

This printout has been approved by me, the author. Any mistakes in this printout will not be fixed by the publisher. Here is my signature and the date: _____

Encoding time in tenseless languages: The view from Zapotec

Maziar Toosarvandani
University of California, Santa Cruz

Many Western American indigenous languages are tenseless, lacking verbal inflection that relates the time of an event or state to the utterance time. Northern Paiute, to name one such language, describes an eventuality that overlaps the speech time (1a) or precedes it (1b) with a single verb form.

- (1) *Northern Paiute*
- a. (Mino'o) *t̩=kaadzi madabbui-winni.*
now REFL=car **fix-PROG**
'They **are fixing** their car (now).'
- b. (Idzi'i) *t̩=kaadzi madabbui-winni.*
yesterday REFL=car **fix-PROG**
'They **were fixing** their car (yesterday).'
- (Toosarvandani, 2017:567–569)

Under many contemporary accounts, the variation between tenseless languages and their tensed counterparts is mostly superficial. In both types of languages, finite clauses are thought to be anaphoric to a contextually salient time, which serves to temporally locate the eventuality. If this *topic time* is retrieved by tense, as in referential theories of tense (Partee, 1973, 1984; Kratzer, 1998), then so-called tenseless languages would also have tense, even if it was never pronounced.

In St'át'imcets, for instance, Matthewson (2006) proposes that a silent tense refers to a topic time located at or before the utterance time. This non-future tense is discernible from its alternation with an overt marker of futurity (see also Jóhannsdóttir and Matthewson 2007 on Gitksan). For other languages, a silent tense has been posited whose reference is not restricted in any way, e.g., in Yucatec Maya (Bohnmeyer, 2009), Washo (Bochnak 2016), and Northern Paiute (Toosarvandani 2016, 2017). When tense is not pronounced, it seems reasonable that its referential potential should be less restricted in this way. Without explicit morphological cues, the language learner would likely not be able to posit anything richer than a binary tense distinction (e.g., overt future vs. covert non-future).

What could underlie this semantic uniformity? The topic time is often taken to play a privileged role in the dynamics of information exchange. Klein (1994:4) identifies it as the time "to which a speaker's claim on [an] occasion is confined." And Kratzer (2014) relates the topic time to an Austinian topic situation, or the state of affairs that an utterance is about. Whatever the ultimate source of this uniformity, it can be stated as a putative linguistic universal.

- (2) *Topic Time Universal*
In all languages, finite sentences are interpreted relative to a topic time.

This universal might seem too trivial to deserve special mention. Indeed, von Stechow and Matthewson (2008), who contemplate several semantic universals making reference to a topic time, never consider one that mandates its existence in the first place.

* I am extremely grateful to Fe Silva Robles, Isidro Vázquez Jerónimo, Raul Díaz Robles, Rosario Reyes Vázquez, and two other speakers of Zapotec for their generosity in teaching me about their language. I would also like to thank the audience at WCCFL 38 for their thoughtful questions and comments.

But it is easy to imagine ways that a language could do without a topic time. One particularly interesting way has been suggested recently by Pancheva and Zubizarreta (2020) for Paraguayan Guaraní, which they argue completely lacks tense.¹

(3) *Paraguayan Guaraní*

- a. Ko'ága a-**jahu**.
now A1SG-**bathe**
'I **am bathing** right now.'

A

- b. Kuehe a-**jahu**.
yesterday A1SG-**bathe**
'Yesterday, I **bathed/was bathing**.'

(Tonhauser, 2011b:260)

Pancheva and Zubizarreta propose that finite clauses in Guaraní locate an eventuality at a contextual time parameter, which by default is the time of utterance, as in 3a. To describe a past eventuality, as in 3b, this “now” is shifted by the same mechanism that enables the present tense, in languages that have it, to describe past eventualities (cf. Schlenker 2004; Eckardt 2015; Anand and Toosarvandani 2017, 2018).

How common are such topic-time-less temporal systems in the world's languages? And how can we tell whether a language even has a temporal system like this in the first place? I will explore these questions from the perspective of Sierra Zapotec, a closely related group of Zapotec varieties from the southeastern Sierra Norte of Oaxaca, Mexico.² Like Guaraní and the others languages mentioned, it is morphologically tenseless.

(4) *Sierra Zapotec*

- a. Na'a⁴ **dzul**⁴ Pe²dro⁴.
now **CONT.sing** Pedro
'Pedro **is singing** now.'

(FA/RM, GZYZ028, 6:15)

- b. (Bi¹ dzunh²³ Ma¹ria¹ ka²te⁴ blhe'e¹⁴du⁴ba³ ne⁴je²?)
'What was Maria doing when you saw her yesterday?')

Dzul⁴=ba³.

CONT.sing=3.HU

'She **was singing**.'

(FA/RM, GZYZ067, 42:50)

There are some initial reasons to think Sierra Zapotec shares a temporal system with Guaraní. Pancheva and Zubizarreta identify an interpretive restriction on future marking, which they take to indicate the absence of a topic time. In Guaraní, while the future marker can locate eventualities in the future of the utterance time, it cannot do so readily relative to a past time. This restriction on a *future-in-the-past* reading is also found in Sierra Zapotec, which is natural if eventualities are directly related to the “now.”

Despite this similarity, I argue that Sierra Zapotec's temporal system must make reference to a topic time. This diagnosis is informed by the temporal organization of narratives in the language. The temporal relations attested between sentences are more flexible than what would be allowed solely by shifting the “now” of the context. Thus, finite sentences in the language must be interpreted relative to a topic time. Since this requires a different explanation for the interpretative restriction on future marking, I suggest that future-in-the-past readings are restricted, at least in Sierra Zapotec, for the same reason that certain

¹ There are other account of tenseless languages as truly lacking tense, including Ritter and Wiltschko's (2005) accounts of Blackfoot and Halkomelem (though see the response by Reis Silva and Matthewson (2007) for Blackfoot).

² The data presented here are based on the judgements of three Zapotec speakers from the towns of San Sebastián Guiloxi, Santiago Laxopa, and Santa María Yalina who now reside in California (Santa Cruz and Los Angeles). Their varieties are all highly mutually intelligible and are most closely related to the Zapotec spoken in San Bartolomé Zoogocho (Long, 1993; Long and Cruz, 2000; Sonnenschein, 2004). I have worked with all three speakers almost continuously since 2016, meeting with them every week on average.

epistemic modals have limited past temporal perspective (Abusch 1997; Hacquard 2011; Rullmann and Matthewson 2018, among others).

On the surface, the temporal system of Sierra Zapotec looks quite different even from other Western American indigenous languages. Verbs inflect for one of several “aspects” (their traditional name) with a lexically-conditioned combination of prefixes, stem suppletion, and tones. But underneath this morphology lies a temporal semantics that is organized along more familiar lines, conforming to the Topic Time Universal. This result, which is motivated by the temporal interpretation of narratives, shows the need for increased attention to narratives, in tensed languages and tenseless languages alike, to understand how time is encoded in human language.

1. Doing without a topic time

In standard theories of temporality, tense relates a *topic time* to a temporal perspective point, which canonically is the time of utterance (Klein 1994, cf. Reichenbach 1947). In referential theories of tense, it does this much like a pronoun, referring to a contextually salient topic time restricted by the appropriate presupposition (Partee, 1973, 1984; Kratzer, 1998).

- (5) *Tense (English, . . .)*
- a. $\llbracket \text{PRES}_i \rrbracket^{c,g} = g(i)$; defined iff $g(i) \subseteq \text{TIME}(c)$
 - b. $\llbracket \text{PAST}_i \rrbracket^{c,g} = g(i)$; defined iff $g(i) < \text{TIME}(c)$

Aspect establishes a relation between the topic time and the eventuality described by the verb phrase. The common aspects, perfective and imperfective, have the following (simplified) lexical entries:

- (6) *Aspect (English, . . .)*
- a. $\llbracket \text{PFV VP} \rrbracket^{c,g} = \lambda t \exists e . \llbracket \text{VP} \rrbracket^{c,g}(e) \wedge \tau(e) \subseteq t$
 - b. $\llbracket \text{IMPF VP} \rrbracket^{c,g} = \lambda t \exists e . \llbracket \text{VP} \rrbracket^{c,g}(e) \wedge \tau(e) \supset t$

Under the accounts described above, while tenseless languages might have the aspects in 6a–b, they would have silent tenses that refer to a topic time with few or no restrictions.

- (7) a. *Tense (St’át’imcets, Gitksan, . . .)*
 $\llbracket \text{NFUT}_i \rrbracket^{c,g} = g(i)$; defined iff $g(i) \leq \text{TIME}(c)$
- b. *Tense (Yucatec Maya, Washo, Northern Paiute, . . .)*
 $\llbracket \text{TNS}_i \rrbracket^{c,g} = g(i)$

The differences between tensed and tenseless languages would thus be almost entirely superficial: in both, finite clauses would be anaphoric to a topic time.

