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Time and Evidence in the Graded Tense System of Mvskoke (Creek)

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Abstract In recent years, much attention has been given to the puzzling relationship between tense and evidence type found in languages where a single morpheme appears to encode both reference to time and to the evidential source for the assertion. In natural language, *tense* has long been understood as serving to locate the time at which the proposition expressed by the sentence holds. The two main theories of *evidentials* both agree that these morphemes serve to identify the type of evidence the speaker has for their assertion. In languages with evidential-tense morphology, these two categories of meaning are intertwined in ways that are unexpected given our understanding of both phenomena. Specifically, these evidential-tense morphemes appear to encode reference to a time that is linked to the situation in which the speaker gains evidence for their assertion. Two competing approaches have emerged in the literature as to whether these evidential-tense morphemes make crucial reference to the *time* evidence was acquired (Lee 2013; Smirnova 2013) or to the *time and place* of the speaker with respect to the event (Faller 2004; Chung 2007). This paper examines the temporal and evidential properties of the Mvskoke (or Creek) *graded* past tense system and finds novel support for the view in which evidential-tenses encode *Evidence Acquisition Time* (EAT). Mvskoke is shown to have three evidential-tenses which form part of its *graded* tense system, comprising recent, middle, and distant past. The main proposal is a formalization of EAT as a moment of belief-state change, i.e. the moment the speaker comes to believe the proposition. It is shown that Mvskoke's evidential-tenses are compatible with a range of evidence types, and this distribution is explained through interactions with viewpoint aspect.

Keywords Tense · Evidence Acquisition Time · Graded Tense · Muskogean

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1 Introduction

In recent years, much attention has been given to the puzzling relationship between tense and evidence type found in languages where a single morpheme appears to encode both reference to time and to the evidential source for the assertion. This is because in languages with *evidential-tense* morphology these two categories of meaning are intertwined in ways that are unexpected given our understanding of both phenomena. Specifically, these evidential-tense morphemes appear to encode reference to a time that is linked to the situation in which the speaker gains evidence for their assertion. In natural language, *tense* has long been understood as serving to locate the time at which the proposition expressed by the sentence holds. On a Kleinian theory of tense (Klein 1994), there is a special semantic relationship between tense and time the sentence is about, the topic time. Evidential-tenses appear to change this relationship and shift the role of tense to locating the time when evidence was acquired. Similarly, these morphemes are unexpected given the two main theories of *evidentials*. On approaches to evidentials that see them as illocutionary (Faller 2002) or as not-at-issue content (Murray 2010), the time at which the speaker gains a particular kind of evidence is not relevant, only the type of evidence. Modal approaches to evidentials (Izvorski 1997; Matthewson et al. 2007; von Stechow and Gillies 2010), classify evidentials as epistemic modals. There is disagreement about whether the epistemic modal base must be anchored to the utterance time (e.g. Condoravdi 2001) or can shift under tense to a past temporal anchor (e.g. von Stechow and Gillies 2008). Evidential-tenses appear to locate a body of evidence in time.

In addition to so-called “experienced/non-experienced past” systems like those in Cherokee (Iroquoian, Pulte 1985) and Cuzco Quechua (Faller 2004), these types of morphemes have been studied in Bulgarian (Izvorski 1997; Smirnova 2013; Arregui et al. 2017; Koev 2017), Korean (Chung 2007; Lee 2011, 2013), and Matsigenka (Amazonian, Fleck 2007). In some of this literature it is proposed that evidential-tenses do not refer to the Topic Time, but to the time (and place, in some approaches) at which the speaker gains evidence for their assertion. The two leading approaches that have emerged from this literature are what I label *temporal approaches* and *spatial approaches*. Under a temporal approach, these evidential-tense morphemes are epistemic modals whose modal base is anchored to a new temporal index - the Evidence Acquisition Time (EAT), the time at which the speaker gains the evidence for their assertion (Lee 2011, 2013; Smirnova 2013). With these approaches, an evidential-tense morpheme has a direct evidence inference if the evidence is acquired *at the same time* as the event unfolds. Spatial approaches, on the other hand, claim that evidential-tense morphemes reference the speaker’s perceptual field as well as the time and location of the event. Under this kind of approach, a direct evidence inference arises when the speaker *is present* and perceives the event as it unfolds (Faller 2004; Chung 2007). Drawing on data from the Mvskoke language (pronounced [məsko:gi], aka Creek, Muskogee, or Seminole), I present evidence in favor of a purely temporal view of evidential tenses. I first demonstrate that Mvskoke tenses appear to make an evidential cut between experienced and non-experienced past events. I then provide data from *simultaneous learning* and *learning after-the-fact* scenarios that adjudicate between the temporal and spatial approaches. I present a novel formalization of Evidence Acquisition Time as the moment of coming to believe the proposition is true. A

relation between the coming-to-believe time and the event time - mediated by aspect - is responsible for the evidential flavor of the tenses.

Understanding the evidential inferences associated with certain of Mvskoke's past tenses explains certain puzzles in the distribution of the past tenses. Mvskoke has four (previously five) *graded* past tenses which indicate how far in the past an event occurred (Haas 1940; Martin 2010, a.o.). I find a split in the past tense system between evidential tenses and a non-evidential tense as well as between graded tenses and a non-graded tense. This finding is novel in that the existing major documentary works make no mention of the evidential component of the tenses (Innes et al. 2004, 2009; Martin 2011), though two early grammatical descriptions hint at the possible relevance of evidence to the tense system (Brinton 1870; Nathan 1977). In the next section, I introduce the basics of the Mvskoke tense system and previous literature on their temporal spans and possible evidential flavor. In §3 I demonstrate that three of Mvskoke's tenses encode temporal remoteness and are additionally accompanied by a direct evidential inference in certain contexts. In §4, I provide an analysis of the tenses as encoding a moment of coming-to-believe. §5 concludes with a comparison to other temporal approaches.

2 Mvskoke Past Tenses

Mvskoke is an endangered Eastern Muskogean language spoken by about 600¹ people in the Seminole and Muscogee (Creek) Nations of Oklahoma, as well as in the Seminole Tribe of Florida. Mvskoke is a highly agglutinating language with complex verbal morphology especially in the tense-aspect domain (Haas 1940; Fitzgerald 2016). All extant Muskogean languages have at least two past tenses differing in remoteness (Booker 1980). Mvskoke stands out in having five past tenses, though one has largely fallen out of use in the modern language (Martin 2010).

2.1 Graded Tenses

Descriptions of the past tenses as early as 1860 associate each tense with a distinct time frame (Buckner and Herrod 1860; Grayson 1885; Loughridge and Hodge 1890). Martin (2010) - following Haas (1940) - provides a more precise description of the system in which the tenses cover disjoint, adjacent intervals of time that are increasingly remote from the present. In his 2010 paper, Martin also notes that the fourth past (P4) has fallen out of use and is no longer recognized by speakers. As a result the temporal intervals which are compatible with each tense have shifted. His representation of the older and more modern systems are summarized below.

¹ This number was estimated based on a survey of the Seminole Nation of Oklahoma in 2009 and an estimate by Judy Montiel, director of the Mvskoke Language Program for the Muscogee (Creek) Nation of Oklahoma. Some community members estimate the number is higher.

(1) <i>Older Tense System</i> P1 today – last night P2 yesterday – 2-3 weeks P3 2-3 weeks – 1-2 years P4 1-2 years – 60 years P5 60 years – ancient	(2) <i>Modern Tense System</i> P1 today – last night P2 yesterday – 1 year P3 1 year – 20 years P4 - no longer used - P5 20 years – ancient
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(Martin 2010, 54)

Martin (2010) shows that although the temporal intervals above accurately reflect speaker judgments about when they would use each tense, he argues based on textual data that the tenses are not exclusively tied to objective intervals of time. Instead more recent tenses can be used to create a pragmatic effect of vividness of the described event. For the purposes of this paper I will adopt Martin’s objective temporal intervals for the modern past tense system in (2). However, I propose some refinements in the course of the discussion, especially as relates to Past 5.

In the earliest descriptions of the tense system, native speakers and linguists have expressed the intuition that there is a divide between Past 1, 2 and 3 and Past 5. While Past 5 is most often used in folktales and to describe events long past, many have noticed that it has a wider use. Several authors agree that Past 5 does not take part in the graded system of the first three past tenses but can be used for any past time. They label it “historic past” (Buckner and Herrod 1860), “indefinite past” (Loughridge and Hodge 1890), or “past perfect tense” Grayson (1885). Martin also notes the wider distribution of Past 5 in his 2010 paper, especially in relative clauses where Past 5 seems to have a nongraded meaning. These intuitions hint at a more complex system than those represented in the tables above. I follow up on these intuitions and argue that Past 5 is not in fact a graded tense, a view with receives strong support from the data presented in §3.

2.2 Tense and Aspect

Mvskoke past tenses interact with aspect in some ways that bear mentioning. In Mvskoke every verb is inflected for aspect through a process of stem-internal ablaut.² There are three ablaut patterns relevant for this paper: the lengthening-and-high-tone pattern which expresses imperfective aspect, the lengthening-and-falling-tone pattern which expresses perfective aspect with a result state inference, and the infix-aspiration pattern which expresses existential perfect aspect. The way these aspects combine with the graded tenses and interact with each other is not entirely straightforward.

There are two ways to express Past 1 depending on whether the event is to be understood as ongoing or completed. An ongoing event involves imperfective aspect and the Past 1 tense suffix. A completed event is expressed as a present perfect with the existential perfect aspect.³ These two forms are illustrated in (3).⁴

² See Haas (1940) and Martin (2011) for detailed morpho-phonological descriptions.

³ The existential perfect takes on various forms depending on the phonological content of the stem. Although it usually involves infix aspiration, between two consonants the infix is the diphthong /-ey/.

