

DOCTORAL DISSERTATION

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**At the intersection of temporal &  
modal interpretation:**  
**Essays on irreality**  
*[working title]*

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# Chapter 1

## Introduction

**D**ISPLACEMENT has been proposed as a universal and distinctive property of human language which permits us to make assertions that are embedded in different times, locations and possible worlds (*e.g.* Hockett’s ‘design features of human language’ 1960:90). Linguistic work — descriptive, pedagogical, theoretical — has traditionally seemed to take for granted a categorical distinction between subtypes of verbal inflection: *viz.* the TEMPORAL and MODAL domains. Whether or not these basic claims are intended as heuristic, the independence of tense, modality, aspect and related categories quickly unravels upon close inquiry into cross-linguistic data: a challenge for linguistic theory, and one that a growing body of literature is identifying (*e.g.*, Condoravdi 2002; Hacquard 2006; Laca 2012; Rullmann & Matthewson 2018 among many others).

The body of this dissertation consists of three more or less related studies that consider the roles of conventionalised linguistic expressions and context (*sc.* the interplay of semantics and pragmatics) in “displacing” discourse – that is, how, in a given discourse context, reference is established to different possible worlds and different times. In other words, we are concerned with the interactions between temporal reference, modal reference and negation/polarity, and the linguistic phenomena that these give rise to. Methodologically, these projects also engage with diachronic considerations in view of explaining variation and change across spatially and temporally separate language varieties. This is motivated by the desiderata formulated by the AMPHICHRONIC PROGRAM — that is, I assume that studying ostensible changes in language use over time has something to teach us about synchronic systems and vice versa, all in the service of developing an understanding of language as a cognitive system (*e.g.*, Anderson 2016; Deo 2015; Kiparsky 2006, see also § 1.3).

The role of this introduction is to lay out (and motivate) the major assumptions and theoretical commitments that underpin these essays and to highlight how, they connect with one another and (hopefully) constitute data and analyses that have the potential to further refine and nuance theories of natural language semantics, specifically in terms of what these have to say about the mechanics of displacement.

Each essay considers data from a number of languages spoken in Aboriginal Australia — particularly Yolŋu Matha and Australian Kriol — on the basis of both published and original data, collected on-site in the Top End and in consultation with native speakers. While there is a rich tradition of Australian language description and recent work has attended to a number of distinctive features in the functional semantics of Australian Languages, in places deploying formal tools, the languages of this continent, hugely linguistically diverse, has otherwise received vanishingly little attention in formal semantic theory (some exceptions to this include Stirling & Dench’s 2012 special issue of *Aust. J. Linguist.* 32,<sup>1</sup> James Bednall’s 2019 thesis on Anindilyakwa temporal and modal expression and Bowler 2014 & Kapitonov 2018 on quantificational expressions in Warlpiri and Kunbarlang respectively.) As we will see, data from these languages promise to challenge and enrich the methodological and theoretical toolbox of formal semantics. Furthermore, it is a general contention throughout this work formal perspectives hold exceptional promise in terms of better understanding this diversity and developing typologies of the expression of functional categories across these languages.

## 1.1 Overview

This body of this dissertation comprises three discrete parts, which represent three related but distinct projects. While they can each be read as independent pieces of work that tackle discrete linguistic phenomena, the methodological tools, assumptions and upshots of each component are mutually informing. As described above, the four chapters all engage with various phenomena at the intersections of tense, mood/modality and negation. They each interrogate the linguistic manifestations of interactions between these semantic categories in view of contributing to a nuanced and cross-linguistically sound semantic theory, with particular implications for our theoretical conceptions of, for example, irreality and counterfactuality. Here, I provide a brief abstract of each of the dissertation’s constituent parts.

**Part I** provides a first formal semantic account of “**apprehensionality**” — a “mixed modal” category that encodes possibility and negative affect with respect to some described eventuality. I pay particular attention to an apparent meaning change trajectory, where future-oriented temporal expressions develop modal readings: the semantical connections between futurity and modality are elegantly modelled by formal apparatus like that described in §1.2 below. In order to get at this, Chapter 2 describes and accounts for the changes in the distribution of the Australian Kriol adverb *bambai*. An observation originally due to Angelo &

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<sup>1</sup>*Australian Journal of Linguistics*’s special issue contained six pieces on various TAME phenomena in Australian languages emerging out of a four-year European Commission-funded grant. Of particular interest from a formal perspective are the contributions of Caudal et al. (2012) and Ritz et al. (2012).

Schultze-Berndt (2016, 2018), *bambai* started its life as a temporal frame adverbial ('soon, shortly thereafter') and has developed so-called "apprehensional" uses. The chapter provides a detailed explanation of the range of uses available to *bambai* in both its temporal and modal functions.

In many contexts *bambai* is translatable as 'otherwise': the account defended here treats *bambai*-type apprehensionals as discourse anaphors that involve the "modal subordination" of their preadjacent to elements of foregoing discourse (Ch 3, cf. Phillips & Kotek forthcoming).

On the basis of this, Ch. 4 comprises a proposed lexical entry which unifies these uses, in so doing, offering an account of the emergence of explicitly modal readings in a future-oriented ("subsequential") temporal adverb, as well as a semantics for apprehensional marking.