Pancheva and Zubizarreta (2020) argue that Guaraní lacks the tenses in 7 altogether, locating eventualities in the present or past without making reference to a topic time.³ Their account has three ingredients:

1. Aspect relates an eventuality directly to the time of a context via a deictic pronoun in the left periphery (cf. Kusumoto 1999).
2. This pronoun picks out the time of an *assessment context*, not the *utterance context*, in a bicontextual semantics (Schlenker, 2004; Sharvit, 2008; MacFarlane, 2014).
3. The assessment time can be shifted into the past, subject to certain constraints (Schlenker 2004; Eckardt 2015; Anand and Toosarvandani 2017, 2018).

This account relies crucially on the interpretive freedom enabled by adding an assessment context. So we should start by motivating the first two ingredients above, before turning to the third ingredient.

³ This diverges from earlier work on Guaraní. Thomas (2014) posits a silent tense for the language, while Tonhauser (2011b) proposes that finite clauses in the language are anaphoric to a topic time, though this is not via tense.

1.1. A bicontextual semantics for tense

Not all tenses are as well behaved as their familiar semantics in 5 would suggest. The simple present in English, for instance, can describe eventualities located not just at the speech time, but also anterior to the speech time.

- (8) Inez, the maid, **brings** in lunch on a tray, one rare hamburger, one cheeseburger and a glass of tomato juice. Jane **tastes** the tomato juice. “Oh,——!” she **says**. “It’s diet.”
 (Tom Wolfe, “The Girl of the Year”)

The simple present’s *historical* (or *narrative*) use is easy to identify, since it does not exhibit the stativity restriction that characterizes more canonical uses. When the simple present describes an eventuality overlapping the utterance time, it is incompatible with eventive predicates (under an episodic interpretation).

- (9) a. Josie **owns** the farm. stative
 b. # Josie **reads** the newspaper.
 Intended: ‘Josie is reading the newspaper now.’ accomplishment
 c. # Josie **plays** the violin.
 Intended: ‘Josie is playing the violin now.’ activity

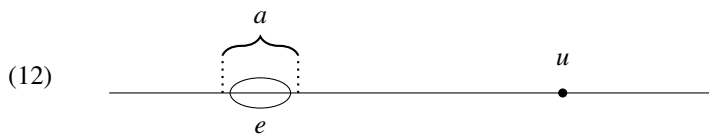
By contrast, the historical present is used for just this purpose, to describe events, as 8 illustrates. With the semantics in 5a, such uses should be impossible, because the present tense would not refer to a topic time located at the utterance time.

Recent work aims to unify these different uses by making tense sensitive to a time coordinate distinct from the time of the utterance context (Schlenker, 2004; Eckardt, 2015; Anand and Toosarvandani, 2017). I will present Anand and Toosarvandani’s implementation of this idea here, since it accounts for the lack of a stativity restriction with the historical present and can straightforwardly be embedded in a theory of discourse structure. Like its alternatives, it appeals to two contexts, which we can call an *utterance context* (*u*) and an *assessment context* (*a*), following MacFarlane (2014).

Linguistic expressions are interpreted relative to both contexts, though they vary in how they are sensitive to features of these contexts. Tense is sensitive to the time of the assessment context, while indexical pronouns are sensitive to coordinates of the utterance context (cf. Sharvit 2008).

- (10) *Tense in a bicontextual semantics (English, ...)*
 a. $\llbracket \text{PRES}_i \rrbracket^{u,a,g} = g(i)$; defined iff $g(i) \subseteq \text{TIME}(a)$
 b. $\llbracket \text{PAST}_i \rrbracket^{u,a,g} = g(i)$; defined iff $g(i) < \text{TIME}(a)$
- (11) *Pronouns in a bicontextual semantics*
 a. $\llbracket \text{I} \rrbracket^{u,a,g} = \text{SPEAKER}(u)$
 b. $\llbracket \text{you} \rrbracket^{u,a,g} = \text{ADDRESSEE}(u)$

In principle, these contexts can be identical or diverge.⁴ As Schlenker (2004) proposes, the different tense uses arise based on the relation between the time coordinates of the two contexts. When the assessment and utterance times are identical, the canonical present arises; when the assessment time precedes the utterance time, the historical present results.



⁴ In Sharvit’s (2008) account of free indirect discourse, they diverge in the scope of an operator quantifying over assessment contexts.

Thus, even the present tense can describe a past eventuality when the assessment time is shifted in this way.

This account also provides a way of understanding the historical present's compatibility with eventives. The stativity restriction is often grounded in the idea that the utterance event is conceived of as instantaneous (Bennett and Partee 1978:10; Cowper 1998:6; among others). With the semantics for present tense in 10a and perfective aspect in 6a, the simple present would have to locate an event inside the assessment time. But this is not possible with the canonical present, when the assessment time is identical to the utterance time, because the event is too wide. For the historical present, the assessment time is unmoored from the utterance time, and so can be wide enough to accommodate an event.

1.2. Present and past without a topic time

Under Pancheva and Zubizarreta's account, this flexibility in the assessment time's location is what enables Guaraní to describe not just present eventualities, but also past ones. Without tense, though, the assessment time must be accessed in some other fashion. This happens via an indexical pronoun in the left periphery that picks out the assessment time.⁵ In a tensed language, this pronoun would provide tense with an evaluation time (cf. Kusumoto 1999, among others). But in Guaraní, the pronoun instead feeds a time to aspect. Consider the following logical form for the sentences in (3a–b) above:⁶

$$(13) \quad \boxed{\text{TIME}(a)} \left[_{(TP)} \left[_{\text{AspP}} \lambda t \exists e . \text{bathe}(\text{SPEAKER}(u))(e) \wedge \tau(e) \circ t \right] \right] = (3a-b)$$

Aspect relates an eventuality directly to the assessment time. (A semantically-vacuous tense head may or may not be present in the language.) Thus, 13 will describe a present eventuality when the assessment time is identical to the utterance time, and it will describe a past one when the assessment time precedes the utterance time.

An argument for the topic-time-less account of Guaraní comes from certain interpretive restrictions on the future marker *-ta*. Tonhauser (2011a:212) observes that when the suffix appears in a root clause out of the blue, it can only describe an eventuality in the future of the utterance time (14a). It cannot have a *future-in-the-past* reading (14b).

- (14) a. A-**jahu-ta** (ko'ẽro).
 1SG-**bathe-FUT** tomorrow.
 Intended: 'I **will be bathing** (tomorrow).'
- b. # Kuehe Kalo o-**purahéi-ta**.
 yesterday Kalo 3SG-**sing-FUT**
 Intended: 'Kalo **was going to sing** yesterday.' (Pancheva and Zubizarreta, 2020)

Tonhauser observes (p. 217), however, that a future-in-the-past reading becomes available in non-initial clauses of a narrative. In 15a, the bringing event is located after the past telling event.

- (15) a. Context: The mother received a call from the school that her daughter had had an accident at school and was now at the hospital. The teacher told her to come to a particular road crossing.
 Upépeve o-guerú-**ta** chupe la i-profesor.
 there A3-bring-**FUT** pron.3O the B3-teacher
 'Her teacher **would/was going to** bring her there.' (Tonhauser, 2011a:217)
- b. Kuehe a-hecha María-pe ha ha'e o-viajá-**ta** hína LA-pe.
 yesterday 1SG-see Maria-DOM and 3SG 3SG-travel-**FUT** PROG LA-LOC
 'I saw Maria yesterday and she **was going to travel** to Los Angeles.'
 (Pancheva and Zubizarreta, 2020)

⁵ In fact, Pancheva and Zubizarreta assume the pronoun can pick out the time of either context. For consistency with preceding work, I have reframed this aspect of their account, so that the pronoun is always indexical to the assessment time.

⁶ The language does not obligatorily mark aspect. While a present event can only be understood as ongoing, past events can be either perfective or imperfective (Tonhauser, 2011b:263–265).

A future-in-the-past reading also becomes available in the non-initial coordinate of a coordination (15b).

If Guaraní had tense, this restriction would be unexpected. Ignoring some semantic details, the future suffix would locate an eventuality in the future of the topic time, as shown in the schematic lexical entry below.

$$(16) \quad \llbracket -ta \text{ VP} \rrbracket^{c:g} = \lambda t \exists e . \llbracket \text{VP} \rrbracket^{c:g}(e) \wedge t < \tau(e)$$

But this incorrectly predicts, then, that 14b should be acceptable. If the topic time is retrieved anaphorically, the availability of a future-in-the-past reading should simply be a matter of finding a suitable time in the past. If this is possible for the bare verb in 3b, then it should also be possible in 14b.

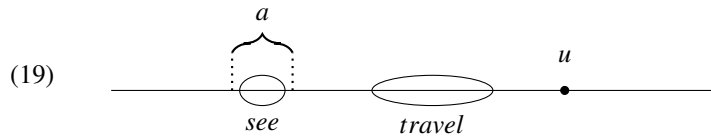
This interpretive restriction on future marking, which we can state as the generalization in 17, is a problem for any account of Guaraní that appeals to an anaphorically retrieved topic time.

