

Semantics of Tense in Nominals

1. Introduction

In many languages, only verbs can be inflected for tense, so much so that tense inflection has often been treated as a characteristic property of verbs (see Baker 2004, pp. 46-47). Nevertheless, it is well known that the temporal interpretation of noun phrases can be independent from that of the verb (Enç 1981, 1986, Musan 1995, 1999). Furthermore, temporal markers are attested on nouns in some languages (Nordlinger & Sadler 2004). This raises the question whether the semantic category of tense is relevant to the interpretation of nominals.

In their seminal study of tense, aspect, and mood inflection in nominals, Nordlinger & Sadler (2004) identified two types of nominal temporal markers: *propositional* markers are attested on nominals but contribute temporal information “relevant to the clause as a whole” (Ibid.: 790), while *independent* markers contribute temporal information local to the nominal. This chapter discusses the semantics of independent temporal markers in nominals, with a focus on past markers.

Ever since Tonhauser’s (2006, 2007, 2008) influential study of Paraguayan Guaraní, the study of independent nominal temporal markers (henceforth: NTMs) has been dominated by the question whether such markers are best analyzed as instances of tense or of another category. Consequently, a significant part of this chapter will be devoted to this question.

The chapter is structured as follows: §2 reviews work on the temporal interpretation of noun phrases in English, in the absence of NTMs. §3 introduces independent NTMs through a discussion of Nordlinger & Sadler’s (2004) study. §4 discusses the interpretation of NTMs in Paraguayan Guaraní and Mbyá Guaraní, two languages that have been central to the debate on the relation of NTMs to verbal tenses. §5 describes discourse related uses of NTMs in Mvskoke (Johnson 2022). §6 concludes.

2. Temporal Interpretation of Noun Phrases

The denotation of many common nouns is time dependent, insofar as their extension varies with time. To illustrate, no adult individual is in the extension of the noun *child*, although they each were at some past time. This observation raises the question whether the temporal interpretation of noun phrases can be independent from that of the verb. Enç (1981, 1986) demonstrates that this is indeed the case. In example (1), the copula is inflected in the present tense, yet the most salient interpretation of the sentence is that every individual that was a fugitive at some (salient) past time is in jail at the time of utterance. In other words, while the time of evaluation of the predicate *be in jail* is set to the utterance time by the present tense, the time of evaluation of the noun phrase *every fugitive* is an independently provided past time.

(1) Every fugitive is now in jail. (Enç 1986: 409)

Enç (1981, 1986) concludes from such examples that the time of evaluation of noun phrases is determined contextually, independently from tense on the verb. More precisely, Enç (1986) proposes that verbs and nouns must both be provided with temporal arguments. In the case of a finite verb, this argument is

saturated by a tense,¹ which denotes a time. In the case of a noun, this argument is saturated by a covert temporal pronoun, whose denotation is inferred based on contextual clues.

Enç's analysis predicts that all noun phrases should be interpretable independently from tense, provided an appropriate time interval is salient enough in the context. To the contrary, Musan (1995, 1999) argues that some noun phrases must be interpreted at the situation time of the main predicate of their clause, that is to say, at the time at which the main predicate holds of its arguments. Such noun phrases are said to be temporally dependent. To illustrate, the noun phrase *many fugitives* in example (2) must be predicated of individuals that are fugitives (from some other place) at the time of their being in jail. This sentence lacks a reading according to which many individuals who were fugitives at some past time are in jail at the utterance time:

(2) There are now many fugitives in jail. (Musan 1995: 11)

The temporal dimension of noun phrase interpretation has also been discussed in connection with such prefixes and modifiers as *ex-*, *former*, *post* or *future*. Jespersen (1924: 282) observed that such suffixes offer "a feeble approximation" to the semantics of verbal tenses. The modifiers *ex-*, *former* and their kin have received some attention in formal semantics, see notably Dowty et al. (1981), Larson & Cho (2003) and Tonhauser (2006) for English. In German, see Meibauer & Scheerer (2008) and Rothstein (2009). The consensus however is that such modifiers are either adjectival or derivational in nature and therefore not part of a temporal inflectional system (see next section for references and discussion of this point).

In sum, there is ample evidence that some noun phrases are temporally independent from the time of the verb in English and German, two languages without NTMs. For a more detailed overview of this phenomenon, see Tonhauser (2020).

3. Introducing Nominal Tense

Nordlinger & Sadler (2004) aim to establish the existence of tense/aspect/mood (TAM) as an inflectional category for nominals, through a survey of TAM marking in a variety of languages of the world. A central issue in the survey is how to define nominal TAM in such a way as to exclude occurrences of TAM markers that should not be considered part of the nominal inflectional system. Nordlinger and Sadler identify nominal TAM by the following characteristics:

(3) Characteristics of nominal TAM (Nordlinger & Sadler 2004: 778)

- i. Nouns (or other NP/DP constituents) show a distinction in one or more of the categories of tense, aspect and mood, where the categories are standardly defined as they would be for verbs.
- ii. This TAM distinction is productive across the whole word class and not simply restricted to a small subset of forms.
- iii. The TAM distinction is not restricted to nominals functioning as predicates of verbless clauses but is encoded on arguments and/or adjunct NP/DPs in clauses headed by verbs.
- iv. The TAM marker is a morphological category of the nominal word class and cannot be treated as a syntactic clitic that merely attaches phonologically to the NP/DP.

¹ Enç (1986) explicitly ignores the complications that arise from aspect, see Enç (1986, p. 421) and footnote 19.

