

When the actual world isn't inertial: Tohono O'odham *cem**

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The particle *cem*¹ in Tohono O'odham (an Uto-Aztecan language also known as "Papago") has two primary readings. The two readings, *unachieved-goal* and *non-continuation*, are both available for the Tohono O'odham sentence in (1).

- (1) Cem 'añ ñ-na:tokc.
cem 1sg 1sg-ready
- a. 'I was ready.'
(speaker: "I was ready, but you weren't there") unachieved-goal
- b. 'I was ready.'
(speaker: "I'm not ready anymore.") non-continuation

The unachieved-goal reading conveys that some goal that the subject had was not fulfilled, and the non-continuation reading conveys that some state held in the past but no longer holds. Both kinds of readings were noted first by Hale (1969).

Predicate nominal structures similarly can also have either reading, as in this example elicited by Marcus Smith (p.c.):

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¹The pronunciation of *cem* is something like IPA [tʃɜm], with a mid central vowel.

- (2) Heñ-veenag 'od: cem ge maakai.
 1s-sibling cop cem indef doctor
 a. 'My brother was a doctor (but now does his job badly).' unachieved-goal
 b. 'My brother was a doctor (but isn't anymore).' non-continuation

This ability to trigger either unachieved-goal or non-continuation readings is one of the properties of *cem* that we will be investigating in this paper.

The second target of our investigation is the behavior of *cem* in eventive sentences, marked with aspect. Eventive sentences such as the one in (3) get only the unachieved-goal reading; presumably they do not get the non-continuation reading because only states can continue in the appropriate sense.

- (3) Huan 'at o cem kukpi'o g pualt.
 Juan aux-pf fut cem open det door
 'Juan tried to open the door.' unachieved-goal

When *cem* appears with eventives, often the closest translation for *cem* in English is “tried to,” as above in (3). If we were to take this intuition at face value, we might propose a generalization that *cem p* sentences implicate that the event described by *p* did not happen. The sentence in (3) does seem to have such an implication. However, eventive *cem* sentences do not always have such implications. In *cem p* sentences marked with perfective aspect, the event actually happens.² This can be seen by the speaker's explication in (4a), and by the fact that (4b) feels contradictory with a continuation to the effect that the event was never given a chance to happen, as in (4c).

- (4) a. Howij 'at cem 'uama.
 banana aux-pf cem yellow
 speaker: “The banana tried to become yellow, but, say, the cow ate it. But it is yellow when the cow eats it.”
 b. Huan 'at cem ku:pio g pualt.
 Juan aux-pf cem open det door
 'Juan opened the door in vain.'
 c. #Huan 'at cem ku:pio g pualt, k'im hua 'i-gei.
 Juan aux-pf cem open det door but-forward there incept-fell
 #'Juan wanted to/tried to/was going to open the door, but he fell on his way there.'

These perfective cases are similar to the stative cases, since in both, while something goes wrong, it's not that the event (or state) itself doesn't happen. If *cem* makes reference to “something going wrong,” we need to make sure that it allows for the event to actually

²A stative predicate X marked with perfective aspect has the meaning “become X”. Note the speaker's attempt to capture the unachieved-goal reading with the English gloss *tried*; this shows that the unachieved-goal reading, or something like it, is possible even though bananas are inanimate. Devens (1972) also points out a number of *cem* sentences with inanimate subjects.

happen in perfective sentences, and the state to actually happen in stative sentences, and for something *else* to go wrong. And in general, we would like to understand interactions between *cem* and aspect in compositional terms.

The third phenomenon we will be investigating is the behavior of *cem* with negation. Hale (1969), in his detailed exposition of *cem*, reported “I do not understand the relationship of [*cem*] to the negative[.]”³ The sentence in (5) provides an excellent example of what is so maddening and tantalizing about the interaction between *cem* and negation.

- (5) Huan 'at cem pi cikp tako.
 Juan aux-pf cem neg work-pf yesterday
 a. speaker: “Juan did work, but he didn't want to.”
 b. speaker: “Juan worked, but he did it badly.”

The affirmative version of (5) would get an English translation ‘Juan tried to work, and in fact he did.’ The negative counterpart in (5) can get an English translation ‘Juan worked, but he didn't want to.’ Perhaps we have some intuitive notion that “trying” and “not wanting to” are somehow opposites, but to English speakers at least, it is not immediately clear how. Something interesting is going on in the interaction between the meaning of *cem* and the meaning of negation. So a theory of *cem* must account for these facts as well.