- (17) *Future-in-the-Past Generalization (FPG)*
A future-in-the-past reading is not available in a root clause outside of narratives.

If Guaraní did not make reference to a topic time, then the FPG could be derived from how the assessment time can be shifted. Under Pancheva and Zubizarreta’s assumptions, the future suffix locates an eventuality in the future of the assessment time, as in the following logical form for 15a:

$$(18) \quad [\text{TIME}(a) \text{ [(TP) } [\text{AspP } \lambda t \exists t' \exists e . \mathbf{bring}(g(8))(g(3))(e) \wedge \tau(e) \circ t' \wedge t < t']]]] = (15a)$$

If the assessment time is shifted into the past after the first sentence in a narrative, then a future-in-the-past reading will be available for all subsequent discourse segments in 15a. A similar analysis of 15b is possible if the coordination constitutes a narrative. In both cases, the future suffix is able to locate an eventuality after the assessment time and before the utterance time.



The FPG could be derived, then, by restricting when assessment time shift can happen. Some constraints would be needed that restrict the assessment time for future-marked sentences outside of a narrative. Below I discuss what shape these constraints might take, but first we should take a look at Sierra Zapotec.

1.3. The view from Zapotec

Sierra Zapotec lacks overt tense morphology. For each verb, several lexically-conditioned combinations of prefixes, stem suppletion, and lexical tone mark what are called “aspects” in the traditional literature. This description is more or less correct for at least the “*completive*,” which conveys perfective aspect, and the “*continuative*,” which conveys imperfective aspect.

- (20) “*Completive*” (*perfective aspect*)
Ne⁴je² bil⁴ Pe²dro⁴.
yesterday COMP.sing Pedro
‘Pedro sang yesterday.’ (FA/RM, GZYZ028, 21:40)

- (21) “*Continuative*” (*imperfective aspect*)
Na’a⁴ dzul⁴ Pe²dro⁴.
now CONT.sing Pedro
‘Pedro is singing now.’ (FA/RM, GZYZ028, 6:15)

By default, the continuative describes an eventuality at the speech time, though it can also describe past eventualities, as in 4b. The completive only describes past events, regardless of the predicate’s

aktionsart.⁷ This default interpretation is perhaps expected for the same reason that the simple present in English is restricted to statives in its canonical use. As discussed in §1.1, if the utterance event is conceived of as instantaneous, then it will be too narrow to contain an event (cf. Smith et al. 2007).

The completive and continuative alternate with a third category, traditionally called the “*potential*,” which is used to describe future eventualities.

- (22) “*Potential*”
 Wxe² gul¹ Pe²dro⁴.
 tomorrow POT.sing Pedro
 ‘Pedro **will sing** tomorrow.’ (FA, GZYZ028, 7:40)

These three “aspects” are most relevant here, though there are a couple others that have a more restricted distribution. Some verbs also have a “dubitative” form, which describes future events about which the speaker is not certain, a “stative” form, or an “infinitive” form, which appears in embedded clauses (Long and Cruz 2000:425–430, 449–451).

The potential in Sierra Zapotec appears to obey the FPG. In an out-of-the-blue context, the potential can only describe an eventuality in the future of the utterance event (23a). But a future-in-the-past reading becomes available in non-initial clauses of narratives (23b) and coordinations (23c).

- (23) a. # Ne⁴je² gul¹ Pe²dro⁴.
 yesterday POT.sing Pedro
 Intended: ‘Pedro **was going to sing** yesterday.’ (FA/RM, GZYZ028, 7:57)
- b. Nille’e²³ bzu²law⁴ gok⁴ yejw⁴. E¹lhua¹ Pe²dro⁴ yelh⁴, perw⁴ bi⁴tu⁴
 at.night COMP.begin COMP.be rain POT.clean Pedro milpa but NEG
 blhua¹=ba³=nh.
 COMP.clean=3.HU
 ‘Last night, it started to rain. Pedro **was going to clean** the *milpa*, but he didn’t.’
 (FA/RM, GZYZ080, 39:50)
- c. Ba² tsda²³ Pe²dro⁴ ts-ja¹-lua¹=ba³ lu² yelh⁴ nha⁴ e¹le⁴ed¹⁴=ba³
 already CONT.walk Pedro CONT-AND-clean=3.HU in milpa and POT.see=3.HU
 behl⁴.
 snake
 ‘Pedro went to clean the *milpa*, and he **would see** a snake.’
 (FA/RM, GZYZ085, 21:34)

This parallel notwithstanding, Sierra Zapotec makes reference to a topic time. The main argument will come from the temporal organization of narratives, which exhibit a flexibility that cannot be accounted for simply by shifting the assessment time. This will depend crucially on constraints on assessment time shift, which are also needed to derive the FPG in Guaraní under a topic-time-less account.

2. Going forwards and backwards

In principle, the location of the assessment time could be entirely free, restricted solely by pragmatic considerations. But there is some evidence, from the temporal interpretation of historical present narratives, that it is tightly constrained. Consider first a sequence of sentences in the simple past in English. These can participate in *narrative progression*, describing a forward-moving sequence of events, as in 24a, or they can be *backshifted* relative to a preceding sentence. In 24b, the meeting can be interpreted as preceding the firing.

- (24) a. *Narrative progression*
 The administration **fired** Mike. He **lost** his house.
- b. *Backshifting*
 The administration **fired** Mike. He **met** with the ambassador.

⁷ Verbs that describe states in the continuative generally have a punctual interpretation in the completive.

This interpretive freedom is only available with specific tense forms. Anand and Toosarvandani (2018) observe that, while the historical present permits narrative progression, it forbids backshifting. In (25b), the meeting can only be understood as following the firing.

- (25) a. The administration **fires** Mike. He **loses** his house.
 b. The administration **fires** Mike. He **meets** with the ambassador.

This contrast correlates with the semantics of tense: the past tense permits backshifting and encodes temporal anteriority, while present tense forbids backshifting and encodes temporal simultaneity. This generalization can be derived from the bicontextual semantics of tense in 10, as long as there are some constraints on how the assessment time can be updated across sentences.

2.1. Constraints on assessment time shift

To account for the absence of backshifting with the historical present, Anand and Toosarvandani propose the *Constraints on Assessment Time Shift* (CATS) below.

- (26) *Constraints on Assessment Time Shift* (cf. Anand and Toosarvandani, 2018:80)
 A sentence S can be evaluated with respect to contexts u and a such that:
- a. $\text{TIME}(a) := \text{TIME}(u)$, or
 b. $\text{TIME}(a) := t$ such that, for the most recent eventuality e_0 , $\forall t'(t' < t \rightarrow t' < \tau(e_0)) \wedge \forall t'(t' < \tau(e_0) \rightarrow t' < t)$

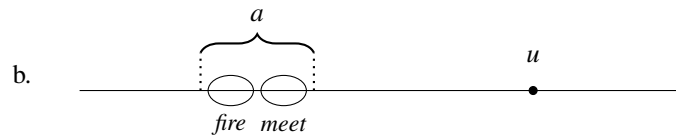
According to CATS, the only way the assessment time can be unmoored from the utterance time is by aligning its left boundary with the left boundary of the most recent eventuality in the discourse.

As stated, CATS also prohibits the assessment time from being shifted for any sentence in discourse initial position, when there are no previously described eventualities. Broadly speaking, this is the right prediction for the historical present, which is infelicitous as the first sentence in a narrative (27a) or in an information-seeking exchange (27b).⁸

- (27) a. # Fifty eight years ago to this day, on January 22, 1944, the Americans **are** preparing to invade Europe.
 b. (What happened on January 22, 1944?)
 # On January 22, 1944, the Americans **are** preparing to invade Europe.

At the same time, CATS derives the impossibility of backshifting with the historical present. If the assessment time can be shifted no farther back in time than the most recent eventuality, then the present tense will never be able to describe an event preceding this eventuality. The bicontextual semantics of present tense in 10a requires temporal inclusion of the topic time in the assessment time, and so only narrative progression (or temporal overlap) will be possible.

- (28) a. The administration **fires** Mike. He **meets** with the ambassador. *no backshifting*



By contrast, the bicontextual semantics for past tense in 10b locates the topic time *before* the assessment time. Thus, when the assessment time has been shifted to align with the most recent eventuality, the past tense will locate an event even farther in the past.

⁸ This is not literally true. Many novels and short stories simply start with the historical present. Just to name one example, the first sentence of *How Much of These Hills is Gold* (by C. Pam Zhang) is: *Ba dies in the night, prompting them to seek two silver dollars*. So either some explicit material is needed to license the historical present, or a particular start-up context is required. Anand and Toosarvandani (2020) observe that clause-initial adverbials describing narrative events seem to be particularly useful for licensing historical present in initial position: e.g., *In the story, the Americans are preparing to invade Europe*.

- (29) a. The administration **fired** Mike. He **met** with the ambassador. *backshifting allowed*



With CATS, it is possible then to derive whether a given tense permits backshifting or not directly from its semantics.