**Part II** comprises a first semantic treatment of **the Negative Existential Cycle** (NEC), also demonstrating its instantiation in a number of subgroups of Pama-Nyungan on the basis of comparative data from Thura-Yura, Yolŋu Matha and Arandic. The Negative Existential Cycle (see Croft 1991; Veselinova 2016) is a proposed grammaticalisation process where negative existential predicates develop into markers of sentential negation. Here (in Ch. ??) I propose a treatment where the PRIVATIVE—a grammatical category described in many Australian languages (*e.g.*, Dixon 2002; Phillips 2021)—is taken to realise the semantics of a negative existential. Diachronically, I provide evidence that erstwhile privatives generalise into sentential negators: an instantiation of the Negative Existential Cycle, giving a unified semantics for nominal and verbal negation in Ch ???. I take this cycle to provide support for a treatment of **negation as a two-place operator** (comparable to contemporary treatments of modal expressions) and additionally suggest that this cycle can be united with general observations made in the grammaticalisation literatures regarding the functional pressures underpinning meaning change — particularly the diachronic loss of the property of "strict/discretionary" indexicality (see Perry 2012).

**Part III** comprises a description and analysis of the encoding of mood/"reality status" in Western Dhuwal/a (WD)—a variety (or set of varieties) of Yolŋu Matha spoken in northern Arnhem Land. Unlike neighbouring varieties, WD exhibits **cyclic tense** (a species of *metrality*/temporal distance marking where a given inflectional category appears to encode the instantiation of a given property at discontinuous intervals) in addition to **negation-based asymmetries in reality-status marking** (cf. Miestamo 2005): a phenomenon where mood distinctions are collapsed in negative predications. **Part III** provides a semantics for WD's four inflectional categories (in particular their modal contribution) which captures and predicts the negative asymmetry. Central to the analysis is the idea that the inflections encode a two-way mood (or "reality status") distinction. This is formulated as a presupposition that a metaphysical modal base is **nonveridical** with respect to the inflected predicate. The species of nonveridicality itself is encoded by

a modal predicate modifier. In WD, the negative particles *yaka* and *bäyŋu* are two such modal expressions. In this sense, the account converges with observations made in Part II, *viz.* it advocates for a treatment of sentential negators and modal expressions as a natural class. These two phenomena (to varying degrees) represent areal features of the languages of central Arnhem Land. Part III concludes with a note discussing change and variation with respect to the semantics of verbal inflections in varieties of Yolŋu Matha.

The next section introduces a number of the key assumptions and formal tools that will be used to analyse each of the phenomena introduced above. Each individual subpart further engages with literature relevant to the respective analysis (*e.g.*, existing treatments of *apprehensionality*, *modal subordination*, *existential predication* and *verbal mood*.)

## 1.2 Formal theories of displacement

As indicated above, the three chapters that constitute the primary contribution of this dissertation comprise four treatments of data about natural language expressions responsible for temporal displacement, modal displacement and negation. In this section, I provide an overview of the formal semantic assumptions that guide and motivate these analyses.

The primary goal of semantic theory is the development of models of linguistic meaning. To this end, an understanding of “meaning” as the conditions on the truth and felicity of a given linguistic expression has proved to be a particularly successful methodology. A crucial distinction, and one that is key to the work presented here, is that between *extensional* and *intensional* semantics. An *extensional semantics* is one where the truth of a given sentence is “defined entirely by its form and the extensions of its component sentences, predicates and terms” (Menzel 2017). On the other hand, truth in an *intensional* logic requires appeal (or relativisation) to some object beyond these, *sc.* some semantical index at which a sentence’s truth or falsity is evaluated. These indices represent the parameters at which a given sentence is uttered – that is, they might be taken to contain information about the time and world of utterance, the discourse participants, etc. — also perhaps describable as “qualifications (of states of affairs)” (Nuyts 2005).

Formal approaches to semantics are largely developed from traditions of mathematical logic (*e.g.*, Montague 1970, see Janssen 2016 for an overview.) Importantly, the first formal temporal logics (*e.g.*, Prior 1957 *et seq.*) build on the frameworks of modal logic, in particular the notion of *possible worlds semantics*. Where a possible world  $w$  is an imaginable state of affairs, a possible ‘way the world could be’ (*e.g.*, Lewis 1986). The basic operationalisation of a possible worlds semantics lies in positing a modal “frame”  $\langle \mathcal{W}, \mathcal{R} \rangle$  — a set of worlds  $\mathcal{W}$  and an accessibility relation  $\mathcal{R} \subseteq \mathcal{W}^2$  which makes “relevant” worlds available. That is, when a pair of

worlds  $\langle w, w' \rangle$  is in  $\mathcal{R}$ ,  $w'$  can be said to be *accessible* from  $w$  or *possible-relative-to*  $w$  (alternatively, if  $w\mathcal{R}w'$ , then  $w$  *can see*  $w'$  (Hughes & Cresswell 1996:37). With a set of worlds and a way of relating them (a modal frame), a semantics can be defined for unary modal operators (normally  $\Box$  or **L**  $\doteq$  ‘it is necessary that’ and  $\Diamond$  or **M**  $\doteq$  ‘it is possible that’.) A standard semantics for these operators given a model  $\langle \langle \mathcal{W}, \mathcal{R} \rangle, \llbracket \bullet \rrbracket \rangle$  — that is, a modal frame and a valuation function  $\llbracket \bullet \rrbracket$  is provided in (1).

- (1) A modal semantics for formulae containing the modal operators  $\Box$  (necessity) and  $\Diamond$  (possibility) (*e.g.*, Hughes & Cresswell 1996:39)
- a.  $\llbracket \Box \varphi \rrbracket^w = 1 \leftrightarrow \forall w' [w\mathcal{R}w' \rightarrow \llbracket \varphi \rrbracket^{w'}]$   
Where  $\varphi$  is some well-formed formula,  $\Box \varphi$  is true in some world  $w$  iff  $\varphi$  is true in **all** worlds  $w'$  accessible from  $w$ .
  - b.  $\llbracket \Diamond \varphi \rrbracket^w = 1 \leftrightarrow \exists w' [w\mathcal{R}w' \wedge \llbracket \varphi \rrbracket^{w'}]$   
Where  $\varphi$  is some well-formed formula,  $\Diamond \varphi$  is true in some world  $w$  iff  $\varphi$  is true in **some** world  $w'$  accessible from  $w$ .