⁴ The data in this paper come from the author’s fieldwork unless otherwise indicated. Abbreviations for the glosses I use are: ACC accusative; AG agent; AKSRT aktionsart; COMP com-

(3) *Tense and Aspect in the Past 1 Interval*

- a. **Nēsis.**
 ni:s-êy-s
 buy.**IMPF-P1**-IND
 ‘He/she was buying it.’ (today up to last night)
- b. **Nēhses.**
 nîhs-is
 buy.**PERF.P1**-IND
 ‘He/she [has] bought it.’ (today up to last night) (Martin 2011, 257)

The existential perfect aspect does not co-occur with the other past tenses,⁵ and perfective aspect does not co-occur with P1.

Perfective aspect is the most common aspectual inflection with Pasts 2 and 3. Imperfective aspect, according to Martin (2011), is possible with these tenses but uncommon. Perfective and imperfective aspect differ in tonal pattern, which is not represented orthographically.

(4) *Tense and Aspect in the Past 2 Interval*

- a. **Nēsvnks.**
 nî:s-ânk-s
 buy.**IMPF-P2**-IND
 ‘He/she was buying it.’
- b. **Nēsvnks.**
 nî:s-ânk-s
 buy.**PFV-P2**-IND
 ‘He/she bought it.’ (Martin 2011, 265)

(5) *Tense and Aspect in the Past 3 Interval*

- a. **Nēsemvts.**
 nî:s-imát-s
 buy.**IMPF-P3**-IND
 ‘He/she was buying it.’
- b. **Nēsemvts.**
 nî:s-imát-s
 buy.**PFV-P3**-IND
 ‘He/she bought it.’ (Martin 2011, 266)

plémentizer; CUR current past; DAT dative; DEM demonstrative; DIR directional; DIST distal; DS different subject; DUR durative; GPL group plural; IMPF imperfective aspect or lengthening grade; IND indicative; INST instrumental; INT intensifier or nasalizing grade; IP medio-passive/spontaneous; LOC locative; NEG negation; NOM nominative; NRP near past; P1 Past 1 or recent past; P2 Past 2 or intermediate past; P3 Past 3 or distant past; P5 Past 5 or remote past; PASS impersonal passive; PAT patient; PERF perfect aspect or aspirating grade; PFV perfective aspect or falling tone grade; PL plural; PRES present tense; PROX proximal; RECIP reciprocal; REMP remote past; SG singular; SS same subject.

⁵ This may be the result of language change. Loughridge and Hodge (1890) provide paradigms for all five past tenses in which they combine freely with all forms of aspectual ablaut. Haas (1940) also provides data showing that Pasts 2-4 can combine with the existential perfect aspect, or ‘aspirating grade’ in her terminology.

The remoteness of an event marked with Past 5 depends on aspect. When Past 5 combines with imperfective aspect, it refers to a time more remote than a year ago, (6). With Past 5, imperfective aspect almost always yields a completed event interpretation. When P5 combines with perfective aspect, it refers to a more recent time, (7).

- (6) Pokkeccakvtēs.
 pòkkicc-a:k-ati:s
 play.ball-PL.**IMPF-P5**-IND
 ‘They played stickball.’ (long ago)
- (7) Pokkeccakvtēs.
 pokkicc-â:k-ati:s
 play.ball-PL.**PFV-P5**-IND
 ‘They played stickball.’ (recently) (RH-Sem-07/13/2019)

A formal analysis of the recency effects with Past 5 are a subject for future research. However, they are likely due to a result state entailment of perfective aspect. If the event occurred more than a year ago, it becomes implausible for the result state to continue into the present, and imperfective aspect is preferred so as to avoid this implausible entailment. Furthermore, the culmination implicature associated with imperfective when it combines with P5 could be explained as pragmatic strengthening of the imperfective aspect when perfective is ruled out as an alternative. This type of explanation would be very similar to that proposed by (Altshuler 2014) for Russian perfective and imperfective aspects. What blocks similar recency effects with Pasts 2 and 3 remains to be explained.

2.3 Evidentiality

In claiming that evidentiality plays a role in the past tense system of Mvskoke, this paper also builds on the rich literature on the Mvskoke language as well as comparative Muskogean literature. Several authors have recognized that Pasts 1-3 are predominantly used for witnessed events, and Past 5 for unwitnessed. These authors characterize Past 5 as an indirect evidential (Brinton 1870, 307 and Nathan 1977, 115). This view is challenged by data presented in Martin (2010). Martin’s data demonstrates that Past 5 can indeed be used when an event was witnessed. Taking into account Martin’s (2010) conclusions, this paper takes another approach to the evidential inferences of the past tenses: if Past 5 is not an indirect evidential, could Pasts 1-3 be direct evidentials?

2.4 Methodology

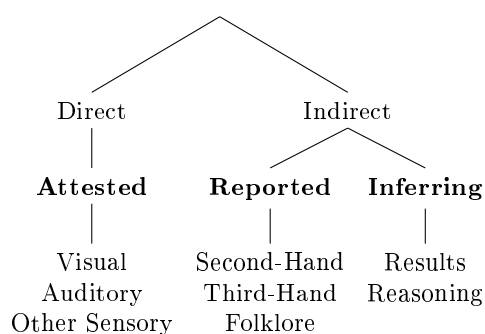
The data presented in this paper comes from original fieldwork with speakers of both the Oklahoma Seminole and Muskogee Creek dialects. The data were collected in one-on-one interviews through translation tasks and acceptability judgment tasks. Examples from the author’s fieldwork are given in the standard Seminole orthography, with a phonemic transcription (following Martin 2011), and a morpheme-by-morpheme gloss adapted from Martin 2011’s glossing conventions.

Original data is referenced by speaker code, dialect - Mus for Muskogee Creek, Sem for Oklahoma Seminole - and date of elicitation.

3 Evidentiality in the Past Tense System

Mvskoke speakers often characterize the difference between past tenses as a difference in *closeness* to the speaker, or force of the statement - *making a declaration* or *stating it as fact*. Drawing on these characterizations, Martin claims that a speaker will use more recent past tenses to refer to events that are personal, closer, or more vivid whereas they will use more remote tenses to describe events that they feel more removed from (Martin 2010, 67). Evidence is another notion that tracks subjective distance of an event. Consider Willett's well-known taxonomy of evidence types, represented in (8).

(8) *Taxonomy of Evidence Types (Willett 1988)*



When a speaker has direct sensory evidence for an event, it will be more vivid and personal to them. Their experience of the event is greater than if they only have sensory evidence of the results of the event, or greater still than if they have only heard of it through reports.

In this section I demonstrate that evidential source plays a role in a speaker's choice of past tense morpheme. Specifically, Mvskoke native speakers have the intuition that using Pasts 1-3 on a main verb commits them to having direct evidence for their assertion. As a result, Past 1-3 are infelicitous in reportative evidence contexts where Past 5 is used instead. In what follows, I show that the choice between past tenses is determined by both temporal interval and whether the speaker has direct evidence for the event. I then address two challenges for characterizing Past 1-3 as direct evidentials and propose that they should be understood as referencing *Evidence Acquisition Time*.⁶

⁶ The reader may wonder about the felicity of the tenses with evidence from inference. One of the puzzles for Pasts 1-3 being direct evidentials is that they are felicitous when the speaker has indirect evidence of the event in the form of results-based inference. This data is presented and discussed in section 3.3. I do not present empirical data as to the felicity of the tenses in reasoning-based inference contexts. Reasoning-based inference contexts are extremely difficult to craft so that there is no secondary evidential source involved (see Silva and AnderBois (2016) for discussion). Attempts to do so in elicitation met with limited success. I do, however, predict that Pasts 1-3 should not be felicitous in reasoning-based inference contexts because the reasoning involved fails to justify a change in beliefs.

3.1 Direct witness inference for Pasts 1-3

When asked to compare an assertion with Pasts 1, 2, and 3 to one with Past 5, speakers report that Pasts 1-3 imply direct witness. Consider the following example for the Past 1 interval. In a reportative evidence context, speakers volunteered Past 5 but rejected Past 1.

- (9) *P1 Reportative Context*: Your friend Mary tells you that she talked to the chief today.
- a. Mary mucv nettv Mēkko emponayvtēs.
 Mary móca nítta mí:kko im-ponây-**ati**-s.
 Mary this day chief 3.DAT-talk.PFV-**P5**-IND
 ‘Mary talked to the chief today.’
- b. #Mary Mēkko emponayis.
 Mary mí:kko im-pona:y-**êy**-s.
 Mary chief 3.DAT-talk.IMPF-**P1**-IND
 ‘Mary talked/was talking to the chief.’ (today)
 Speaker Comment: That would be if you saw her talking to him.
 (DLR-Mus-06/17/2019)

The speaker comment above illustrates the pervasive intuition that Past 1 commits the speaker to having witnessed the event. Similarly, in a direct witness context for the Past 1 interval, speakers reject Past 5 and volunteer Past 1.

- (10) *P1 Direct Witness Context*: Imagine you saw Mary talking to the chief this morning. Could you say (10-a)?
- a. #Mary Mēkko emponayvtēs.
 Mary mí:kko im-ponây-**ati**-s
 Mary chief 3.DAT-talk.PFV-**P5**-IND
 ‘Mary talked to the chief.’
 Speaker Comment: If you saw, you’d say [(10-b)].
- b. Mary Mēkko emponvyis.
 Mary mí:kko im-pona:y-**êy**-s
 Mary chief 3.DAT-talk.IMPF-**P1**-IND
 ‘Mary talked/was talking to the chief.’
 Speaker Comment: *emponayis* means that you saw.
 (IAH-Sem-06/07/2019)

The same judgments hold for Past 2. In the example below, the target sentence includes a subordinate clause *cokv-tvlvme ‘svlikat* ‘it was printed in the newspaper’ which ensures that the sentence is judged with the indirect evidence source. The verb marked with Past 5 is acceptable when paired with this subordinate clause, but the corresponding sentence with Past 2 was judged to be unacceptable.

