Theories of meaning in the field: Temporal and aspectual reference

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1   Introduction

Many linguists make it their goal to describe the grammars of under-studied languages that do not yet play a role in linguistic theorizing. Describing languages is challenging for many reasons, including the following two. First, describing the grammar of an under-studied language is a complex, and therefore potentially daunting, task. Second, the description needs to properly reflect the "genius" of the language (Sapir 1921) without being excessively influenced by pre-conceived notions about better-studied languages, but while still allowing for meaningful comparisons to the grammars of other languages. Meeting this second challenge is particularly important given the fast rate at which languages are dying and the pressing need for bringing evidence from these languages to bear on theories of meaning and on the study of language variation and universals. We argue in this paper that these challenges can be met by the informed and cautious use of theory.

Benefits and pitfalls of involving theory in language description have been widely discussed, mainly with an eye towards phonetics, phonology, morphology and syntax (see e.g. Dixon 1997; Gil 2001; Hyman 2001; Noonan 2005; Rice 2005; Dryer 2006; Rice 2006; Haspelmath 2010a). In the study of meaning, however, the interplay between theory and fieldwork-based description has received less attention. Matthewson (2004), the only paper outside this volume to discuss general methodology for fieldwork on meaning, introduces readers to key semantic and pragmatic notions and the intricacies involved in distinguishing them in fieldwork, but does not explicitly address the interplay between theory and fieldwork-based description. Tonhauser *et al.* (2013) develop diagnostics for exploring theoretically-informed properties of projective contents with theoretically untrained consultants, but also do not discuss the relationship between theory and fieldwork.

In general, there remains a lamentable disconnect between theories of meaning and fieldwork-based research on meaning, with several unfortunate consequences. For one, many grammars

do not discuss basic meaning properties of the languages described, focusing instead on "good descriptions of the phonetics and the phonology, as well as of the morphology and the syntax" (Noonan 2005:360; see also Rice 2005 for a discussion of the contents of grammars). Other grammars cover semantic topics but fail to define the terminology used, or use terminology in ways that do not reflect the properties of the language being described. And in some grammars, the data presented are intriguing, but the descriptions lack precision, making them unsuitable for cross-linguistic comparison and for assessing theories of meaning.

Our goal in this paper is to explicitly discuss the interplay between theory and fieldwork in the study of meaning. Specifically, with respect to the two challenges of fieldwork-based research mentioned above, we argue that i) theory can guide fieldwork on meaning, and when it does, more comprehensive descriptions of meaning result,[1] and ii) compared to linguistic fieldwork that is not theoretically informed, theoretically-informed descriptive fieldwork has greater potential for revealing the "genius" of the language under investigation (how it differs from other languages), for improving theories, and also for increasing our knowledge of language variation and universals.

We argue for these two points on the basis of fieldwork-based research on a particular domain of meaning, namely temporal and aspectual reference. In so doing, we also provide a theoretically-informed guide to exploring and providing **meaning descriptions** in this empirical domain. Meaning descriptions are statements of empirical generalizations about the form-meaning mapping in a particular language. Such descriptions form the basis for, and are therefore distinct from, formal semantic and pragmatic analyses, which rely on tools from set theory and logic to formulate compositional models of the form-meaning mapping. We also distinguish the description of a language from its documentation, which is theory-independent and aims at "creat[ing] a record of a language in the sense of a comprehensive corpus of primary data" (Himmelmann 2006:3).

We focus on this empirical domain for two reasons. First, no guide for conducting theoretically-informed fieldwork on temporal and aspectual reference is available (for an excellent cross-linguistic

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[1]Murray (this volume) makes a related point.

overview of this empirical domain, see e.g. Chung and Timberlake 1985). Second, both of us have explored temporal and aspectual reference with theoretically untrained native speaker consultants of Badiaranke (since 2004) and Paraguayan Guaraní (also since 2004), respectively. Badiaranke is an Atlantic language, spoken by 10,000 to 15,000 people in Senegal, Guinea, and Guinea-Bissau; Paraguayan Guaraní, a member of the Tupí-Guaraní family, is spoken by over four million people in Paraguay and Argentina.

After introducing in section 2 a theoretical framework for exploring temporal and aspectual reference, we discuss in detail how familiarity with this framework can guide fieldwork on temporal and aspectual reference in sections 3 and 4, respectively. Section 5 is devoted to discourse about the future, which can be realized through temporal, aspectual, modal, and mood-based strategies. Throughout these sections, we also discuss how assuming a theoretical framework can increase the potential of the descriptive work to reveal the genius of the language and to improve theory. The paper concludes in section 6 with a discussion of five requirements that theoretically-informed descriptions must meet if they are to be valuable for the study of meaning.

2   A theoretical framework for describing temporal and aspectual reference

The theoretical framework for describing temporal and aspectual reference that we introduce in this section is a neo-Reichenbachian one. This framework assumes that the temporal and aspectual reference of clauses can be described in terms of temporal relations between three time intervals, which are introduced in detail in section 2.1: the evaluation time, the topic time (sometimes also called "reference time"), and the eventuality time (Kamp and Reyle 1993; Klein 1994). The neo-Reichenbachian framework serves as a starting point for our discussions of temporal and aspectual reference in sections 3 and 4, as it is the framework both of us work in and also one that much research on temporal and aspectual reference is couched in.

The framework serves as a *tool* for accurate description, not as an ultimate, irrevocable determinant of how every language will behave. If data discovered in a language cannot be described within the framework, the data should not be discarded, nor should they be twisted into conforming to the framework. Rather, such a situation motivates modification of the framework. As Rice (2006:262) puts it: in a good linguistic description "[t]he theory informs and shapes, but does not control" the description.

2.1   Time intervals in a neo-Reichenbachian framework

We assume that clauses describe eventualities, a cover term for events and states (Bach 1986). The **eventuality time** (ET) of a clause is the time at which the eventuality it describes is temporally located; for an event, this is the time at which it occurs and, for a state, the time at which it holds. The **utterance time** (UT) is the time at which a matrix clause is uttered; it is relative to this time that the truth conditions of the clause are evaluated. But not all clauses are evaluated relative to the utterance time: some subordinate clauses, for instance, may be evaluated relative to the eventuality time of the matrix clause. The more general **evaluation time** (EvT) is therefore used to refer to the time relative to which a clause is evaluated. The third time interval assumed in neo-Reichenbachian frameworks is the **topic time** (TT), which is the interval the uttered clause is about. To illustrate the three time intervals, consider (1), adapted from Klein (1994:3f.):

(1)   Context: A judge (J) is interrogating a witness (W) in court.

J: What did you notice when you looked into the room?

W: The light was on.   [TT $<$ UT; TT $\subseteq$ ET]

The judge's question fixes the topic time as the past interval when the witness looked into the room. If the witness is a cooperative interlocutor who adheres to general conversational principles (Grice 1975), in particular the principle of making her utterance relevant to the current discourse goal, then her answer can be assumed to elaborate on what the world was like at this topic time. The eventuality time of the sentence W utters is the time at which the light was on. Competent speakers

of English understand W's utterance to convey that the light was already on when W looked into the room. That is, we understand W's utterance to convey that the eventuality time temporally includes the topic time, which precedes the evaluation time (here, the utterance time).

This framework privileges two temporal relations between these three times: the temporal relation between the evaluation time and the topic time of a clause constitutes the clause's **temporal reference**, whereas the temporal relation between the topic time and the eventuality time of the clause constitute its **aspectual reference**.[2] W's utterance in (1) is annotated with an abbreviation of its temporal reference (TT < UT) and its aspectual reference (TT ⊆ ET). (We provide such annotations for select examples throughout the paper to illustrate a variety of temporal and aspectual references attested cross-linguistically.) This notation indicates that the sentence uttered by W is only compatible with topic times that are temporally located prior to the evaluation time, which is the utterance time in (1). This restriction is due to the past tense form of the verb *to be*: past tense restricts topic times to times prior to the evaluation time, as discussed in detail in section 3. The aspectual reference of the clause W utters is the inclusion relation, i.e. the eventuality time of the state of the light being on includes the topic time, as discussed in detail in section 4.

2.2   Distinguishing temporal/aspectual reference from tense/aspect

A distinction that is crucial for the discussions in this paper is between the temporal and aspectual reference of clauses, on the one hand, and tense and aspect, on the other. We use these latter terms exclusively to refer to natural language expressions with certain properties. In particular, a **tense** is an expression that forms part of a grammatical paradigm and that constrains the temporal reference of the clause in which it occurs;[3] a (grammatical) **aspect** is an expression that forms part

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[2]Cable (2013) argues that temporal remoteness markers in Gĩkũyũ temporally relate eventuality times to evaluation times. This language thus provides evidence for a third privileged temporal relation, namely between evaluation and eventuality times. See also Comrie 1985:ch.5 on temporal remoteness markers.

[3]This definition differs from Comrie's (1985) much-cited definition of tense as "grammaticalized expression of location in time" (p.9), which does not specify *what* is located in time, e.g. the eventuality time, the topic time, or

of a paradigm and constrains the aspectual reference of the clause in which it occurs.[4]

The distinction between temporal/aspectual reference as properties of clauses and tense/aspect as expressions that constrain temporal/aspectual reference is essential for exploring the form–meaning mapping across languages. For example, whereas every language can realize clauses with past temporal reference (where the topic time precedes the evaluation time), not all languages have past tense morphemes that constrain the topic time to a past time. Likewise, every language can convey progressive aspectual reference (where the eventuality time temporally includes the topic time), but not every language has a distinguished progressive aspect marker to convey this aspectual meaning.

Keeping temporal and aspectual reference separate from tense and aspect allows precise statements about similarities and differences in the form-meaning mapping, as illustrated for English and Paraguayan Guaraní (henceforth Guaraní) in (2). In the context given, both the English example in (2a) and the Guaraní example in (2b) convey that the eventuality of the speaker bathing is ongoing at the topic time, the time when the door bell rang, which temporally precedes the utterance time. But whereas this meaning is conveyed in English by uttering a sentence with a past tense finite verb (*was*) and a progressive aspect construction (*be V-ing*), it is conveyed in Guaraní by a sentence that only consists of the verb stem *–jahu* 'bathe' inflected for first person singular.[5]

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something else altogether. It also differs from the definition of tense in Chung and Timberlake (1985:203) as locating "the event in time by comparing the position of the frame [the eventuality time, RC/JT] with respect to the tense locus." This definition of tense, as temporally relating the eventuality time and the utterance time, is also found in e.g. Zagona (1990) and Stowell (1996).

[4]A linguistic paradigm is generally defined as a set of forms that are derived from the same base form and that contrast with one another semantically and morphosyntactically (see, e.g., Beard 1995:254). Some paradigms, including the English tense paradigm, are impoverished, consisting only of an overt morpheme and an unmarked form. English modals, in contrast, are not paradigmatic by this definition, since the English modal verbs (*can, must, might*, etc.) do not share a common root.

[5]Glosses in this paper use the following abbreviations: 1, 2, 3 = 1st, 2nd, 3rd person; 1sg.3sg = 1st person acting on 3rd person (etc.); A = set A cross-reference marker; AFF.DECL = affirmative declarative clause marker; COMPL

(2) Context: I tell my mother that yesterday my door bell rang at a very inopportune moment.