Ideally, CATS would have a source in some deeper principle. In one way of thinking, this is nothing more than salience. The utterance time is always a natural resolution for the assessment time because of the utterance event's inherent prominence. Other than that, the only anchor for the assessment time is the most recent eventuality introduced in the discourse. Simple salience runs into problems, however, with narratives longer than two sentences. In these more complex discourses, a sentence can be related temporally to a discourse segment located farther back in the discourse than the most recent sentence. A long line of research has taken this to show that natural language discourse has a hierarchical structure (Hobbs 1979; Grosz and Sidner 1986; Mann and Thompson 1988, among others). Taking this structure into account, Anand and Toosarvandani (2020) identify a source for CATS in how the assessment time is resolved anaphorically within Segmented Discourse Representation Theory (SDRT; Asher and Lascarides 2003), though a recency constraint is still needed, even if it is defined over hierarchical discourse structures.

Even as an empirical generalization, CATS makes testable predictions about the temporal organization of narratives. It prohibits backshifting with the historical present by ruling out assessment time shift indefinitely far into the past. If CATS is a general constraint, then any sentence that locates an eventuality at the assessment time should not be able to be backshifted, whether tense is involved or not. Backshifting can be used, in other words, as a probe for the temporal system that a language has.

2.2. The possibility of backshifting

Recall that, under the topic-time-less account of Guarani, a sentence in the perfective or imperfective aspect must describe an eventuality that overlaps the assessment time. If a sentence in the completive conveys perfective aspect, it would thus have the following schematic logical form:

$$(30) \quad [\text{TIME}(a) \text{ } [_{\text{TP}} \text{ } [_{\text{AspP}} \lambda t \exists e . \text{[[VP]]}(e) \wedge \tau(e) \subseteq t]]]]$$

According to CATS, the assessment time cannot be shifted farther back into the past than the most recent eventuality. So only narrative progression is predicted to be possible with the completive.⁹ (This is only true if the completive does, in fact, convey perfective aspect, and not perfect aspect, a possibility that I exclude in the Appendix.)

Indeed, the completive can describe a forward-moving sequence of events: each sentence in 31 describes an event that temporally follows the event of the preceding sentence.

- (31) [...]**ben**=e' pastiy, ben=e' **we'**ej=a' na'
 COMP.give=3.EL pill COMP.give=3.EL COMP.drink=1SG and
beyal=a'. Kate' **b-e-llinh**=a' lill=a' kon bi **gosh**=a'
 COMP.feel.relief=1SG when COMP-REP-arrive=1SG home=1SG with NEG COMP.tell=1SG
 xna'=a bi gok chi=a'.
 mother=1SG what COMP.happen to=1SG
 '[... she **gave**] me a pill that I **took** and I **felt relief**. When I **arrived** back at my house, I just
 didn't **tell** my mother what happened to me.' (Long, 1993:206)

But a completive sentence can also be backshifted relative to a preceding sentence, whether this is in the completive (32a) or the continuative (32b).

⁹ The same prediction holds for the continuative, though I focus just on the completive here.

- (32) a. *‘Then the one man just left and arrived at home, but after he killed that poor fellow and laid him in the curve where the faucet is way up there.*
 Nha’ **de=chhgw**a bene’ dao’ prob=a’ kate’ uyenhi’ to zil
 and **CONT.lie=INT** person little poor=DEF when COMP.become.dawn one morning
 Juev. **Betw=e’** le’ unhiz=e’ do yenh=e’[...]
 Thursday **COMP.kill=3.EL** 3.EL COMP.seize=3.EL around neck=3.EL
 ‘The poor man **was just lying** there when dawn came on a Thursday morning. He **had killed** him seizing him by the neck[...]’ (Long, 1993:272)
- b. “Ja-na’=to’ bi’ walhall che=to’ nha=nh’ de nha’. Ba
 AND-see=1PL.EXCL CL hometown of=1.PL.EXCL that=DEF be there already
cheyollhale’=be’, ba chat=be’, **g-os-ot** bene’ ka’ lebe’.
CONT.agonize=3.HU already **CONT.die=3.HU COMP-PL-kill** people those 3.HU
 “We went and saw it was our fellow villager was lying there. He **was already in the throes of death**, already dying, because those men **had killed** him.”
 (Long, 1993:264)

In 32a, the man was killed before he came to be lying in the road at dawn; and, in 32b, he was killed (really, attacked) before he was agonizing for the villagers to see.

While the possibility of backshifting is entirely unexpected under a topic-time-less account, both sequencing possibilities are predicted if finite sentences contains a silent tense. Consider the schematic logical form below, which uses the completely unrestricted tense in 7b.

$$(33) \quad [\text{TIME}(a) [\text{TP } g(i) [\text{AspP } \lambda t \exists e . \llbracket \text{VP} \rrbracket (e) \wedge \tau(e) \subseteq t]]]]$$

With no constraints on the topic time, it can be resolved to a time before the assessment time, giving rise to backshifting.¹⁰

2.3. An alternative set of constraints

This argument relies crucially on assessment time shift being tightly constrained, so that the assessment time can only be updated, as CATS states, to the time of the most recently described eventuality. But could the assessment time plausibly be anchored in a different way to allow backshifting without a topic time?

Pancheva and Zubizarreta adopt the constraints in 34, which also do not allow the assessment time to shift just anywhere in the past. Clause (ii) prohibits the assessment time from preceding the time of the most recent eventuality, just like CATS. But clause (i) further restricts when assessment time shift can happen for the first time, *regardless of position in the discourse* (whether in an information seeking exchange (σ_0) or in the initial (σ_1) or subsequent (σ_2, \dots) sentences of a narrative). (Note: t_n is equivalent to $\text{TIME}(a)$, and t_s to $\text{TIME}(u)$.)

- (34) *Evaluation time shift ($t_n \neq t_s$) in free-standing clauses σ_0 and narratives $\sigma_1 \sigma_2$*
- (i) Initial evaluation time shift in σ (whether σ_0, σ_1 , or σ_2 when the evaluation time in σ_1 is t_s) may not precede the time of σ ’s event: $t_n \not\prec \tau(e)$.
- (ii) Evaluation time shift in σ_2 may not precede the time of σ_1 ’s event: $t_{n2} \not\prec \tau(e_1)$.
 (Pancheva and Zubizarreta, 2020:11)

Part of clause (i) is universal. In all languages, “initial” assessment time shift for the first time in a discourse is only permitted if a sentence describes an eventuality that overlaps or precedes the assessment time. Thus, future-marked sentences can only be interpreted relative to a shifted assessment time if it was shifted earlier in the discourse.¹¹

¹⁰ In principle, the topic time could also follow the assessment time. This may be prohibited by a generalized version of the Upper Limit Constraint (Abusch, 1997), which rules out reference to times in the future of the local evaluation time in an attitude context. If it holds also of the assessment time, then the topic time will never follow the assessment time without the introduction of quantification.

¹¹ This does not seem to be correct for the English future, which is unproblematic as the ‘initial’ shifted segment in a discourse, as when it follows a simple past sentence.

Non-future-marked sentences can, by contrast, be interpreted relative to a newly shifted assessment time, though when this can happen is subject to crosslinguistic variation. In English, the assessment time can only be shifted in narratives, since the historical present is infelicitous in an information-seeking exchange, as shown in 27 above. But in Guaraní, where bare sentences freely receive a past interpretation, as illustrated in 3, the assessment time must be able to shift for the first time even outside of narratives.

In a language that allowed for this more liberal assessment time update, a temporal interpretation akin to backshifting thus might be expected, even without a topic time. A non-future-marked sentence could be located temporally anterior to a preceding sentence when the assessment time was updated as if the sentence were free standing or the start of a new discourse. Then, it would not be subject to clause (ii) of the constraints in 34. Pancheva and Zubizarreta take this to be possible in Guaraní, pointing to discourses like 35, which 5 out of the 10 speakers that they consulted approved. (This improved if an indirect evidential was added to the second sentence; then, 8 out of 10 approved.)

(35) Context: Juan likes to bother his sister Maria at school. The teacher explains why she had to punish him.

Kuehe, Maria ho-'a kyhágui. Juan o-myaña chupe.
 yesterday Maria 3-fall from-hammock Juan 3-push 3SG
 'Yesterday Maria fell from the hammock. Juan pushed her.'

(Pancheva and Zubizarreta, 2020:10)

Crucially, however, this is not a true backshifted interpretation, which involves a temporal inference relating the two sentences. Under the analysis of this discourse dictated by the constraints in 34, an inverse interpretation, when it is possible at all, is in some sense accidental. The discourse comprises, by hypothesis, two disconnected utterances, which can but need not be understood as temporally related. And insofar as they are, the relation between them would be guided solely by world knowledge and general pragmatic principles, not a calculation based on the semantics of tense and the perspective introduced by the assessment time. This may, in fact, be the source of the variability in the acceptability of 35, if speakers differ in how willing they are to do this.