- (11) *P2 Reportative Context*: Imagine that you see an article in the newspaper that reports that the President bought a dog yesterday.
- a. Cokv-tvlvme ‘svlikat, Wvcenv Mēkko
 co:ka-talamí (i)s-a-lēyk-a:t wacína mí:kko
 paper-daily INST-LOC-sit.SG.PFV-COMP washington chief
 efvn vpohvtēs.
 ifá-n apô:h-**ati**:s
 dog-ACC buy.PFV-**P5**-IND
 ‘It was printed in the newspaper, the President bought a dog.’
- b. #Cokv-tvlvme ‘svlikat, Wvcenv Mēkko
 co:ka-talamí (i)s-a-lēyk-a:t wacína mí:kko
 paper-daily INST-LOC-sit.SG.PFV-COMP washington chief
 efvn vpohv**nk**s.
 ifá-n apô:h-**ánk**-s
 dog-ACC buy.PFV-**P2**-IND
 Speaker Comment: No, that sounds like you were there when he bought the dog.
- (DLR-Mus-07/11/2018)

When the context supports direct visual evidence in the Past 2 interval, speakers reject Past 5 and accept Past 2. This is seen in (12).

- (12) *P2 Direct Witness Context*: Imagine you’ve been telling your brother there’s a girl who wants to see him in Seminole. Then last week you drove by the diner and saw them together. You want to tell me that they saw each other.
- a. Etehecak**v**nk-s.
 iti-hic-â:k-**ánk**-s
 RECIP-see-PL.PFV-**P2**-IND
 ‘They saw each other.’
- b. #Etehecak**v**tēs.
 iti-hic-â:k-**ati**:s
 RECIP-see-PL.PFV-**P5**-IND
 Speaker Comment: [I couldn’t say that] if I saw them at the diner.
- (LSB-Mus-06/21/2017)

Turning to Past 3, the context in example (13) establishes a past topic time which precedes the present by at least 30 years. Technically, according to Martin’s (2010) intervals, we expect this time frame to be incompatible with Past 3. However, the speakers I consulted most naturally volunteer Past 3 when speaking of someone’s childhood. We see this in (13) where the context locates an event within the chief’s childhood (about 30-40 years ago for the chief of the Seminole Nation at the time of elicitation).

- (13) *Refining P3 Interval - Context:* Imagine you knew the chief when he was young and knew he attended a certain church. You saw him there on many occasions. Now we are passing the church and you want to tell me this.

Mēkko mvnettof, mv mēkusvpkv-cuko
 mí:kko manítt-o:f má mi:kosapka-cóko
 chief young-when DEM.DIST prayer-house
 arēt owemvts.
 a:ʔ-í-t ô:w-**imát**-s
 go.about.SG.IMPF-DUR-SS be.PFV-**P3**-IND
 ‘When the chief was young, he went to that church.’

(MAE-Sem-07/13/2018)

Example (14) tests indirect evidence in this same time frame. As with the Past 2 example, (14) makes an indirect evidence context explicit through the use of the subordinate clause *cokv-tvlvme hoccihocat* ‘it was written in the newspaper’. The sentence with Past 3 is unacceptable in the new context, (14-a). Instead, the speaker volunteered Past 5, (14-b).

- (14) *P3 Reportative Context:* Now imagine you read a newspaper story about the Chief in which you learned that he frequented a certain church when he was young. Could you say the sentence in (14-a)?

a. #Cokv-tvlvme hoccihocat, Mēkko mv
 coka-talamí hocc-éyho:c-â:t mí:kko má
 paper-daily write.IMPF-CAUS.PASS-COMP chief DEM.DIST
 mēkusvpkv-cuko arēt owemvts.
 mi:kosapka-cóko a:ʔ-í-t ô:w-**imát**-s
 prayer-house go.SG.IMPF-DUR-SS be.PFV-**P3**-IND
 Intended: It was written in the newspaper, the chief went to that church.

Speaker Comment: No, if it’s according to the paper it would be [the sentence in (14-b)]

b. Cokv-tvlvme hoccihocat, Mēkko mv
 coka-talamí hocc-éyho:c-â:t mí:kko má
 paper-daily write.IMPF-CAUS.PASS-COMP chief DEM.DIST
 mēkusvpkv-cuko arēt owvtēs.
 mi:kosapka-cóko a:ʔ-í-t ô:w-**ati**-s
 prayer-house go.SG.IMPF-DUR-SS be.PFV-**P5**-IND
 ‘It was written in the newspaper, the chief went to that church.’

(MAE-Sem-07/13/2018)

The examples presented in this section demonstrate that Pasts 1-3 are not compatible with reportative evidential sources even at times compatible with the temporal intervals they are associated with. Instead Pasts 1-3 are limited to utterances with direct evidential sources. On the other hand, we have seen that Past 5 is accepted in reportative contexts at any past time, but is unacceptable with

Table 1 Three options for evidential inferences of Mvskoke tenses

	Semantic Entailment		Pragmatic Implicature	
	1. P1-P3 Direct P5 Indirect	2. P1-P3 Direct P5 <i>unspecified</i>	3. P1-P3 <i>unspecified</i> P5 Indirect	
Direct	-P1 -P2- -P3- // // // //	-P1 -P2- -P3- -P5-	-P1 -P2- -P3- // // // //	
Indirect	-----P5-----	-----P5-----	-----P5-----	

direct evidence at the Past 1 and 2 intervals, and presumably in the Past 3 interval as well.⁷

3.2 Pragmatics of the evidential inferences

As previewed in the introduction, there are three ways one could account for the evidential inferences associated with the tenses. First, these inferences would be explained if the tenses semantically encoded evidential requirements that restricted them to either direct or indirect evidence sources. This option would have Pasts 1-3 semantically encode a direct evidential requirement and Past 5 an indirect evidential requirement. The second and third alternatives would derive one of the evidential inferences pragmatically. Either Pasts 1-3 are evidential or Past 5 is evidential; the other tenses are unspecified for evidentiality. If Pasts 1-3 semantically encode a direct evidential requirement and Past 5 is unspecified for evidentiality, then Past 5 would be limited to indirect evidence contexts not because of a semantic clash with direct evidence, but because of competition with the direct evidential past tenses. Similarly, if Past 5 semantically encodes indirect evidence and Pasts 1-3 are unspecified for evidentiality, then Pasts 1-3 would be limited to direct evidence not because of a semantic clash with indirect evidence, but because of competition with the indirect evidential Past 5. These are illustrated in Table 1.

As can be seen in Table 1, Options 1 and 3 make nearly identical predictions about the distribution of the tenses. Option 3 is the view implicitly taken in earlier Muskogeanist literature (Brinton 1870; Nathan 1977). In principle this option predicts that P1-P3 could be used in indirect evidence contexts if Past 5 were blocked for some reason. However, Past 5 would never be used in direct evidence contexts. Option 2 stands out in predicting that P5 should be possible in direct evidence contexts. What makes this possible is that P3 has an interval that does not extend indefinitely into the past. If a speaker is old enough, it is plausible that they have direct evidence for very remote events outside the P3 interval.

A strong argument against Options 1 and 3 comes from Martin (2010). Martin provides elicited evidence that Past 5 can be used for a directly experienced event *provided it is more remote than Past 3*. The elicited example below demonstrates that at very remote past times, speakers accept Past 5 on a sentence describing their own actions - necessary witnessed and experienced by the speaker.

⁷ At this time, I do not have a negative judgment for Past 5 in a direct witness Past 3 context.

- (15) hofðⁿ-o:f mi:c-ay-**áti**:-s.
 long.ago.INT-when do.IMPF-1.SG.AG-**P5**-IND
 ‘I did it long ago [P5].’ (*glosses adapted*, Martin 2010, 53)

This judgment is replicated in (16) with another type of direct evidence. This example demonstrates that an elderly speaker (over 60 years of age) can use Past 5 to talk about a childhood event they have direct evidence for. This option is not available to a younger speaker (approx. 20 years old).

- (16) Context: Imagine you and your friends are talking about a certain Mvskoke Hymn. You haven’t heard the hymn since you were very young, but want to tell me that you have heard it.
- a. Cvmvnettof, mv yvhiketv pohvyvtēs.
 ca-manítt-ô:f ma yaheykitá po:h-ay-**áti**:-s
 1.SG.PAT-young-when DEM song hear.IMPF-1.SG.AG-**P5**-IND
 ‘When I was young, I heard that song.’
 Speaker Comment: I could say that. But [a younger speaker] would have to [use Past 3]. (RMM-Mus-12/17/2021)

These two examples show that at past times more remote than those covered by the Past 3 interval, Past 5 can be used for events the speaker has direct evidence for. Only Option 2 predicts the use of P5 in the direct evidence contexts presented above. As such the evidence presented here is a strong argument in favor of viewing Past 5 as unspecified for evidentiality.

If Past 5 is unspecified for evidentiality, then it is in principle compatible with the direct evidence contexts in (10) and (12). I propose that pragmatic implicatures account for the infelicity of Past 5 in the examples just mentioned. Specifically, I argue that pragmatic reasoning is responsible for the indirect evidence inference associated with Past 5. After laying out a formal semantics for the tenses in section 4, I formalize the pragmatic reasoning which leads to the evidential inferences of the Mvskoke tenses.

In summary, the examples seen in this section have demonstrated that Pasts 1-3 are incompatible with reportative contexts. On the other hand, Past 5 was shown to be infelicitous in direct evidence contexts in the Past 1 and 2 intervals (the same presumably holding for Past 3), but felicitous with direct evidence outside those intervals. Taking these data into account, the following interim hypothesis is proposed.

- (17) *Evidentiality of Past Tense Morphemes - Interim Hypothesis:*
 Pasts 1, 2 and 3 indicate that the speaker has direct evidence for the event asserted in the utterance.
 Past 5 is unspecified for evidentiality.

There are puzzles for this hypothesis though. Characterizing Pasts 1-3 as direct evidentials is problematic in a number of contexts where these past tenses are still used, but the person uttering the sentence does not have direct evidence for the event. We turn to these puzzles now.

3.3 Puzzles for a ‘Direct Evidence’ approach

There are two situations in which a speaker may use Pasts 1-3 without having direct evidence for the event in question. First, a speaker may use an evidential tense when they receive a report about the event *as it is taking place*. Second, a speaker may use an evidential tense on an auxiliary verb if they learn about the event through a first-hand report or by perceiving its results *after the fact*. In Willett’s taxonomy of evidence types, these are both considered indirect evidence. For the Mvskoke tenses, these evidence types pattern with direct evidence.