(3.i) entails that tense should be defined identically in the nominal and verbal domains. As we will discuss in §4, this has been a major source of contention in subsequent studies of NTMs. Incidentally, Nordlinger & Sadler (2004) do not offer an explicit definition of tense. (3.ii) rules out such markers as the derivational prefix *ex-* in English, which is restricted to nouns denoting occupations and non-kin relationships (cf. Dixon 2014: 113-114). (3.iii) rules out NTMs restricted to predicative uses of nominals, as illustrated in example (4). Nordlinger & Sadler (2004: 777) reason that in such cases, the presence of TAM marking on the nominal can be attributed to its being a clausal predicate or head:

- (4) Abaza (Northwest Caucasian; O’Herin 1995: 127 *apud* Baker 2004:51)

Y-aba	də-ʃ̣i-maxč̣i’a-b
3SM-father	3S-goatherd-STAT/PRES
‘His father is a goatherd.’	

Finally, (3.iv) rules out clitics that attach to nominals but may originate outside the noun phrase, such as the cliticized future auxiliary *’ll* in English.

Within the inventory of markers that meet the criteria in (3), Nordlinger and Sadler make a further distinction between independent and propositional nominal TAM markers. Independent nominal TAM markers specify parameters of interpretation of the nominal itself. This is illustrated in example (5), where the nominal past marker *-lh* specifies the time of evaluation of the noun phrase *thel sí:lá:lh* (‘my late grandmother’):

- (5) Halkomelem Salish (Salishan; Brent Galloway pc. to Nordlinger & Sadler 2004: 782)

El-éliyemet-tsel-cha	the-I	sí:lá:-lh.
REDUP-dream.about-1SG.SUBJ-FUT	the.F-my	grandparent-PST
‘I’ll be dreaming about my late grandmother.’		

By contrast, propositional TAM markers specify parameters of interpretation of the most local clause head within which the nominal is embedded, as illustrated by example (6), where the nominal past marker *-ke* specifies the time of evaluation of the verb *óso* (‘go’):

- (6) Sirionó (Tupian; Firestone 1965: 37-38; Nordlinger & Sadler 2004: 795)

Ési-ke	óso	ñá	íi-ra.
woman-PAST	go	near	water-to
‘The woman went near the water.’			

Nordlinger & Sadler’s (2004) identify independent nominal TAM in 12 languages. Out of these, 11 are indigenous to the Americas, 8 of them from South America and 3 from North America. Since this chapter focuses on independent nominal tense/temporal marking, the reader is referred to Nordlinger & Sadler (2004) for a discussion of propositional nominal TAM.

4. Are Nominal Temporal Markers Tenses?

4.1 Nominal Temporal Markers in Paraguayan Guaraní

In an influential sequence of publications, Tonhauser (2006, 2007, 2008) explores the distribution and interpretation of Paraguayan Guaraní nominal temporal markers and argues that they should not be

Tonhäuser (2007) adopts a neo-Reichenbachian model of tense and aspect (Reichenbach 1947, Klein 1994), according to which tense relates a reference time (RT) to a perspective time, which in deictic uses of tense corresponds to the utterance time (UT). In this model, aspect relates RT to the situation time ST of the eventuality that the verb phrase is predicated of. This is illustrated by examples (7a) and (7b).

- For the interpretation of nominals, Tonhauser (2007) motivates the introduction of three temporal parameters, as defined in (8).

- In intransitive nominals that are not modified by temporal markers, t_{poss} is irrelevant and $t_{\text{np}} = t_{\text{nom}}$. Tonhauser demonstrates that the noun-phrase time of such nominals can be interpreted at the reference time, the utterance time, or a contextually given time, just as in English and German. The last option is illustrated by example (9).

- The lexicon of Paraguayan Guaraní includes two NTMs, *-kue* and *-rã*.² Tonhauser characterizes their interpretation in terms of four properties: the precedence meaning property, the change-of-state meaning property, the existence meaning property, and cooccurrence restrictions with semantic noun classes.

² A third NTM, *-range*, is analyzed as the combination of *-rã* and *-ngue*, which is the nasal/voiced allomorph of *-kue* (Tonhauser 2007: 859).

- (10) $t_{\text{poss}} < t_{\text{np}} = \text{RT} = \text{UT}$
 Che a-reko peteĩ lívro de medisína, che-aguélo mba'e-kue.
 B1SG 1SG-have one book of medicine B1SG-grandfather thing-KUE
 'I have a medicine book, it was my grandfather's.' (Tonhauser 2007: 836)

- (11) $\text{RT} = \text{UT} = t_{\text{np}} < t_{\text{nom}}$
 Che-memby, peteĩ chokokue-rã, o-ho gueteri eskuela-pe.
 B1SG-child one farmer-RA A3-go still school-PE
 'My child, a future farmer, still goes to school.' (Tonhauser 2007: 837)

The **change-of-state meaning property** of *-kue* states that the property or relation denoted by the nominal expression it modifies ceased to hold prior to the noun phrase time. This is illustrated by example (12), where *Juan peteĩ mbo'ehara-kue* entails that Juan stopped being a teacher before the noun phrase time. Tonhauser argues that the property denoted by the noun may hold again of the individuals that the noun is predicated of at the noun phrase time. The felicity of example (13) is given as evidence.