My mother asks me: *What were you doing when the door bell rang?*

    a. I was bathing.   English   [TT < UT; TT ⊂ ET]

    b. A-jahu.   Guaraní   [TT < UT; TT ⊂ ET]
        A1sg-bathe
        'I was bathing.'

Thus, past temporal progressive aspectual reference is conveyed by both the English and the Guaraní utterances in (2). But only in English is this meaning is conveyed as part of the meanings of the morphemes that comprise the uttered sentence; uttered in other contexts, the Guaraní sentence is compatible with other types of temporal and aspectual reference. If we used e.g. "tense" to refer both to the temporal reference of a clause and to an expression that constrains temporal reference, as some authors do, we would need to say that both the English and the Guaraní examples have past tense, thereby obscuring the differences between the two languages.

The examples in (2) also allow us to make another point that is key for our discussions in this paper, namely the importance of considering the temporal and aspectual reference of **utterances**, i.e. sentences in context,[6] rather than of sentences in isolation. The context in (2) plays a very important role: it fixes a particular temporal and aspectual reference for the utterances. The fact that the utterances in (2a) and (2b) are judged to be acceptable by English and Guaraní speakers, respectively, in this context is evidence that they are both compatible with past temporal progressive aspectual reference, despite differing in form. Crucially, sentences presented without a context,

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= complementizer; D3 = deictic particle; DEF = definite; DET = determiner; FEM = feminine; FUT = future; IMP = imperative; IMPF = imperfective; INC = incomplete; INCL = inclusive; LOC = locative; MASC = masculine; NOM = nominative; NMLZ = nominalizer; NPST = non-past; P = preposition; PAR = participial; PFV = perfective; pl = plural; PRES = present; PRET = preterite; PROSP = prospective; Q = question; sg = singular; TERM = terminative; TOP = topic

[6]Context is taken to be the utterance context, the context in which the utterance is made, which is a body of information held in common by the interlocutors in the discourse, including information from the utterance situation, the linguistic context in which the utterance is made, as well as the information structure of the preceding discourse (e.g. Roberts 2004:197f.)

or translations of sentences into the contact language do not constitute data that can be used to evaluate hypotheses about the form-meaning mapping (as discussed in Matthewson 2004:§3 and Cover's and Deal's papers in this volume).

2.3 Theoretically-informed meaning description

The neo-Reichenbachian framework just introduced takes a particular perspective on the temporal and aspectual reference of utterances: the framework privileges three time intervals (the evaluation, topic and eventuality times) and two temporal relations between them (the temporal reference relation between the evaluation and the topic times, and the aspectual reference relation between the topic and eventuality times). Inherent to the framework is thus a very strong hypothesis regarding the form-meaning mapping in the domain of temporal and aspectual reference in any language, namely that this mapping can be described by reference to these three time intervals and two temporal relations. In particular, for any given linguistic expression of the language, the framework demands that the researcher ask whether the meaning of the expression constrains either of the two relations, and, if so, how. And for any given temporal or aspectual reference relation expressible in the framework, the researcher is held to explore how that particular relation is expressed in the language. This strong hypothesis, and the questions resulting from it, can guide fieldwork on temporal and aspectual reference in a particular language.

Another feature of the framework is that the relevant categories, such as 'temporal reference' and 'tense', are (at least partially) defined on the basis of the three privileged time intervals, not only on the basis of particular structures or morphological forms. As a consequence, the definitions of the categories provide guidance about the positive and negative evidence the researcher has to provide in support of a particular hypothesis about the form-meaning mapping. To argue, for instance, that a particular form restricts temporal reference, the researcher has to provide evidence that clauses with this form are compatible with some but not all of the possible temporal relations between the evaluation time and the topic time.

The framework can lead to more comprehensive meaning descriptions since, simply put, the language description is only complete once the contributions to temporal or aspectual reference of all the forms of the language have been identified, and once the linguistic realizations of all possible temporal and aspectual reference relations have been explored. Awareness of how temporal and aspectual reference is realized in other languages allows the researcher to identify which properties of the form-mapping in the language under investigation are cross-linguistically novel, and which ones are attested already. Descriptive research on temporal and aspectual reference within this neo-Reichenbachian framework also has the potential to lead to revisions of theories of temporal and aspectual reference, namely whenever an empirical generalization established for a particular language cannot be captured in the framework.

Despite such advantages of theoretically-informed descriptive fieldwork, some researchers argue that bringing theory into the field is problematic since, as Haspelmath puts it, theoretical frameworks may "set up expectations about what languages should, can and cannot have, and once a framework has been adopted, it is hard to free oneself from the perspective and the constraints imposed by it" (Haspelmath 2010a:303). More specifically, the worry is that working within a particular theory will lead the researcher to impose theoretically-motivated categories on the language to be described, without recognizing that "all languages have different categories" (Haspelmath 2010a:302). Thus, such researchers think it best not to use theory in language description, or to only use "atheoretical" frameworks, such as General Comparative Grammar (Lehmann 1989), Canonical Typology (Corbett 2005, 2007), Basic Linguistic Theory (Dixon 2010), and Framework-Free Description (Haspelmath 2010a,b). We argue that the aforementioned qualities of theoretically-informed descriptive fieldwork far outweigh any potential dangers.

In fact, every description is theory-dependent to some extent. Even purportedly atheoretical descriptions make some assumptions about how language is structured and how it can be described. For instance, one case study that Haspelmath uses to illustrate Framework-Free Description, a description of Tagalog syntax by Schachter and Otanes (1972), uses terms like 'core' and 'topic'. In order for a description that employs these terms to be explicit, these terms must be defined in

the context of some theoretical framework, even if these are *language-specific* theoretical terms. Rather than asking researchers to abandon their theoretical assumptions when conducting fieldwork, it seems more productive to encourage an explicit discussion of the theoretical assumptions that were made as the research was conducted. We therefore advocate for the informed and cautious use of theory in conducting descriptive fieldwork, coupled with a willingness to abandon or modify the theory in light of relevant empirical findings.

Some resistance against using a theoretical framework in language description seems to stem from the perception that such frameworks generally assume language universals in structure and the form-meaning mapping, i.e. that such frameworks generally subscribe to the Chomskyan Universal Grammar paradigm. Evans and Levinson (2009), for instance, maintain that there is "[a] widespread assumption among cognitive scientists, growing out of the generative tradition in linguistics, ... that all languages are English-like but with different sound systems and vocabularies" (p.429). Theoretical frameworks that have built-in assumptions about language structures and the form-meaning mapping may indeed be particularly likely to unduly affect descriptions of meaning in a particular language. For example, if a framework for the description of temporal and aspectual reference assumes that every sentence in any language realizes a Tense Projection (TP) with a T(ense) inflectional head, or that the topic time be introduced by a tense morpheme, there is a danger that descriptions in this framework assume such structures or morphemes without providing empirical evidence for them. But theory-informed descriptions need not make any assumptions about linguistic universals: theory-informedness merely involves doing description in a way that acknowledges the existence of, and uses as a descriptive tool, some theoretical framework. In particular, the neo-Reichenbachian framework we use in this paper (and in our research) makes no assumptions about the universality of particular syntactic structures or morpheme inventories. Rather, the framework provides the researcher with a general hypothesis about a particular domain of meaning, namely temporal and aspectual reference, and a means for providing theoretically-informed meaning descriptions that employ well-defined terminology.

3   Exploring temporal reference

In the previous section, the temporal reference of a clause was defined as the temporal relation between the topic time and the evaluation time. In other words, the temporal reference of a clause is the set of topic times it is compatible with. We speak of a clause being compatible with **past temporal reference** if the set of topic times the clause is compatible with includes ones that temporally precede the evaluation time; likewise, we speak of a clause being compatible with **present temporal reference** or **future temporal reference** if the set of topic times the clause is compatible with includes ones that overlap with or follow the evaluation time, respectively.

In exploring temporal reference in a language, one may have the goal of describing the entire language, or the more modest goal of discussing the contributions of particular expressions to temporal reference. In the context of the theoretical framework introduced in the last section, the first goal amounts to exploring hypotheses about how temporal reference is constrained in the language, and the second one involves exploring hypotheses about how certain expressions constrain temporal reference.

Cross-linguistic research has revealed that the temporal reference of clauses may be constrained by tenses, temporal adverbials, embedding constructions as well as context. Section 3.1 illustrates how temporal reference restrictions can be explored in matrix clauses, where the evaluation time is the utterance time. Section 3.2 then turns to the temporal reference of subordinate clauses. Our discussion in this section, as well as in sections 4 and 5, focuses on the kind of data that support hypotheses about temporal and aspectual reference rather than on methods for obtaining such data. One such method is judgment elicitation, but data may also be obtained from (spoken and written) corpora and questionnaires (such as that used in Dahl 1985). For discussions of methods see Matthewson (2004), Krifka (2011) and the papers in this volume, especially that by Bohnemeyer.

3.1 Temporal reference in matrix clauses

The examples in (1) and (2) already illustrated that the temporal reference of matrix clauses is constrained by context. The examples in (3) show that temporal adverbs also constrain temporal reference: whereas both (3a) and (3b) have past temporal reference since they address a contextually given question about a past topic time, the temporal adverb *yesterday* in (3a) constrains the temporal reference of the clause to the day-long interval that precedes the day that contains the utterance time, and the temporal adverb *last year* in (3b) constrains the temporal reference of the clause to a year-long interval that precedes the year that contains the utterance time. We thus understand Mario's writing to be temporally located within the interval denoted by *yesterday* in (3a) and within the interval denoted by *last year* in (3b).

(3) Context: When did Mario write an obituary? $[TT < UT; ET \subseteq TT]$

    a. Mario wrote an obituary yesterday. $[TT < UT; ET \subseteq TT; TT \text{ is yesterday}]$

    b. Mario wrote an obituary last year. $[TT < UT; ET \subseteq TT; TT \text{ is last year}]$

In some languages, temporal reference is also constrained by tenses. The past tense verb *wrote* in (3a) constrains the topic time of the clause in which it occurs to a time prior to the utterance time. This constraint on the temporal location of the topic time introduced by the tense is compatible with the constraints on the temporal location of the topic time introduced by context and the temporal adverb *yesterday*, rendering this an acceptable utterance. The example in (4), by contrast, is judged to be unacceptable.[7] We hypothesize that the unacceptability judgments are due to conflicting constraints on the temporal location of the topic time: the non-past tensed verb *writes* constrains the topic time to a time at or in the future of the utterance time, which is incompatible with the constraints on the topic time introduced by context and the temporal adverb.

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[7]We use # to indicate that the unacceptability of the utterance is hypothesized to be due to semantic/pragmatic (rather than syntactic) reasons.

(4) Context: What did Mario write?

#Yesterday, Mario writes an obituary.

In the following, we illustrate two diagnostics that are typically used to establish temporal reference restrictions in research with theoretically untrained native speakers.

