes temporal information in a non-temporalist (eternalist) way. But there are other ways information like temporal information can be encoded in language. In English, for instance, information about location is encoded not in a distinct clause level via variable binding, but by locative prepositional phrases. This is not, I believe, a 'relativist' way to encode location, but it is a distinct strategy. There are other strategies that can be seen in other languages, including ones relying on richer case systems than we find in English. Moreover, apparently some languages encode location via a system strikingly like that of tense in English. On the other hand, whether all languages opt for the grammatical enrichment strategy for tense is the topic of a lively debate. There are a number of languages which do not display any overt tense morphology. Whether they have an underlying TP position or related functional projections is a delicate question. As far as I know, none of these languages indicate temporalist encodings, so I am inclined to suspect that the anti-temporalist conclusion we have come to by looking at the grammar of English holds more generally. All the same, we should be careful about the cross-linguistic situation.

Without going so far afield linguistically, we can still see hints of how an alternative strategy for encoding temporal information might have been introduced. I shall conclude by considering such a possibility. This will show that, though the encoding of temporal information

by languages (like English) is fundamentally anti-temporalist, this is a contingent 'choice' that language appears to have made.

The way to see hints of an alternative strategy for encoding temporal information is to consider VPs and other predication structures again. The grammatical enrichment strategy posits temporal variables in VPs. These variables function purely as 'slots' for the addition of temporal information from tenses (they are bound, and never filled in directly by context). Thus, there is a sense in which VPs are temporally neutral, but not wholly blind to time. If we could imagine asserting a VP, as it were 'bare', and not as part of a TP, we would come very close to imagining asserting a temporalist proposition. At least, insofar as we could make sense of asserting it with its temporal variable neither bound nor fixed by context, we might thereby imagine asserting something with a temporalist semantic value.

It is hard to know if we can really imagine this or not. But looking more closely at small clauses, we can observe some cases where something closer to what we might need to imagine could actually be happening. In the end, I shall suggest, it does not actually provide what we would need, but still, these cases will help structure our imaginative thought experiment.

There are some well-known cases where small clauses can be asserted 'bare', not embedded in full TPs. Many of these are non-productive environments, such as telegrams, signs, etc.[8] Unfortunately for temporalists, however, what these cases seem to show is another non-temporalist strategy, rather than a way to imagine a temporalist one. As is discussed at length by Potts and Roeper (2006), when we do succeed in asserting a matrix small clause, it expresses a highly enriched meaning, which includes temporal information, but also much more. Compare:

(6) a. Ali in Nepal.

[8] There are languages, like Hebrew, where the present tense copula is at least not pronounced.

b. Ali was photographed in Nepal.

Imagine these as labels for a photo, where matrix small clauses are allowed. As Potts and Roeper discuss, the two are not synonymous, and indeed, the small clause form seems to express more than the full TP. For our purposes, we may also note that it is temporally specific to the time of the photographing.

What this appears to show is not a way to express temporalist propositions, but that language can carry out 'enrichment' by less grammatical and more pragmatic means as well. In the non-productive environments where we can assert small clauses, we have some other non-grammatical way to carry out the job that is usually done by enrichment by tense. When we do, it leads to a different enrichment than the usual apparatus of tense provides. This shows one way in which the particular strategy of grammatically enforcing a TP versus predication distinction is one option among many for enriching predication structures. But it still does not illustrate a temporalist option.

Interestingly, the situation appears to be different for children, which will provide a better hint for imagining the temporalist option. Potts and Roeper note, following Bloom (1973), that children regularly assert small clause-like structures:

(7) a. Me big.

b. Baby highchair.

The also note that generally, children do not use embedded small clauses.

Does this indicate that children are at some stages somehow temporalists? Presumably not. At least, I seen no reason to think that children are asserting propositions that differ radically from the ones we assert. (Though I hardly have enough understanding of the developmental process to say with any certainty.) Rather, as Potts and Roeper also point out, it

more likely simply reveals ways in which child language lacks some features of adult language. Presumably, at an early stage, children lack functional projections like TP. Thus, to express their thoughts, they have to press more impoverished, unenriched forms into service.

Though I am doubtful that child language is temporalist, thinking about this stage of language development can help us to see how a temporalist strategy for encoding tense might have arisen. Let us suppose that the small clauses children assert are like the temporally neutral predication structures we identified in adult language. Such structures are associated with something like families of temporally specific meanings, and presumably children use them to convey a particular member of the family. In fact, it appears that in the course of (English) language development, these become restricted to appearing under TPs, and are only able to contribute predication to enriched temporally specific matrix clauses. But we can easily enough imagine another possibility. Language could encode the parameterized families of meanings as the semantic values of predication structures. These would be indistinguishable from temporalist propositions. There would then be no bar to allowing them to appear as matrix clauses unenriched, thereby in effect grammaticalizing what the children seem to do in an ad hoc way in conveying contents. The result would be temporalist propositions as the semantic values of matrix clauses. Presumably, tenses as operators on these values could readily be added as well, achieving the very set-up the operator argument imagines. Rather than opting for the grammatical enrichment strategy, we can now imagine how language could have grammaticalized the situation children find themselves in at some stages of language development. This helps us to imagine how temporalist semantic values, and sentential operators, might have appeared. At the point where children assert small clauses, it appears

temporalism might have been a reasonable strategy for language development to take, but it appears not to be the one it does take.

We have thus seen that the grammatical enrichment strategy, which English applies to tense, is in fact one among many options. We saw a more pragmatic option, and briefly a more 'lexical' one English uses for locatives. We have also seen how we might be able to imagine a fully temporalist strategy arising the course of language development. As far as I know, this option is never taken in human language (though as I mentioned, the question of what happens in purportedly 'tenseless' languages is a difficult one). But it appears to be a coherent option, and one that could have been reasonable given the situation children encounter. It appears to be a contingent feature of our languages that they do not opt for temporalism. The failure of sententiality, and the attendant treatment of parameter dependence through the grammatical enrichment strategy, is thus not a conceptual observation about content. It is a contingent feature of language. Cappelen and Hawthorne hold that simplicity and monadic truth are metaphysically fundamental and carve the world at the joints. That may well be. But if it is right that the facts about language, however deep, are also contingent, then language will likely not be the place to find this out.

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