This paper has two major goals. The first is to propose a semantic contribution for *cem*, and thereby to explain the puzzling examples above.⁴ The second goal of this paper, to be addressed in a somewhat shorter section than the first, is to place *cem* in a cross-linguistic context. As exotic as it initially may look to English speakers, *cem* turns out to be only minimally different from other, more familiar modals.

There are a few issues to note briefly before we begin the discussion proper. First, although the related language Akimel O'odham (also known as “Pima”) also has a similar *cem* particle (Devens 1972), in this paper I will be discussing Tohono O'odham. Secondly, I will not have much to say about the syntax-semantics interface, since O'odham syntax is highly non-configurational (Smith 2004).

Another issue I would like to set aside for the moment is one more closely connected with the main topic at hand. *Cem* seems always to contribute pastness as part of its meaning; cf. Hale (1969) and Devens (1972). The question is whether this past specification can be entailed by the meaning of *cem*, or whether indeed *cem* includes a past tense sememe, in addition to a sememe corresponding to the rest of its meaning. Both Tohono O'odham and Akimel O'odham are so-called “tenseless” languages, but I am not sure that the non-existence of tense morphology in those languages provides any argument one way or the other. Hale and Devens both explicitly assume that there is something about ref-

³His comment continues with, “nor do I have data which would lead to an understanding of the use of [*cem*] with other than human subjects.” It should be mentioned that Hale wrote his paper based on data he had already elicited, without having had a chance to explicitly ask his consultant (Albert Alvarez) about *cem*.

⁴It is to be hoped that explicating these properties will shed some light on other, apparently related uses of *cem*, such as in desideratives and counterfactual conditionals (Hale 1969).

erence to the actual world that is limited to past times.⁵ But nothing in the current paper hinges on how this question is answered. I suspect that the answer will come, if it does come, from comparison with *cem*-like elements in typologically different languages, if any there be.

1 The proposal and its consequences

The proposal for the meaning of *cem p* sentences (where *p* stands for the linguistic form that denotes a proposition *p*), is given in (6). The concept of inertia worlds is discussed at length below, and is adapted from Dowty's (1977, 1979) proposal for the English progressive.

- (6) Meaning of *cem p* sentences:
Cem p sentences presuppose that all inertia worlds for *s* are worlds in which *p*(*s*), and assert that the actual world is not an inertia world for *s*.

It may not be immediately clear from this proposal how it accounts for any of the above data, but it is especially unclear, at first inspection, how it accounts for the two observed readings of *cem* sentences, non-continuation and unachieved-goal. The relevant idea is that inertia, the principle that “things proceed normally,” can make reference to either physical forces (in which case the non-continuation reading results) or intentions (in which case the unachieved-goal reading results). By reference to “things proceeding normally,” of course, we can make reference to things not proceeding normally, i.e., “something going wrong.”

In the first part of this section, we will construct the proposal, and in the second, see how it accounts for these two meanings in stative *cem* sentences, as in (1) and (2). The third part examines how this proposal fares when considering interactions between *cem* and aspect, as in (3) and (4), and the fourth part treats the interaction between *cem* and negation, as in (5).

1.1 Capturing inertia

Dowty (1977, 1979) introduced the notion of *inertia worlds* to account for certain properties of progressives in English. In physics, inertia is the principle that anything at rest or in motion will tend to stay at rest or in motion, unless outside forces intervene. This idea turns out to be quite useful for explaining why (7a) does not entail (7b).

- (7) a. John was drawing a circle.
 b. John drew a circle.

Dowty called the non-entailment of (7b) the “imperfective paradox.” It is a paradox, or at least surprising, under a certain kind of analysis of the progressive (Bennett and Partee 1978, Klein 1997): If the progressive conveys that the proposition *John draws a circle* holds

⁵For independent justification of the assumption with respect to past *and* present times, see Prior (1967), Abusch (1998), and Copley (2004a).

over an interval surrounding the topic time,⁶ we would expect (7a) to entail (7b). However, it does not; John could have been interrupted part of the way through the circle, and never finished it, and it could still have been true that he was drawing a circle, even though it was not true that he drew a circle. Dowty's solution was to propose that the proposition holds over an interval surrounding the topic time only on certain possible worlds, namely, those in which nothing interferes with the event. These worlds are the inertia worlds. The actual world, of course, need not be one of these inertia worlds. If John was interrupted in the actual world before he could finish the circle, clearly some other force intervened, so that actual world did not turn out to be an inertia world.

Whenever a set of possible worlds is deemed to be an ingredient of meaning, a large part of the work lies in determining precisely how that set of worlds should be characterized. A number of papers have addressed this question, among them Landman (1992), Portner (1998), and Higginbotham (2004), and attempted to deal with various difficulties in specifying the set of inertia worlds. The difficulties, as I see it, lie in three major categories.