Direct evidence has been characterized in various ways in literature on evidentials and evidential-tense morphemes. Under one approach, direct evidence involves the speaker being present and perceiving the event with one of their senses. Kalsang et al. (2013) take an approach of this kind for Tibetan direct evidentials. Building on Speas (2010), these authors propose that evidentials encode relations between situations, particularly between the Event Situation and the Information Situation. Direct evidentials, in their view, encode a relation of overlap between these two situations. Faller (2004) and Chung (2007) also take this kind of approach for evidential-tenses in Cuzco Quechua and Korean, languages whose tense systems show evidential distinctions. These authors treat situations in more depth, proposing that evidentials encode a relation between the temporal and spatial traces relevant to the situations mentioned above. For the event situation, Faller (2004) and Chung (2007) refer to the spatio-temporal trace of the event; that is, the extension of the event in space and time. For the information situation, these authors refer instead to the *perceptual field* of the speaker - the locations that the speaker perceives over time. When the speaker’s *perceptual field* and the spatio-temporal trace of the event overlap, evidence is direct; when they do not overlap, evidence is indirect. I call such approaches *spatial approaches*.

A second type of approach developed to account for evidential-tense systems considers direct evidence to involve acquiring evidence for the event *at the same time* as it unfolds. Lee (2013) and, following her, Smirnova (2013) claim that evidential-tense morphemes make crucial reference to *Evidence Acquisition Time* (EAT). This approach claims that evidential-tenses encode a relation between times only. Thus direct evidentials encode an overlap relation between the EAT and the event time (ET). With indirect evidentials, there is no overlap between these two temporal indices. I call these approaches *temporal approaches*.

These two types of approaches make different predictions for the situations in which a direct evidential-tense will be acceptable. A spatial approach predicts that direct evidential-tenses require that the event described by the main predicate and the event of acquiring evidence must overlap in both time and space. A temporal approach predicts that they only need to overlap in time. Until modern inventions such as the telephone, the radio, and the television, all situations in which the speaker acquires evidence at the same time as the event unfolds were also situations in which the speaker was in the same place as the event. In other words, all situations of temporal overlap were also situations of spatial overlap.

One type of context that is able to adjudicate between these two approaches is what I call a *simultaneous learning context*. In this type of context, the speaker acquires evidence over the phone, the TV, or another type of sensory evidence which is simultaneous with the event, but the speaker is not in the same location as the event. A temporal approach, but not a spatial approach, correctly predicts

that Mvskoke Pasts 1-3 are acceptable in simultaneous learning contexts. In the context below, the speaker learns of the event over the phone as it is happening.⁸ In this scenario, one can felicitously use Past 2 on the main verb.

- (18) *Phone Simultaneous Context:* Imagine that yesterday, your friend called you and said, “I’m over here at the barber shop. My wife is getting her hair cut.” Then today I ask how your friend’s wife is doing and you want to tell me that she got her hair cut.
- Vnhesse ēhiywvn ekv-essen ent on how **vnks**.
 An-híssi i:héywa-n iké-yssi-n ìn-ton *hò:w-ánk-s*.
 1.SG.DAT-friend 3.PAT.wife-ACC hair-ACC 3.DAT-cut.PFV.PASS-**P2**-IND
 ‘My friend’s wife got her hair cut.’

(RMM-Mus-06/25/2019, PF-Mus-11/28/2018)

Additionally, when the speaker’s evidence comes from live TV, Past 2 is also acceptable.

- (19) *TV Simultaneous Context:* Yesterday you watched the Chickasaw stickball game live on TV.
- Empokkēckv Cekvsalkē Mississippi vpehyet
 im-pokkí:cka Cikas-álki: Mississippi apíhy-it
 3.DAT-ball.game Chickasaw-GPL M. go.TPL.PERF-SS
 pokkeccak **vnks**.
 pokkicc-â:k-**ánk-s**
 play.ball-PL.PFV-**P2**-IND
 ‘The Chickasaw went to Mississippi and played their ball game.’

(RH-Sem-07/13/2019)

In the above examples the speaker was not in the same location as the event took place, but they learned of the event as it was happening. In these situations, speakers report that Past 2 is acceptable. These provide strong evidence in support of a temporal approach.

A second type of context that is not predicted to be direct by a spatial approach is what I call a *Learning After-the-Fact* context. In Mvskoke when a speaker has evidence of an event after the fact - visual evidence of the results or a first-hand report - it is no longer felicitous to use Past 1-3 on the main verb. However, speakers still accept Past 1-3 when they are affixed to a special auxiliary verb. In the following Past 1 context, the speaker learns about the event after it has taken place through a first-hand report. In this context, a main verb inflected for Past 1 is unacceptable, (20-b). Instead the speaker volunteered a sentence with an auxiliary construction in which P1 appears suffixed to the auxiliary *hak-* ‘become’, (20-a).

⁸ Thanks to Vincent Homer for suggesting this type of example.

(20) *Past 1 Learning After-the-Fact*: Imagine your friend called you on the phone just now and told you he just cut his hair.

a. Vnhesset vnhuehiket ekv-esse
 an-híssi-t an-hoyh éyk-it iké-yssi
 1.SG.DAT-friend-NOM 1.SG.DAT-call.PERF-SS head-hair
 warehpvt **hakis.**
 wa:t-ihp-át **ha:k-êy-s**
 cut-IP.PERF-P5 **become.IMPF-P1-IND**
 ‘My friend called, he cut his hair.’

b. #Vnhesset vnhuehiket ekv-esse
 an-híssi-t an-hoyh éyk-it iké-yssi
 1.SG.DAT-friend-NOM 1.SG.DAT-call.PERF-SS head-hair
 wahres.
 wáh-t-is
 cut.PERF.P1-IND

Speaker Comment: No, you’d say (20-a). (IAH-Mus-11/10/2018)

The auxiliary construction with Past 1 is unacceptable in a direct witness context.

(21) *P1 Direct Witness Context*: Imagine that today you saw your friend Mary talking to the Mēkko. Now, you want to tell me this.

a. Mary Mēkko emponayis.
 Mary mí:kko im-pona:y-êy-s.
 Mary chief 3.DAT-talk.IMPF-P1-IND

‘Mary talked/was talking to the chief.’ (today)

b. #Maret Mēkko emponahyvt **hakis.**
 Mary-t mí:kko im-ponáhy-át **ha:k-êy-s**
 Mary-NOM chief 3.DAT-speak.PERF-P5 **become.IMPF-P1-IND**

‘Mary had talked to the Chief.’

Speaker Comment: No, You’d have to say (21-a). That would be if Mary told me she had talked to the Mēkko.

(DLR-Mus-06/17/2019)

The same pattern is seen with Pasts 2 and 3. In the next two examples, the speaker compared the two sentences in question in two contexts. Context A for each example is a Simultaneous/ Direct Witness Context. In both cases (which differ only in the temporal interval for the topic time) the Direct Witness Context is one in which the speaker was home when the phone rang, but did not answer. Context B for each example is the Learning After-the-Fact Context. In both cases, this involved the speaker being gone from home when the phone rang and only later seeing the call on their answering machine. In Context A, only the sentences in which Past 2 or Past 3 is affixed to the main verb are acceptable. In Context B, only the sentences with Past 2 or Past 3 affixed to the auxiliary verb are acceptable.⁹

⁹ The phone call examples in (22) and (23) are patterned after similar examples in Hayashi (2011).

- (22) a. *P2 Direct Witness Context - Context A*: A month ago, Sam called you twice on the phone. You were in the room when the phone rang, but you didn't answer.
- b. *P2 Learning After-the-Fact Context - Context B*: You weren't home one day last month, but when you returned to the house you saw on your answering machine that Sam had called you twice.
- (i) Hvse hvnkvnkē Sam vhokkolvn vnhuehkvns.
 hasí hánk-ankí: Sam ahókkola-n an-hôyhk-**ánk-s**
 month one-ago Sam twice-ACC 1.SG.DAT-call.PFV-P2-IND
 'Sam called me twice, one month ago.'
 ✓ Context A, # Context B
- (ii) Hvse hvnkvnkē Sam vhokkolvn vnhuehkv**t**
 hasí hánk-ankí: Sam ahókkola-n an-hôyhk-**át**
 month one-ago Sam twice-ACC 1.SG.DAT-call.PFV-**P5**
hakvnks.
ha:k-ánk-s
become.IMPF-P2-IND
 'Sam called me twice, one month ago.'
 # Context A, ✓ Context B (MAE-Sem-08/04/2018)
- (23) a. *P3 Direct Witness Context - Context A*: About two years ago, Sam called you on the phone. You were in your house when he called, but you didn't answer the phone.
- b. *P3 Learning After-the-Fact Context - Context B*: About two years ago you were gone from your house. When you returned you saw on your answering machine that Sam had called you.
- (i) Ohrolopē hokkolvnkē mahen, Sam
 ohłolopí: hokkól-ankí: mâ:h-in Sam
 year two-ago very.PFV-DS Sam
 vnhuehkemvts.
 an-hôyhk-**imát-s**
 1.SG.DAT-call.PFV-**P3-IND**
 'About two years ago, Sam called me.'
 ✓ Context A, # Context B
- (ii) Ohrolopē hokkolvnkē mahen, Sam vnhuehkv**t**
 ohłolopí: hokkól-ankí: mâ:h-in Sam an-hôyhk-**át**
 year two-ago very.PFV-DS Sam 1.SG.DAT-call.PFV-**P5**
hakemvts.
ha:k-imát-s
become.IMPF-P3-IND
 'About two years ago, Sam called me.'
 # Context A, ✓ Context B (MAE-Sem-08/04/2018)

These examples demonstrate that when the speaker learns of an event after it takes place through perceptual evidence of the results (such as a message on an answering machine) or through a first-hand report, the speaker can use Past 1-3, but only in a special kind of auxiliary construction. This auxiliary construction involves an embedded shortened form of Past 5 on the participle and the verb

haketv ‘to become’ used as an auxiliary. This is a curious construction because the most frequently used auxiliary in Mvskoke is the copular verb *ometv* ‘to be’. In section 4.3 I provide a way to think about this auxiliary construction in terms of its temporal contribution.