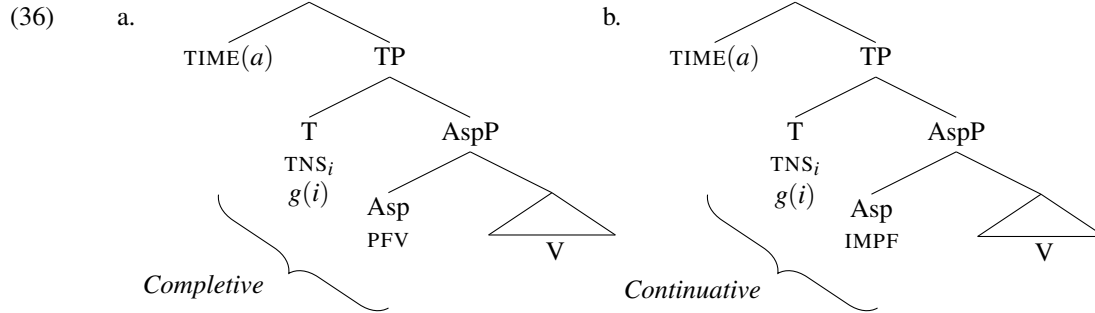
But such an analysis is not possible for Sierra Zapotec, which appears to have true backshifting. The examples of temporal inversion in 32 are naturally occurring, and when checked with three native speakers, all three unhesitatingly accepted them. Moreover, the backshifted sentences are not isolated utterances, evaluated independently of what comes before or after them. They form a coherent part of an overall narrative, describing an event in the past of the event described by the preceding sentence. To account for this inference, it does not seem possible to do without a topic time.

2.4. Taking stock

Let's take stock. I have argued that Sierra Zapotec has a silent tense that is anaphoric to a contextually salient topic time. Completive and continuative morphology realize this tense, along with aspect (either perfective or imperfective).

(i) Oedipus left the camp with gleaming eyes. He **will slay** his father in just a few minutes.

This is perhaps not surprising if *will* in English is a combination of present tense and the modal *woll* (Abusch, 1997). The example in (i) would thus be an instance of the historical present, which alternates frequently in narratives with the simple past (Schiffrin, 1981).



I will assume that the silent tense is completely unconstrained in Sierra Zapotec, though there is nothing that rules out the possibility that it is a non-future tense, as Matthewson (2006) proposes for St'át'imcet.

3. Back to the Future-in-the-Past Generalization

While the flexibility of a topic time is necessary for backshifting in Sierra Zapotec, the FPG now poses a problem. This interpretive restriction on future marking in Guaraní can be derived, as we saw earlier, by eliminating tense altogether. But if the potential encodes an anaphoric tense like the completive and continuative, a future-in-the-past reading should arise whenever the discourse context is sufficiently rich to provide it with an antecedent.

A future-in-the-past reading might not be expected in an out-of-the-blue context for this reason (cf. Matthewson (2006:692) on St'át'imcet). But the potential cannot even be shifted into the past in an information-seeking exchange like 37a.

- (37) (E¹ beh²⁴ Pe²dro⁴ lhe'ej⁴ ne⁴je^{2?}? 'Did Pedro build the corral yesterday?')
- a. # **Gonh**²³=ba^{'3}=nh, perw⁴ btahs⁴²=ba^{'3}.
 POT.do=3.HU=3.IN but COMP.sleep=3.HU
 Intended: 'He **was going to build** it, but he fell asleep.' (FA/RM, GZYZ080, 1:50)
- b. **Dzonh**²³=ba^{'3}=nh, perw⁴ bi⁴tu⁴ be⁴yoll⁴ beh⁴=ba^{'3}=nh.
 CONT.do=3.HU=3.IN but NEG COMP.finish COMP.do=3.HU=3.IN
 'He **was building** it, but he didn't finish.' (FA/RM, GZYZ074, 10:25)

By contrast, a question suffices to establish an antecedent for the continuative (37b). This contrast is particularly significant since the continuative exhibits a shifted interpretation in all the other environments that the potential does. It can receive a past interpretation in both a narrative (38a) and a coordination (38b).

- (38) a. ...perw ja-ya=to' pur xis lhas, xis ya'a. Kanha' **chhak**-chhgwa
 but AND-carry=1PL.EXCL only stick thin stick green at.that.time CONT.be=INT
 to yejw zag.
 one rain cold
 '...but we went and brought back just thin, green sticks. That time it **was raining** a cold rain.' (Long, 1993:217–218)
- b. Perw na' g-os-onh=e' we'e do yelh, gawe bi bishgal do yelh, nha'
 but then COMP-PLdo=3.EL drinking all night NEG any sleep all night and
chhe-se-zoll=de' kate' uyeni' lla lni nha'.
 CONT-PL-be.drunk=3.EL when COMP.dawn day fiesta that
 'But they drank all night, getting no sleep all night, and they **were drunk** when dawn came on the day of the festival.' (Long, 1993:239)

Simply put, the potential does not obey the same conditions on anaphora resolution as the continuative. A source for the FPG should thus probably be sought in the particular semantics of the potential.

3.1. The modal semantics of the potential

The potential has both temporal and modal meaning components. Roughly speaking, it has an *intention* sense, conveying how the world should be according to an agent's intentions or desires (39a), and a *prediction* sense, expressing how the world will turn out, given either the speaker's epistemic state or the current state of affairs in the actual world (39b).

- (39) a. “Nha⁴ **gunh**²³=dzu⁴=ba³ **pre**²**gunt**⁴ chi² u¹kaw⁴da³=ba³ u¹ka⁴a⁴=ba³
 so **POT.do**=1PL.INCL=3.HU **question** if DUB.accept=3.HU DUB.marry=3.HU
 bi⁴i²³ tse⁴=lhe².”
 child of=2PL
 ‘‘We **will ask** her if she wants to marry your son.’’ (IVJ, SLZ2028-t1, 5)
- b. Context: A child breaks their new toy. Her mother says:
E¹**lhok**² xa²=u²=nh ka²te⁴ e²nezd⁴=e² bla²=u² ju²get²
POT.get.angry father=2SG=DEF when **POT.know**=3.EL COMP.break=2SG toy
 tsi⁴=u⁴=nh.
 of=2SG=DEF
 ‘Your father **will be angry** when he finds out you broke your toy.’
 (FA/RM, GZYZ079, 59:00)

In this respect, the potential parallels the auxiliary *will* in English (Copley, 2002:80), as well as the future suffix in Guaraní (Tonhauser, 2011a).¹²

For *will*, the modal meaning component is often associated with an abstract modal *woll* that combines with tense and aspect (Abusch, 1997). In English, this modal's domain can be restricted overtly by an *if*-clause, as well as covertly in modal subordination (Roberts 1989). The modality expressed by the potential can be restricted in both these ways as well.

- (40) a. ... **she bi yolle nis wchinh=to' nachh shej=to'**
 if **NEG STAT.contain water POT.use=1PL.EXCL then POT.go=1PL.EXCL**
 chope ni'a bej che=to'.
 two time well of=1PL.EXCL
 ‘... **if there is no water on hand to use**, we [**will**] **make** two trips to our well (to get water).’ (Long, 1993:67–68)
- b. Chi² ga²la⁴le⁴=ba³ we¹=ba³ da² gaw²³ ka²bayw⁴ tse⁴=ba³, bi⁴tu⁴
 if **POT.forget**=3.HU **POT.give**=3.HU ? **POT.eat** horse of=3.HU **NEG**
 so¹=ba³ wenh² nha⁴ e¹lla⁴yitsj⁴=ba³. Nha⁴ **gat**¹ ka²bayw⁴
POT.be=3.HU good and **POT.feel.sad**=3.HU then **POT.die** horse
 tse⁴=ba³=nh le² bdel⁴ tonh²³=ba³.
 of=3.HU=DEF because ? **POT.be.hungry**=3AN
 ‘If Pedro forgets to feed his horse, he will feel bad and be sad. Then his horse **will die** because it will be hungry.’ (RM, GZYZ086, 18:20)

For these reasons, I take potential morphology in Sierra Zapotec to realize an abstract modal like *woll*. Following Condoravdi (2003), this expresses universal quantification over worlds accessible from the world of evaluation in a branching worlds model.

$$(41) \quad \llbracket \text{POT} \rrbracket^{u,a,g}(P) = \lambda t \lambda w \forall w' : w' \in \text{ACC}(t)(w) . P(w')(t)$$

Condoravdi argues that *woll* is relativized to one of two modal bases.¹³ With a *metaphysical* (or totally realistic circumstantial) modal base, it quantifies over all worlds that are identical to the world of

¹² There are accounts of *will* in which it is purely temporal, as in Kissine's (2008) recent proposal. But that proposal, at least, still appeals to a covert epistemic modal. A purely temporal account of *will* would most likely have to attribute its modal flavor entirely to pragmatics and the norms of assertion.

¹³ I set aside the question of whether the potential encodes an ordering source, as Copley (2002) and Werner (2006) argue for *will* in English. It does seem that some further relativization is needed to account for the contrast in 23b–c.

evaluation up through some time (though they can diverge after this time). With an *epistemic* modal base, it quantifies over all worlds that are compatible with what someone (often the speaker) knows in the world of evaluation.