The first difficulty is in deciding what constitutes an outside intervention; it seems that the difference between "outside" and "inside" is fairly flexible. The second difficulty is in deciding what constitutes an initial part of any event. For example, if John briefly touches his pen to the paper, how can we be sure whether that event is an initial part of a John-draw-circle event in the worlds where nothing else intervenes (supposing we have overcome the first difficulty and can define the "nothing else intervenes" part)? Finally, the third kind of difficulty is in dealing with cases where the run time of the event seems to be, problematically, *after* the topic time, as in progressive achievements (*Mary was arriving at the station*) and futurates (*The Red Sox were playing the Yankees tomorrow, but they changed their mind*).

Of these three kinds of difficulties, the last one may be specific to progressives; the first two, on the other hand, might be expected to arise wherever inertia worlds are invoked. Since we are invoking inertia worlds for the analysis of *cem p* sentences, we will have to deal with at least the first two kinds of difficulties.

I have no particularly new way to solve the first difficulty (defining the difference between "outside" and "inside" influences). It is generally solved by assuming that one can take different "perspectives" on the facts, including some facts and not others. In this vein, let's assume that there is a *local situation* that acts as the situational input to the logical form, and that what is in the local situation (individuals, event predications, etc.) is determined by pragmatics.

Elsewhere (Copley, to appear (a,b)) I have suggested that the way out of the second⁷ difficulty is to introduce another notion into the semantics, that of a *force*. A force can be thought of as an impetus towards an ideal set of situations; namely, the situations that would result if that force were left undisturbed. Many things are forces: physical forces, of course, as well as "intentional forces," i.e., obligations, plans, and schedules. (This

⁶Or equivalently for us, that there is an event of that description whose run time overlaps the topic time. Dowty was writing before the neo-Davidsonian revolution.

⁷And irrelevantly for us, the third.

is the part that captures the grammatical indifference to distinction between force of will and natural force, and which will get us the two meanings of *cem.*) The inertia worlds of a situation can be thought of as worlds in which the net force – the force obtained through the cognitive process of adding up all the forces active in the situation – does not get disturbed.

This move solves the second difficulty. We no longer are restricted to looking at what John actually does when he touches his pen to paper to draw an arc; we can look at what he intends to do, since his intention is a force. He could draw the same arc while intending to draw an oval, and we would not be able to say felicitously that he had been drawing a circle, unless there were other, stronger forces active in the local situation that outweighed his intention, to make a net force that “wanted” a circle.

The net force provides an ordering source (in the sense of Kratzer (1991)): It picks out the most ideal situations. Let’s model it with a function from situations to properties of situations. So a net force is “active” in a local situation s is a function f of type $\langle s, \langle s, t \rangle \rangle$ where s is in the domain of f . The image of f , namely $f(s)$, is the set of ideal-with-respect-to- f situations that result if the force is left undisturbed, i.e., no other forces external to the local situation are applied.

We can draw an analogy from forces to propositions. Both take a situational argument, by assumption; both have a relationship with situations. For propositions, the relation is *is true in*; for force, the relationship is *is active in*.

- (8) a. propositions: type $\langle s, t \rangle$, p is true in s iff $s \in \text{domain of } p$
 b. forces: type $\langle s, \langle s, t \rangle \rangle$, f is active in s iff $s \in \text{domain of } f$

There are certainly questions raised by the addition of forces, but for now, let’s use them to define inertia worlds, based on a notion of inertial continuations that does most of the work:

- (9) For any situation s , force f , and situation s' , where f is the net force active in s :
 s' is an *inertial continuation* for s iff $s' \in f(s)$.

We define inertial continuations as situations that are in the image of f , where f is the net force active in s . This notion is useful to define as a relation between situations because we have defined forces in that way as well; we need to be able to look at a local situation, not just the world it is in, and it makes sense to think of a set of situations, not a set of worlds, as being the image of f . Let’s assume that the image of f only contains situations whose run times are (just?) after the run time of s ; the cognitive-perceptual system is smart enough to not put any situations with earlier run times in $f(s)$.

An inertia world for a situation s is defined as a world that contains an inertial continuation for s :

- (10) For any situation s , and world w : w is an *inertia world* for s iff:
 $s \in w$ and $\exists s'$ that is an inertial continuation of s , such that $s' \subseteq w$.