In conclusion, this section has presented evidence for making the following generalizations about the evidential contributions of the past tenses.

- (24) a. *Generalization #1*: When Pasts 1, 2 and 3 are affixed to the main verb, the speaker has learned of the event as it happens.
 b. *Generalization #2*: When Pasts 1, 2 and 3 are affixed to an auxiliary verb, the speaker has learned of the event after the fact.

The characterization of Pasts 1-3 above are very different from characterizations of either tense or evidentials. Notice that there is no mention of any *source of evidence*. Notice also that these morphemes crucially restrict the *time of learning* to a particular past interval. If the *time of learning* and the *time of the event* are simultaneous, the morpheme must be affixed to the main verb. If the *time of learning* occurred after the *time of the event*, then the morpheme must appear on an auxiliary verb. In the next section I provide a formal analysis of the Mvskoke evidential-tenses.

4 Formal Analysis: Moment of Belief-State Change

In the previous section, I presented data which motivated viewing Mvskoke Pasts 1-3 as having an evidential component to their meaning. While this seemed at first blush to be a direct evidence inference, the compatibility of Pasts 1-3 in Simultaneous Learning contexts and Learning After-the-Fact contexts demonstrated that what is at stake with Past 1-3 is not whether evidence is direct, but that evidence is acquired either simultaneously to the event or shortly following the event. I take this to support a temporal approach to evidential-tense morphemes which makes crucial reference to the *Evidence Acquisition Time* or EAT. First proposed by Lee (2011), EAT is a new temporal index intended to enrich a neo-Reichenbachian system of times so that there are four times that a sentence’s temporal operators can refer to: event time (ET), evidence acquisition time (EAT), topic time (TT) and utterance time (UT).

With these temporal indices, the generalizations for Mvskoke’s evidential-tenses can be reworded. The difference between monoverbal and auxiliary constructions with Pasts 1-3 can be reframed as a difference in the temporal relation between the EAT and the ET, which I illustrate below in Table 2. In what follows, I will characterize EAT as a moment of changing one’s belief state and derive the relation between EAT and ET through the contribution of viewpoint aspect.

In monoverbal constructions, EAT and ET overlap. This is achieved through commonly assumed semantics for perfective and imperfective aspect, as discussed below. In a Kleinian view of tense and aspect, aspect relates properties of events to properties of times, giving us the relation between the run time of the event and the TT. I propose that Pasts 1-3 restrict TT in two ways. First, they place it within an interval of time at a certain distance from the UT. Second, they restrict it to the time the speaker learned of the event, the EAT. Thus, in monoverbal constructions, EAT and TT refer to the same time and overlap (∞) with ET. This

derives the use of Pasts 1-3 the direct witness contexts as well as the simultaneous learning contexts. Monoverbal constructions with Past 5, on the other hand, quite simply locate an event in the past of the utterance. Therefore, under this approach, Past 5 is an unrestricted past tense similar to English past tense.

Table 2 Temporal Relations in Monoverbal and Auxiliary Constructions.

Construction	Aspect	Lower Tense	Higher Tense
Monoverbal P1-P3	ET ∞ EAT/TT	-	EAT/TT \prec UT
Monoverbal P5	ET ∞ TT	-	TT \prec UT
Auxiliary	ET ∞ t'	$t' \prec$ EAT/TT	EAT/TT \prec UT

In auxiliary constructions, ET precedes EAT. I take the auxiliary construction itself to be a past perfect construction consisting of two past tenses: a lower instance of Past 5 and a higher tense which is either Past 1, 2, or 3. In auxiliary constructions (im)perfective aspect on the main verb relates ET to another temporal index as usual. The relative Past 5 tense then contributes a precedence relation which places that temporal index into the past of a time identified as the EAT by the matrix past tense. In essence, auxiliary constructions communicate that the speaker learned of a past event. Since the learning came after the event took place, these constructions are compatible with indirect evidence contexts. The evidential-tenses in both clause types have the same semantics and relate EAT to the UT through the intervals that they refer to.

4.1 EAT as Belief-State Change

Drawing on the informal language used here, I take EAT (or the learning time) to represent the time at which the speaker *came to believe* a proposition. I further formalize this as the time at which one's belief state changes from not believing p to believing p . More specifically, for an individual x to come to believe a proposition p at a time t means that for all times preceding t , it was not the case that p was true in all of x 's belief worlds at those past times. Similarly, for all times equal to and following t , p is true in all x 's belief worlds at those future times.¹⁰ I formalize this below by defining a meta-language predicate COME-TO-BELIEVE.

$$(25) \quad [\lambda x_e. [\lambda t_i. [\lambda w_s. [\lambda P_{(st)}. \text{COME-TO-BELIEVE}(x, t, w, P)]]]] = [\lambda x_e. [\lambda t_i. [\lambda w_s. [\lambda P_{(st)}. \forall t' : t' \prec t. \neg \forall w' \in \text{BEL}(x, w, t'). P(w') = \text{T} \ \& \ \forall t'' : t \preceq t''. \forall w'' \in \text{BEL}(x, w, t''). P(w'') = \text{T}]]]]]$$

For a world to be in the belief worlds of x it must be consistent with x 's beliefs at a certain world and time.

$$(26) \quad w' \in \text{BEL}(x, w, t) \text{ iff } w' \text{ is consistent with the beliefs of } x \text{ in } w \text{ at } t.$$

¹⁰ A reviewer points out that this requirement may be too strong. It is possible to relativize the interval to a time following (and including) the topic time up to (and including) the utterance time. However, without a theory of belief revision it is unclear whether this step is necessary and what implications it would have.

This definition formalizes evidence acquisition time as the time at which the speaker comes to believe p . In other words, EAT is the time the speaker's belief state changes - when they go from being agnostic about the proposition to believing the proposition. What - if any - evidence initiates this change in belief state is not explicit in this semantics. This does not however make the semantics of Pasts 1-3 too weak, because the proposed semantics for Pasts 1-3 require that the time of coming to believe p is identical to the time at which p holds, deriving the intuition that Pasts 1-3 require learning to take place simultaneously with the event in monoverbal sentences. The desired truth conditions for a sentence like (27-a) are given in (27-b).

- (27) a. Wvcenv Mëkko efvn vpohvns.
 wacína mí:kko ifá-n apô:h-ánk-s
 white chief dog-ACC buy.PFV-P2-IND
 ‘The President bought a dog.’
- b. \llbracket The President bought-P2 a dog $\rrbracket = T$ iff there is a past time t' included in the P2-Interval (yesterday to a year ago), and the speaker came to believe at t' that the President bought a dog at t' .

I assume that tenses are restricted indefinite quantifiers over times and introduce a temporal index i which receives its value from the contextual variable assignment function g . I propose that P1-P3 are relative tense operators of type $\langle ist, ist \rangle$. They introduce existential quantification over times and a contextually salient topic interval $g(i)$. The tense restricts the times quantified over to both the contextually salient interval and the appropriate interval associated with Pasts 1-3. Finally, this time is fed as an argument to the Come-to-Believe predicate. I abstract away from the precise semantics of the Pasts 1-3 intervals here. Instead, in the formulae that follow, I refer to them as the P1-interval, P2-interval, and P3-interval. Example (28) illustrates the proposed semantics for Past 2, which I abbreviate hereafter as in (29).

- (28) \llbracket Past 2 $_i \rrbracket^{c,g} = [\lambda P_{\langle i, st \rangle}. [\lambda t_i. [\lambda w_s. \exists t'. t' \subseteq g(i) \ \& \ t' \subseteq \text{P2-interval}(t)$
 $\& \forall t'' : t'' \prec t'. \neg \forall w' \in \text{BEL}(sp(c), w, t''). P(w') = T$
 $\& \forall t''' : t' \preceq t'''. \forall w'' \in \text{BEL}(sp(c), w, t'''). P(w'') = T]]]$
- (29) \llbracket Past 2 $_i \rrbracket^{c,g} = [\lambda P_{\langle i, st \rangle}. [\lambda t_i. [\lambda w_s. \exists t'. t' \subseteq g(i) \ \& \ t' \subseteq \text{P2-interval}(t)$
 $\& \text{COME-TO-BELIEVE}(sp(c), t', P(t'))$ in w]]]]

Past 2 is evaluated relative to a context c and a variable assignment function g . I represent the evaluation time as a temporal argument present in the syntax and label it t^* , following Kusumoto (2005). Past 2 relates an interval (introduced by existential quantification) to the topic time ($g(i)$) and to the P2-Interval. The P2-interval is relative to the evaluation time. Furthermore, the interval quantified over by the tense node is identified as the time at which the speaker comes to believe P . Crucially, the *coming to believe* time is also the time which is applied to the proposition, so that the speaker comes to believe the proposition at the time that it takes place.