Diagnostic #1: Co-occurrence restrictions with temporally locating adverbs   The first diagnostic rests on the assumption that temporally locating adverbs constrain the temporal location of the topic time, as illustrated with the examples in (3). If the expression under investigation can co-occur with a particular temporally locating adverb, this can be taken as evidence that the expression is compatible with the temporal reference restrictions imposed on the clause by the adverb. Inability to co-occur with such an adverb can support the hypothesis that the expression is incompatible with the temporal reference restrictions introduced by the adverb (assuming that one has excluded other possible reasons for the unacceptability judgment).

We illustrate this diagnostic with the so-called "present" tense verb form of Standard High German. As illustrated by the example in (5), this verb form may co-occur with the temporally locating adverbs *im Augenblick* 'right now' and *morgen* 'tomorrow', but not with *gestern* 'yesterday'. These data are compatible with the hypothesis that the "present" tense verb form of Standard High German is compatible with present and future temporal reference, but not with past temporal reference (and is therefore better referred to as a non-past tense).

(5) Im   Augenblick / Morgen   / #Gestern   **arbeite**   ich an meiner Dissertation.
    at.the moment   tomorrow   yesterday work.NPST I   at my   thesis
    'Right now I am / Tomorrow I will be / #Yesterday I was working on my thesis.'

The diagnostic can also be applied to explore temporal reference restrictions of adverbs, such as Guaraní *kuri*. In the examples in (6), *kuri* co-occurs with the verb *a-jahu* 'A1sg-bathe', which consists of a verb stem inflected only for person/number information, and various temporally locating adverbs. The fact that *kuri* can co-occur with *kuehe* 'yesterday' in (6a), but not with *ko'ãga*

'now' or *ko'ẽro* 'tomorrow' in (6b,c), provides support for the hypothesis that *kuri* restricts the temporal reference of the clause in which it occurs to topic times that precede the utterance time.

(6)   a.   Kuehe   a-jahu   **kuri**.
           yesterday A1sg-bathe PAST
           'Yesterday I bathed/was bathing.'

       b. #Ko'ãga a-jahu   **kuri**.
           now   A1sg-bathe PAST
           (Intended: 'I am bathing right now.')

       c. #Ko'ẽro   a-jahu   **kuri**.
           tomorrow A1sg-bathe PAST
           (Intended: 'Tomorrow I am going to bathe.')

However, as mentioned above, it is important to establish not only that a sentence in which particular forms co-occur is judged to be unacceptable, but also why it was judged to be so. Note, for instance, that (7), which differs from (6c) only in the omission of *kuri*, is also judged to be unacceptable (in contrast, (6b) without *kuri* is judged to be acceptable).

(7) #Ko'ẽro   a-jahu.
      tomorrow A1sg-bathe
      (Intended: 'Tomorrow I will bathe.')

(6c) thus does not provide conclusive evidence that *kuri* is incompatible with future temporal reference, since the unacceptability of that example may instead be due to the incompatibility of *ko'ẽro* 'tomorrow' with *a-jahu* 'A1sg-bathe'.

Diagnostic #2: Contextually constrained temporal reference   The second diagnostic relies on the assumption that the context in which a clause is uttered constrains its temporal reference, as illustrated with the example in (2). Thus, if an uttered clause is judged to be acceptable in a context that constrains the temporal reference of the utterance to a particular time, this provides evidence that the clause is compatible with that particular temporal reference. Unacceptability of

the utterance in such a context can support the hypothesis that the utterance is incompatible with that particular temporal reference.

We can use this diagnostic to provide further evidence for the hypothesis that the Standard High German "present" tense verb restricts the temporal reference of the clause to a non-past time. One way of contextually constraining the temporal reference of an utterance is through a question that utterance is intended to answer (as discussed in section 2.1), but assertions can also be used to constrain topic times (see e.g. example (10)). The answer utterance is thus contextually restricted to present or future temporal reference in (8a), or to past temporal reference in (8b).

(8) a. Context: What are you doing right now/tomorrow morning?

   Ich arbeite an meiner Dissertation.
   I work.NPST at my thesis

   'I am / will be working on my thesis.'

  b. Context: What did you do yesterday morning?

   #Ich arbeite an meiner Dissertation.
   I work.NPST at my thesis

   (Intended: 'I worked on my thesis.')

The observation that the answers in (8a) are judged to be acceptable, but not that in (8b), further supports the hypothesis that the "present" tense form restricts the temporal reference of the clause in which it occurs to non-past times.

We can also use this diagnostic to explore whether utterances of Guaraní clauses with *kuri* are compatible with future temporal reference. The context in (9a) restricts the temporal reference of the answer to times that precede the utterance time, i.e. past temporal reference, whereas the context in (9b) restricts it to future temporal reference. The answer utterance in (9c) is judged to be acceptable in response to (9b), but not in response to (9a). These observations support the hypothesis that (9c) is compatible with future temporal reference,[8] but not past temporal reference.

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[8]These data are also compatible, however, with the hypothesis that *ko'ẽro* 'tomorrow' temporally locates the even-

The utterance in (9d) differs from that in (9c) only in the addition of *kuri*. This utterance is judged to be acceptable in response to (9a) but not in response to (9b). These findings suggest that (9d) is not compatible with future temporal reference, but only with past temporal reference.

(9) a. Context 1: A music festival will take place tomorrow in the next town over. Yesterday, I ran into Raul, who was very grumpy. Today, I ask his mother: *Why was Raul so grumpy yesterday?*

b. Context 2: A music festival will take place tomorrow in the next town over. I discuss with my friend how the organizers had to cancel a lot of acts for financial reasons. I ask my friend: *Who will still perform?*

c. Raul o-purahéi-ta   farra-há-pe   ko'ẽro.
Raul A3-sing-PROSP party-LOC-at tomorrow
'Raul will sing at the festival tomorrow.'

d. Raul o-purahéi-ta   **kuri** farra-há-pe   ko'ẽro.
Raul A3-sing-PROSP PAST party-LOC-at tomorrow
'Raul was going to sing at the festival tomorrow.'

[TT < UT; TT > ET, ET within tomorrow]

Note that, to make this argument about (9d), it was crucial to establish not only that this example is judged to be unacceptable in the context of (9b), and differs from (9c) in this regard, but also that the example is judged to be acceptable in some context (i.e. is grammatical). What (9d) conveys in the context of (9a) is that, at the past topic time, Raul had the intention of singing at the festival; the utterance implicates that the singing event will not take place. These examples thus provide evidence that clauses with *kuri* are compatible only with past temporal reference.[9]

tuality time (see the first pitfall discussed below). In accordance with this hypothesis, Tonhauser (2011a,b) provides evidence that *–ta* 'PROSP' is not a future tense, which temporally locates the topic time in the future of the evaluation time, but a prospective aspect/modal, which temporally locates the eventuality time in the future of the topic time.

[9]Although *kuri* 'PAST' restricts the temporal reference of the clauses it occurs in, it is not a tense, given our definition of tense, since it is not paradigmatic: Guaraní clauses do not necessarily realize a temporal adverb (see Tonhauser 2010, 2011a for discussion).

Potential pitfalls   One potential pitfall of diagnostic #1 is that temporally locating adverbs may temporally locate not only the topic time of the clause but also its eventuality time. In (6c), for instance, *ko'ẽro* 'tomorrow' might also specify the time at which the event of bathing will take place (and this is the analysis advocated for in Tonhauser 2011a,b). Likewise, the temporal adverb *on Sunday* in (10) temporally locates the event of Rick submitting his homework, whereas the topic time is constrained by the preceding adverbial clause *when I talked to him on Monday*:

(10)   Rick had a homework due yesterday (Wednesday). However, when I talked to him on Monday, he told me that he had submitted it **on Sunday** already.

Thus, co-occurrence patterns with temporally locating adverbs should ideally be complemented with evidence from contextual reference restrictions.

   Another potential pitfall is a too-limited application of the diagnostics, restricted to familiar temporal adverbs and adverbial constructions. Given examples like (7), for instance, one might presume that Guaraní verbs inflected only for person/number information are incompatible with adverbs denoting future times. But exploration of a wider range of adverbs and adverbial constructions reveals that this conclusion is premature, as discussed in Tonhauser (2011b). In (11), for example, the matrix clause contains the verb *a-juka* 'I kill' and the temporal adverb *ko ka'aru* 'this afternoon', which in the given context refers to the upcoming afternoon:

(11)   Context: It's morning and the speaker is talking about a goose walking past her and the addressee.

Ja'ú-ta-re   ko gánso ko'ẽro,   **a-juka**   ko ka'arú-pe.
A1pl.INCL-eat-PROSP-for this goose tomorrow A1sg-kill this afternoon-at

'Since we are going to eat this goose tomorrow, I will kill it this afternoon.'   (Tonhauser 2011b:260)

In sum, empirically sound generalizations about temporal reference restrictions emerge from consideration of a wide variety of examples in which context or temporal adverbs constrain temporal reference.

3.2 Temporal reference of subordinate clauses

Subordinate clauses also have temporal reference (for discussion, see e.g. Enç 1987; Ogihara 1995; Abusch 1997; Gennari 2003; Kusumoto 2005; Kubota *et al.* 2009; Smirnova 2009). And since expressions that constrain temporal reference may also occur in subordinate clauses, a description of temporal reference in a language is incomplete if only matrix clauses are considered. One of the ways in which tenses across languages differ is brought out in subordinate clauses, including clauses embedded under propositional attitude verbs, relative clauses and temporal adjunct clauses. Some tenses are **absolute**, which means that the evaluation time relative to which they constrain the temporal location of the topic time is the utterance time in both matrix and subordinate clauses. Other tenses are **relative**, which means that the evaluation time relative to which they constrain the topic time is the utterance time in matrix clauses but a time other than the utterance time in subordinate clauses, typically the matrix clause eventuality time.

The contrast between absolute and relative tenses is illustrated with the pair of examples in (12): both the English example in (12a) and the Japanese example in (12b) convey, in the given context, that Anna was sick at the past time of Ken's report. In the English example, the verb in the subordinate clause is marked with a past tense, whereas it is marked with a non-past tense in the Japanese example.

(12)   Adapted from Kubota *et al.* (2009:310)

Context: Anna was sick yesterday when Ken visited her. Immediately after his visit, Ken told Sandra: "Anna is sick." Earlier today, Sandra told her mother:

a. Ken said that Anna was sick.

b. Ken-wa Anna-ga   byooki da   to   it-ta.   Japanese
Ken-TOP Anna-NOM sick   be.NPST COMPL say-PAST
'Ken said that Anna was sick.'

This observation suggests either that the tenses in the two languages do not have the same meanings, or that the tenses have the same meanings but that the two languages differ in their syntax-

semantics interfaces (see the references above for proponents of the two proposals). On the former proposal, one might argue that the English past tense in (12a) is an absolute tense, whereas the Japanese non-past tense in (12b) is a relative tense.

The reading of (12a) is sometimes referred to as a temporally 'overlapping' reading. This reading is in contrast to a temporally 'back-shifted' reading of the same example in a different context, which conveys that Anna was sick at a time prior to Ken's saying. In Japanese, the back-shifted reading is realized with a (relative) past tensed complement clause. The observation that, in English, a past tensed complement clause embedded under a past tensed matrix clause can lead to a temporally overlapping and a back-shifted reading has been taken by some as a motivation for saying that English past tense is relative (like in Japanese) and that the two languages differ at the syntax-semantics interface; specifically, with respect to whether a "Sequence of Tense" rule is available (see references above).