I have not formalized the ontology of situation semantics and branching time which would be needed to give these definitions real meaning, though I have in mind something like a

marriage of Kratzer (1989), in which situations are parts of worlds, and Thomason (1970), in which worlds branch through time.⁸ If the reader can accept this admittedly imperfect state of affairs, we can see how it will provide the framework for an account of *cem*.

1.2 The two meanings

Keeping in mind that net forces can either be intentional or physical, let us now see how the proposal would account for the two meanings of *cem p* sentences. Recall the proposal, repeated below as (11):

- (11) Meaning of *cem p* sentences:
Cem p sentences presuppose that all inertia worlds for *s* are worlds in which *p(s)*, and assert that the actual world is not an inertia world for *s*.

The reader is asked to keep in mind that, while the proposal is not the simplest one that might account for these readings of statives, the complications will prove necessary shortly, when eventive predicates and negation are considered. But let us ascertain first how the statives fare under this proposal.

Consider first a non-continuation reading, as in (12):

- (12) 'O'ohona 'o cem suam.
 sign aux-impf cem yellow
 'The sign was yellow.'
 (speaker: "it's no longer yellow") non-continuation

We may assume that the local situation – that is, the past situation, at the topic time – includes just the sign, with a zero net force on it, since it is not changing color, or anything else, in that past situation. The predicted assertion and presupposition are also given:

- (13) Assertion: In all inertia worlds for *s*, the sign is yellow in *s*.
 Presupposition: The actual world is not an inertia world for *s*.

The proposed assertion is that in all inertia worlds for the local situation, the sign is yellow in the local situation. The proposed presupposition is that the actual world does not turn out to be an inertia world for the local situation. That is, there is no inertial continuation of *s* in the actual world;⁹ instead, a force intervenes to disturb the sign's color. This entails that the sign is no longer yellow at the speech time.

⁸In my head this system lacks the property of persistence, the property that every situation is part of at most one world. Kratzer has argued that persistence must be a property of any adequate situation semantics. My suspicion, however is that any branching version of situation semantics will have to be non-persistent, because that is exactly what is needed in order to model the branching of time. It remains to be seen whether the problems Kratzer raises with non-persistent systems will apply to situation semantics in a branching time model.

⁹By the definition of inertia world given above, this means that the sign stops being yellow exactly at the end of *s*. I do not think this is a problem; *s* could be arbitrarily long.

One crucial assumption that needs to be made to make this account work is that *s* is in fact a part of the actual world.¹⁰ For this, we simply need to assume that the situational input to the sentence is required to be actual. This would be a very reasonable assumption, given that default inputs, insofar as we can identify them, generally seem to reflect the here and now (the speech time, the speaker, etc.). If *s* is a part of the actual world, then it is clear that the actual world can't escape being a world in which the sign is yellow. But it escapes being an inertia world because the sign does not stay yellow; some force intervenes.

There is a possible conceptual problem with this story, that comes up if we switch to talking about bananas instead of signs:

- (14) Howij 'o cem suam.
 banana aux-impf cem yellow
 'The banana was yellow.'

This is the same sentence as (13), and has a very similar meaning, only that the sign has been replaced by a banana. As before, the local situation must include the banana, with no forces on it, so that the inertia worlds are ones in which the banana is still yellow. But conceptually, this is a problematic assumption; surely there is a force on the banana, namely its natural disposition to turn black eventually. Why wouldn't the inertia worlds be the ones in which it turns black? For the current proposal to be true, it must be that that force, no matter how internal it is, is nonetheless not in the local situation, though why they wouldn't be is puzzling. Unfortunately I will have to leave this issue here.

Recall where we are in the argument: We are trying to explain why the proposal in (11) accounts for both the non-continuation reading and the unachieved-goal reading of stative sentences. Consider now one of the unachieved-goal cases, as below in (15).

- (15) Cem 'añ ñ-na:tokc.
 cem 1sg 1sg-ready
 'I was ready.'
 speaker: "I was ready in vain, you weren't there" unachieved-goal

The local situation in this case presumably includes at least the speaker, and the plan for the interlocutor and the speaker to go out together. Remember that this plan counts as a force, from which inertial continuations are calculated (and from those, the inertia worlds are calculated). The inertia worlds are all those worlds in which the plan is realized, without any interference. The assertion and presupposition are predicted to be as in (16):

- (16) Assertion: In all inertia worlds for *s* (i.e., worlds in which the plan is realized), the speaker is ready at *s*.
 Presupposition: The actual world is not an inertia world for *s*.

¹⁰This point is where the question of whether *cem*'s past meaning is analytic comes up; recall that the origin of the past meaning is irrelevant to us at the moment.