Given the proposed semantics for Pasts 1-3, their acceptability in simultaneous and learning after-the-fact contexts follows from their interaction with viewpoint

aspect. For the purposes of this paper, I give imperfective and perfective aspect traditional semantics associated with these aspects.¹¹

- (30) a. $\llbracket \text{IMPF} \rrbracket = [\lambda P_{\langle \epsilon, st \rangle}. [\lambda t'_i. [\lambda w'_s. \exists e. t' \subset \tau(e, w') \ \& \ P(e, w') = T]]]$
 b. $\llbracket \text{PFV} \rrbracket = [\lambda P_{\langle \epsilon, st \rangle}. [\lambda t'_i. [\lambda w'_s. \exists e. \tau(e, w') \subseteq t' \ \& \ P(e, w') = T]]]$

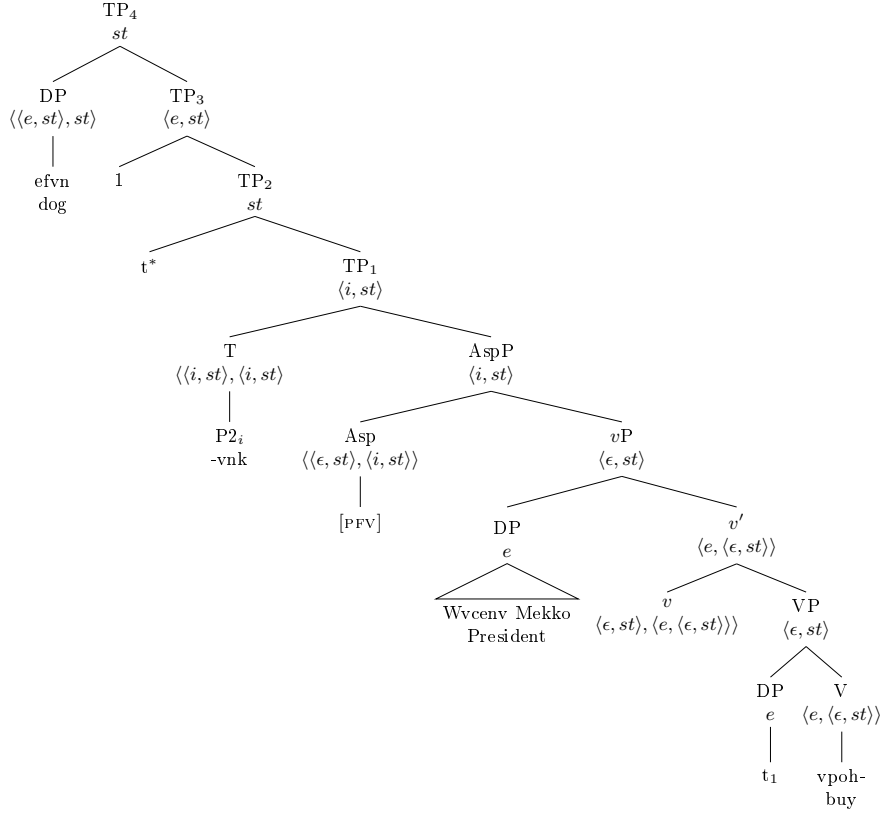
I assume that viewpoint aspect includes existential quantification over events and relates the run time of the event to the topic time.

4.2 Monoverbal Sentences

In monoverbal sentences, Past 1, 2 or 3 combine with a verb inflected for either imperfective or perfective aspect. In either case, aspect will require the TT to overlap with the ET, and the evidential-tense will identify the TT as the time of *coming-to-believe*. Thus the *coming-to-believe* time will overlap with ET. Example (31) shows the LF for the monoverbal sentence (27-a). Once composed (27-a) will have the truth conditions in (32). I use Davidsonian event semantics in the following derivations.

¹¹ I do not encode the result state entailment of perfective aspect or address the culmination implicature of imperfective aspect. Instead I refer the reader to Altshuler's (2014) analysis of Russian partitive aspects which share these properties with Mvskoke's aspectual operators.

(31) LF for (27-a)



(32) $\llbracket \text{The President bought-P2}_i \text{ a dog} \rrbracket^{c,g} = \text{T in } w \text{ iff}$
 $\exists x. \text{dog}(x) \text{ in } w \ \& \ \exists t'. t' \subseteq \text{P2-interval}(t^*) \ \& \ t' \subseteq g(i) \ \& \ \text{COME-TO-BEL}(\text{sp}(c), t', w, [\lambda w'. \exists e. \tau(e, w') \subseteq t' \ \& \ \text{buy}(e, w') \ \& \ \text{Ag}(e, w') = \text{The President} \ \& \ \text{Th}(e, w') = x])$

Applying the meaning of the COME-TO-BELIEVE predicate yields the following expanded truth conditions.

(33) $\llbracket \text{The President bought-P2}_i \text{ a dog} \rrbracket^{c,g} = \text{T in } w \text{ iff}$
 $\exists x. \text{dog}(x) \text{ in } w \ \& \ \exists t'. t' \subseteq \text{P2-interval}(t^*) \ \& \ t' \subseteq g(i) \ \&$
 a. $\forall t'' : t'' \prec t'. \neg \forall w' \in \text{BEL}(\text{sp}(c), w, t'') . [\exists e. \tau(e, w') \subseteq t' \ \& \ \text{buy}(e, w') \ \& \ \text{Ag}(e, w') = \text{The President} \ \& \ \text{Th}(e, w') = x] \ \&$
 b. $\forall t''' : t' \preceq t''' . \forall w'' \in \text{BEL}(\text{sp}(c), w, t''') . [\exists e. \tau(e, w'') \subseteq t' \ \& \ \text{buy}(e, w'') \ \& \ \text{Ag}(e, w'') = \text{The President} \ \& \ \text{Th}(e, w'') = x]$

These truth conditions will be satisfied only if the time that the speaker came to believe the proposition is also the topic time of the proposition. Since the proposition bears perfective aspect, the time of the event ends up overlapping with the learning time. In most contexts this will mean the speaker directly witnessed the event, but it will also hold in simultaneous contexts like (18) and (19).

The only way in which Past 2 differs from the other evidential tenses is in the interval that restricts the time of belief-state change. I give the denotations for Pasts 1-3 in (34) below.

- (34) a. $\llbracket P1_i \rrbracket^{c,g} = [\lambda P_{\langle i,st \rangle}. [\lambda t_i. [\lambda w_s. \exists t'. t' \subseteq P1\text{-interval}(t) \ \& \ t' \subseteq g(i) \ \& \ \text{COME-TO-BELIEVE}(sp(c), t', P(t')) \ \text{in } w]]]$
 b. $\llbracket P2_i \rrbracket^{c,g} = [\lambda P_{\langle i,st \rangle}. [\lambda t_i. [\lambda w_s. \exists t'. t' \subseteq P2\text{-interval}(t) \ \& \ t' \subseteq g(i) \ \& \ \text{COME-TO-BELIEVE}(sp(c), t', P(t')) \ \text{in } w]]]$
 c. $\llbracket P3_i \rrbracket^{c,g} = [\lambda P_{\langle i,st \rangle}. [\lambda t_i. [\lambda w_s. \exists t'. t' \subseteq P3\text{-interval}(t) \ \& \ t' \subseteq g(i) \ \& \ \text{COME-TO-BELIEVE}(sp(c), t', P(t')) \ \text{in } w]]]$

Note that the above denotations do not include any precedence relation between the come-to-believe time t' and the evaluation time t . It is the semantics of the P1, P2, and P3 intervals that require t' to be in the past of t .

An evidential tense sentence in imperfective aspect will receive similar truth conditions and will also enforce an overlap between the event time and the time the speaker came to believe P . Thus the truth conditions for an imperfective sentence with Past 1-3 will require that the speaker come to believe P at a time which is entirely contained in the run time of the event. Linking the learning time to the event time through the semantics of viewpoint aspect makes some fine-grained predictions about how much of the event the speaker has direct evidence for. With imperfective aspect, a direct witness use should be compatible with the speaker witnessing only part of the event. It may or may not continue after that time. Given the semantics of the perfective aspect, a direct witness use should require that the speaker witness the entire event or witness it as it is completed. Testing these predictions for Mvskoke imperfective and perfective aspect is left for future work. I do, however, provide here an account of auxiliary constructions which also appeals to aspect.

4.3 Auxiliary Constructions

I follow Loughridge and Hodge (1890) in viewing the auxiliary construction noted in section 3.3 to be a type of past perfect construction. More precisely, I view the auxiliary construction as a complex tense construction with a sequence of two past tenses - Past 5 on the main verb and an evidential-tense on the auxiliary. I hold that it is the precedence relation introduced by the lower Past 5 that leads to the indirect evidential flavor of auxiliary constructions. The desired truth conditions for a sentence with an auxiliary construction like (35-a) are given in (35-b).

- (35) a. Sam vnhuehkv_t hakvnks.
 Sam an-hóyhk-át ha:k-ánk-s
 Sam 1.SG.DAT-call.PFV-P5 become.IMPV-P2-IND
 ‘Sam called me.’
 b. $\llbracket \text{Sam called-P5 aux-P2 me} \rrbracket = T$ iff there is a past time t' included in the P2-Interval (yesterday to a year ago), and the speaker came to believe at t' that Sam had called at a time t'' prior to t' .

I assume a non-evidential, relative past tense semantics for Past 5 in (36), in accordance with the evidence presented in previous sections. Here I depart from

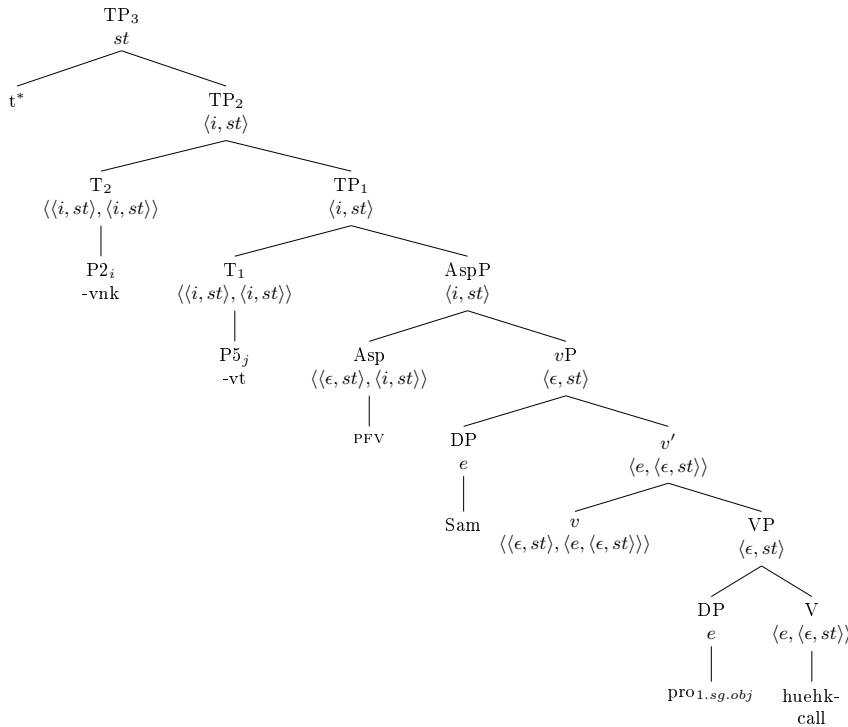
Martin (2010)'s intervals and give Past 5 a semantics which does not reference any graded interval of time.

$$(36) \quad \llbracket P5_i \rrbracket^g = [\lambda P_{\langle i, st \rangle} . [\lambda t_i . [\lambda w_s . \exists t' . t' \prec t \ \& \ t' \subseteq g(i) \ \& \ P(t', w) = T]]]$$

I assume that, as in English, the auxiliary that appears in perfect constructions is inserted to host the tense features of the higher T head and that the features of the lower T head are realized on the main verb (see Arregi and Klecha (2015) and references therein). The reason behind the choice of the auxiliary *hak-*, instead of the more general copular auxiliary *om-*, is unclear. A possible reason for the choice may be the semantic overlap between coming to believe and the change of state meaning of the verb *hak-* 'become'. The choice of imperfective aspect on an auxiliary following a verb inflected for perfective aspect is in keeping with the wider pattern in the Mvskoke language (see Martin 2011, 244). Although there is no empirical data at present as to its meaning contribution, I propose that one can think of the imperfective aspect on the auxiliary as indicating that the result state (contributed by the perfective aspect) surrounds the topic time provided by the tense on the auxiliary verb. To make my proposed semantics more transparent and to highlight how the evidential meaning results from relations between times, I gloss over the semantic contribution of the auxiliary and the aspect it is inflected for.