To determine whether a tense is relative or absolute, it is necessary to identify whether its evaluation time in subordinate clauses is the utterance time, as can be argued for the English example in (12a), or whether it may be some other time, such as the matrix clause eventuality time, as in the Japanese example in (12b). For a discussion of how different propositional attitude verbs affect the temporal reference of the subordinate clause, see Smirnova (2009).

Another example of a subordinating construction that may affect temporal reference is temporal adjunct clauses with *after* and *before*, exemplified in (13). These two expressions convey a temporal ordering between the eventualities described by the matrix and the subordinate clauses.

(13)   (Beaver and Condoravdi 2003:41)

    a. Mozart died after he finished the Requiem.

    b. Mozart died before he finished the Requiem.

Tenses also show intriguing behaviors in the antecedents of conditionals. For example, as discussed in Kaufmann (2005), the example in (14a) with the present tensed verb *submits*, is "only felicitous under a special reading which includes an element of 'certainty' or 'scheduling'" (p.

232f.), whereas "[t]his connotation is absent" when this clause realizes the antecedent of a conditional, as in (14b). Conditional antecedents realized with past tensed verbs give rise to counterfactual interpretations, as illustrated in (15), the past tensed antecedent clause need not have past temporal reference (see e.g. Iatridou 2000; Ippolito 2003 for discussion).

(14)   (adapted from Kaufmann 2005:232)

    a.   Sam **submits** his paper to a journal.

    b.   If Sam **submits** his paper to a journal, we won't include it in our book.

(15)   If you **bought** it tomorrow, you would get a discount.

The interpretation of tenses in conditionals shows that explorations of temporal reference quickly encroach on questions of modality and mood. We return to this matter in section 5.

3.3   Tenseless languages and temporal reference in discourse

The observation that some languages make do without tense morphemes is entirely compatible with what we have said above about the role tenses play in constraining temporal reference: in tenseless languages, temporal reference is constrained only by optional temporal adverbials, context and embedding constructions. In addition to Guaraní, languages that have been described as tenseless and that have received tenseless analyses include Yukatek (Mayan, Bohnemeyer 2002, 2009) and Kalaallisut (Eskimo-Aleut, Bittner 2005, 2011). See Matthewson's (2006) analysis of St'át'imcets (Salish) as a "superficially tenseless" language.

As already mentioned in section 2.3, some syntactic and semantic frameworks conceive of all languages as tensed, regardless of whether the language has tenses and a tensed analysis is empirically motivated. In some Chomskyan frameworks, for example, the T(ense) node is obligatory since the realization of subject noun phrases is intimately tied to the specifier position of the Tense Phrase that T projects (e.g. Chomsky 1995). Likewise, under the assumption that the meaning of a tense is needed in order for a sentence to denote a proposition (e.g. May 1991; Partee 1992,

as discussed in von Fintel and Matthewson 2008:157), a tenseless language necessarily receives a tensed analysis.

Even outside the confines of such syntactic and semantic frameworks, it has been proposed that all languages receive tensed analyses. An argument in favor of such proposals is made on the basis of observations about how utterances in tensed and tenseless languages are interpreted in discourse. Consider the discourse in (16), which conveys that the events of Juan getting up, bathing, and eating breakfast temporally occur in sequence, one after the other.

(16) Juan got up. He bathed and he ate breakfast.

The temporal interpretation of the discourse in (16) is generally assumed to be due to the topic time of a clause being anaphorically dependent on the topic time of preceding discourse (see e.g. Partee 1984; Hinrichs 1986; Kamp and Reyle 1993). Some authors attribute the context-dependency of English utterances to (the past) tense, which is said to be anaphoric to the contextually salient topic time (e.g. Partee 1984). Other authors assume that the topic time is introduced by the functional category T (Stowell 1996; Kratzer 1998). The observation that narrative discourses in tenseless languages also exhibit temporal progression interpretations, as illustrated for Guaraní in (17), is then taken to provide evidence that such languages have a T node that realizes (phonologically empty) tenses (e.g. Matthewson 2002) or introduces the topic time.

(17) Context: What did Juan do last Sunday?

O-pu'a,   o-jahu   ha o-rambosa.
A3-get.up A3-bathe and A3-breakfast

'He got up, bathed and ate breakfast.'   (Tonhauser 2011b:264)

But, as discussed in Ritter and Wiltschko (2004), it is not necessary to assume that the topic time is introduced by T. Shaer (2003), for example, argues that it is introduced by the verb itself. For Bohnemeyer (2009), the topic time of an utterance constitutes part of the interpretation of the utterance, regardless of whether what was uttered was a tensed or a tenseless sentence. Thus,

depending on the theoretical framework assumed, it is possible to provide tenseless (and T-less) analyses of tenseless languages.

3.4   Interim summary

In the neo-Reichenbachian framework, theoretical terms such as 'tense' and 'temporal reference' receive precise definitions, and the framework can thereby serve as a guide to identifying evidence for a) whether a language has tenses, b) if it has tenses, what kind of tenses it has, c) temporal reference in matrix and subordinate clauses, and d) temporal reference in discourse. Thus, within this framework, theoretically-informed meaning descriptions, such as "The so-called German 'present' tense is a non-past tense", that are useful for cross-linguistic comparison can be established.

4   Exploring aspectual reference

As with temporal reference, there are two questions a fieldworker might attempt to answer about aspectual reference in the target language. First, how can a particular aspectual reference be expressed in the language? And second, what constraints do particular expressions in the language impose on aspectual reference?

In section 3, we discussed four ways of constraining temporal reference: context, adverbials, tenses, and subordinating constructions. Similarly, aspectual reference can be constrained by context and by adverbial expressions, as well as by paradigmatic forms whose purpose is to convey aspectual reference – that is, grammatical aspects. Additionally, aspectual properties of the lexical content itself can play a role in restricting aspectual reference. We first consider the effect of grammatical aspects.

4.1 Effects of grammatical aspects on aspectual reference

Grammatical aspects are grammaticalized ways of encoding different relationships between the topic time (TT) and the eventuality time (ET). In the discussion below, we follow Comrie (1976) in capitalizing names of grammatical aspects in particular languages (while leaving types of aspectual reference in lowercase).

An aspectual distinction that is commonly encoded morphologically is that between **perfective** and **imperfective** aspectual reference. For the former, a common definition is that the topic time temporally includes the eventuality time:

(18)   Perfective aspectual reference: $ET \subseteq TT$[10]

Pulaar (Atlantic) is one language that has grammaticalized this contrast. (19) illustrates a Perfective-marked Pulaar clause.[11]

(19)   Haŋki   Mariam def- ii.   [$TT < UT$; $ET \subseteq TT$; TT is yesterday]
       yesterday Mariam cook- PFV
       'Yesterday Mariam cooked.'

To establish that *-ii* is a perfective aspect, we need two kinds of evidence. The first is that clauses with *-ii* can be felicitously and truthfully used in contexts where the eventuality time is included in the topic time. (19), for instance, can be truthfully uttered in a context in which sometime during the preceding day, Mariam cooked. The eventuality time is the time spanned by the event of Mariam cooking, while the topic time is delimited by the adverb *haŋki* 'yesterday'. Thus the eventuality time is indeed included within the topic time.

Compatibility with a context where the topic time includes the eventuality time is a *necessary* condition for perfective aspectual reference, but not a *sufficient* one. To ensure that *-ii* entails

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[10]Klein (1994) proposes a less restrictive version of perfectivity: TSit AT TT (where Klein's TSit is equivalent to our ET and AT represents temporal overlap). On that analysis, it is possible for only the tail end (but not, according to Klein, only the front end) of the eventuality time be included in the topic time.

[11]The Pulaar sentences were modified from examples in Fagerberg-Diallo (1983:248), then judged by three native speakers as being truthful in the given contexts.

perfective aspectual reference, we need negative evidence: namely, we must establish that clauses with *-ii* are *not* judged true in contexts where the eventuality time is not included in the topic time. Indeed, *Mariam def-ii* is not a possible response to a question like 'When you walked into the house, what was Mariam doing?' In that context, the topic time is the moment at which the addressee entered the house, and the questioner is asking for a description of an eventuality whose time *includes* the topic time. Because it can only be used when the eventuality time is included in the topic time, *-ii* is a perfective aspect.

If, in contrast, a certain form requires that the eventuality time include the topic time, then that form entails imperfective aspectual reference. (See Deo (2009) for a more sophisticated, unified analysis of imperfective aspectual reference.)

(20)   Imperfective aspectual reference: TT ⊂ ET

Imperfective aspectual reference is commonly divided into two subtypes: **progressive** and **habitual** (e.g. Bybee *et al.* 1994:151). To establish that a form is an imperfective aspect, then, we need to determine that it can have both progressive meaning and habitual meaning, depending on context.

In Pulaar, a single Imperfective form can indeed realize progressive or habitual aspectual reference. In (21), the initial clause sets up the topic time as the time at which the speaker saw Mariam. The sentence can be truthfully uttered if at that topic time, Mariam had begun cooking but had not yet finished – that is, the cooking event was in progress at the topic time.

(21)   Mi yiy- ii   Mariam **omo**   **def- a**.   [TT < UT; TT ⊂ ET]
        1sg see- PFV Mariam 3sg.IMPF cook- IMPF
        'I saw Mariam cooking.' (Literally: 'I saw Mariam [while] she was cooking.')

One might hypothesize that an expression that realizes progressive aspectual reference entails imperfective aspectual reference. To determine whether the hypothesis is empirically adequate, one needs a context that demands habitual aspectual reference – meaning, roughly, that the eventuality time spans not a single event, but a set of multiple events of the same type, which together tempo-

rally subsume the topic time. If the hypothesized imperfective form is acceptable in this context, then the hypothesis is sustainable; if not, the form is more likely only a progressive aspect. (22) provides a relevant example for Pulaar.

(22)   Context: The speaker is talking about a woman named Mariam. Because she is the only woman of working age in the household, she is responsible for cooking lunch and dinner every day.

Omo   def-   a   ñande fof.   [UT $\subseteq$ TT; TT $\subset$ ET]
3sg.IMPF cook- IMPF day   every

'She cooks every day.'

In this example, the topic time is not specified; instead, it is implicitly assumed to be some interval approximately equivalent to the time of utterance. (The adverb 'every day' does not denote the topic time, but instead specifies the frequency of individual cooking events.) Thus there is a span of time during which a series of events occurs, each one consisting of Mariam cooking something; this span of time is the eventuality time, and it includes the topic time. Since the same construction that realized progressive aspectual reference in (21) realizes habitual aspectual reference in (22), this construction appears to be an imperfective aspect.

Beyond inclusion, another temporal relationship between the topic time and the eventuality time is precedence. Aspects that entail that the eventuality time follows the topic time (TT $<$ ET) are called **prospective** aspects, and those that entail that the eventuality time precedes the topic time (ET $<$ TT) are sometimes called **perfect** aspects. In English, prospective aspectual reference is conveyed by the *be going to* construction, illustrated in (23).