- (12) Juan peteĩ mbo'ehara-kue, #ha mbo'ehara gueteri
 Juan one teacher-KUE and teacher still
 'Juan is a former teacher, #and he is still a teacher.'
- (13) Juan peteĩ mbo'e-ha-ra-kue, ha ko'agã mbo'e-ha-ra jey.
 Juan one teach-NOM-AG-KUE and now teach-NOM-AG again
 'Juan is a former teacher, and now he's a teacher again.'

With *-rã*, the change-of-state property conveys that the property or relation denoted by the nominal begins to hold after the noun phrase time. This is illustrated in (14).

- (14) Kuehe a-hechapeteĩ abogado-rã-me.
 yesterday A1SG-see one lawyer-RA-PE
 #A-hecha-ramo-gua-re ha'e abogado-ma.
 A1SG-see-COND-OF-RE 3.PRON lawyer-already
 'Yesterday I saw a future lawyer. #When I saw him he was a lawyer already.'
 (Tonhauser 2007: 839)

The **existence meaning property** of *-kue* states that noun phrases suffixed with *-kue* can only be true of entities that exist both at the noun phrase time and at the nominal time. Consequently, the noun phrase *pa'i-kue* ('priest-KUE') cannot be predicated of an individual who died as a priest, as illustrated by example (15). With possessive noun phrases that denote temporary relations, the existence property can be satisfied by the existence of the possessor at the noun phrase time, as shown in example (16).

- (15) [context: The town of San Isidro once had a priest called Jose. This man died as a priest.]

#pe pa'i-kue Jose
 that priest-KUE Jose
 'that ex-priest Jose' (Tonhauser 2007: 842)

- (16) [context: The town of San Isidro once had a priest called Jose. This man died as a priest]
 ore-pa'i-kue Jose
 B1.PL.EXCL-priest-KUE Jose
 'our ex-priest Jose' (Tonhauser 2007: 843)

With *-rã*, the existence property is weaker: it states that the modified noun phrase can only be true of entities that exist at the noun phrase time and that have a spatiotemporal continuation that exists at the nominal time. This accounts for examples like (17), where butterflies are spatiotemporal continuations of caterpillars:

- (17) [context: pointing to some caterpillars]
 Umi yso panambi-rã.
 These caterpillar butterfly-RA
 ‘These caterpillars are future butterflies.’ (Tonhauser 2007: 846)

Finally, *-kue* and *-rã* are not attested with all nouns but are subject to cooccurrence restrictions summarized in table 1. Notably, *-kue* is unattested on nouns that denotes food artifacts, natural kinds or permanent and final stage properties.

Tonhauser (2007) proposes that the precedence, change-of-state and existence properties are built in the denotations of *-kue* and *-rã*, which are reproduced in (18) and (19). Note that these denotations only apply when *-kue* and *-rã* are suffixed to a property-denoting nominal.³ In these denotations, $\tau(x)$ is the lifetime of the entity x , and $\tau(P(x))$ is a maximal interval throughout which P holds of x .

	PROFESSIONS	NONFOOD ARTIFACTS	FOOD ARTIFACTS	NATURAL KINDS (EXCEPT HUMAN RELATIONS)	TEMPORARY HUMAN RELATIONS	PERMANENT/ FINAL-STAGE HUMAN RELATIONS
<i>-kue</i>	✓	✓	*	*	✓ _{poss}	*
<i>-rã</i>	✓	✓	✓	✓	✓ _{poss}	✓ _{poss}

Table 1 The acceptability of *-kue* and *-rã* across semantic noun classes (Tonhauser 2007: 842)

- (18) The meaning of *-kue* for properties P (Tonhauser 2007: 848):

$$\forall P \forall x (KUE(P)(x) = 1 \text{ at } t_{np} \text{ in } w \text{ iff } \exists t_{nom} (t_{nom} < t_{np} \ \& \ \tau(P(x)) = t_{nom} \text{ in } w \ \& \ t_{np} \subseteq \tau(x)))$$

The precedence property of *-kue* is encoded by the statement “ $t_{nom} < t_{np}$ ” in (18). Its change-of-state property is entailed by the conjunction of the statements “ $t_{nom} < t_{np}$ ” (the nominal time t_{nom} precedes the noun phrase time t_{np}) and “ $\tau(P(x)) = t_{nom}$ in w ” (the nominal time is a maximal interval throughout which P holds of x). The existence property is encoded by the statement “ $t_{np} \subseteq \tau(x)$ ” (the noun phrase time is a subinterval of the lifetime of x).

- (19) The meaning of *-rã* for properties P (Tonhauser 2007: 850):

$$\forall P \forall x (RA(P)(x) = 1 \text{ at } t_{np} \text{ in } w \text{ iff } \forall w' \in \text{Best}(\text{Circ}, \text{NOcc}, P) \ \exists t_{nom} \exists x' (t_{np} < t_{nom} \ \& \ t_{nom} = \tau(P(x')) \text{ in } w' \ \& \ \text{cont}(x, x') \text{ in } w' \ \& \ t_{np} \subseteq \tau(x)))$$

The precedence property of *-rã* is encoded by the statement “ $t_{nom} < t_{np}$ ” in (20). Its change-of-state property is captured similarly to that of *-kue* in (18), but in the case of *-rã*, it is required to hold between the entity x that the noun phrase is predicated of, and a spatiotemporal continuation x' of x (“ $\text{cont}(x, x')$ ”) in the worlds that are optimal with respect to a circumstantial modal base *Circ* and a non-occurrence ordering source *NOcc* (cf. Dowty 1979, Portner 1998). To illustrate, sentence (17) will entail that the caterpillars that the noun phrase *panambi-rã* (‘butterfly-RA’) is predicated of will become butterflies in all

³ Tonhauser (2007) provides separate denotations for uses of NTMs that combine with relation-denoting nominals.

worlds where they develop as expected given the current circumstances, and nothing happens that would interrupt this development.