According to this prediction, the assertion should be that in all inertia worlds for the local situation s (that is, those worlds consistent with the plan), the speaker is ready in s . The proposed presupposition is that the actual world did not turn out to be an inertia world for the local situation. That is, there was some development that made the actual world continue in a non-inertial way, so that the plan did not get realized as envisioned by the planners; in this context it is most likely that the interlocutor did not show up. This result is as desired.

We have seen that the proposed meaning for *cem p* sentences can account for both the non-continuation and the unachieved-goal readings of stative *cem p* sentences. Significantly, no component of the meaning of *cem p* sentences says that p does not hold of the actual world. We turn now to the interaction of *cem* with aspect, where this property will again be useful.

1.3 Behavior with aspect

As we shift our attention to eventive predicates, we will need to think Tohono O'odham aspect. There is no morphology for marking tense in Tohono O'odham; a sentence can typically have either past or present topic time, depending on context. Aspect is marked, and relates the situation in which the event takes place to the local situation.

- (17) a. Huan 'at o kukpio g pualt.
 Juan aux-pf fut open det door.
 'Juan will/would open the door.' future
- b. Huan 'o kukpi'ok g pualt.
 Juan aux-impf open-impf det door
 'Juan is/was opening the door.' imperfective
- c. Huan 'at ku:pio g pualt.
 aux-pf open det door
 'Juan opened the door.' perfective

The characterization we will assume here owes a debt to one proposed by Schachter and Otones (1972) for Tagalog. The future¹¹ says that the event is not yet begun at the time of the local situation, the imperfective says that the event is ongoing at the time of the local situation, i.e., begun but not completed, and the perfective says that the event is already completed at the time of the local situation.

- (18) a. future: $\lambda w \lambda p \lambda s . \exists s' \text{ such that } s' \subseteq w \text{ and } s' > s: p(s')$
 b. imperfective: $\lambda w \lambda p \lambda s . \exists s' \text{ such that } s' \subseteq w \text{ and } s' \text{ overlaps } s: p(s')$
 c. perfective: $\lambda w \lambda p \lambda s . \exists s' \text{ such that } s' \subseteq w \text{ and } s' < s: p(s')$

As we have seen, *cem* can occur in sentences with aspect. Here it is in a minimal triple:

¹¹Here future counts as an "aspect;" see Copley (to appear, b) for why.

- (19) a. Huan 'at o cem kukpi'o g pualt.
 Juan aux-pf fut cem open det door
 'Juan tried to open the door.' future + *cem*
- b. Huan 'o cem kukpi'ok g pualt.
 Juan aux-impf cem open det door
 'Juan was trying to open the door.' imperfective + *cem*
- c. Huan 'at cem ku:pio g pualt.
 Juan aux-pf cem open det door
 'Juan opened the door in vain.'
 (entails: Juan opened the door) perfective + *cem*

According to the consultants, (19a) is felicitous when Juan trips before getting to the door at all, or when he tugs on the door but does not manage to open it; (19b) is felicitous when Juan tugs on the door but does not manage to open it, and (19c) is felicitous when he opens the door, but it doesn't stay open.

As mentioned above, the perfective example in (19c) is the most baffling at first, since it entails that Juan actually succeeded in opening the door. This means that 'Juan tried to open the door' is not an appropriate free translation for (19c), and more importantly, that *cem* does not trigger any entailment of the non-occurrence of the event. But we have already seen that the stative examples also require there not to be such an entailment, so we are on solid ground.

Let us see how the proposal fares with the examples in (19), assuming initially that the local situation contains at least Juan, the door, and Juan's intention to open the door. Note that the aspect seems to affect the event as usual, so it must take scope under *cem*. The proposed assertions in (21) take this fact into account.

- (20) a. Assertion of (19a), future:
 All inertia worlds w are such that $[\exists s' \text{ such that } s' \subseteq w \text{ and } s' > s: p(s')]$
- b. Assertion of (19b), imperfective:
 All inertia worlds w are such that $[\exists s' \text{ such that } s' \subseteq w \text{ and } s' \text{ overlaps } s: p(s')]$
- c. Assertion of (19c), perfective:
 All inertia worlds w are such that $[\exists s' \text{ such that } s' \subseteq w \text{ and } s' < s: p(s')]$
- (21) Presupposition (all): The actual world is not an inertia world.