Building on these modal logic traditions, Prior (1957; 1958; 1967) analogised **Past** and **Future** tense operators to possibility modals: effectively, these operators are all taken to existentially quantify over a set of states-of-affairs (set of accessible reference points: times/possible worlds).<sup>2</sup> In the case of temporal operators, the relevant accessibility relation  $\mathcal{R}$  is identified as  $\prec$  (or  $\succ$ ), where  $t \prec t'$  reads: ‘ $t$  precedes  $t'$ ’. Consequently,  $\prec_{\langle w, t \rangle}$  ( $\succ_{\langle w, t \rangle}$ ) make available only the temporal predecessors (successors) of the evaluation index, assuming a dense, linearly-ordered set of times  $t, t', t'' \dots \in \mathcal{T}$ .<sup>3</sup> The sets of times that are made available by each of these relations is schematised in Fig. 1.1.

By analogy, then, with possibility modals, a past tense operator might be taken to existentially quantify over times preceding the reference time (as in 2 below.)

- (2)  $\llbracket \mathbf{PAST} \varphi \rrbracket^{w, t} = 1 \leftrightarrow \exists \langle w, t' \rangle [\langle w, t' \rangle \prec \langle w, t \rangle \wedge \llbracket \varphi \rrbracket^{w, t'}]$   
**PAST** $\varphi$  is true at  $t$  iff there is some time  $t'$  that is a predecessor to the reference index (formally, a world-time pair  $\langle w, t \rangle$ ) such that  $\varphi$  was true at  $t'$ .

<sup>2</sup>See Copeland (2002, 2020) and Markoska-Cubrinovska (2016) for more on the foundational contributions of Arthur Prior to the development of modal (esp. tense) logic.

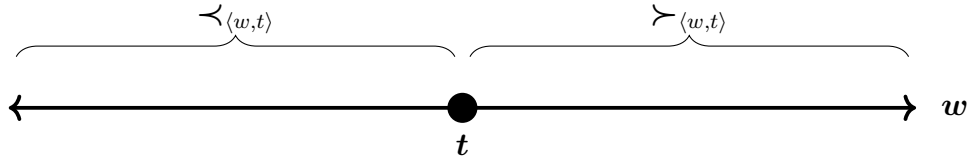
<sup>3</sup>For completeness:

A binary relation (*e.g.*,  $\prec$  over  $\mathcal{T}$ ) is:

- a. **LINEARLY ORDERED** iff it is connex, transitive, irreflexive and asymmetric
- b. **DENSE** iff it is isomorphic to  $\mathbb{R}$  (*i.e.*,  $\forall t, t'' [t \prec t'' \rightarrow \exists t' [t' \neq t \neq t'' \wedge t \prec t' \prec t'']]$ )



**Figure 1.1.** Temporal accessibility relations: the sets of world-time pairs preceding and following  $\langle w, t \rangle$  are labelled  $\prec_{\langle w, t \rangle}$  and  $\succ_{\langle w, t \rangle}$  respectively (adapted from Kaufmann, Condoravdi & Harizanov 2006:93). Time is assumed to “flow” infinitely rightwards.



### 1.2.1 Indeterminist tense logic: on future contingents & branching times

A related consequence of theories of temporal and modal logic emerging out of the philosophical and semantic traditions is the notion of “branching time”, which underscores the intimate relationship between temporal and modal reference.

Models of branching time capture a crucial asymmetry between past and future temporal reference: namely the indeterministic, inherently **unsettled** (or *contingent*) nature of predications about future times — an intuition frequently attributed to Aristotle’s example of tomorrow’s sea battle (*De Interpretatione*: Ch. 9; see Øhrstrøm & Hasle 1995 for a review of the thinking around this issue.) Widely adopted and developed, the formulation of branching time models is attributed to Arthur Prior and (a 17-year old) Saul Kripke (see Ploug & Øhrstrøm (2012) for a history of the correspondence of the two logicians.)

In effect, branching time formalisms seek to capture the idea that “for any given time there may be not merely a single future course of time, but multiple possible futures” (Dowty 1977:63, see also Burgess 1978; Thomason 1970 a.o.) — that is, a model of time as *right-branching* (rather than linear.) This asymmetry between the past and the future is observed in multiple places by Prior (1957; 1967, see also Copeland 2020), who develops what he refers to as a couple of alternative solutions, developed by indeterminists, to the problem of future contingency (*e.g.*, 1967:121ff): namely an *Ockhamist* versus a *Peircian* conception of the truth of tensed propositions.<sup>4</sup>

<sup>4</sup>In adopting these descriptors – recast in Burgess 1978 as the *actualist* and *antactualist* schools respectively – Prior alludes to observations made in William of Ockham’s tract *De Prædestinatione* (1945 [ca. 1322-4]) and by Charles Sanders Peirce (*e.g.*, Collected Works, Vol 6, ¶368). The primary inflection point between these two notions of truth is the “Peircian” collapse of the distinction between Ockhamist notions of future necessity and contingency. For the Ockhamist  $\mathbf{Fut}_t \varphi$  is valuable at  $t$ , even if its truth value is unknown, whereas for the Peircian  $\mathbf{Fut}_t \varphi$  is false until that point in the future of  $t$  where (perhaps)  $p$  comes to be true (that is, the systems differ on whether or not  $\mathbf{Fut}_t \varphi \wedge \mathbf{Fut}_t \neg \varphi$  is valid.) Prior (1967:126ff) formalises and give a detailed comparison of these two systems (also additional discussion in Nishimura 1979; Øhrstrøm & Hasle 1995, 2020 including the so-called “Leibnizian” extensions made to the Ockhamist system.)