(23)   Max was going to watch a DVD tonight, but his DVD player broke.

(23) is true in a particular context if and only if the time at which the DVD viewing had been planned to take place follows the past topic time, perhaps the time at which Max decided on his program for the evening. Thus, the eventuality time follows the topic time; this relationship between the topic time and the eventuality time defines prospective aspectual reference.

(24) Prospective aspectual reference: TT $<$ ET

Despite occasional assumptions to the contrary (e.g. Bybee and Dahl 1989, Dahl and Velupillai 2011), *be going to* is not a simple future tense, as attested by its ability to combine with auxiliaries entailing at least past and present temporal reference, as in *Louisa was going to eat/is going to eat*. (See Schroeder 2011 for additional arguments to this effect.)

Like the Prospective, the English Perfect – which consists of a tensed *have* auxiliary followed by a participle – is compatible with multiple kinds of temporal reference (e.g. *Louisa had (already) eaten/ has (already) eaten/ will have (already) eaten*). (25) exemplifies the Perfect aspect with past tense.

(25) By the time I got to the station, my train had already left.   [TT $<$ UT; ET $<$ TT]

Some researchers, including Klein (1994), define perfect aspectual reference as in (26).

(26) Perfect aspectual reference: ET $<$ TT

To establish how a language conveys the meaning in (26), one needs to set up a context in which the eventuality time ends before the topic time begins. (25), for instance, is felicitous and true in a context where the speaker arrived at the train station at 3 p.m., but her train departed at 2:58 p.m. The initial clause of (26) sets up the time of the speaker's arrival as the topic time; the time of the train's departure is the eventuality time. In this context, where the eventuality time fully precedes topic time, English uses the Perfect aspect.

The analysis in (26) works well enough for (25), which illustrates the **existential** reading of the Perfect: by topic time, there has been an event of the train's leaving. This analysis does not properly capture other instances of the Perfect, however. In (27), for example, the eventuality time of the speaker living in Columbus does not precede the topic time – which A's question sets up as a time interval surrounding the utterance time – but includes it.[12] This reading of Perfect clauses

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[12]Note that in (27), we allow for the possibility of non-proper inclusion of the topic time by the eventuality time – i.e. the possibility that the topic time may be coextensive with the eventuality time. This prediction is validated by the

is called the **universal** reading. (For discussions of different readings of the English Perfect, see Kiparsky 2002 and Portner 2003.)

(27) A: Where are you living these days?

      B: I live in Columbus. Actually, I've lived there since 2001.   [UT $\subseteq$ TT; TT $\subseteq$ ET]

Another problematic prediction of the analysis in (26) is that perfects should be unable to combine with other aspects that entail different relationships between the eventuality time and the topic time. This prediction is wrong, as illustrated in (28), which combines the Perfect with the Progressive.

(28) The cat has been playing with that string for the last three hours.

To address these problems with the Neo-Reichenbachian analysis, a number of alternative approaches to the Perfect have been proposed. These include **current relevance** theories (e.g. Inoue 1979, Moens and Steedman 1988, Binnick 1991:100-104, Bybee *et al.* 1994:61, and Smith 1997:107) and **Extended Now** theories (e.g. McCoard 1978, Bennett and Partee 1978, Dowty 1979, Iatridou *et al.* 2003, Portner 2003).

The analysis in (26) seems to be a better fit for what Bohnemeyer (2002) calls **terminative aspect** in Yukatek, which contributes the information that the relevant eventuality is terminated at the topic time. In example (29), the clause that is marked with the terminative aspect *ts'o'k* 'TERM' implies that at the topic time, which is established by the initial clause, the event of the child's dying has already terminated.

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following twist on (25):

(i) On his seventh birthday, Michael moved to Michigan. Up to that time, he had lived in Mississippi.

Here, the topic time for the second sentence is set up as Michael's entire lifetime from birth until his seventh birthday. The sentence asserts that the state of Michael's living in Mississippi endured from the time of his birth until he moved to Michigan on his seventh birthday. Thus, the time of the Michael-living-in-Mississippi eventuality is coextensive with the topic time.

(29) K-u   k'uch-ul-o'b-e', **ts'o'k** u   kim-il le   chàampal-e'.
      IMPF-A.3 arrive-INC-TOP TERM A.3 die-INC DEF small:child-D3
      '(By the time) they arrived, the baby had already died.'   (Bohnemeyer 2002:284)

In sum, a grammatical aspect is better analyzed as contributing terminative aspectual reference than perfect aspectual reference if it does not allow for universal readings.

The grammatical aspects discussed thus far map to five different kinds of aspectual reference: perfective, imperfective, prospective, perfect, and terminative. Not every clause in every language is marked morphosyntactically with a particular aspect. Nonetheless, as was illustrated in example (2), and as we will discuss further in section 4.2 below, every clause uttered in a given context has some aspectual reference – just as finite clauses without tense marking have a temporal reference (see section 3.3 above). A given language may have more or fewer (grammatical) aspects than the five discussed above. It might, for instance, have separate progressive and habitual aspects, rather than a general imperfective. On the other hand, for a particular aspectual reference in a particular language, there may or may not be a grammatical aspect that entails that aspectual reference.

Cross-linguistically, it is common for an expression to constrain not only aspectual reference, but also modal and/or temporal reference – i.e. to refer to possibility/probability/necessity, or to the relationship between the topic time and the utterance time (or some other evaluation time). We now illustrate some expressions that restrict a combination of aspectual, temporal, and modal reference.

Aspectual/modal forms

Any time that an affirmative declarative clause that contains a certain expression does not entail full realization of the eventuality it describes, that expression must be suspected to describe possible, rather than actual, eventualities. The most famous case of this is arguably the **imperfective paradox**. Many authors, starting with Dowty (1977, 1979), have noted that with some sentence pairs, as in (30), the Past Progressive (a subtype of imperfective) entails Simple Past (with a perfective reading), but with others, like those in (31), this entailment relation does not hold.

(30)   a. Harry was flying on his broomstick.

           b. Harry flew on his broomstick.

(31)   a. Petunia was knitting a sweater for Dudley.

           b. Petunia knit a sweater for Dudley.

The imperfective paradox can be explored in other languages by pairing an imperfective or progressive sentence with its perfective equivalent, then testing whether the first entails the second.

This puzzle involves a property of clauses that we discuss in section 4.3 below – namely lexical aspect. Specifically, a Past Progressive entails its Simple Past counterpart with **activities** – which describe only a process with no logical endpoint – but not with **accomplishments** – which describe a process leading up to a logical endpoint (e.g. the existence of a sweater in (31)).

To solve the paradox, many authors have argued for a modal approach: English Progressive sentences entail that, at the topic time, an eventuality has begun, and that, at a time in the future of the topic time, this eventuality is likely to develop into one of the type described by the sentence. However, if the eventuality is an accomplishment, there is no guarantee that its logical endpoint is ever reached in the actual world (so Petunia, for instance, may never complete the knitting of the sweater). For analyses along these lines, the reader is referred to Dowty (1977, 1979), Landman (1992), and Portner (1998).

Prospective aspectual reference, too, is commonly intertwined with modal reference. The modal properties of the English Prospective *be going to*, in particular, are clearest with past temporal reference, where the construction implicates non-realization of the eventuality (much like the Guaraní construction in (9d) in section 3.1). Use of (32a), for instance, implicates that the speaker's singing plans have been changed. Evidence that the non-realization of the speaker's singing is only an implicature, not an entailment, comes from the fact that this inference can be cancelled, as illustrated by the continuation in (32b).

(32)   a. I was going to sing at the opera yesterday.

           b. I was going to sing at the opera yesterday, and, in fact, I did!

The interpretation of (32b) and its Guaraní counterpart in (9d) provide further evidence that the English *be going to* construction and the Guaraní suffix *–ta* 'PROSP' encode a modal meaning in addition to prospective aspectual reference (TT < ET). After all, if, e.g., (32a) only conveyed past temporal prospective aspectual reference (where the topic time is temporally located prior to the utterance time, and the eventuality time temporally follows the topic time but is temporally located within the denotation of *yesterday*), then (32a) would entail that the speaker sang yesterday. But despite the possible continuation in (32b), (32a) does not entail event realization, as illustrated by the fact that it can be continued with …*but I couldn't because I was sick* (and likewise for the Guaraní counterpart, as discussed in Tonhauser 2011a).

Aspectual/temporal forms

The (so-called) English bare Present tense restricts temporal reference to non-past topic times. But the form's meaning is not only temporal (contrary to what its name might suggest): in addition, it imposes habitual aspectual reference.[13] (33), for example, would be an appropriate way of talking about Eleanor's habitual behavior toward Brussels sprouts.

(33)   Eleanor eats Brussels sprouts.

Evidence that this verb form does not entail imperfective aspectual reference is that it is incompatible with a progressive interpretation: (33) is unacceptable in a context in which Eleanor is gingerly nibbling at the first Brussels sprout she has ever tasted. Thus, expressions that constrain

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[13]This verb form is compatible with other temporal and aspectual references in so-called "historical present" or "sportscaster's present" uses (see Comrie 1985:37 for discussion) and in news headlines that assert the occurrence of an event in the recent past:

(i)   McCain Says Decree by Egypt's Mursi Is 'Unacceptable'. (Bloomberg News, November 27, 2012)

Context: Headline of a story about a statement that Senator John McCain made in reaction to a decree by President Mursi of Egypt. (http://www.bloomberg.com/news/2012-11-25/mccain-says-decree-by-egypt-s-mursi-is-unacceptable-.html)

both temporal and aspectual reference constrain both the relation between the topic time and the eventuality time, and between the topic time and the evaluation time.

Expressions can also simultaneously constrain temporal, aspectual and modal reference. For discussion, see e.g. Cipria and Roberts (2000), Ippolito (2004), and Hacquard (2006).

4.2   Effects of context and adverbials on aspectual reference

Context can also constrain aspectual reference, either in addition to or in place of overt aspect markers. We can see this effect with the English simple past ("Preterite"), which lacks aspectual marking and can receive both a perfective and an imperfective interpretation. In the context of A's utterance in (34a), B's statement receives a perfective interpretation: B biked to school, and the riding-to-school event was fully contained within the day of utterance. In the context of A's utterance in (34b), however, the same statement receives a habitual interpretation: riding-to-school events recurred regularly.

(34)   a.   A: What did you do for exercise today?

B: I biked to school.

b.   A: I got my first car when I turned 16. After that, I drove to school every day.

B: I never had a car in high school. I biked to school.

Aspectual reference can also be constrained by adverbials. In English, different types of adverbial clauses (e.g. a time measure phrase preceded by *for* vs. *in*) restrict aspectual reference in different ways. Hence *Ellen played the sonata* receives a perfective interpretation in (35a) – since the sonata is completed within the hour-long topic time – but an imperfective interpretation in (35b).

(35)   a.   Ellen rehearsed the sonata in an hour.