The LF and truth conditions for the sentence in (35-a) are given below.

(37) LF for (35-a)



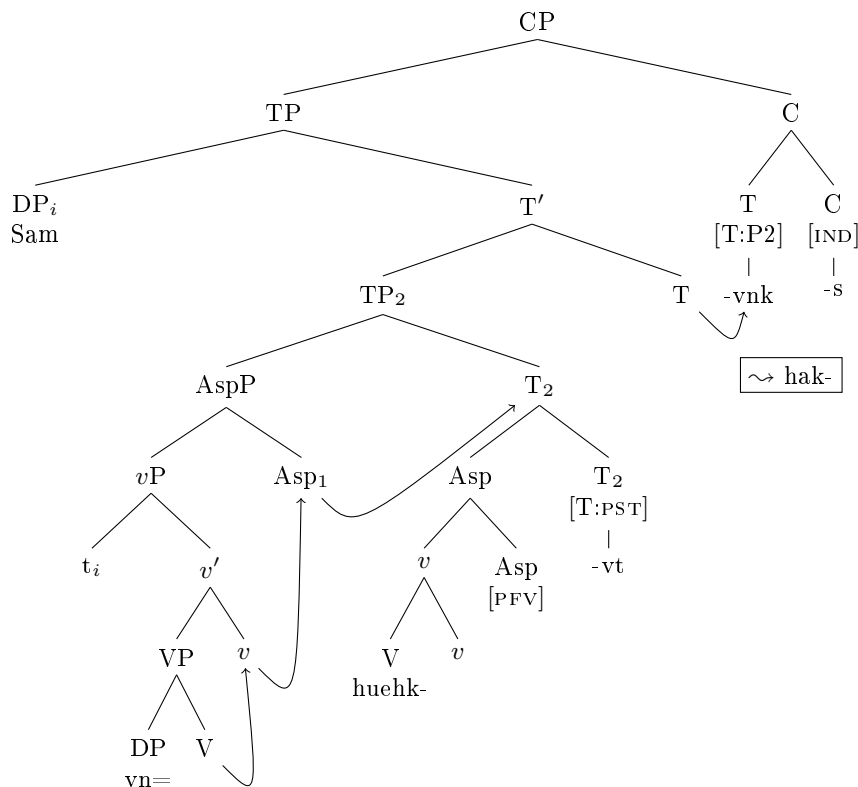
- (38) $\llbracket \text{Sam called-P5}_j \text{ Aux-P2}_i \text{ me} \rrbracket^{c,g} = T \text{ in } w \text{ iff}$
 $\exists t'. t' \subseteq \text{P2-interval}(t^*) \ \& \ t' \subseteq g(i) \ \& \ \text{COME-TO-BELIEVE}(\text{sp}(c), t', w),$
 $[\lambda w'. \exists t''. t'' \prec t' \ \& \ t'' \subseteq g(j) \ \& \ \exists e. \tau(e, w') \subseteq t'' \ \& \ \text{call}(e, w') \ \&$
 $\text{Ag}(e, w') = \text{Sam} \ \& \ \text{Th}(e, w') = \text{sp}(c)]$

To achieve the order of morphemes, I assume a head-final syntax for Mvskoke and that the verb undergoes total head-movement - that is, V moves through each functional head until it reaches the highest functional projection. To account for the auxiliary construction, I propose that head-movement stops if it would result in a *feature conflict*. I follow Arregi and Klecha (2015) in defining feature conflict as a situation that arises when adjacent heads bear a feature of the same type. I reword their definition of feature conflict in (39).

- (39) *Feature Conflict*: Two heads X and Y conflict in features if X and Y both bear features of type F.

Crucially, auxiliary constructions involve two tense features. As a result the verb moves only as high as T₂ and the auxiliary *hak-* is inserted to host Past 2's tense features and the indicative mood morpheme.

- (40) *Morphosyntax of (35-a)*.



In summary, we have seen that the semantics of both monoverbal and auxiliary constructions can be captured using the same semantics for Past 2 (and

for Pasts 1 and 3). The difference between monoverbal and auxiliary constructions comes down to the aspect of the clausal complement of the evidential tense. In a monoverbal clause, Past 2 takes an AspP in the perfective or imperfective aspect, the temporal relation introduced by either aspect results in an overlap between the event time and the time of the speaker's coming to believe. In an auxiliary construction, P2 takes a clause with an additional tense feature. Past 5 contributes a precedence relation between the time of the event and the time the speaker comes to believe that event took place. Past 5 affects the construction in two ways. Semantically, the precedence relation is responsible for the indirect evidential meaning. Morphosyntactically, the presence of the additional tense feature is responsible for auxiliary support.

To conclude, I will briefly describe how a monoverbal Past 5 sentence is composed. When Past 5 is the highest tense, its time argument will be saturated by the evaluation time t^* . This will yield a proposition of type $\langle s, t \rangle$ which, when evaluated in the actual world, yields the following truth conditions:

- (41) a. $[_{TP} \text{ a dog } 1 [_{TP} t^* \mathbf{P5}_i [_{AspP} \text{ PFV } [_{vP} \text{ President } t_1 \text{ buy }]]]]$
 b. $\llbracket \text{ The President bought-P5}_i \text{ a dog } \rrbracket^{c,g} = \text{T in } w \text{ iff}$
 $\exists x. \text{dog}(x) \text{ in } w \ \& \ \exists t'. t' \prec t^* \ \& \ t' \subseteq g(i) \ \& \ \exists e. \tau(e, w) \subseteq t' \ \& \ \text{buy}(e, w)$
 $\ \& \ \text{Ag}(e, w) = \text{The President} \ \& \ \text{Th}(e, w) = x$

The semantics in (41) correctly predict that a monoverbal sentence with Past 5 will be true in any past tense context regardless of the remoteness of the time or the type of evidence the speaker has for the assertion. It is the pragmatic competition between tenses that leads to the restricted distribution of Past 5 sentences. I turn to this in section 4.4.

The analysis presented here makes two predictions about the behavior of tenses in embedded environments which I am unable to test at this time. First, I have given all the Mvskoke past tenses denotations of the same semantic type: $\langle \langle i, st \rangle, \langle i, st \rangle \rangle$. They introduce a time and shift that time into the past of an evaluation time, which is either the utterance time t^* or a time provided by a higher tense. In the matrix clauses and the auxiliary construction data we have seen so far, Pasts 1-3 were always interpreted relative to the utterance time and the speaker of the utterance context was always the individual coming to believe the proposition. However, this analysis makes predictions which call these two generalizations into question. First, it predicts that it should be possible for Pasts 1-3 to 1) embed under another tense operator and 2) to locate a time within an interval that is evaluated relative to a time other than the utterance time. Secondly, it predicts that the individual argument of the COME-TO-BELIEVE predicate should not be able to shift from the speaker of the utterance context to the subject of an embedded clause. The empirical data on the embeddability of Pasts 1-3 is incomplete at this time, however relevant data would come from embedding Pasts 1-3 in intensional environments such as under verbs of saying or thinking.

4.4 Competition between tenses

In the preceding discussion, the empirical data led me to propose a semantics for a Past 5 sentence that is both non-evidential and non-graded. Given these semantics, Past 5 is true in direct evidence contexts and compatible with any past

time. Consequently, my analysis as it stands does not explain why speakers reject Past 5 in direct evidence contexts in the P1 and P2 (and presumably also P3) intervals. I propose that pragmatic competition between the weaker Past 5 and stronger Pasts 1-3 is responsible for the indirect evidence and temporal remoteness inferences associated with the use of Past 5.

The pragmatic reasoning involved in Mvskoke is similar to the reasoning that results in Scalar Implicatures. Scalar Implicatures arise when two or more lexical items form a scale of informativity and the less informative item is used. If the speaker is being cooperative, then Grice's first maxim of Quantity (Make your contribution as informative as required) will result in reasoning to the effect that the more informative item is false. Usually, informativity is defined in terms of logical entailment. Utterances with the more informative item asymmetrically entail utterances with the less informative item. Given the semantics of the COME-TO-BELIEVE predicate introduced above, a P2-sentence (as illustrated in (42-a)) does not logically entail a P5-sentence (as illustrated in (42-b)). Informativity defined in terms of logical entailment will not be able to account for the pragmatic competition between Pasts 1-3 and Past 5.

- (42) a. $\llbracket \phi\text{-P2}_i \rrbracket = \text{T iff } \exists t'. t' \subseteq \text{P2-interval}(t^*) \ \& \ t' \subseteq \text{g}(i) \ \& \ \text{COME-TO-BEL}(\text{sp}(c), t', \phi(t'))$
 b. $\llbracket \phi\text{-P5}_i \rrbracket = \text{T iff } \exists t'. t' \prec t^* \ \& \ t' \subseteq \text{g}(i) \ \& \ \phi(t')$

If however, we define informativity in terms of assertability as in (43), then we can explain the Scalar Implicature-like reasoning associated with the use of Past 5.¹²

- (43) *Informativity* (defined in terms of assertability)
 A sentence p is more informative than another sentence q if i) in every context in which p can be asserted q can be asserted, and ii) the reverse does not hold.