For the indeterminist (*i.e.*, on the assumption that the future isn't settled and predetermined), then, FUTURE markers, are inherently modal operators insofar as they can be taken to quantify over different possible worlds — here to be represented as “branches.”<sup>5</sup> (Potential) futures, then, are calculated from with respect to a given evaluation time. Broadly speaking,  $\mathbf{Fut}\varphi$ , when evaluated at  $t$ , can be taken to say that, along all those futures branching from  $t$ , there's some later time ( $t'$ ) at which  $\varphi$  is true (see Thomason 1970:267).<sup>6</sup>

Here, I briefly lay out a version of the “branching time frame” as laid out by authors including Thomason (*e.g.*, 1984:§5) and Burgess (*e.g.*, 1978) *a.o.*

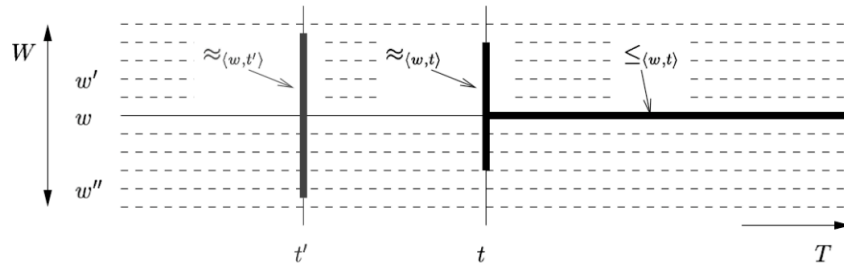
**The mechanics** A branching-time/tree frame  $\mathfrak{T}$  is a partially-ordered set (*i.e.*, a pair  $\langle \mathcal{I}, \prec \rangle$ ). That is, we assume a set of semantical indices (referred to elsewhere as *moments*) that is partially-ordered by the transitive precedence relation ‘PRECEDES’  $\prec$ . In effect, this set  $\mathcal{I}$  can be recast as comprising a set of world-time pairs  $\langle w, t \rangle \in \mathcal{W} \times \mathcal{T}$  (which is assumed in the so-called “parallel worlds” model, presented in Figure 1.2.)<sup>7</sup>

At any given index  $i \in \mathcal{I}$ , there is a single past and an infinity of branching

<sup>5</sup>“Branches” — the set of (maximal) chains within the (poset)  $\mathfrak{T}$  — refers directly to this apparent “right-branching” property of time (*sc.* future contingents). Prior also refers to “routes.” This terminology is apparently equivalent to the “histories” of other authors (Belnap et al. 2001; Dowty 1977; Tedeschi 1981; Thomason 1970 *a.o.*) or “chronicles” of yet others (Øhrstrøm & Hasle 1995). For some authors histories are distinguished from branches in that branches consist only of sequences of indices  $\prec$ -posterior to a specified branching point — that is,  $\prec$ -final subsets of histories (*e.g.*, Zanardo 1996:4). I'll be using the terms interchangeably.

<sup>6</sup>In fact, on Thomason's modified, trivalent account of truth valuation, a given sentence is generally true at  $\alpha$  iff it is true in all  $h \in \mathcal{H}_\alpha$  (*i.e.* all those histories  $h$  that run through  $\alpha$ ) (1970:274ff). Thomason (1984) uses  $B_t$  equivalently. Tedeschi (1981:247) uses a closely related strategy.

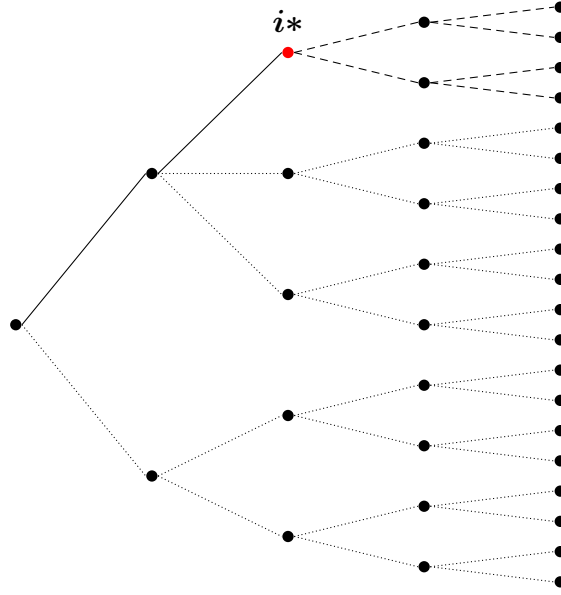
<sup>7</sup>For an excellent overview of the related set of objects  $\mathcal{W} \times \mathcal{T}$ -frames — adopted in Condoravdi (2002); Kaufmann (2005) *a.o.*, see Kaufmann et al. (2006). For comparisons with branching times models, see Rumberg 2016a; Thomason 1970, 1984.



**Figure 1.2.** Two-dimensional modal logic. The thick lines represent sets of individual indices accessible from  $\langle w, t \rangle$  by the modal relation  $\approx$  (vertical) and the temporal relation  $[\preceq]$  (horizontal). For example, the worlds accessible via  $\approx$  from  $w$  and  $t$  are also accessible at  $t'$ , but not necessarily vice versa (diagram and caption from Kaufmann, Condoravdi & Harizanov 2006:95)

futures. Left-linearity (*i.e.*, the tree’s trunk) is meant to depict the intuitive fixity (“settledness”) of the past versus the right-branching property, depicting the indeterminacy and openness of the future. The framework is diagrammed in Figure 1.3 below.