Interpretation: Within a time interval lasting one hour, Ellen played the entire sonata from beginning to end. The sonata cannot be more than one hour long (at Ellen's pace).

    b. Ellen rehearsed the sonata for an hour.

       Interpretation: Within a time interval lasting one hour, Ellen played part(s) of the sonata. The entire sonata may or may not be more than one hour long.

If context or an adverbial constrains the temporal relation between the topic time and the eventuality time for a particular clause, and an aspectual marker is acceptable in that clause, then we can conclude that that aspect is compatible with the aspectual reference required by the context or the adverbial. In the Badiaranke example in (36), for example, context and the adverbial clause together require a perfective interpretation.

(36)   Context: Aamadu and Binta began writing a letter at 1:00 and finished writing the letter at 2:00.

      birĩ   1:00 haː 2:00 safiŋə- bɔ̃ de   leːtar.
      since 1:00 until 2:00 write- 3pl AFF.DECL letter

      'Between 1:00 and 2:00, they wrote a letter.'

The sentence in (36) contains a verbal stem (*safiŋ-* 'write'),[14] followed by a subject agreement suffix (-*bɔ̃* '3pl'), followed by a particle, *de*, that appears in affirmative declarative clauses. From the acceptability of the construction in the given context, we can conclude that the construction is compatible with perfective aspectual reference. (36) is *not* acceptable, however, in a context where the letter-writing began before 1:00 and ended after 2:00, so the construction is not compatible with imperfective aspectual reference.

4.3   Effects of lexical aspect on aspectual reference

In (36), only a (past) perfective interpretation is available for *safiŋə-bɔ̃ de leːtar* 'they wrote a letter'. The same is true of the examples in (37)-(38), which employ the same construction (verb + subject agreement + *de*): (37) is not appropriate if Mari is still laughing, and (38) cannot be uttered truthfully until the stick-breaking is done.

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[14]The [ə] after [safiŋ] in (36) is epenthetic.

(37) Context: Mari, a child, has just laughed after catching sight of the household cat. She is no longer laughing.

Mari das- ə̃ de.
Mari laugh- 3sg AFF.DECL

'Mari laughed.'

(38) Context: The speaker has just seen a video in which a person snaps a wooden stick in half.

kutt- ə̃ doko sẽ de.
break- 3sg stick DET AFF.DECL

'He broke the stick.'

In (37)-(38), as in (36), the construction in question describes events completed during a topic time in the immediate past. In (39)-(40), however, the same construction receives a present imperfective interpretation: the states described are ongoing at the topic time, which here overlaps with the utterance time. (39) is a claim about the way most Africans look in general, including at the utterance time; (40) is an exchange about B's current state of health.

(39) baː   Afrik bajə-   bə̃ de.
     people.of Africa be.black- 3pl AFF.DECL
     'Africans are black.'   (Cover 2010:67)

(40) Context: The speakers are exchanging greetings.

A: kẽdan- iː de   ba?   B: haː kẽdan- ə̃ de.
   be.healthy- 2sg AFF.DECL Q   yes be.healthy- 1sg AFF.DECL
   'Are you healthy?'   'Yes, I'm healthy.'

The data in (36)-(40) pose a puzzle: Is there any semantic property shared by (36)-(38), but not by (39)-(40), that correlates with the observed divide in aspectual reference?

The key difference is that the sentences in (36)-(38) describe **events**, while those in (39)-(40) describe **states**. States are eventualities that are essentially unchanging. For linguistic (not evolutionary) purposes, the skin color of Africans is a stable property; while the state in (40) is more

ephemeral, B's physical condition is fundamentally the same at any point during the time that s/he is healthy. Events, in contrast, evolve over time: different sounds are emitted during the laughing event, the stick changes from unbroken to broken through the breaking event, and so on.

The state-event distinction belongs to the domain of **lexical aspect**, also known as Aktionsart, propositional aspect (Verkuyl 1993), or situation type (Smith 1997). None of the commonly used terms are quite ideal: *Aktionsart* overemphasized "actions," to the exclusion of other eventuality types; *lexical aspect* wrongly suggests that the property in question pertains only to individual lexical items, and cannot emerge compositionally; *propositional aspect* goes to the other extreme by implying that only full propositions have the property; *situation type* uses the term *situation*, which means something different in formal semantics, to refer to eventualities. We will use the term "lexical aspect," while noting that the domain of this property is not limited to individual lexical items. Rather, the word "lexical" here means that the aspectual properties in question arise from lexical items (in the absence of tenses and grammatical aspects) *and the ways they combine* – that is, lexical aspect is compositional. "Lexical aspect" stands in contrast to the "grammatical aspects" discussed above (perfective, imperfective, etc.).

The idea of lexical aspect is that the **lexical content** of a sentence bears some inherent aspectual properties, distinct from those introduced by grammatical aspect. The lexical content, sometimes called the "untensed proposition" of a sentence, is the semantic content contributed by the lexical items themselves, what is left when the tense and grammatical aspect are stripped away (Klein 1994:1-12). As with lexical aspect, lexical content is a property not only of isolated lexemes, but also of their combination. Thus in a sentence like *Jim squished a bug*, the lexical content describes a Jim-squishing-a-bug eventuality; the grammatical component contributes the temporal and aspectual information. Similarly, in (41a.i) below, the *-s* on *loves* is not part of the lexical content, since it marks present temporal reference; the lexical content of the sentence is <Mary love cupcakes>, which describes a Mary-loving-cupcakes eventuality.[15]

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[15]We follow Klein (1994) in using angled brackets to distinguish lexical content from fully inflected sentences.

Five lexical aspect categories are typically recognized, namely **states, activities, accomplishments, achievements**, and **semelfactives**. (All the types that are not states – i.e. activities, accomplishments, achievements, and semelfactive – are events.) English sentences exemplifying each are given in (41).

(41)   Sentences illustrating different kinds of lexical aspect

    a. States:

        i. Mary loves cupcakes.

        ii. Millicent was happy.

    b. Activities:

        i. The monkey danced.

        ii. Mildred and George were chatting animatedly on the phone.

    c. Accomplishments:

        i. The children are building a sandcastle at the beach.

        ii. This bridge freezes over in the winter.

    d. Achievements:

        i. My train will arrive at 2:13.

        ii. Wilfred's pet tarantula died.

    e. Semelfactives:

        i. He knocked once, loudly.

        ii. Nancy blinked innocently.

See Bar-El (this volume) for an in-depth discussion of lexical aspectual classes and their cross-linguistic properties.

As we saw in (36)-(40), lexical aspect sometimes constrains aspectual reference. So does grammatical aspect, as discussed in section 4.1. These two influences are not independent of one another: in English, as in Badiaranke, the meaning and even acceptability of a given grammatical

aspect is often dependent on lexical aspect. The English Progressive, for instance, is frequently claimed to be incompatible with stative lexical contents (e.g. *#Kim is knowing French*; see e.g. Vendler 1957, Comrie 1976). To evaluate this claim, we need to create, and assess the meaning of, Progressive-marked sentences in which the lexical content is stative. The examples in (42) meet this description.

(42) a. You're being ridiculous.

   b. I'm loving this veggie burger.

The two sentences in (42) are judged grammatical by native speakers. (42a) can be aptly addressed to someone who is exhibiting ridiculous behavior, whether or not s/he is ridiculous in general, and (42b) can be said while consuming a delicious burger. It is not quite right, then, that stative lexical contents disallow Progressive aspect. A better characterization, suggested by the data in (42), is that the Progressive coerces statives into the reading that the states are time-delimited and/or manifested in some specific behavior (cf. Michaelis 2003).

Similarly, aspectual coercion occurs when the Progressive occurs with a semelfactive predicate, forcing the lexical aspect to shift to an activity made up of multiple occurrences of the semelfactive. In (43), the only reading is that at the moment when Kelly woke up, a series of knocks was ongoing.

(43) Kelly woke up with a start. Someone was knocking loudly at the door.

While in Badiaranke the distinction between stativity and eventivity is key for aspectual interpretation, Bohnemeyer and Swift (2004) argue that in some languages, a similar divide exists between **telic** and **atelic** sentences. **Telicity** is the property of having an inherent logical endpoint (e.g. the logical endpoint of the lexical content of <*Owen run three miles*> is the three-mile mark; the logical endpoint for <The mirror shatter suddenly> is a transition from an intact mirror to a broken one). According to Bohnemeyer and Swift (2004), in German, Russian, and Inuktitut, clauses unmarked for aspect receive a perfective interpretation by default when their compositionally derived lexical content is telic, but an imperfective interpretation when it is atelic. In the Inuktitut data in (44), taken from Bohnemeyer and Swift (2004:267), neither clause is marked for

aspect or tense; the telic sentence in (44a) receives a past perfective reading, while the atelic one in (44b) receives a present imperfective reading (the walking is ongoing at a topic time including the utterance time) in an out-of-the-blue context.

(44)   a. ani-   juq.
          go.out- PAR.3sg
          'S/he went out.'[16] $[ET \subseteq TT; TT < UT]$

        b. pisuk- juq.
          walk- PAR.3sg
          'S/he is walking.' $[TT \subset ET; UT \subset TT]$

Due to the ability of lexical aspect to affect aspectual reference, one cannot generalize about the aspectual reference of particular forms on the basis of the meaning of a small, random selection of sentences; instead, exploring the aspectual reference of some construction necessitates consideration of a systematic array of sentences representing all types of lexical aspect. (This systematic array need not be presented in a boring manner; see Louie, this volume.)

In seeking to explore the full range of lexical aspects, language-specific diagnostics for lexical aspect must be applied – language-specific, because certain classic tests for English, such as the *for an hour/ in an hour* test for telicity (Vendler 1967, e.g.; see (35) above), simply fail in other languages (including Badiaranke, which lacks the prepositions to express this distinction). Meanwhile, diagnostics that work for other languages might well not work for English. Badiaranke is just one of many African languages in which a single construction gets, by default, a past perfective interpretation when the lexical content is eventive, but a present imperfective interpretation when the lexical content is stative (as we saw in (36)-(40)). Welmers (1973) calls such constructions "factatives." In such languages, a lexical content whose stativity is unclear can be tested by placing it in the construction in question, then checking whether or not the clause can be understood as a statement about an eventuality that is ongoing at speech time.

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[16]The "participial" is "the standard indicative mood in [this dialect of Inuktitut]" (Bohnemeyer and Swift 2004:267).

Crucially, when a sentence is translated to another language, lexical aspect might well change. To figure out the aspectual properties of a particular lexical content in the target language, we can begin with reasonable *working* assumptions based on what we know about other languages, while remaining open to the possibility that these assumptions are wrong. These working assumptions will help us develop language-specific diagnostics for lexical aspect; at the same time, the language-specific diagnostics help us to test the working assumptions. In Badiaranke, for instance, the above generalization about factative meaning emerges from a consideration of a large number of simple sentences with different predicates. In simple sentences including only the predicate, subject agreement, and *de*, predicates including those in (45) all behave like those in (39)-(40) with respect to their temporal and aspectual interpretation:[17]

(45) *ka-dʒinn-e* 'be red', *ka-niŋanaː-e* 'be happy', *ka-kab-e* 'know', *ka-lafiɲieːn-e* 'want', *ka-roːm-e* 'be short'. . .