There is no clear evidence, one way or another, that the potential in Sierra Zapotec allows for an epistemic modal base. In English, this additional relativization is motivated by epistemic uses of *will*, which express an inference, relative to the speaker’s knowledge, about the world at the time of utterance, e.g., *She will be in her room* (see Winans 2016 for details). The potential does not have a present epistemic use.

- (42) Context: It is January. My cousin Pedro, who lives in Oaxaca, does not like cold weather. When he visits California, he is often cold. Pedro is now in Alaska. I say:

Ye²yag⁴ Pe²dro⁴ (na⁴a⁴).

POT.be.cold Pedro now

Intended: ‘Pedro **will be cold** (now).’

(FA/RM, GZYZ079, 1:15:25)

While this could be attributed simply to the absence of an epistemic modal base, present epistemic uses in Sierra Zapotec are plausibly ruled out for a different reason. The potential also encode *prospective* aspect, which would locate an eventuality after the topic time (cf. Kratzer 2011).

- (43) $[[\text{PROSP VP}]^{u,a,g} = \lambda t \exists t' \exists e. [[\text{VP}]^{u,a,g}(e) \wedge \tau(e) \circ t' \wedge t < t']$

In Sierra Zapotec, decomposing the potential into a modal and prospective aspect would be invisible. But there are languages whose future markers also prohibit a present epistemic reading, which mark this prospective aspect overtly: e.g., Gitksan (Matthewson, 2012, 2013), Hausa (Mucha, 2013), and Washo (Bochnak, 2019).

3.2. Toward a solution

With the modal core of the potential’s semantics in place, we can work toward a solution for the FPG. Some terminology will be useful first. Condoravdi (2002) distinguishes the *temporal perspective* of a modal — the time at which the modal base (and ordering source) are evaluated — from its *temporal orientation* — the eventuality’s run time relative to the temporal perspective. These two parameters can vary mostly independently, as the modal *might* illustrates.

- (44) a. *Present perspective + future orientation*
John **might** win the game.
b. *Present perspective + past orientation (epistemic use)*
John **might have** won the game (but I’m not sure if he did).
c. *Past perspective + future orientation (counterfactual use)*
John **might have** won the game (if he hadn’t been feeling sick that day).

(Rullmann and Matthewson, 2018:281)

In its canonical future-oriented use, *might* has present perspective and future orientation (44a). But when it is accompanied by the auxiliary *have*, it can have an epistemic use, describing a past eventuality from a present epistemic perspective (44b) or a counterfactual use, in which an eventuality is described in the future of a past perspective point (44c).

The FPG can be reformulated with this distinction in mind. While the potential always has future temporal orientation, it can have either present or past temporal perspective. Since the potential does not admit a future-in-the-past reading in root clauses outside of narratives, it only has present temporal perspective in these contexts.

- (45) *Future-in-the-Past Generalization (FPG; revised)*

The potential can have only present temporal perspective in a root clause outside of narratives.

Stated this way, there is an obvious parallel between the potential and certain epistemic modals that only allow present temporal perspective outside of attitude contexts. In English, *might* (without *have*) is necessarily anchored to a present epistemic state in root contexts (Abusch 1997, Hacquard 2011; Rullmann and Matthewson 2018, among others).

(46) John's bride **might** become rich.

A past temporal perspective is only possible if *might* is embedded under an attitude verb: compare 46a to the parallel example with a relative clause in 47b.

- (47) Context: In 1990, John married a woman. He knew at that time that she had some financial prospects.
- a. John believed [that his bride **might** become rich].
 - b. # John married [a woman who **might** become rich]. (Abusch, 1997:21)

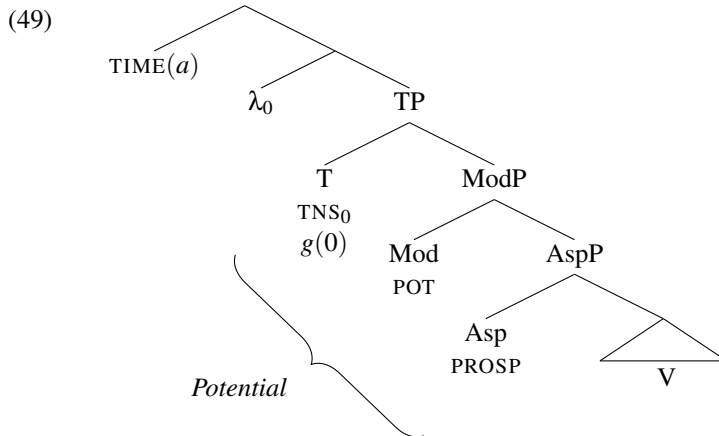
Similarly, with the potential, a past perspective is possible in an attitude context (48a), but not in a relative clause in an extensional context (48b).

- (48) a. Go⁴shyi⁴ gokd⁴ Pe²dro⁴ [gak² zahg⁴ ne⁴je²].
 last.week COMP.think Pedro **POT.happen** cold yesterday
 'Last week, Pedro thought it **would be cold** yesterday.' (FA/RM, GZYZ081, 12:30)
- b. # Go⁴shyi⁴ bzi'i⁴ Pe²dro⁴ [ba²ke'² e¹xhonj¹⁴=b ne⁴je²].
 last.week COMP.buy Pedro cow **POT.run=3.AN** yesterday
 'Last week, Pedro bought the cow that **would run** yesterday.'
 (FA/RM, GZYZ081, 8:00)

If we take this parallel seriously, the source for the FPG could lie in whatever restricts the temporal perspective for epistemic modals like *might*.

In English, the restriction on *might* is sometimes traced to an inability to take scope under tense, which makes it essentially tenseless (Abusch 1997, among others). Without an outer tense, the modal can only be interpreted relative to the local evaluation time. But there are languages where epistemic modals have past temporal perspective outside of attitude contexts, and this is usually attributed to an outer (past) tense, e.g., Dutch and St'át'imcets (Rullmann and Matthewson, 2018). Condoravdi 2002). If all modals have a uniform temporal representation, then even *might* would have to have an outer tense.

For the potential in Sierra Zapotec, one possibility is that it encodes a special null tense that can only be bound: it would contribute a distinguished variable which must be abstracted over (von Stechow, 1995). In root contexts, this tense would be bound and saturated by the temporal pronoun in the left periphery, which is indexical to the context of assessment (cf. Kusumoto 1999).



Potential morphology would thus realize a combination of this null tense and a modal. To exclude a present epistemic use, it would also encode prospective aspect, as discussed above.

With this semantics for the potential, a future-in-the-past reading is impossible outside of narratives, because the assessment time and utterance time are the same. The logical form for the infelicitous utterance in 23a, which is repeated in 50a below, is given in 50b.

- (50) a. # Ne⁴je² gul¹ Pe²dro⁴.
yesterday POT.sing Pedro
Intended: ‘Pedro **was going to sing** yesterday.’ (FA/RM, GZYZ028, 7:57)
- b. $[\text{TIME}(a) \lambda t_0 [\text{TP TNS}_0 [\text{ModP } \lambda t \lambda w \forall w' : w' \in \text{ACC}(t)(w) .$
 $\exists t' \exists e . \text{sing}(e)(w') \wedge \tau(e) \circ t' \wedge t < t' \wedge t' \subseteq \text{the day before TIME}(u)]]]$

When $\text{TIME}(u) = \text{TIME}(a)$, combining the temporal adverbial with prospective aspect yields a contradiction.

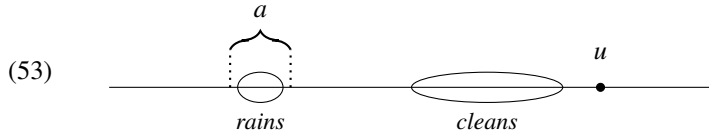
- (51) $\lambda w \forall w' : w' \in \text{ACC}(\text{TIME}(a))(w) .$
 $\exists t' \exists e . \text{sing}(e)(w') \wedge \tau(e) \circ t' \wedge \boxed{\text{TIME}(a) < t'} \wedge \boxed{t' \subseteq \text{the day before TIME}(u)}$

A future-in-the-past reading thus depends entirely on whether the assessment time has been shifted. In an out-of-the-blue context, it has not been shifted, since the utterance time is the default. In an information-seeking exchange like 37b, the same presumably holds.

A future-in-the-past reading becomes available in narratives, when the assessment time can be unmoored from the utterance time after the first sentence has introduced an eventuality into the discourse.

- (52) a. Nlle'e²³ bzu²law⁴ gok⁴ yejw⁴. E¹lhua¹ Pe²dro⁴ yelh⁴...
at.night COMP.begin COMP.be rain POT.clean Pedro milpa
‘Last night, it started to rain. Pedro **was going to clean** the *milpa*[...].’
(FA/RM, GZYZ080, 39:50)
- b. $[\text{TIME}(a) \lambda t_0 [\text{TP TNS}_0 [\text{ModP } \lambda t \lambda w \forall w' : w' \in \text{ACC}(t)(w) .$
 $\exists t' \exists e . \text{clean}(\text{the-milpa})(e)(w') \wedge \tau(e) \circ t' \wedge t < t']]]$

Once the assessment time is updated to the time of the raining event, the cleaning event is located after this, so that it can, in principle, take place entirely in the past of the utterance time.