Cooccurrence restrictions with semantic noun classes are not directly encoded in the denotations of *-kue* and *-rã* but are derived from their semantic properties. Notably, *-kue* is predicted to be unacceptable with nouns that denote permanent or final stage properties of relations due to a clash between the change-of-state and existence meaning properties: when the property that a noun denotes holds of an entity until the end of its lifetime, that entity cannot both cease to have the property before t_{np} (per the change-of-state property) and continue to exist until t_{np} (per the existence property).

4.2 Against Nominal Tense: Evidence from Paraguayan Guaraní

Tonhauser (2006, 2007, 2008) argues that the semantic properties of *-kue* and *-rã* she uncovered are incompatible with an analysis of these markers as tenses. She proposes that a true nominal tense should be characterized by the following semantic properties:

- (20) The category NOMINAL TENSE (Tonhauser 2008: 337-338)
- A nominal tense marker has (at least) the following properties:
- (a) The marker occurs on nominal expressions, and its meaning affects the noun phrase it occurs with.
 - (b) The set of nominal tense markers of the language form a grammatical paradigm. This means that the grammar of the language requires that in certain grammatically specified environments the noun be marked by one and only one member of the nominal tense paradigm, parallel to verbal tense paradigms.
 - (c) In those environments where nominal tense markers are required, the markers are realized with nominal expressions without regard to the semantics of the head noun.
 - (d) The marker encodes a temporal relation between the noun-phrase time t_{np} and the utterance time (deictic tense), or between the noun-phrase time t_{np} and another contextually given perspective time (relative nominal tense).
 - (e) A pure nominal tense does not encode a state change. If the marker under consideration encodes a state change, it cannot be a pure nominal tense.
 - (f) The noun-phrase time may be anaphorically resolved in discourse.

(20) can be understood as a strengthening of Nordlinger & Sadler's (2004) definition of nominal tense. Both approaches define nominal tenses as productive inflectional markers that are interpreted as independent rather than propositional temporal operators. Where Tonhauser departs from Nordlinger & Sadler's definition is in constraining the interpretation of nominal tense in a way that reflects a neo-Reichenbachian definition of verbal tense as relating the reference time to a perspective time.⁴ By contrast, verbal aspect relates the reference time to the situation time of the verb. Criteria (b) to (f) in (20) can be derived from this definition of verbal tense as follows (cf. Tonhauser 2007: 858-861):

- In the verbal domain, tenses cannot cooccur, since the relations expressed by different tenses cannot consistently hold of the reference time and the perspective time. Likewise, nominal tenses should not cooccur (criterion b).

⁴ The perspective time of non-embedded tenses and of deictic uses of tense is utterance time. In languages with relative tense, the perspective time of embedded tenses is the situation time of the embedding predicate (Tonhauser 2007: 857).

- Verbal tenses relate the reference time to the perspective time, regardless of the semantic property of the verb phrase. Consequently, verbal tenses are attested with all verbs regardless of their semantic class. Likewise, nominal tenses should be attested with all nouns regardless of their semantic class (criterion c).
- Tonhauser considers that the counterpart of the situation time in the nominal domain is the nominal time, while the counterpart of the reference time is the noun phrase time. Consequently, a nominal tense should relate the noun phrase time to a perspective time (criterion d).
- Since verbal tenses do not relate the situation time to the perspective time, they do not encode a change of state. Likewise, nominal tenses should not encode a change of state (criterion e).
- In referential theories of tense, tenses denote the reference time, and their denotation can be resolved anaphorically (Partee 1984, Kamp & Reyle 1993). Likewise, it should be possible to resolve the noun phrase time of nominal tense anaphorically (criterion f).

Tonhauser argues that Paraguayan Guaraní NTMs violate criteria (b) to (f). As discussed in the previous subsection, *-kue* is subject to cooccurrence restrictions with semantic noun classes (violation of criterion c) and both NTMs encode a change-of-state meaning property (violation of criterion e). Additionally, *-kue* and *-rã* may cooccur (violation of criterion b), as illustrated by example (21).

- (21) A-hecha pa'i-rãngue-pe.
 A1SG-see priest-RA-KUE-PE
 'I am seeing the former future priest.' (Tonhauser 2007: 859)

Finally, Tonhauser argues that *-kue* and *-rã* locate the nominal time with respect to the noun phrase time and that the noun phrase time resists anaphoric resolution, thereby violating properties d and f.

Tonhauser (2006, 2007, 2008) concludes that Paraguayan Guaraní NTMs do not belong to the same semantic category as tense. Furthermore, she observes that none of the sources used in Nordlinger & Sadler (2004) establish that NTMs share properties with tenses other than the precedence property. This challenges Nordlinger & Sadler's (2004) conclusion that tense is attested as an inflectional category of nominals across different areas and language families.