For (19a), the future version, the predicted assertion is then that the inertial worlds the local situation s are such that Juan opens the door at a time later than the run time of s . The presupposition is that the actual world does not turn out to be an inertia world for s . This would entail, as desired, that Juan did not open the door at a time later than the run time of s . Since the Juan-open-door event takes place on the inertial continuations after s , it is not taking place during s , so the sentence is (as desired) appropriate in cases where the intervening forces intervene at a point when Juan has not yet begun to open the door. Why then is it also acceptable when he is tugging at the door but does not open? I would

suggest that it is acceptable because in one sense Juan hasn't opened the door yet, because the door isn't open; in another sense, he is in the midst of opening it because he has begun the action. This explanation would have to rest on a lexical ambiguity for the verb meaning 'open', but it would likely be a very general ambiguity.

For the imperfective case in (19b), the predicted assertion is the following: The inertia worlds of the local situation at *s* are such that there is a Juan-open-door event with a run time overlapping that of *s*. The predicted presupposition is that the actual world does not turn out to be an inertia world for the local situation *s*. As desired, this combination entails that Juan did not completely open the door, though he did partially open the door, since he was in the middle of doing so during the local situation.

Now let us consider the perfective in (19c). The predicted assertion is that the inertia worlds for the local situation *s* are such that Juan opened the door before *s* began. Since the inertia worlds all agree with the actual world up to at least the end of *s* (this is "historical determinism,") it is entailed that Juan opened the door before *s*. This does not conflict directly with the predicted presupposition, that the actual world (after *s*) was not an inertia world for *s*. That is, something else happened that made the actual world not an inertia world for the local situation. But if this is so, we have to reconsider what was in the local situation, and accommodate some other force in it. The reason is that the only force we put in it so far is Juan's intention to open the door. He did open the door, so his intention to open the door must not have been frustrated. Therefore, there must have been some other force in the local situation that was frustrated; perhaps it was an intention to keep the door open for some reason.

This option of accommodating an additional force in the local situation should also be available for unachieved-goal *cem p* sentences that are imperfective or future. I have no data bearing on whether this is true or not, but I predict that it should be true. The point about the perfective was that the first local situation we thought of was not a possible one, because the use of the perfective entails that the intention to do *p* cannot have been frustrated. As we have seen earlier, these other aspects permit this intention to be the only force, but it need not be.

1.4 Behavior with negation

So far we have accounted for the two readings of *cem* sentences, and the interaction of *cem* with aspect. We turn now to the interaction of *cem* with negation. The prediction with negation is (all else being equal) that the assertion in a negative sentence ought to be denied, but that the presupposition should be the same as with the affirmative sentence. Thus we predict that the assertion of a negative *cem p* sentence should be the following: On all inertia worlds for the local situation, not-*p*.¹² The predicted presupposition is the same; the actual world is not an inertia world.

Both the non-continuation and unachieved-goal readings for stative *cem p* sentences behave as predicted. Consider (22), for example:

¹²If you are wondering why not "On not all inertial continuations..., *p*", see section 2.3 below.

- (22) Pi 'o cem suam g howij.
 neg aux cem yellow det banana
 'The banana wasn't yellow.'
 speaker: "I walked by the banana tree yesterday, it wasn't yellow, but now it's
 yellow." non-continuation

We predict the following for (22):

- (23) Assertion: All inertia worlds for *s* are worlds in which *p*(*s*).
 Presupposition: The actual world is not an inertia world for *s*.

And indeed, (22) conveys that the banana is not yellow in the local situation. Tellingly, it also confirms that what we have written as a presupposition really should be a presupposition, since it survives negation.

The unachieved-goal case fares similarly:

- (24) Pi añ cem ñ-na:tokc.
 neg 1sg.aux.impf cem 1sg-ready.impf
 'I wasn't ready.'
 speaker: "Someone came by – I wasn't planning to go, so I wasn't ready."
 unachieved-goal

Here we assume that the local situation includes at least the speaker, and the speaker's plan to not go out. The predicted assertion is that on all inertia worlds for *s*, speaker wasn't ready in *s*. The predicted presupposition is that the actual world was not an inertia world for the local situation *s*. That is, the plan to not go out was frustrated by someone's coming by.

For eventive predicates, which are always unachieved-goal, let us reconsider our negative perfective example.

- (25) Huan 'at cem pi cikp tako.
 Juan aux-pf cem neg work-pf yesterday
 a. speaker: "Juan did work, but he didn't want to."
 b. speaker: "Juan worked, but he did it badly."

In this case the speaker has provided two different unachieved-goal readings,¹³ one in which Juan's desire is frustrated and one in which (let's say) the boss's desire for Juan is frustrated. We assume for the reading in (24a) that the local situation includes Juan's desire not to work; for the reading in (24b), it includes instead the boss's desire for Juan to work well. The predicted presupposition is that the actual world was not an inertia world for the local situation. For the reading in (24a), the reason is that Juan's intention for himself

¹³Technically, of course, these are not different readings on the current proposal, but the same reading in different contexts. The same could also be said of non-continuation "readings" of statives, as compared to unachieved-goal "readings;" the meaning is the same, but the contextual input, i.e., the local situation, is different.