In every situation where $\phi\text{-P2}$ can be asserted, $\phi\text{-P5}$ can also be asserted. There are two components of meaning that make this so. First, since the P2-interval is an interval of past time, both sentences assert the existence of a past time at which ϕ holds. Second, the COME-TO-BELIEVE predicate asserts that $\phi(t')$ follows from the speaker's beliefs; given the nature of assertion and sincerity conditions, a speaker would not assert a P5 sentence if $\phi(t')$ didn't follow from their beliefs. Indeed, if speakers want to convey a lack of commitment to the truth of a P5 sentence, they must explicitly do so through the use of epistemic modals or an outright denial.

A P5 sentence is thus less informative than a sentence with P1, P2, or P3 in that it doesn't narrow down the temporal interval and it does not add the information about coming to believe ϕ as it took place. When a speaker uses the less-informative P5, one infers either that the speaker did not find out as the event took place or that the event did not take place in the P1, P2, or P3 intervals. This disjunction of implicatures is due to the two ways to make the P1, P2, or P3 sentence false. To see this, let us consider what the scale of strength would need to be for the tenses. Consider the scale in (44):

- (44) $\langle \text{P5}, \{\text{P3}, \text{P2}, \text{P1}\} \rangle$

¹² I thank Seth Cable for suggesting this approach to the competition between P1-P3 and P5.

The P1-P3 tenses cover disjoint intervals of time each of which are also covered by P5. Thus the scale of strength is such that P5 is the weaker alternative for each of the evidential tenses. The assertion of a P5 sentence will be pragmatically strengthened by conjoining the negation of all stronger alternatives. Thus the semantics of a P5 sentence illustrated in (45-a) will be conjoined with the negation of the disjunction of the P3, P2, and P1 alternatives, illustrated in (45b-d).

- (45) a. $\exists t'.t' \prec t^* \ \& \ t' \subseteq g(i) \ \& \ \phi(t')$
 b. $\wedge \neg[\exists t'.t' \subseteq \text{P3-interval}(t^*) \ \& \ t' \subseteq g(i) \ \& \ \text{COME-TO-BEL}(\text{sp}(c),t',\phi(t'))]$
 c. $\vee \exists t'.t' \subseteq \text{P2-interval}(t^*) \ \& \ t' \subseteq g(i) \ \& \ \text{COME-TO-BEL}(\text{sp}(c),t',\phi(t'))]$
 d. $\vee \exists t'.t' \subseteq \text{P1-interval}(t^*) \ \& \ t' \subseteq g(i) \ \& \ \text{COME-TO-BEL}(\text{sp}(c),t',\phi(t'))]$

Simplifying (45b-d) by De Morgan's Law will result in the negation of each of the disjuncts. The resulting pragmatically strengthened utterance can be paraphrased as in (46).

- (46) There is a past time at which ϕ holds,
 and there is not a time in the P3 interval at which the speaker learned of ϕ as it took place,
 and there is not a time in the P2 interval at which the speaker learned of ϕ as it took place,
 and there is not a time in the P1 interval at which the speaker learned of ϕ as it took place.

For the alternatives to be false, it is sufficient for either i) the time the eventuality held (t') to not fall within either the P3, P2, or P1 interval, or ii) for the speaker to not have learned of the eventuality at the same time as the eventuality held. When reasoning about the utterance, if the speaker has made it clear (perhaps through the use of a first person pronoun as in (15)) that they did learn of ϕ as it took place, then the interlocutor will draw a temporal remoteness inference - they will conclude that ϕ must have fallen outside the P1-P3 intervals. If however, the speaker makes it clear (perhaps through the use of a temporal adverbial) that ϕ took place in one of the graded intervals, then the interlocutor will draw an indirect evidence inference - they will conclude that the speaker must not have learned of ϕ as it was taking place.

Accounting for the distribution of Past 5 with Gricean quantity implicatures predicts that when neither evidence type nor temporal interval is relevant to the conversation, Past 5 should be felicitous in direct witness contexts in the P1, P2, or P3 intervals. While I have not yet confirmed this in elicitation, textual examples suggest that this prediction is on the right track. The following example is drawn from an 1883 letter to A.E.W. Robertson. The author of the letter describes his experience in a Baptist church and discusses the teaching he heard there. He uses Past 5 to describe his visit to the Baptist church even though it is clear that he has first-hand evidence for his visit and locates it in the Past 2 interval with the phrase *nettv-cako vmkēn* 'last Sunday' in (47-a).

- (47) a. Momen **nettv-cako vnkēn** likiyat
 mo:m-ín **nitta-cá:ko =ankí:-n** lēyk-ay-a:t
 be.SO.IMPF-DS **Sunday** =**last-ACC** sit.SG.PFV-1.SG.AG-COMP
 en hvsvklatkv-fvccvn vkerkv hokkolen ayit
 in- hasakla:tka-fácca-n akí:ka hokkó:li-n â:y-ey-t
 3.DAT- west-direction-ACC mile two-ACC go.SG.PFV-1.SG.AG-SS
 ‘And now, last Sunday I traveled two miles west of my home,’
- b. Este-lvste tvlofvn ce hocefkēn
 isti-lasti- taló:fa-n ci- hocífk-i:-n
 person-black- town-ACC 2.PAT- be.called-DUR-DS
 erorit
 iḷ-ó:ḷ-ey-t
 DIR-arrive.SG.PFV-1.SG.AG-SS
 ‘and arrived at a black town which bears your name,’
- c. mēkusvpov-cukon ecēyvyvtēs.
 mi:kosapka-cóko-n i-ci:y-ay-**áti:-s**
 prayer-house-ACC 3-enter.IMPF-1.SG.AG-**P5-IND**
 ‘and entered a church house...’
- d. Momof erkenkv hvmket Este-cate liken
 mo:m-ôf iḷkináka hámki-t isti-cá:ti lēyk-in
 be.SO.IMPF-when preacher one-NOM person-red sit.SG.PFV-DS
 heciyvtēs.
 hi:c-ay-**áti:-s**
 see.IMPF-1.SG.AG-**P5-IND**
 ‘And seated inside I saw an Indian man, a preacher.’

(Tanyan 1883, *glossing added*)

The (a) and (b) examples establish the temporal location in the P2-interval and the evidence source as direct perception. In spite of this being a context in which Past 2 is the most informative tense, the author uses Past 5 in both (47-c) and (47-d). I argue that since the content of the teaching at the church is the main topic of conversation, the temporal interval and evidence source are conversationally irrelevant. As a result, Past 5 is felicitous.

5 Conclusions

This study has taken a close look at the evidential inferences associated with Mvskoke’s past tenses and provided novel evidence supporting the existence of a divide between the graded, evidential Pasts 1-3 and the non-graded, non-evidential Past 5. Pragmatic competition between the tenses, and not lexical semantics, is responsible for the temporal remoteness and indirect evidential inferences associated with Past 5. This work supports a novel analysis of Pasts 1-3 wherein both their temporal and evidential inferences follow from their lexical semantics. As discussed, so-called evidential tenses are present in a wide range of unrelated languages. The evidence from Mvskoke and from simultaneous learning contexts made it possible to distinguish between the predictions of the two prominent approaches to evidential tenses. Mvskoke Pasts 1-3 were shown to be sensitive to the time of

evidence acquisition/coming to believe and not to the location of the event and the speaker.

My proposed analysis of the evidential Pasts 1-3 involved reference to a moment of *coming-to-believe* without encoding evidence source *per se*. Instead the “evidential” component of Pasts 1-3 was derived through relations between the moment of *coming-to-believe* and lower tense or viewpoint aspect. My formalization is thus a simplification of other temporal approaches, such as Lee (2013) for Korean *-te/-ney* and Smirnova (2013) for the Bulgarian evidential participle (EVP). Both of these authors include an evidential restriction in their semantics. This may not be strictly necessary if one adopts the Belief-State Change analysis presented here. The main reason for the evidential restrictions that Lee (2013) and Smirnova (2013) propose are that the evidential-tenses in these languages are incompatible with reasoning-based inference. They present contexts in which the speaker reasons, based on past experience or their understanding of the preferences of the agent, that a certain proposition holds (see Lee 2013, 5-6 and Smirnova 2013, 491). Under the Belief-State Change analysis, the infelicity of evidential-tenses in these contexts is due to the reasoning involved failing to justify a change in belief on the part of the speaker. Inference based on results, however, does justify a change in belief and is acceptable with evidential-tenses in all three languages. The cross-linguistic difference in compatibility with certain evidence types are summarized in Table 3.

Table 3 Compatibility with Indirect Evidence Types

	Results-Based Inference	Reasoning-Based Inference	Written Sources	Hearsay
Mvskoke P1-P3	✓	predicted: ✗	✗	✗
Korean <i>-te/-ney</i>	✓	✗	✓	✗
Bulgarian EVP	✓	✗	✓	✓

The discussion above introduced the idea that the kind of evidence a speaker has may or may not provide them with the degree of certainty required to add a proposition to their belief state. One could imagine that languages have different thresholds for the degree of certainty a speaker needs before they can say they *believe* a proposition. This point of variation could be responsible for the differences we see in compatibility of evidential-tenses with indirect evidence types. In a language like Mvskoke where the threshold for believe is high, evidence from written sources, hearsay, and reasoning-based inference would not bring the speaker to the required degree of certainty. In Korean and Bulgarian the threshold may be lower so that written sources do meet the minimum degree of certainty for belief. Variation in the threshold for belief would, in most cases, interact with evidence type as I have sketched. However it would not necessarily be reducible to compatibility with evidence types. A particular written source might be considered highly reliable and justify a greater degree of certainty on the speaker’s part than other written sources. It is also possible for visual evidence to be unreliable as in situations of hallucination, for example.¹³

¹³ Thanks to Ana Arregui for discussion on this topic.

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Conflict of interest

The authors declare that they have no conflict of interest.

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