4.3 Nominal Tense Redux

Thomas (2014) takes issue with Tonhauser's (2006, 2007, 2008) conclusion that Guaraní NTMs should not be categorized as tenses. His argument is based on an analysis of the NTMs *-kue* and *-rã* in Mbyá Guaraní, a Guaraní language closely related to Paraguayan Guaraní. Thomas shows that the four properties⁵ of Paraguayan Guaraní NTMs identified by Tonhauser also hold of Mbyá *-kue* and *-rã*. However, he offers an alternative analysis of the change-of-state property of *-kue* as a cessation implicature, a type of inference that is also triggered by verbal tenses in English and other languages. Furthermore, he proposes that the existence property is not encoded in the meaning of NTMs but results from the interaction of NTMs with existence presuppositions of noun phrases. Building on this analysis, Thomas argues that *-kue* should be

⁵ I.e., the precedence meaning property, the change-of-state meaning property, the existence meaning property and cooccurrence restrictions with semantic noun classes.

analyzed as a nominal tense, while *-rã* is best analyzed as a future oriented modal operator. This subsection focuses on the past marker *-kue*.

Remember that in Tonhauser's analysis, the change-of-state property of *-kue* states that the property denoted by the modified nominal ceased to hold before the noun phrase time, but it does not state that the property does not hold at the noun phrase time. This analysis was supported by examples such as (13). A similar example from Mbyá is given in (22). In Tonhauser's interpretation of (13), the noun phrase time of *mburuvicha-kue* is set to the time of utterance. The felicity of the continuation 'now, he is a leader again' would indicate that *Juan mburuvicha-kue* does not entail that Juan is not leader at the noun phrase time. Thomas (2014) notes however that the statement *Juan mburuvicha-kue* is ambiguous between a present interpretation ('Juan is an ex-leader') and a past interpretation ('Juan was an ex-leader'). The past interpretation can be blocked by preposing the adverb *agỹ* ('now') as in example (23). In that case, the continuation becomes infelicitous. This suggests that (22) is only acceptable when the noun phrase time of *mburuvicha-kue* precedes the time of utterance and that *-kue* conveys that the property denoted by the modified numeral does not hold at the noun phrase time.

- (22) Juan mburuvicha-kue, ha'e agỹ mburuvicha ju.
 Juan leader-PAST and now leader again
 Intended interpretation: 'Juan is a former leader, and now he is a leader again.'
 Proposed interpretation: 'Juan was an ex-leader, and now he is a leader again.' (Thomas 2014: 384)
- (23) Agỹ, Juan mburuvicha-kue, #ha'e mburuvicha ju.
 Now Juan leader-PAST and leader again
 'Now, Juan is an ex-leader, #and he is still a leader.' (*ibid.*)

Thomas argues that this reinterpretation of the change-of-state property makes it possible to analyze it as a cessation implicature, similar to implicatures triggered by the use of the past tense with stative predicates in English (Musan 1995, 1997; Magri 2009; Altshuler & Schwarzschild 2012), as illustrated by example (24):

- (24) Amanda Rippon was a Faculty Member and is a barrister at New Park Court Chambers.
 Cessation implicature: Amanda Rippon is not currently a Faculty Member. (Thomas 2014: 394)

More precisely, Thomas (2014) models the change-of-state property of *-kue* as an obligatory, embedded implicature (Chierchia 2004, Chierchia et al. 2009, Katzir 2007, Magri 2009). An exhaustivity operator EXH is inserted at the left periphery of the noun phrase, which negates alternatives to the structure in its scope. To illustrate, the structure of the modified noun phrase *opygua-kue* ('ex-priest') in (25a) is as in (25b), where t_{np} is a covert temporal pronoun that denotes the noun phrase time. As indicated in (25c), the noun phrase denotes a property of individuals x that were priests at some time t' before the noun phrase time $g(t_{np})$, and that are not priests at the noun phrase time. The alternative that is negated by the exhaustivity operator is simply the unmodified noun phrase *opygua*. Thomas adopts Magri's (2009) theory of grammatical implicatures, according to which implicatures that arise from the negation of an alternative are cancelled whenever the alternative is irrelevant. In order to account for the obligatory status of the implicature (i.e., the fact that it cannot be cancelled), Thomas (2014: 399-400) proposes that unmodified noun phrases are always relevant alternatives to noun phrases modified by NTMs.

- (25) a. opygua-kue
 Priest-PAST
 'Ex-priest'
- b. [1 [EXH [t_{np} [-kue [t₁ opygua]]]]]
- c. $\llbracket -kue \rrbracket^{w,g,c} = \lambda P.\lambda t.\exists t'.P(t') \ \& \ t' < t$
- d. $\llbracket (37b) \rrbracket^{w,g,c} = \lambda x.\exists t'.t' < g(t_{np}) \ \& \ \text{priest}(w, t', x) \ \& \ \neg \text{priest}(w, g(t_{np}), x)$

The existence property is captured as an interaction between the cessation implicature of NTMs and existence presuppositions of noun phrases. Following Musan (1995, 1997), Thomas (2014) argues that predicating a noun phrase such as *opygua* ('priest') of an individual x at a time t presupposes that x is alive at t , which we represent as $\tau(x) \circ t$. Consequently, a modified noun phrase such as *opygua-kue* should be interpreted as shown in (26), where the presupposition operator ∂ (Beaver & Krahmer 2001) is used to introduce presupposed content. Predicating this property of an individual x asserts that x was a priest at some time t' before the noun phrase time $g(t_{np})$ and that x is not a priest at the noun phrase time. In addition, the predication presupposes not only that x is alive at t' but also that x is alive at the noun phrase time. This second presupposition originates within the cessation implicature.