**Figure 1.3.** A branching times frame  $\mathfrak{T} = \langle \mathcal{I}, \prec \rangle$  following von Prince (*e.g.*, 2019:591). Time “flows” rightwards and vertically aligned indices are taken to be “copresent”.  $i^*$  represents the *evaluation index* (present time & actual world.)



**Branches** A branch  $b$  which runs through any  $i \in \mathcal{I}$  is a (maximal) linearly  $\prec$ -ordered subset (*sc. chain*) of  $\mathcal{I}$ . In this sense, a branch can be taken to correspond to a possible world/a complete possible course of events charting “an entire possible temporal development of the world” (Rumberg 2019:148). If all indices  $i$  are analogous to world-time pairs  $\langle w, t \rangle$ , then some  $b$  which contains  $i$  (notated  $b \ni i$ ) is formally a chain of indices, effectively modelling a timeline/set of possible developments of a given world through time — analogous to a chain over  $\mathcal{W} \times \mathcal{T}$  :  $\langle \langle w, t \rangle, \langle w, t' \rangle, \langle w, t'' \rangle, \dots, \langle w, t_n \rangle \rangle$ . Note that these frameworks normally appear to assume that indices correspond to the state of a world at a moment of time. I assume that this model can be extended relatively straightforwardly to capture interval semantic notions (*e.g.*, Bennett & Partee 2004; Dowty 1982; Landman 1991 a.o.).<sup>8</sup>

<sup>8</sup>This extensibility is also suggested in Dowty 1977 and Tedeschi 1981, which propose an interval semantic formalism for branching futures. Dowty gives a branching time (re)definition of an interval  $\mathfrak{z}$  as a connected proper subset ( $\sqsubset$ ) of a history (1977:64) — *i.e.*, a “sub-branch.” Formally:

An interval  $\mathfrak{z}$  is a subset of  $\mathcal{I}$  such that:  $\exists b[\mathfrak{z} \sqsubset b \wedge \forall i, i', i'' \in b[i, i'' \in b \wedge i \prec i' \prec i'' \rightarrow i' \in \mathfrak{z}]]$

I will refer to these indices, which constitute the elements of a given branch as **branchmates**. Given that branches are linearly ordered by  $\prec$ , pairs of branchmates are necessarily related by  $\prec$  (and equally by the related linear orders: the weak counterpart  $\preceq$  and the complements of these two orders  $\succ, \succcurlyeq$  respectively.)

(4) Two indices  $i, i'$  are branchmates iff  $i \prec i' \vee i = i' \vee i \succ i'$

And Priorian-type tense operators can be reformulated as asserting relations between pairs of branchmates  $i, i'$  (along a given branch  $b$ ):

- (5) a.  $\llbracket \text{PAST}\varphi \rrbracket = \lambda i. \exists i' [i' \prec i \wedge \varphi(i')]$   
 b.  $\llbracket \text{FUTURE}\varphi \rrbracket = \lambda i. \exists i' [i' \succ i \wedge \varphi(i')]$

Given that there are, in-principle, infinite logically possible futures for a given index,  $B_i$  will be taken to represent the set of all possible branches  $b$  that run through (that is, contain) a given index  $i$  ( $\cup \ni i$  or  $b, b', b'', \dots \ni i$ ). I'll sometimes also use the notation  ${}^b i$  in quantified expressions as a shorthand restricting the domain of  $\mathcal{I}$  to a specified branch — *i.e.*,  $\mathcal{I}$  its subset  $\{i \in \mathcal{I} \mid i \in b\}$ .<sup>9</sup>

**The “co-present”** Øhrstrøm & Hasle (2020) additionally point out that, for Kripke, these points are ranked with respect to one another — where each rank (or, diagrammatically, layer) of the tree constitutes an equivalence class of “co-present” indices (modally accessible in a  $\mathcal{W} \times \mathcal{T}$ -model, see Kaufmann, Condoravdi & Harizanov 2006:95).<sup>10</sup> That is, indices that are neither successors nor predecessors of one another — *i.e.*, those are not ordered by  $\prec$  with respect to one another — can still be temporally compared. In developing a branching-time semantics for conditionals,<sup>11,12</sup>

Thomason & Gupta (1980) propose an additional “co-present” relation ( $\simeq \subseteq \mathcal{I}^2$ ) which defines an equivalence class of co-present indices. With the relation  $\simeq$  over  $\mathcal{I}$ , an index can be compared across, *e.g.*, all possible futures. As Landman

<sup>9</sup>*E.g.*,  $\exists {}^b i \varphi = \exists i [i \in b \wedge \varphi]$  reads ‘there exists some index along  $b$  s.t.  $\varphi$ ’

<sup>10</sup>Similarly, Belnap et al. (2001:194ff) distinguish between *moments* (=indices) and *instants*, where the latter are partitions of a tree structure that represent “[a] horizontal counterpart of histories (=branches).” “Rank” is attributed to Kripke in a 1958 letter to Arthur Prior (published in Ploug & Øhrstrøm 2012:373ff).

<sup>11</sup>A crucial desideratum of their account is that it formalise Stalnaker’s notion of maximal “similarity” between the evaluation world and the antecedent proposition, following Stalnaker 1968; Stalnaker & Thomason 1970.