(namely, the intention not to work) is not realized; for the reading in (24b), the reason is that the boss's intention for him to do good work is not realized.

In either reading the assertion and presupposition should be the same, as predicted:

- (26) Assertion:
 All inertia worlds w are such that $[\exists s' \text{ such that } s' \subseteq w \text{ and } s' < s: p(s')]$
 Presupposition: The actual world is not an inertia world for s .

For both readings, the predicted assertion is that on inertia worlds for the local situation s , Juan didn't work before s . But the actual world is not an inertia world for s . The most obvious way for the actual world to not be an inertia world for s is for Juan to have worked in the actual world before s . I predict that this should be an entailment if the local situation is either of the two possibilities we have given. However, I also predict that if another force is contextually salient, (25) should be able to convey that Juan didn't work, but that something else went wrong because he didn't work.

Marcus Smith (p.c.) has provided me with an example of a negative future sentence with *cem*:

- (27) Juan 'at cum pi o hii tako.
 Juan aux-pf *cem* neg fut go-pf yesterday
 'Juan didn't want to go yesterday (but he did).'

This example is very similar to the perfective one above. I leave it as an exercise for the reader to determine how the proposal accounts for this example.

To conclude this section: We have seen how the proposed meaning for *cem p* sentences accounts for the puzzles presented at the beginning of this paper. At this point, we will take a step back and consider how *cem* fits into a cross-linguistic picture of modality.

2 Placing *cem* in context

The preceding analysis raises a number of questions: Why is there a particle like *cem*? Where does it fall in a typology of modality? And is it particularly bizarre? In this section, I will argue that *cem*, despite initial appearances, is actually minimally different from other elements with modal semantics. (Such elements I will abbreviate as "modals," whether or not they are realized morphologically by modal auxiliaries.) It is certainly not the only modal to show an alternation between physical and intentional forces. Like other more familiar modals, it provides a presupposition specifying a relationship between the inertial continuations and the actual world (as I've argued, it happens to specify that the actual world is *not* an inertial continuation, but other relationships are possible). Finally, like other modals it exhibits what von Stechow (1997) calls Homogeneity: the exclusion of the middle under negation.

The examples of "more familiar modals" below are in English – historically the most familiar of languages to generative linguists – but many other languages could equally

have been used. The point is that *cem* is formally similar to many modals that are widespread in the languages of the world.

2.1 *The two meanings, revisited*

The idea that *cem*'s inertial ordering source uses either forces of will or physical forces does not single it out as unusual. A case for this kind of alternation can also be made for other, more familiar modals. For example, *will* can be used either to state an intention, or to make a prediction:

- (28) Will you marry me?
- a. Yes, I will. I (hereby) agree to marry you. (statement of intention)
 - b. Yes, I will. That's just the sort of thing I might do. (prediction)

The statement of intention reading in (28a), I have argued elsewhere (Copley 2002, to appear (b)), is a reflection of the use of intentions as an ordering source, while the prediction reading in (28b) uses natural forces to order the worlds. Of course it is odd pragmatically to have to make a prediction about one's own actions, so (28b) is somewhat strange. A more natural context for the prediction case is provided by (29), where the prediction reading is much more natural, as in (29b); one can also imagine a god of rain using an intentional ordering source, as in (29a).

- (29) Will it rain this summer?
- a. It will. (spoken by god of rain)
 - b. It will. (spoken by mere mortal with a knowledge of the patterns of nature)

Will is certainly not the only familiar modality to appeal both to intentions and to physical forces. Habituals as well can reflect either manmade laws or natural laws, as in (30a) and (30b) respectively.

- (30) John eats the rice.
- a. We need someone to eat it, and we've decided it's him. (statement of intention)
 - b. Whenever we get rice, John ends up eating it. (observation)

The manmade law reading in (30a) uses intentions to determine what the law-abiding worlds are like, while the natural law reading in (30b) uses physical and dispositional characteristics of John. But in either case, the same habitual form is used.

It seems fairly ordinary, then, for a morpheme to be indifferent to whether the net force (ordering source) is based on physical or intentional forces; *cem* is not unusual in this regard.

2.2 Efficacy

The second characteristic of *cem* that is not unusual is its specification of a relationship between the actual world and inertial continuations; in this it turns out to be minimally different from certain other familiar modals.