- (26) $\llbracket (26b) \rrbracket^{w,g,c} = \lambda x.\exists t'.t' < g(t_{np}) \ \& \ \text{priest}(w, t', x) \ \& \ \partial(\tau(x) \circ t') \ \& \ \neg(\text{priest}(w, g(t_{np}), x) \ \& \ \partial(\tau(x) \circ t_{np}))$

Thomas' analysis of the change-of-state and existence properties of Mbyá NTMs challenges Tonhauser's (2007, 2007, 2008) argument that such markers should not be categorized as tenses. Both the change-of-state and the existence properties are factored out of the denotation of *-kue* and *-rã*. Cessation implicatures responsible for the change-of-state property are also attested with verbal tense and the existence property is explained by an independent feature of nouns (existence presuppositions). Consequently, Thomas argues that the change-of-state and existence properties should not be taken as evidence that the semantics of Mbyá NTMs is distinct from that of verbal tense markers, and neither should cooccurrence restrictions on semantic noun classes, which are consequences of the change-of-state and existence properties. Under this analysis then, Mbyá NTMs satisfy criteria (c) and (e) of Tonhauser's characterization of true nominal tenses in (20). Furthermore, criterion (b) (nominal tenses cannot cooccur) is argued to be satisfied if *-rã* is a future oriented modal operator rather than a tense. As for criterion (f), Thomas argues that Tonhauser's (2006, 2007) evidence that the denotation of Guarani NTM cannot be anaphorically determined is inconclusive (see Thomas 2014: 407-409). Criterion (d) still appears to be violated by Mbyá NTMs, which relate the nominal time to the noun phrase time, rather than to some nominal counterpart of the reference time. Thomas (2014: 406-407) observes that the motivation for positing a reference time distinct from the perspective time and the situation time is provided by complex tenses, such as the pluperfect. In the absence of counterparts of complex tenses in the nominal domain, one may question the relevance of this notion for the analysis of NTMs. Thomas suggests that one can instead take the noun phrase time to be the nominal counterpart of the perspective time of a relative tense. Mbyá NTMs would then be the nominal equivalent of relative tenses in the verbal domain.

4.4 Revisiting Tonhauser’s Definition of Nominal Tense

While Thomas (2014) argued that the Mbyá Guaraní NTM *-kue* satisfies Tonhauser’s (2008) definition of nominal tense, Bertinetto (2020) challenges Tonhauser’s definition itself. At the heart of Bertinetto’s (2020) objections is the observation that morphological exponents of tense in the verbal domain commonly express aspect and modality or mood as well. To illustrate, verbal tense suffixes in Italian encode not only tense but also aspectual and mood features (Bertinetto 2020: 312). As a consequence, one should acknowledge that morphological tense markers (which Bertinetto refers to as *tense_μ*) may have interpretations that are not be reducible to the semantic category of tense (referred to as *tense_σ*). Revisiting Guaraní NTMs from this perspective, Bertinetto (2020) argues that they express a combination of tense, aspect and modality, but that they do not differ from verbal markers of tense in this respect.

5. Discourse-Related Interpretations of Nominal Tense

5.1 Mvskoke Nominal Tense

Discourse-related interpretations of NTMs locate discourse referents with respect to their order of mention. Johnson (2022) presents a detailed investigation of such uses of NTMs in Mvskoke (Creek). Mvskoke has five verbal tenses, four of which also encode evidentiality and temporal remoteness (see Mucha’s chapter in the present volume for a discussion of Johnson’s (2022) semantics of Mvskoke graded tense). Four of these tenses are attested in nominals, as summarized in table 3. Past 4 is obsolete both in its nominal uses and in its verbal uses. Following Johnson, we refer to Mvskoke tenses as P1, P2, etc.

Tense	Appearing on verbs	Appearing on nouns
Past 1	-ey	-eysí:
Past 2	-ánk	-ankí:
Past 3	-imát	—
Past 4	-ant(a)	anná:
Past 5	-atí:	-tá:ti:

Table 2: Mvskoke Verbal and Nominal Tenses (Johnson 2022: 218)

Of all three nominal tenses currently in use, only P1 and P2 have discourse-related interpretations, of which Johnson identifies two subtypes: a Shared Past Experience (SPE) interpretation and a Discourse Anaphoric interpretation. These two interpretations are illustrated by examples (27) and (28) with P1.

- (27) Context: You and I went to a hymn singing last night and met a preacher who was leading the hymns. Today at church, that preacher is here as a guest pastor. We both see him and recognize him. You notice he dropped his hymn book and want to mention that to me.

(Mv)	erkenvkv	isē	esyvhiketv	cokv	atakwihkes.
(má)	iʔkináka	=eysí:	is-yaheyk-itá	có:ka	a:-tak-wéy<h>k-is
(DEM)	preacher	=P1	INST-sing-NMLZ	book	DIR-LOC-quit<PFV.P1>-IND

‘(That)/The preacher (we met at another time) just dropped the hymnal.’ (Johnson 2022: 320)

- (28) Context: You are telling me about two young men you teach Mvskoke to. You tell me first about a young man who is very analytical and tries to understand the grammar. Then you talk to me about a second young man who is really good at picking up ways of saying things and speaks very well. How would you tell me that you saw this young man three months ago, but the first young man visited you this morning.

Hvse	tuccēnvkē,	este	mvnette	{ isē /	apunicvyisē	}
hasí	toccî:n-ankí	ísti	manítti	=eysí:	a:poneyc-ay-eys-í:	
month	three-P2	person	young	=P1	talk.about.IPFV-1SG.AG-NMLZ	

hēcvyvnks.
hî:c-ay-ánk-s
see.PFV-1SG.AG-P2-IND

‘Three months ago, I saw the young man (I was just talking about)’ (Johnson 2022: 324)

Both interpretations are also attested with P2. In SPE interpretations, P1 locates the shared experience in an interval that extends from the time of utterance to the night before, while P2 locates it at an earlier interval (Johnson 2022: 200, 222). In discourse anaphoric interpretations, “P1 identifies the referent most recently talked about and P2 identifies the referent talked about at an earlier time” (Johnson 2022: 324).