<sup>12</sup>This formalism, related to the alternativeness relation ( $\approx$ ) of Thomason (1984:149), has a similar outcome/motivation to the “instant” or “time (value) function” of Rumberg (2016b:27), Belnap et al. (2001:195) and von Prince (2019:592), where *time* maps an index to a set of “clock times” ordered by  $\prec$  (isomorphic to branches). Similarly Landman (1991:102) provides a number of ways of establishing equivalence classes of co-present indices. *E.g.*, in what turns out to be an operationalisation of the Kripke’s observation referenced above, “rank” can be measured using a function  $d : \mathcal{I} \rightarrow \mathbb{N}$  that returns the how many “nodes” a given index is from  $\mathcal{T}$ ’s defined “origin” node (*viz.*  $\bigcirc$  — the  $\prec$ -minimal element of  $\mathcal{I}$ , *cf.* Zorn’s lemma). Equivalence classes can then be defined as sets of indices the same number of nodes from the origin, *sc.*  $\approx = \lambda i \lambda i'. d(i) = d(i')$ .

(1991:101) points out, in counterfactuals like: *if she hadn't left me a week ago, I wouldn't be so miserable now*, the indexical adverb *now* appears to pick out an index co-present with the time of speech, but crucially on a different “branch.”

Armed with this relation then, Thomason & Gupta define an (anti)posteriority relation that holds between indices that aren't branchmates:

(6) (Anti)posteriority (Thomason & Gupta 1980:311)

- a.  $i$  is **posterior** ( $\succ$ ) to  $j$  iff there is some copresent index of  $j$  (say,  $j'$ ) that is a successor to  $i$   $i \succ j \Leftrightarrow \exists j'[j' \simeq j \wedge i \succ j']$
- b.  $i$  is **antiposterior** to  $j$  iff  $i$  is not posterior to  $j$  or is copresent with  $j$

**Settledness** As suggested above, models of branching time seek to formalise intuitions about asymmetries between past and future predications. We have seen above how the truth of future contingents can be modelled using “forking paths” (i.e. branches of linearly ordered subsets of  $\mathcal{I}$ ). Conversely, the model is “left-linear”, depicting ‘our notion of necessity *given* the past, [where] only one past, the actual one, is possible’ (Burgess 1978:159). That is, for any index there is only one unique sub-branch representing its history/set of predecessors

(7) **Left linearity** — i.e.,  $\mathcal{T}$  is not branching to the past iff — where  $a, b, b' \in \mathcal{I}$  :  
 $\forall a, b, b' [(b \prec a \wedge b' \prec a) \rightarrow (b \prec b' \vee b = b' \vee b \succ b')]$  (Landman 1991:105)

Settledness/historical necessity is normally expressed in terms of **historical alternatives**. This refers to the notion of equivalence classes of possible worlds ( $\approx_t \subseteq \mathcal{W} \times \mathcal{W}$ ) : those worlds which have identical ‘histories’ up to and including a reference time  $t$ .

The properties of the *historical alternative* relation (in a  $\mathcal{T} \times \mathcal{W}$  model) are given in (8) which will permit for a formal definition of settledness as in (9).

(8) **Historical alternatives**  $\approx \subset \mathcal{T} \times \mathcal{W} \times \mathcal{W}$

- a.  $\forall t [\approx_t \text{ is an equivalence relation}]$   
 All world-pairs in  $\approx_t$  (at an arbitrary time) have identical pasts up to that time.  
 Their futures may diverge.  
 The relation is symmetric, transitive and reflexive (i.e., an equivalence relation).
- b. **monotonicity**  
 $\forall w, w', t, t' [(w \approx_t w' \wedge t' \prec t) \rightarrow w \approx_{t'} w']$   
 Two worlds that are historical alternatives at  $t$  are historical alternatives at all preceding times  $t'$ .

That is, they can only differ with respect to their futures.

(Thomason 1984:146)

The monotonicity property (8b) captures the intuition that the metaphysical alternatives that are available at given world-time pair change (monotonically) through time: that is, there is a unique possible state of the worlds at all times in the past. Given that branching-time models are definitionally taken to be left-linear, this additional equivalence relation isn't needed for them: it is a theorem of the system that  $\preceq$  is monotonic (compare 8b' below.)

(8) b'. **monotonicity of  $\preceq$**

$$\forall i, i', i'' [[i' \preceq i \wedge i'' \preceq i] \rightarrow [i' \preceq i'' \vee i'' \preceq i' \vee i = i'']]$$

Importantly, the notion of historical alternativeness/necessity is deployed in linguistic semantics to capture a number of natural language phenomena (e.g., Condoravdi 2002; Kaufmann 2002; Thomason 1984). Settledness, a related property, is satisfied if the instantiation of a given predicate is identically determined at all historical alternatives to a given world-time pair  $\langle w*, t_0 \rangle$  is adapted in (9) below.

(9) **Settledness for  $P$  in  $w*$**

$$\forall w' : w* \approx_{t_0} w' :$$

$$AT([t_0, \_], w', P) \leftrightarrow AT([t_0, \_], w'', P)$$

A property  $P$  (e.g., an eventuality) is settled in a reference world  $w'$  iff  $P$  holds at a reference time  $t_0$  in all of  $w'$ 's historical alternatives  $w''$  as calculated at  $t_0$ .<sup>13</sup>

Further developing this notion, Condoravdi (2002:82) gives a definition of “presumed settledness” — a property of predicates (see also Kaufmann 2002, 2005). In effect,  $P$  is presumed settled in a given discourse context iff ‘the instantiation of the property it applies to is presupposed to be historically necessary if true (or equivalently, impossible if false.)’ This is formalised in (11).<sup>14</sup>

<sup>13</sup>The  $AT$  relation holds between a time, world and an eventive property iff  $\exists e[P(w)(e) \& \tau(e, w) \subseteq t]$  — i.e. if the event's runtime is a subinterval of  $t$  in  $w$  (Condoravdi 2002:70). This can accommodate stative and temporal properties with minor adjustments (see *ibid.*). For the sake of perspicuity, I abstract away from (davidsonian) event variables in this section.