In contrast, predicates including those in (46) trigger a past perfective reading in the same construction:

(46) *ka-kam-e* 'dance', *ka-seːt-e* 'talk', *ka-waɟ-n-e velo* 'repair a bike', *ka-rədd-e paːdə* 'build a room', *ka-nij-e kaːs* 'break a glass', *ka-wub-e* 'cough', *ka-peredʒ-e* 'blink'. . .

All the predicates in (45) denote properties that remain stable for some non-momentary interval – i.e states; those in (46), in contrast, denote eventualities that inherently involve change, i.e. events. With exposure only to the predicates in (45)-(46), then, we could hypothesize that the difference in temporal and aspectual interpretation correlates with a difference between stative and eventive lexical contents. (This hypothesis would be disproven if, for instance, other predicates turned out to meet the semantic requirements for eventivity, yet received a present imperfective interpretation in this construction.)

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[17]The Badiaranke predicates are given here in the infinitival form; there is no morphological equivalent to English bare stems.

Armed with this working hypothesis, we could use the construction in question to determine the aspectual class of a lexical content whose categorization is uncertain. For instance, it is not immediately obvious how Badiaranke will categorize a predicate like *ka-dattaː-e*, which means 'sleep'. In English, the verbal form (as opposed to the adjectival form *asleep*) is treated as an activity: (47a), but not (47b), can felicitously and truthfully be used to assert that at the utterance time, the children are not awake.

(47)   a. The children are sleeping.

         b. #The children sleep.

The question is, when it is placed into the factative construction, as in (48), can the Badiaranke counterpart of *sleep* receive a present imperfective interpretation, or not?

(48)   bepoːse pã   dattaː- bə̃ de.
        children DET sleep- 3pl AFF.DECL
        'The children are asleep.'

The answer is "yes": (48) can be felicitously and truthfully used to assert that a group of children is asleep at the utterance time. Thus we can conclude that the Badiaranke verb *dattaː-* 'sleep' is stative, unlike its English verbal counterpart.

This process of making hypotheses about how different lexical aspectual classes behave, and figuring out which aspectual class a particular lexical content exemplifies, is not a linear one. Instead, there is a constant feedback loop: both the hypotheses about diagnostics for different aspectual classes, and the conclusions about the aspectual class of a particular lexical content, inform one another and are subject to change.[18]

Thus far, we have treated lexical aspect as a property of lexical content. Separating the lexical content from the sentence in which it appears allows us to talk about the effect of grammatical aspects on different types of lexical content. The effect of Progressive aspect on statives, as in (42) above, and the imperfective paradox illustrated in (30)-(31) are cases in point.

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[18]We thank Lisa Matthewson for helping to clarify this point.

Lexical content is not, however, the only level at which aspectual classes can be defined. As pointed out by Dowty (1986), it is equally important to consider the aspectual properties of entire *sentences* (fully inflected with tense and aspect). Dowty uses the same terminology – states, activities, and accomplishments/achievements[19] – as do treatments based on lexical content, but defines them at the sentence level. He defines aspectual classes of sentences on the basis of the **subinterval property**: if a sentence is true at an interval i, it is a state if it is also true at all subintervals of i, an activity if it is true at subintervals of i down to a certain size, and an accomplishment/achievement if is true at no subinterval of i (Dowty 1986:42).

From the perspective of Dowty (1986), Progressive sentences are inherently stative (also Smith 1997): all Progressive-marked sentences adhere to the strictest version of the subinterval property (i.e. they are true at any instant during the interval at which they are true).[20] Thus (41b.ii) and (41c.i), which were classified above as containing activity- and accomplishment-type lexical content respectively, are both stative at the sentential

This analysis accounts for certain similarities between Progressive sentences (derived statives) and sentences whose lexical content is stative (lexical statives). Neither Progressive sentences nor non-Progressive stative sentences move the topic time forward in time, unlike eventive sentences with perfective aspectual reference (see the discussion in section 3.3). In (49a), for instance, the topic time for *He shuddered* is understood to be later than that of *A snake fell on him*, so that the shuddering event is understood to follow the snake-falling event. In (49b), the second clause

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[19]Dowty (1986:42-3) treats accomplishments and achievements as a single aspectual class of 'telic' sentences

[20]Jürgen Bohnemeyer (p.c.) brings to our attention the dilemma of whether imperfectives and progressives are inherently stative, or whether instead statives are inherently imperfective. There certainly are such things as perfectives of statives, as in *I was happy today from 2 p.m. to 4 p.m., but depressed the rest of the time* – but the inherent stativity of imperfectives or imperfectivity of statives is a thorny issue. The solution to this chicken-and-egg problem will depend on a number of theoretical assumptions about aspect – including the extent to which grammatical and lexical aspect should be separated at all – and we will not be able to resolve the dilemma here. The reader is referred to Sasse (2002) for a very thorough discussion of the divergent perspectives on this issue.

is a lexical stative and, in (49c), it is a derived (progressive) stative. In both of these examples, the shuddering events are understood to temporally overlap with the eventualities described in the preceding clauses, rather than following them.

(49)   a. Indiana Jones opened his eyes. A snake fell down on him. He shuddered.

        b. Indiana Jones opened his eyes. The pit he was in was full of snakes. He shuddered.

        c. Indiana Jones opened his eyes. Snakes were falling down on him. He shuddered.

A similar stative property holds of Perfect sentences. In (50), Indiana Jones is still awake (in the result state of having woken up) when he shudders.

(50)   Indiana Jones opened his eyes. He had awoken from a nightmare about snakes. He shuddered.

Thus, depending on one's research focus, it can be important to look both at the aspectual properties of the lexical content itself, and of the aspectual class of the fully inflected sentence.

4.4   Summary

We have seen in this section that aspectual reference may be constrained by context or by adverbials. It is also possible for aspectual reference to arise by default from lexical content. And of course, languages have dedicated aspects, and/or combined tense/aspect/modal forms. Note that although we have attempted to isolate these factors for clarity of exposition, in many examples aspectual reference will be constrained by some combination thereof.

5   The linguistic realization of future discourse

This section is concerned with ways in which languages allow their speakers to talk about the future. We refer to this as **future discourse**, i.e. discourse about eventualities that are temporally located in the future of the utterance time (UT $<$ ET). Future discourse may be realized through future temporal reference (UT $<$ TT), as discussed below, but is distinct from it.

It is well established that across languages **past discourse** (ET < UT), i.e. discourse about eventualities that are temporally located in the past of the utterance time, can be realized through past temporal reference, as discussed in section 3, through (present or past temporal) perfect aspectual reference, as discussed in 4, or through a combination thereof (e.g. past temporal perfect aspectual reference). In contrast to past discourse, future discourse is intimately connected with modality since the future, in contrast to the past, is necessarily unknown and indeterminate. As a consequence, future discourse is inherently modal, in the sense of being about possible worlds that characterize ways in which the world may develop. We have to be careful, however, to distinguish the inherent modality of future discourse from the meanings coded by natural language expressions used to realize future discourse: despite the modal nature of future discourse, linguistic expressions used to realize future discourse need not themselves have a modal component to their semantics.

5.1 Grammatical aspects that realize future discourse

As discussed above, prospective aspect markers in combination with present temporal reference realize future discourse by temporally locating the eventuality time in the future of the (present) topic time (TT < ET). The English and Guaraní prospective aspect markers have a modal meaning component in addition to the aspectual one, since eventuality realization is not entailed even when the eventuality time is temporally located prior to the utterance time, as in examples (9) and (32b).

Another example of a prospective aspect is Scottish Gaelic *a' dol a*, according to Reed (2012). As shown in (51a), *a' dol a* is compatible with past, present and future tense, which supports the hypothesis that it does not constrain the temporal relation between the topic and the utterance time (i.e. is not a tense). That *a' dol a* requires the topic time to precede the eventuality time (making it a prospective aspect), is illustrated in (51b), where the only acceptable reading is that 'noon' delimits the topic time, placing it in the past of the utterance time.

(51) (Reed 2012:6)

    a. Bha/tha/bithidh   Calum a dol a phòsadh   Mairi.
       be.PAST/be.PRES/be.FUT Calum *a' dol a* marry.PAR Mairi

       'Calum was/is/will be going to marry Mairi.'

    b. Aig meadhon-latha bha   Calum a dol a phòsadh   Mairi, ach aig uair gabh
       at   mid-day   be.PAST Calum *a' dol a* marry.PAR Mairi but at hour take.PAST
       e   an   t-eagal.
       3sg.MASC the.sg.MASC fear

       'At noon Calum was going to marry Mairi, but at 1 he got scared.'   (Reed 2012:16)

The prospective aspect is not the only aspect that can be used to realize future discourse cross-linguistically. In Badiaranke, statements about future times require the same aspectual/modal construction that is used to express imperfective aspectual reference (progressive and habitual); Cover (2010, 2011) calls this the Imperfective construction. Badiaranke Imperfective clauses consist, at minimum, of a verb stem preceded by an aspectually-conditioned subject agreement prefix. In (52), the (bold-faced) Imperfective-marked clause asserts that the singing eventuality is ongoing at the topic time (progressive aspectual reference); in (53), raining events recur regularly throughout the topic time (habitual aspectual reference). But in (54), the singing eventuality is predicted to occur *within* a future topic time (perfective aspectual reference, future temporal reference). Note that although this construction is called Imperfective, the aspectual reference of (54) is in fact perfective (the running event will not take up the entire topic time denoted by 'tomorrow').

(52) Context: A child walked home from school, singing all the way. The speaker caught sight of the child as she walked along.

    dʒeːnə- mãnã   de   **mpə-**   **tʃimə** (pəraŋe).
    see-   1sg.3sg AFF.DECL 3sg.IMPF- sing   going

    'I saw her singing (as she went along).'

(53) Context: The conversation takes place in 2006. In 2004, the speaker visited the north of Senegal, known as the Fuuta. During her stay, it rained once a week.

paːrə peːs   u-   jak- akõ   fe Fuuta wẽ loːkũ woː **mpi-**   **dʒafə**
two.years.ago NMLZ.SG- be- PAST.1sg P Fuuta DET week every 3sg.IMPF- rain
de   pakkã.
AFF.DECL one

'Two years ago when I was in the Fuuta, every week it used to rain once.'

(54)   Context: A certain individual is planning to run two miles the next day.

kũpia   kilomeːtr maːe **mpə-**   **kər.**
tomorrow kilometer two   3sg.IMPF- run

'Tomorrow it's two kilometers he'll run.'

Use of a single form – optionally or obligatorily – for imperfective aspectual reference and future temporal reference is also attested in other West African languages, including Pulaar, Wolof (Nussbaum *et al.* 1970:360), Balanta (Fudeman 1999:94), Kisi (Tucker Childs p.c.) and Mani (Tucker Childs p.c.). Indeed, as observed by e.g. Dowty (1977) and Copley (2002), even the English Progressive has a futurate use:

(55)   Context: The speaker has just been asked to go to a movie later in the evening and is now scrambling for an excuse to decline.