In addition to the discourse-related interpretations of P1 and P2, all three nominal past tenses have change-of-state interpretations, as illustrated in (29) with P1.

- (29) Last night, a deacon was given the authority to preach as a pastor. This morning he taught the church for the first time as pastor. I knew they were giving this deacon (that we both know) the authority to be a preacher, but I was not at church or at the ordination. Later that day I ask you, Who preached this morning?

Hvthvyvtke	-isē,	cuko-vfastv	(isē)	erkenkv
hathayātki	=eysí	coko-afá:sta	(=eysí:)	iþkináka
morning	=P1	house-caretaker	(=P1)	preacher
hahoyan		erkenahkes.		
há:<ho:>y-â:n		iþkiná<h>k-is		
make.IPFV<PASS>-COMP.DS		preach<PFV.P1>-IND		

‘This morning the former deacon who was made a preacher, preached.’ (Johnson 2022: 230)

Additionally, P5 also has decessive interpretations (i.e., the past tense conveys that the individuals that the noun is predicated of are deceased or no longer exist), as illustrated in (30). Such interpretations are unattested with P1 and P2.

- (30) Mvhakv-cuko ohhēcv tatē
maha:ka-cóko oh-hí:ca =tá:ti:
school-house LOC-see.NMLZ =P5
Decessive: ‘the late school principal’
Change of state: ‘the former school principal’ (Johnson 2022: 236)

Another difference between P1 and P2 on the one hand and P5 on the other hand is that the former are restricted to definite noun phrases, while the latter is attested with both definites and indefinites. Finally, while P1 and P2 encode temporal remoteness, P5 is a general past tense. Table 4 summarizes the differences between these three nominal tenses:

Tense	Interpretation	Distribution
P1 and P2	Discourse-related and change of state	Definites only
P5	Change of state only	Definites and indefinites

Table 3: Differences between P1/P2 and P5 (Johnson 2022: 374)

Johnson (2022: 286-289) argues that P5 should be analyzed as a temporal modifier in the extended projection of the noun, similarly to the Mbyá NTM *-kue*. The change-of-state inference of P5 is analyzed as an obligatory, embedded implicature, as in Thomas’s (2014) analysis, with the exception that nominals modified by P5 do not exhibit the existence property. By contrast, Johnson demonstrates that this analysis cannot be extended to P1 and P2, since it fails to account for discourse-related interpretations and the restrictions of these NTMs to definite noun phrases. Furthermore, it predicts that Mvskoke NTMs should compete with one another in the calculation of cessation implicatures, contrary to facts (Johnson 2022: 297-300). Johnson argues instead that P1 and P2 should be analyzed as modifiers of resource situations.

Resource situations are situation arguments of nominals that account for contextual domain restriction, such as the restriction of the noun *people* to Swedes in example (31):

- (31) Sweden is a funny place. ... Most people really dislike foreign tennis players.
(von Fintel 1994, Johnson 2022: 301)

Johnson argues that resource situations are introduced by determiners and only by strong determiners. As a consequence, P1 and P2 are predicted to be unattested with indefinite noun phrases. The denotations proposed for definite determiners and P1/P2 tenses are as specified in (32) and (33), where *P1-interval* and *P2-interval* are properties of intervals that capture the restriction on temporal remoteness introduced by P1 and P2. Note that in these denotations, a resource interval t_r is used in place of a resource situation.

- (32) $\llbracket \emptyset_{\text{def}} \rrbracket^{\text{w}, \text{g}, \text{c}} = \lambda t_r. \lambda P. \exists! x [x \in C \ \& \ P(x)(t_r)]. \iota x. P(x)(t_r)$ (Johnson 2002: 306)

(33) Nominal P1 and P2 (Johnson 2002: 305):

- a. $\llbracket P1 \rrbracket^{t_0} = \lambda t': t' \subseteq \text{P1-interval}(t_0). t'$
- b. $\llbracket P2 \rrbracket^{t_0} = \lambda t': t' \subseteq \text{P2-interval}(t_0). t'$

P1 and P2 convey that the resource interval argument t_r of strong determiners denotes a sub-interval of a P1 or P2 interval, as shown in (34):

(34) Tensed nominals (Johnson 2022: 307)

- a. $\llbracket [D_{def} t_r P1 \lambda_2 [NT_2 NP]] \rrbracket^{g, t_0} = \lambda x. \llbracket N \rrbracket(x)(g(r))$
only defined if $\exists! x. x \in C \& \llbracket N \rrbracket(x)(g(r)) \& g(r) \subseteq \text{P1-interval}(t_0)$
- b. $\llbracket [D_{def} t_r P2 \lambda_2 [NT_2 NP]] \rrbracket^{g, t_0} = \lambda x. \llbracket N \rrbracket(x)(g(r))$
only defined if $\exists! x. x \in C \& \llbracket N \rrbracket(x)(g(r)) \& g(r) \subseteq \text{P2-interval}(t_0)$

Johnson further argues that whether P1/P2 receive a discourse related or a change-of-state interpretation depends on the way the semantic value of the resource interval t_r is determined. In contexts where t_r is identified with a contextually salient interval, the nominal tense receives a discourse related interpretation. SPE and discourse anaphoric interpretations correspond to different forms of contextual salience of the resource interval: SPE interpretations arise when the resource interval is introduced extra-linguistically (e.g., via visual salience), while discourse anaphoric interpretations arise when it was introduced in previous conversation. In contexts where the resource interval cannot be resolved to a contextually salient interval, it is interpreted by default as a maximal interval throughout which the nominal predicate is true. This leads to a change-of-state interpretation.