<sup>14</sup>As a property holding between sentences (rather than properties) and doxastic agents, Kaufmann similarly defines this condition (‘presumption of decidedness’) as:

$\varphi$  is **presumed decided** by agent  $\alpha$  at  $i$  iff  $\Box_{\sim\alpha}(\varphi \rightarrow \Box_{\sim\alpha}\varphi)$  is true at  $i$ . (Kaufmann 2005:240)

That is, iff: in all of  $\alpha$ 's doxastic alternatives, if  $\varphi$  holds at  $i$ , then it holds at all of  $i$ 's historical alternatives.

(11) a. **The common ground**

The common ground (somewhat heuristically) is the set of propositions that are taken to be believed by all discourse participants (doxastic agents)  $\alpha$  in the discourse context ( $c$ ).

$$cg_c \stackrel{\text{def}}{=} \bigcap_{\alpha \in c} \text{DOX}_\alpha(w^*)$$

b. **The presumption of settledness for  $P$** 

$$\forall w' : w' \in \cap cg, \forall w'' : w' \approx_{t_0} w'' :$$

$$AT([t^*, \_], w', P) \leftrightarrow AT([t^*, \_], w'', P) \quad (\text{Condoravdi 2002:82})$$

A property  $P$  (e.g. an eventuality) is presumed settled in a common ground  $cg$  iff  $P$  is settled at all historical alternatives  $w''$  to all worlds  $w'$  compatible with  $cg$ .

Here, a common ground is taken to be equivalent to a context set ( $\cap cg$ , cf. Stalnaker 1978:321ff) — *sc.* the set of worlds that the speaker takes to be epistemically accessible for participants in the discourse context/the set of worlds where all propositions known by the discourse participants are true (compare also Kaufmann's definition in fn. 14).

Once again, and drawing on the relations described above, this relation between context set and property can be recast in a branching-time model as in (9'); again  $i^* \in \mathcal{I}$  represents the evaluation/reference index (analogous to  $\langle w_0, t_0 \rangle$  above).

(9') **Settledness-at- $i^*$  for  $P$  (branching times)**

$$\forall b \left[ b \in B_{i^*} \rightarrow \exists i' \left[ i' \in b \wedge \forall j \left[ i' \simeq j \wedge [AT(i', P) \leftrightarrow AT(j, P)] \right] \right] \right]$$

A property  $P$  is settled at an evaluation index  $i^*$  iff all branches running through evaluation time  $i^*$  contain a co-present index  $j \in \cup \simeq i'$  such that  $P$  is instantiated at  $i'$  iff it's also instantiated at  $j$ . (*I.e.*,  $P$  is settled at  $i^*$  iff it's instantiated at all or none of the indices that are copresent with  $i'$  (a branch-mate of  $i^*$ .)

Similarly, in a branching time framework, we would stipulate that  $P$  is **presumed settled** iff, for any possible branch  $b$  that is compatible with a given common ground,  $P$  is identically determined at  $b$  and all of the historical alternatives to that particular  $b$ .

**A modal trichotomy** As a consequence of this, Von Prince (2017, 2019) establishes a neat formal trichotomy between the ACTUAL, POTENTIAL and COUNTERFAC-TUAL domains by appealing to this framework (see also Rumberg 2016b:41, 2019). This is modelled as having  $\prec$  induce a partition of  $\mathcal{I}$ : that is, all  $i \in \mathcal{I}$  can be sorted into (exactly) one of these three sets. This partition is reproduced in (12).

- (12) Given a contextually defined ACTUAL PRESENT ( $i^* = \langle w^*, t^* \rangle$ ),  $\mathcal{I}$  can be partitioned into three subdomains:
- The ACTUAL (past/present) =  $\{i \mid i \preceq i^*\}$   
The utterance index  $i^*$  and its predecessors are the realm of the ACTUAL. Compare this notion to the equivalent one of *historical alternatives to  $w$  at  $t$* . These indices will be shown to be associated with the (notional semantic category of) REALIS.
  - The POTENTIAL =  $\{i \mid i \succ i^*\}$   
Successors to the index of utterance  $i^*$  are the realm of the POTENTIAL: the full set of metaphysically possible futures to  $i^*$ .
  - The COUNTERFACTUAL =  $\{i \mid i \text{ is unordered by } \prec \text{ w/r/t } i^*\}$   
Those  $i \in \mathcal{I}$  which neither precede nor succeed the utterance index  $i^*$ : i.e., indices that are not (possible) branchmates of  $i^*$ .

Each cell of this partition is represented in Figure 1.3 above: solid lines join those indices that are  $i^*$ -ACTUAL, whereas dashed and dotted lines represent  $i^*$ -POTENTIAL and -COUNTERFACTUAL branches respectively. This trichotomy is shown to have significant linguistic import (which will be explored throughout the dissertation.)

### 1.2.2 Modal auxiliaries as quantifiers: Kratzer 1977 *et seq.*

Building on the tense logics introduced above, following (Kratzer 1977; 1981b; 1991 a.o.), modal expressions are taken to denote **quantifiers over possible worlds**. Crucially, like other natural language quantifiers, modal auxiliaries are taken to contain (implicit) restrictions over their quantificational domain. For Kratzer the distinction between so-called *epistemic* and *deontic* readings of modal auxiliaries is a function of this restriction. This distinction is shown in the sentence pair in (13) below.