For coordinations like 23a, these are plausibly just narratives, with each coordinate equivalent to an independent sentence for assessment time shift.

In an attitude context, such as 48a, the future-in-the-past reading arises from the semantics of the verb, which quantifies over times (and worlds). The left-peripheral temporal pronoun is absent in this case, with tense being bound directly by the matrix verb instead.

- (54) a. Go⁴shyi⁴ gokd⁴ Pe²dro⁴ [gak² zahg⁴ ne⁴je²].
last.week COMP.think Pedro POT.happen cold yesterday
‘Last week, Pedro thought it **would be cold** yesterday.’ (FA/RM, GZYZ081, 12:30)
- b. **think** $\lambda t_0 [\text{TP TNS}_0 [\text{ModP } \lambda t \lambda w \forall w' : w' \in \text{ACC}(t)(w) .$
 $\exists t' \exists e . [\text{VP}](e)(w') \wedge \tau(e) \circ t' \wedge t < t' \wedge t' \subseteq \text{the day before TIME}(u)]]]$

The potential has restricted past temporal perspective, then, because it encodes a special null tense. The continuative and completive are more free, because they realize an anaphoric tense.

3.3. A prediction about relative clauses

A future-in-the-past reading is impossible inside the relative clause in 48b for the same reason it is impossible in root clauses. When the assessment and utterance times are identical, an eventuality must temporally follow the utterance, cf. 50 above. But under this account, a future-in-the-past reading should become available when a relative clause occurs in a narrative. This prediction is borne out.

- (55) a. “Ka’ chhak bllinha’ [gan’ gonh=a’ llinh=a’].”
 thus CONT.happen COMP.arrive=1SG where POT.do=1SG work=1SG
 “That’s what was happening when I arrived [where I **would do** work].”
 (Long, 1993:40)
- b. Go⁴dwiz⁴ bi²de² Ma¹ria¹ lni⁴ La⁴xop²=e’nh². Da⁴ nezdzw¹⁴. Nha⁴
 last.year COMP.come Maria fiesta Laxopa=DEF EXIST first then
 bda⁴=ba³ lao² yell². Nha⁴ byej²=ba³ yu’u⁴dao⁴. Nha⁴
 COMP.walk=3.HU around town then COMP.go=3.HU church then
 ja¹-na⁴le¹=ba³ go’on²⁴ [ye¹-se’e⁴-xhi²=e’² llah⁴ yo⁴ble²]. Nha⁴
 COMP.AND-visit=3.HU bull POT-PL-ride=3.EL day next then
 blhe’ed¹⁴=ba³ tu⁴ bidao²³ dzue²=ba³ da² dzaw² go’on²⁴=e’nh⁴.
 COMP.see=3.HU one child CONT.give=3.HU ? CONT.eat bull=DEF
 ‘Last year, Maria came to Laxopa for the fiesta. It was her first time. She took a walk
 around the town. She visited the church. She visited [the bull they **would ride** the next
 day]. She saw a boy feeding the bull.’
 (RM, GZYZ086, 44:00)

This effect of narratives is general. Any environment that would normally prohibit a future-in-the-past reading should permit it when embedded in a narrative.

4. Final thoughts

In sum, it does not seem possible to do without a topic time in Sierra Zapotec. A silent tense in Sierra Zapotec, anaphoric to a contextually salient time, enables backshifting with the completive and continuative. At the same time, the potential obeys the FPG in 17, restricting a future-in-the-past reading to non-initial segments in a narrative, just like the future marker in Guaraní. While Pancheva and Zubizarreta attribute this to the general absence of a topic time in the language, such a solution is not available in Sierra Zapotec. Instead, I argued that the potential encodes a modal whose temporal perspective must be the local evaluation time, which in a bicontextual framework is the time of the assessment context.

Under this account, the source of the FPG in Sierra Zapotec lies in the semantic properties of the potential, combined with a general mechanism for assessment time shift. It might seem inherently desirable to replace specific constraints that make reference to particular grammatical categories with more general ones, but we have to wonder why, for the potential, temporal perspective is restricted to the local evaluation time. While this is also true of *might*, other epistemic modals in English and in other languages are not so restricted (see Rullmann and Matthewson 2018). Thus, while the semantics I have offered for the potential is descriptively adequate, the more explanatory task of understanding why it is restricted in this particular way remains.

In closing, I would highlight the important role that narratives have played in the development of the accounts of both Guaraní and Sierra Zapotec. For Pancheva and Zubizarreta, a contrast between narrative and other conversational genres motivated a tenseless semantics. And it was the availability of backshifting in narratives that demonstrated the need for a topic time in Sierra Zapotec. These results recommend an increased attention to narratives, in tensed languages and tenseless languages alike, for constructing and arbitrating theories of how time is encoded in language.

Appendix: Perfective, not perfect

We have been assuming that the completive conveys only *perfective* aspect. But even without tense, its participation in backshifting would not be surprising if it conveyed *perfect* aspect, either solely or in addition to perfective aspect. While there are several possibilities for the semantics of perfect aspect (see Kamp and Reyle 1993:593–601 for an overview), it minimally must encode anteriority of the event relative to a temporal anchor (Reichenbach’s “reference point”). One possible lexical entry for perfect aspect simply locates an event before a salient time interval:

$$(56) \quad \llbracket \text{PERF}_i \text{ VP} \rrbracket^{c:g} = \lambda t \exists e. \llbracket \text{VP} \rrbracket^{c:g}(e) \wedge \tau(e) < t$$

Consider now the hypothetical logical form for a sentence in the perfect aspect without tense:

$$(57) \quad [\text{TIME}(a) \text{ [(TP) } [\text{AspP } \lambda t \exists e . \text{ [[VP]]}(e) \wedge \tau(e) < t]]]]$$

If the assessment time has been shifted, as in a narrative, then the perfect will locate an event even farther in the past.¹⁴

There are three reasons, however, to think that the completive in Sierra Zapotec does not convey perfect aspect. First, the present perfect in English can only describe a past eventuality that has some “current relevance.” If I am making dinner and I want to find out whether you will be having any, I can ask you *Have you eaten?* But the completive cannot be used in this way without the adverb *ba*² ‘already’.

- (58) Q: E¹ #(ba²) u⁴daw⁴=u⁴?
 Q already COMP.eat=2SG
 Intended: ‘Have you eaten?’
 A: #(Ba²) u¹⁴daw⁴=a⁴.
 already COMP.eat=1SG
 Intended: ‘I have eaten.’ (FSR, 03/03/2020)

This is only a weak argument, though, since “current relevance” is particular to the present perfect in English. Parallel forms in Romance and Germanic are more liberal in how they describe past events.

A stronger argument comes from temporal adverbials, which can pick out a time after the event’s termination with the perfect, e.g., *At 3 o’clock, John had left the store* (Hornstein, 1990:24). With the completive, this is not possible. The temporal adverb *be’ey*²³ *zil*⁴-*te*⁴ ‘in the morning’ can only frame the event itself, as in 59a, and so it is infelicitous in 59b where the event culminates before the morning.

- (59) a. Context: Every day, Pedro must finish his homework before going to school in the morning. Today, he did it in the morning.
Be’ey²³ **zil**⁴-**te**⁴ benh⁴=ba³ ta²rea⁴ tse⁴=ba³.
early morning-since COMP.do=3.HU homework of=3.HU
 ‘He did his homework this morning.’ (FA/RM, GZYZ067, 1:17:33)
 b. Context: Every day, Pedro must finish his homework before going to school in the morning. Today, he did it yesterday evening.
 # **Be’ey**²³ **zil**⁴-**te**⁴ benh⁴=ba³ ta²rea⁴ tse⁴=ba³.
early morning-since COMP.do=3.HU homework of=3.HU
 Intended: ‘This morning, he had done his homework.’ (FA/RM, GZYZ067, 1:18:53)
 [RM: “No, porque lo hizo ayer.”]

This argument is not completely watertight, though, since temporal adverbials in Sierra Zapotec could directly constrain the run time of the event, rather than the topic time. This is, for instance, what Pancheva and Zubizarreta are committed to in Guaraní, where they argue there is no topic time.

A stronger argument comes from temporal adjunct clauses. Like a temporal adverbial, they can pick out a time after the event terminates with the perfect aspect, e.g., *When Liz woke up, the basement had flooded*. This is not, however, possible with the completive in Sierra Zapotec.

- (60) [**Ka**²**te**⁴ **b-e**⁴-**banh**⁴ **Ma**¹**ria**¹=**nh**], #(ba²) be⁴-se⁴-dzu⁴ jed² tse⁴=ba³=nh.
when COMP-REP-live Maria=DEF already COMP-PL-leave chicken of=3.HU=DEF
 Intended: ‘When Maria woke up, her chickens had escaped.’ (FA/RM, GZYZ080, 56:00)
 [RM: “Cuando despertó...no [en la noche].”]