In Johnson's analysis then, P1 and P2 differ from P5 not only in their denotation but also in their syntactic height: while P5 heads a functional projection in the extended projection of the noun, P1 and P2 are modifiers of D heads (Johnson 2022: 351-352). The three tenses also differ in their deictic status. The remoteness inference conveyed by P1 and P2 is always calculated with respect to the time of utterance: P1 conveys that the resource interval it modifies lies between the time of utterance to the night that precedes it, while P2 conveys that it lies before the night that precedes the time of utterance. Consequently, P1 and P2 are interpreted deictically (Johnson 2022: 291-295). By contrast, P5 locates the time of evaluation of the noun (Tonhauser's nominal time) in the past of a time of evaluation that may be different from the time of utterance (Tonhauser's noun phrase time).

A prediction of Johnson's analysis is that P1 or P2 may co-occur with P5. This prediction is borne out, as illustrated by the naturally occurring example (35). Johnson notes that the interpretation of such examples remains to be studied.

- (35)
- | | | | | | | |
|-----|-----------|--------|---------|-----|-----------------|-------|
| Mv | vculvke | vnkē | tatē | mv | fullvtē | tat |
| ma | acol-akí | =ankí: | =tá:ti: | ma | foll-atí: | =ta:t |
| DEM | elder-GPL | =P2 | =P5 | DEM | go.about.TPL-P5 | =ATN |
- 'when our elder where here...' (Johnson 2022: 336)

5.2 Consequences for the Typology of NTMs

Extending her analysis of Mvskoke NTMs to other languages, Johnson (2022: 405-410) proposes that NTMs belong to one of two types. Low NTMs are realized as functional projections in the extended projection of the noun and only license change-of-state interpretations. Examples of such NTMs would include Guaraní *-kue*, Mvskoke P5 and possibly the Halkomelem past NTM (Burton 1997, Wiltschko 2003). High NTMs are adjoined to a strong D head and license both change-of-state and discourse related interpretations. Examples include Somali NTMs (Lecarme 1996, Ivan & Özyilidiz 2018), Mvskoke P1 and P2, as well as ʔayʔajuθəm NTMs realized on determiners (Reisinger et al. 2021). Finally, both types of NTMs may occur in a single language, as is the case in Mvskoke and ʔayʔajuθəm. The resulting classification of NTMs is illustrated in table 4.

NTMs	Languages
Low NTMs only	Mbyá and Paraguayan Guaraní (Tonhauser 2007, Thomas 2014)
High NTMs only	Somali (Lecarme 1996: et seq.)
Both	Myskoke and ʔayʔajuθəm (Reisinger et al. 2021)

Table 4: Typological Picture for Languages with NTMs (Johnson 2022: 410)

6. Conclusion

Studies of nominal temporal marking in formal semantics were spurred by Tonhauser’s (2006, 2007, 2008) study of Paraguayan Guaraní NTMs. Reacting to Nordlinger & Sadler’s (2004) seminal cross-linguistic study, Tonhauser argued that Paraguayan Guaraní NTMs should not be categorized as tense and called into question the existence of nominal tense. The question whether tense is attested in nominals has remained at the heart of subsequent studies of NTMs. While Tonhauser’s arguments have met with objections (Nordlinger & Sadler 2008, Thomas 2014, Bertinetto 2020), the debate is still open.

An important contribution of Tonhauser’s work was the identification of the change-of-state and existence inferences associated with NTMs. Subsequent work has attempted to analyze some change-of-state inferences as cessation implicatures, thereby narrowing the gap between the interpretation of NTMs and verbal tense (Thomas 2014, Ivan & Ozyildiz 2018, Johnson 2022). Existence inferences have received comparatively less attention, although they have been likened to lifetime effects observed in the verbal domain (Thomas 2014, cf. Musan 1997 on lifetime effects).

More recently, Johnson’s (2022) work has greatly expanded our understanding of crosslinguistic variation in the interpretation of NTMs. Johnson identifies two types of NTMs, which can co-occur in a single language: low NTMs associated with a change-of-state interpretation and high NTMs associated with a discourse related interpretation. Johnson’s study of Mvskoke also established that remoteness distinctions encoded in some verbal tenses are also attested in the nominal domain.

Because this chapter focused on studies of NTMs in formal semantics, it was not possible to give justice to the rich descriptive literature on this phenomenon. In addition to the primary references discussed in Nordlinger & Sadler's (2004) typology, the reader may consult the following references, organized by language: Ashéninka Perené (Arawak; Mihas 2013), ɣayʔaʃuθəm (Salishan; Reisinger et al. 2021), Chorote (Mataguayo; Carol 2015), Halkomelem (Salishan; Wiltschko 2003), Kuikuro (Carib; Franchetto & Santos 2009), Movima (unclassified; Haude 2011), St'át'imcets (Salishan; Demirdache 1997), Tariana (Arawak; Aikhenvald 2022), Tikuna (Tikuna-Yuri; Montes 2019), Tsou (Austronesian; Chang 2015), and Tundra Nenets (Uralic; Nikolaeva 2015).

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