I have argued above that *cem* presupposes that actual world is not inertial. Elsewhere I have argued that other modals presuppose that the actual world *is* inertial. In Copley (2002), this is proposed for *will*, habituais, and other modals, in order to ensure that they actually make a claim about the actual world, instead of just making a claim about inertial continuations. That they do make a claim about the actual world is almost self-evident, but in any case, evidence is provided in (31).

- (31) a. #I'll marry you, but really I'm not actually going to.
b. #Bears eat meat, but they are all strict vegetarians.

On the other hand, other modalities, such as “epistemic” *should* and the progressive, seem to presuppose nothing about whether actual world is inertial or not. I argue in Copley (2004b) that *should* says that all inertia worlds are p worlds, but that it makes no commitment to whether the actual world is one of those inertia worlds (as shown by the possibility of either continuation in (32a)). Likewise, the imperfective paradox shows us that the progressive also allows the actual world to be inertial or not, as shown in (32b).

- (32) a. John should be there, but he isn't/and in fact he is.
b. John was drawing a circle, but he didn't finish/and in fact he finished.

If this line of thinking is correct, *cem* is one of a number of modals with a presupposition expressing a relationship between inertia worlds (those worlds in $f(s)$) and the actual world. If we call this dimension “efficacy,” we can then speak of three different kinds of efficacy: positive, negative, and zero.

- (33) Efficacy: a presupposition specifying the relationship between the inertia worlds and the actual world
positive efficacy (actual world is an inertia world): *will*, habituais
negative efficacy (actual world is not an inertia world): *cem*
zero efficacy (no presupposition): *should*, progressive

Cem therefore differs from these other kinds of modality in the value of this dimension, but the dimension is relevant to all of these kinds of modality. Again, *cem* is no outlier.

2.3 Homogeneity

Earlier, in the discussion about the interaction between *cem* and negation, I sneaked in an assumption. Here I would like to show that that assumption is one relevant to many other modals. The assumption was that negation would have what amounted to low scope.

(34) Predicted assertion: On all inertial continuations of the local situation at *t*, not-*p*

Why wasn't this the predicted assertion? "On not all inertial continuations of the local situation at *t*, *p*"?

I have no answer to that question here (to do so might break my self-imposed restriction on not saying anything about the syntax-semantics interface), but I would like to note that the same question arises for other kinds of modality. von Stechow (1997) calls this property *Homogeneity*: the middle – the case where sometimes *p* and sometimes not-*p* – is excluded.

For example, the negation of (35a), given in (35b), only says of the situations in question that they are all not-*p* situations. It does not say that they are not all *p* situations.

- (35) a. Dogs eat meat.
 = In all normal/inertial situations with certain properties, dogs eat meat.
 b. Dogs don't eat meat.
 = In all normal/inertial situations with certain properties, dogs don't eat meat.
 ≠ In not all normal/inertial situations with certain properties do dogs eat meat.

Futures such as *will* have Homogeneity as well, as Aristotle first noticed. If you think a sea battle is possible but not necessary, you will not use the *won't p* sentence in (36b); that is reserved for cases when you think the sea battle is necessary.

- (36) a. There will be a sea battle tomorrow.
 = On all inertia worlds, there is a sea battle tomorrow.
 b. There won't be a sea battle tomorrow.
 = On all inertia worlds, there isn't a sea battle tomorrow.
 ≠ On not all inertia worlds is there a sea battle tomorrow.

So we should not be surprised that *cem* also exhibits Homogeneity.

3 Conclusions

This paper had two aims: to explicate the meaning of *cem p* sentences, and to put *cem* into cross-linguistic context.

The first aim was addressed by way of reference to inertia worlds: worlds in which the net force in the local situation are not disturbed. *Cem p* sentences, I proposed, assert that the inertia worlds for the local situation are worlds in which *p* holds (where *p* might be a non-atomic proposition, including aspect or negation); and they presuppose that the actual world is not an inertia world for *s*. The two main readings of *cem p* sentences, non-continuation and unachieved-goal, were argued to fall out naturally from the fact that forces can be either physical or intentional in nature.

The second aim was addressed by comparing *cem* to other kinds of modality on three different semantic properties. *Cem* was found to be like other, more familiar modals

in having the intentional/physical alternation, and in the property of Homogeneity (exclusion of the middle). It differs from other modals, but only minimally, along a dimension we called “efficacy”, a presupposed relationship between the actual world and the inertia worlds. The similarity between *cem* and other modals is an encouraging result for anyone interested in language universals, hinting as it does at a “toolkit” of sememes with which to understand modality in general.

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