Sorry, I can't – I'm washing my hair tonight.

See e.g. Bohnemeyer (2002:ch. 6.2.2) and Bittner (2005) for a discussion of aspect/modal markers in Yukatek and Kalaallisut, respectively, that can realize future discourse.

5.2   Mood and modality can realize future discourse

As discussed in Bittner (2005), one strategy for realizing future discourse in Kalaallisut is through mood-marking expressions that convey that the speech act is a request or wish:

(56)   Qimmi-t nirukkar-**niar-tigik**.
dog-PL   feed-please-IMP.1pl.3pl
'Let us feed the dogs, OK?'   (Bittner 2005:353)

Expressions that encode modal meanings can also convey future discourse, as illustrated with the Guaraní examples in (57) with the existential modal *–ne* 'MIGHT'. The time of the raining eventuality described in (57a) is temporally located within the denotation of *ko'ẽro* 'tomorrow', i.e. in the future of the utterance time. The example conveys that this eventuality is an epistemic possibility from the perspective of the utterance time. Sentences with *–ne* 'MIGHT' are merely compatible with an interpretation in which the eventuality time temporally follows the utterance time. That they do not entail such an interpretation is illustrated with (57b), in which the eventuality time temporally overlaps with the utterance time.

(57)   Adapted from Tonhauser (2011a:210)

    a.   Ko'ẽro   o-ky-**ne**.
        tomorrow A3-rain-MIGHT
        'It might rain tomorrow.'

    b.   Context: A family is discussing who might be disrespectful to them. The father says
        to the daughter:

        Nde rei-kuaa-**ne**,   che memby!
        you A2sg-know-MIGHT my child

        'You might know, my child!'

For discussions of the interaction between modality and temporality see e.g. Thomason (1984, 2007), Condoravdi (2002), Kaufmann (2005), Kaufmann *et al.* (2006), Hacquard (2010) and references therein.

5.3   Future tense

In language description, an expression that is used to realize future discourse is often called a "future tense" or, simply, a "future". For instance, in the Guaraní grammar tradition (e.g. Gregores and Suárez 1967; Liuzzi and Kirtchuk 1989; Zarratea 2002), the suffix *–ta* 'PROSP' is typically considered a future (tense). But, as the discussions in the preceding sections have made

clear, not every expression that realizes future discourse is a future tense, i.e. an expression that restricts the temporal location of the topic time to times that follow the utterance time.

To determine whether a linguistic form is a future tense, it needs to be established whether use of that form entails that the topic time follows the utterance time. To distinguish, for instance, between a future tense (UT < TT) and a prospective aspect (TT < ET), the acceptability of the form in a context in which one of these conditions is met but the other one is not needs to be explored. We expect that a future tense should be acceptable in contexts in which the topic time follows the utterance time, even if the eventuality time does not follow the topic time (but instead includes it, or is included in it). On the other hand, we expect that a prospective aspect is acceptable in contexts in which the eventuality time follows the topic time, even if the topic time precedes or includes the utterance time. With respect to Guaraní –*ta*, examples like (9d) in the context of (9b) provide evidence that this linguistic form is a prospective aspect, since (9d) is acceptable even when the topic time precedes the utterance time, as long as the eventuality time temporally follows the topic time. If (9d) had not been grammatical, or had not been acceptable in the context of (9b), –*ta* would remain as a candidate for a future tense.

While it is possible to show that a form is *not* a future tense, but instead is e.g. a grammatical aspect, it is more challenging to be certain that a form *is* a future tense. One difficulty in identifying whether there are future tenses is that it is still an open question how to characterize this meaning category (see also Comrie 1989). Whereas Yavaş (1982), for instance, maintains that a future tense should be able to occur in all clauses that have future temporal reference, Bohnemeyer (2000) points out that many languages have designated modal markers that convey that a future eventuality is epistemically possible, an obligation, a desire, a wish or a prediction. He argues that it may be implausible to expect a future tense to occur in clauses that realize future discourse with these modal attitudes: the existence of designated modal expressions in the language may simply block the occurrence of the future tense in such clauses.

Another point of contention concerns the question of whether a future tense should only constrain the temporal relation between the topic time and the utterance time, or whether it may also

convey a modal meaning (and which modal meanings it may convey). Some researchers argue that future temporal reference is a necessary but not a sufficient condition for future tenses (e.g. Enç 1996; Kaufmann 2005). Given that future discourse, and hence also future temporal reference, is inherently non-factual, and given that non-factual assertions are accompanied by a modal attitude, it is unclear whether "pure" future tenses exist, or whether a future tense should always be expected to contribute a modal meaning as well. We agree with Comrie (1985) that whether there are languages with pure future tenses can only be answered "on the basis of the investigation of grammatical expressions of future time reference across a number of languages" (p.44). That this is not a trivial task is evidenced by the fact that no consensus has been reached even for the English auxiliary *will*, which has been analyzed as a future tense that also encodes modality (e.g. Enç 1996; Kaufmann 2005), as a future tense that does not encode modality (e.g. Kissine 2008) and as a modal marker that does not (necessarily) entail future temporal reference (e.g. Werner 2006, Klecha to appear). These authors' papers provide a plethora of pointers to the kind of evidence that can be brought to bear on the question of whether a particular linguistic form in the language under investigation is a future tense, or at least whether and how it differs from English *will*.

6 Requirements for theoretically-informed meaning descriptions

In this paper, we have argued that theory can guide fieldwork on meaning, that theoretically-informed fieldwork can result in more comprehensive meaning descriptions, and that theoretically-informed descriptions are instrumental to improving theories of meaning, and to uncovering language universals and variation. By taking into account what we already know about how linguistic forms map to meanings and vice versa, theoretically-informed descriptive work makes it possible to see how a newly-described language expands that knowledge.

We end the paper by pointing to specific qualities that enable theoretically-informed meaning descriptions to contribute to the assessment and development of theories of meaning and to the study of cross-linguistic universals and variation. In the spirit of Bird and Simons (2003), who

recommend best practices for maximizing the long-term usability of language documentation, we present five requirements for meaning descriptions. These requirements must be met in order to maximize a description's potential for contributing to the assessment of theories of meaning, and to our understanding of the cross-linguistic mapping between form and meaning.

(58)   **Requirements for fieldwork-based, theoretically-informed descriptions of meaning**

      a. The description should be based on well-defined meaning categories.

      b. The description should be based on semantic data.

      c. The description should be based on positive and negative evidence.

      d. The description should maximize replicability.

      e. The description should maximize generalizability.

In the following, we discuss each requirement in turn.

(58a) The description should be based on well-defined meaning categories.
A meaning category (such as 'tense' or 'aspect') is well-defined if the definition makes predictions about how an expression that encodes that meaning is distributed in the language (e.g. which other expressions it can(not) co-occur with) and which contributions the expression makes to the meanings of sentences in which it occurs. An examples of an insufficiently precise definition is Comrie's (1985:9) definition of tense as "grammaticalized expression of location in time" (see footnote 3). See Tonhauser (2008) for a discussion of the importance of basing descriptions on well-defined meaning categories.

Descriptions that use terms such as 'past tense' or 'imperfective aspect' without providing definitions for the terms are unsatisfying, since such terms can be defined in a variety of ways. If, for instance, a description discusses a 'perfective aspect' without defining it, readers will, at best, be unsure about the meaning of the perfective in this language and, at worst, they will assume the meaning of some better-known perfective. The need for clear, language-specific explanation of category labels is especially strong if the meaning of the form for which a label is used differs

from the meaning that the label is typically used for (as noted by Haspelmath 2010b.) It is for this reason that in section 5.1, we took care to state how the meaning of the Badiaranke Imperfective differs from that of more familiar imperfective aspects.

(58b) The description should be based on semantic data.

Data relevant to semantic/pragmatic theorizing consist of sentences uttered in a specific context and a judgment of the acceptability/truth of the uttered sentence in that context by a native speaker (see also Matthewson 2004:371). These data may be collected through a variety of methods: judgment elicitation is suitable for obtaining both positive and negative evidence (cf. 58c), but positive evidence can also be obtained from written or spoken corpora (which can be assumed to contain only sentences judged to be acceptable; see Cover this volume for discussion), questionnaires, and production experiments (for a discussion of methods, see e.g. Krifka 2011 and Bohnemeyer this volume). Translations do not constitute data (though they may provide clues about the meanings of sentences of the object language; see Matthewson 2004 and Deal this volume).

(58c) The description should be based on positive and negative evidence.

As illustrated with examples (8) to (11), positive evidence identifies particular meanings that an utterance is compatible with, whereas negative evidence identifies particular meanings that an utterance is incompatible with. A meaning description thus only identifies the truth and felicity conditions of a particular utterance if both positive and negative evidence are provided.

(58d) The description should maximize replicability.

By this we mean that the information provided about how the empirical generalization was established should be precise enough to allow other researchers to replicate the findings in the same language or to explore comparable meanings in other languages. The level of detail should be on par with the level of detail provided in "method" and "analysis" sections of experimental papers. In particular, the discussion should include information about how the researcher interacted with the consultants (one-on-one elicitation, group interviews, participant observation, etc.), the number of consultants that participated in the research, relevant characteristics of the consultants (sex, age,

linguistic background, etc.), the range of examples elicited, the prompts given to the consultants in elicitation, and even, ideally, the kinds of responses by consultants that led to positing that the consultant judged the utterance to be (un)acceptable (including verbal and non-verbal cues, such as puzzled looks, laughing, and shaking of heads). This last piece of information is particularly important to provide to ensure cross-consultant and cross-language comparability. A meaning description that provides this level of detail about the methodology by which the data were obtained not only maximizes replicability, but also allows for subsequent explorations of the same topic to improve on the methodology, as discussed in Tonhauser *et al.* (2013).

(58e) The description should maximize generalizability.

The more consultants participate in a descriptive research project, and the wider the range of utterances that are judged, the more likely it is that the empirical generalizations that constitute the meaning description will generalize to the grammar of the entire language and to the wider population of speakers. Furthermore, the more consultants are involved and the more utterance types are judged, the easier is it to identify patterns about the language that are particular to a subset of consultants due to, for instance, sociological or dialectal variation. In practice, it is often not feasible to conduct fieldwork-based research with many consultants (e.g. due to limited speaker availability and/or fieldwork time constraints). To identify the extent to which the meaning description is generalizable, a descriptive research project should be explicit about how many consultants participated, the range of data used to establish a particular empirical generalization, and for which data and empirical generalizations there were disagreements between the consultants' judgments.

Acknowledgments

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Abstract

Over the past three decades, theories of meaning have increasingly become informed by empirical generalizations based on data gathered in fieldwork with theoretically untrained native speakers.

This paper discusses the interplay between theory and fieldwork in the study of meaning. Specifically, we argue that i) theory can guide fieldwork on meaning and when it does, more comprehensive meaning descriptions result, and ii) theoretically-informed descriptions are instrumental to improving theories of meaning, and to uncovering language universals and variation. We argue for this theoretical stance on the basis of fieldwork on temporal and aspectual reference, and thereby also offer a theoretically-informed guide to exploring temporal and aspectual reference in the field.

Keywords