Importantly, a time following the event can be targeted as long as *ba*² ‘already’ is present. This would not be possible if the temporal adjunct clause directly constrained the run time of the event. It seems reasonable to conclude, then, that the completive conveys perfective aspect, not perfect aspect.

¹⁴ By analogy, a present or past perfect sentence in a historical present narrative obligatorily induces backshifting:

- (i) The administration **fires** Mike. He **{has, had} met** with the ambassador

References

- Abusch, Dorit. 1997. Sequence of tense and temporal de re. *Linguistics and Philosophy* 20:1–50.
- Anand, Pranav and Maziar Toosarvandani. 2017. Unifying the canonical, historical, and play-by-play present. *Sinn und Bedeutung* 21:19–34.
- Anand, Pranav and Maziar Toosarvandani. 2018. No explanation for the historical present: Temporal sequencing and discourse. *Sinn und Bedeutung* 22:73–90.
- Anand, Pranav and Maziar Toosarvandani. 2020. Tense and temporal sequencing in discourse. Ms., University of California, Santa Cruz.
- Asher, Nicholas and Alex Lascarides. 2003. *Logics of conversation*. Cambridge: Cambridge University Press.
- Bennett, Michael and Barbara H. Partee. 1978. *Toward the logic of tense and aspect in English*. Bloomington, IN: Indiana University Linguistics Club.
- Bochnak, M. Ryan. 2016. Past time reference in a language with optional tense. *Linguistics and Philosophy* 39:247–294.
- Bochnak, M. Ryan. 2019. Future reference with and without future marking. *Language and Linguistics Compass* 13:e12307.
- Bohnemeyer, Jürgen. 2009. Temporal anaphora in a tenseless language. In *The expression of time*, eds. Wolfgang Klein and Ping Li, 83–128. Berlin: De Gruyter.
- Condoravdi, Cleo. 2002. Temporal interpretation of modals: Modals for the present and for the past. In *The construction of meaning*, eds. David Beaver, Stefan Kaufmann, Brady Clark, and Luis Casillas, 59–88. CSLI Publications.
- Condoravdi, Cleo. 2003. Moods and modalities for *will* and *would*. Ms., PARC and Stanford University.
- Copley, Bridget. 2002. The semantics of the future. Ph.D. Dissertation, Massachusetts Institute of Technology.
- Cowper, Elizabeth. 1998. The simple present tense in English: A unified treatment. *Studia Linguistica* 52:1–18.
- Eckardt, Regine. 2015. *The semantics of free indirect discourse: How texts allow us to mind-read and eavesdrop*. Leiden: Brill.
- von Fintel, Kai and Lisa Matthewson. 2008. Universals in semantics. *The Linguistic Review* 25:139–201.
- Grosz, Barbara J. and Candace L. Sidner. 1986. Attention, intentions, and the structure of discourse. *Computational Linguistics* 12:175–204.
- Hacquard, Valentine. 2011. Modality. In *Semantics: An international handbook of natural language meaning*, eds. Claudia Maienborn, Klaus von Heusinger, and Paul Portner, volume 2, 1484–1515. Berlin: De Gruyter.
- Hobbs, Jerry R. 1979. Coherence and coreference. *Cognitive Science* 3:67–90.
- Hornstein, Norbert. 1990. *As time goes by: Tense and Universal Grammar*. Cambridge, MA: MIT Press.
- Jóhannsdóttir, Kristin M. and Lisa Matthewson. 2007. Zero-marked tense: The case of Gitksan. *North East Linguistic Society (NELS)* 37:299–310.
- Kamp, Hans and Uwe Reyle. 1993. *From discourse to logic: Introduction to modeltheoretic semantics of natural language, formal logic, and Discourse Representation Theory*. Dordrecht: Kluwer Academic Publishers.
- Kissine, Mikahil. 2008. Why *will* is not a modal. *Natural Language Semantics* 16:129–155.
- Klein, Wolfgang. 1994. *Time in language*. London: Routledge.
- Kratzer, Angelika. 1998. More structural analogies between pronouns and tense. *Semantics and Linguistic Theory (SALT)* 8:92–110.
- Kratzer, Angelika. 2011. What “can” can mean. Ms., Lecture notes, University of Massachusetts, Amherst.
- Kratzer, Angelika. 2014. Situations in natural language semantics. In *The Stanford encyclopedia of philosophy*, ed. Edward N. Zalta. Spring 2014 edition. URL <http://plato.stanford.edu/archives/spr2014/entries/situations-semantics/>.
- Kusumoto, Kiyomi. 1999. Tense in embedded contexts. Ph.D. Dissertation, Massachusetts Institute of Technology.
- Long, Rebecca and Sofronio Cruz. 2000. *Diccionaria Zapoteco de San Bartolomé Zoogocho Oaxaca*.

- Mexico City: Instituto Lingüístico de Verano.
- Long, Rebecca A. 1993. *Zoogocho Zapotec interlinear text project*. Mexico City: Instituto Lingüístico de Verano.
- MacFarlane, John. 2014. *Assessment sensitivity: Relative truth and its applications*. Oxford: Oxford University Press.
- Mann, William C. and Sandra A. Thompson. 1988. Rhetorical Structure Theory: Towards a functional theory of text organization. *Text* 8:243–281.
- Matthewson, Lisa. 2006. Temporal semantics in a superficially tenseless language. *Linguistics and Philosophy* 29:673–713.
- Matthewson, Lisa. 2012. On the (non-)future orientation of modals. *Sinn und Bedeutung* 16:431–446.
- Matthewson, Lisa. 2013. Gitksan modals. *International Journal of American Linguistics* 79:349–394.
- Mucha, Anne. 2013. Temporal interpretation in Hausa. *Linguistics and Philosophy* 36:371–415.
- Pancheva, Roumyana and Maria Luisa Zubizarreta. 2020. Temporal reference in the absence of tense in Paraguayan Guaraní. *North East Linguistic Society (NELS)* 50.
- Partee, Barbara H. 1973. Some structural analogies between tenses and pronouns in English. *Journal of Philosophy* 70:601–609.
- Partee, Barbara H. 1984. Nominal and temporal anaphora. *Linguistics and Philosophy* 7:243–286.
- Reichenbach, Hans. 1947. *Elements of symbolic logic*. Berkeley, CA: University of California Press.
- Reis Silva, Maria Amélia and Lisa Matthewson. 2007. An instantaneous present in Blackfoot. *Semantics of Underrepresented Languages in the Americas (SULA)* 4:191–214.
- Ritter, Elizabeth and Martina Wiltschko. 2005. Anchoring events to utterances without tense. *West Coast Conference on Formal Linguistics (WCCFL)* 24:343–351.
- Roberts, Craige. 1989. Modal subordination and pronominal anaphora in discourse. *Linguistics and Philosophy* 12:683–721.
- Rullmann, Hotze and Lisa Matthewson. 2018. Towards a theory of modal-temporal interaction. *Language* 94:281–331.
- Schiffrin, Deborah. 1981. Tense variation in narrative. *Language* 57:45–62.
- Schlenker, Philippe. 2004. Context of thought and context of utterance (a note on free indirect discourse and the historical present). *Mind and Language* 19:279–304.
- Sharvit, Yael. 2008. The puzzle of free indirect discourse. *Linguistics and Philosophy* 31:353–395.
- Smith, Carlota S., Ellavina T. Perkins and Theodore B. Fernald. 2007. Time in Navajo: Direct and indirect interpretation. *International Journal of American Linguistics* 73:40–71.
- Sonnenschein, Aaron. 2004. A descriptive grammar of San Bartolomé Zoogocho Zapotec. Ph.D. Dissertation, University of Southern California.
- von Stechow, Arnim. 1995. On the proper treatment of tense. *Semantics and Linguistic Theory (SALT)* 5:362–386.
- Thomas, Guillaume. 2014. Nominal tense and temporal implicatures: Evidence from Mbyá. *Natural Language Semantics* 22:357–412.
- Tonhauser, Judith. 2011a. The Paraguayan Guaraní future marker *-ta*: Formal semantics and cross-linguistic comparison. In *Tense across languages*, eds. Renate Musan and Monica Rathert, 207–232. Berlin: De Gruyter.
- Tonhauser, Judith. 2011b. Temporal reference in Paraguayan Guaraní, a tenseless language. *Linguistics and Philosophy* 34:257–303.
- Toosarvandani, Maziar. 2016. The temporal interpretation of clause chaining in Northern Paiute. *Language* 94:850–889.
- Toosarvandani, Maziar. 2017. The imperfective semantics of durative gemination in Northern Paiute. *International Journal of American Linguistics* 83:561–601.
- Werner, Tom. 2006. Future and non-future modal sentences. *Natural Language Semantics* 14:235–255.
- Winans, Lauren. 2016. Inferences of *will*. Ph.D. Dissertation, University of California, Los Angeles.