- (13) Two readings of English modal auxiliary *must* from Kratzer (1977:338)
- All Māori children **must** learn the names of their ancestors
  - The ancestors of the Māori **must** have arrived from Tahiti

In effect, the different readings (“flavours”) of *must* in (13a-b) arise as a consequence of different **restrictions** that are made over the set of possible worlds. In effect, the deontic reading (13a) makes a claim about only (and all) those worlds/possible states-of-affairs in which Māori children adhere to some set of societally-given rules, laws and expectations. Conversely (13b) makes a claim about only (and all) those possible worlds that are compatible with everything that the speaker knows. These subsets of  $\mathcal{W}$  are referred to as **conversational backgrounds** (*sc.* an *epistemic*



vs. *deontic* conversational background). By assuming that conversational backgrounds are supplied by broader linguistic context, a major advantage of the Kratzerian program is that modal auxiliaries like *must* and *can* can be taken to be semantically unambiguous. The accessibility relations against which modal propositions were verified in earlier modal logics (sc. modals as unary operators) are reconceptualised as contextually-retrieved functions from worlds to (sets of) propositions (see Kaufmann, Condoravdi & Harizanov 2006).

A sentence of the form *must*  $\varphi$  asserts that  $\varphi$  is true in all relevant worlds (universally quantifying over a subset of  $\mathcal{W}$ , returned by a **modal base** (i.e., a conversational background)  $f$ ) whereas one of the form *can*  $\varphi$  makes a weaker claim, namely that the truth of  $\varphi$  is *compatible* with those worlds. That is, *must* is a universal quantifier and *can* is an existential quantifier over possible worlds (14).

(14) The semantics of necessity/possibility modal auxiliaries (adapting from Kratzer 1977:346)

- a.  $\llbracket \text{must} \rrbracket = \lambda f \lambda p \lambda w. \forall w' [w' \in \cap f(w) \rightarrow w' \in p]$   
*must*  $p$  is true given a modal base  $f(w)$  if  $p$  follows from  $f(w)$
- b.  $\llbracket \text{can} \rrbracket = \lambda f \lambda p \lambda w. \exists w' [w' \in \cap f(w) \wedge w' \in p]$   
*can*  $p$  is true given a modal base  $f(w)$  if  $p$  is compatible with  $f(w)$

A second type of conversational background, the **ordering source**, is formally similar to the modal bases invoked above insofar as it comprises a set of propositions  $o(w)$ . This set can induce an *ordering* over the worlds in the modal base in terms of how well each world conforms with  $o(w)$ . Appealing to multiple interacting conversational backgrounds has allowed for successful modelling of linguistic expressions that denote/appeal to graded possibilities and probability and subtle differences in modal “flavours.” That more than one conversational background is required is well illustrated in (15) (adapted from Kaufmann, Condoravdi & Harizanov 2006).

(15) *Randi must pay a fine for drink-driving*  
 $\nRightarrow$  ‘In all those worlds where the rules are best followed, Randi must drink-drive.’

(15) shows that a deontic conversational background can’t serve as the modal base for *must* (as this would require that all law-abiding worlds to be characterised by Randi’s drink-driving.) Instead, we appeal to a “circumstantial” modal base  $f(w)$ : that is, we consider worlds where relevant circumstances (including Randi’s drink-driving) obtain, and universally quantify into a subset of those, namely the ones that best conform to whichever set of rules/laws govern drink-driving (sc. those propositions in the deontic ordering source  $o(w)$ .) Generally this is operationalised by appealing to a function  $\text{BEST}_{o(w)}$  which takes a set of worlds and returns the “best”

worlds as determined by an ordering source  $o$  (i.e., those worlds in  $f$  best conforming to the ideal contained in  $o$  as in (16) adapted from von Fintel & Heim 2011:61.)<sup>15</sup>

- (16) The best worlds in a modal base  $f$  according to an ordering  $\prec_{o(w)}$
- $$\text{BEST}_{o(w)}(\cap f(w)) = \{w \in \cap f(w) \mid \neg \exists w' [w' \prec_{o(w)} w]\}$$

- (17) *must* relativised to two conversational backgrounds (modal base  $f$  and ordering source  $o$ )

$$\llbracket \text{must} \rrbracket^{o,f} = \lambda p \lambda w. \forall w' [w' \in \text{BEST}_{o(w)}(\cap f(w)) \rightarrow w' \in p]$$

*must*  $p$  is true in  $w$ , given conversational backgrounds  $\langle f, o \rangle$  if  $p$  is true in all the worlds that are best conforming to  $o(w)$  in  $\cap f(w)$

The formal implementation of orderings and comparisons of sets of worlds (or branches) will be further discussed in the main part of this dissertation.

**Quantifying over  $\mathcal{T}$**  Once again, we can recast the contribution of modal expressions within a branching-times type ontology (suggested in von Prince 2019:594, note 9). In such a system, modals will be taken to quantify over branches ( $\mathcal{B} \subseteq \wp(\mathcal{I})$ ) — again, maximal chains within  $\mathcal{I}$  or sets of indices that are linearly ordered by  $\prec$ . Given that each unique branch represents a possible course of events, modal operators can be taken to quantify over  $\mathcal{B}$ , much as they do over  $\mathcal{W}$  in possible world semantics.

This involves recasting conversational backgrounds — sets of propositions — as functions from indices to sets of possible branches of  $\mathcal{I}$ . A deontic conversational background  $\text{DEONT}(i)$ , for example, is a set of propositions which represent the body of laws at a given index  $i$ . As in possible worlds analyses, these conversational backgrounds restrict the domain of quantification to some contextually relevant subset of  $\mathcal{B}_i$  — i.e. a subset of those branches that run through  $i$ .

Proposals for Branching-theoretic lexical entries for the English modal auxiliaries in (14) are modified accordingly below.<sup>16</sup>

- (14') Proposed modification to semantics for modal auxiliaries (14) for  $\mathcal{T}$ -frames.

- a.  $\llbracket \text{must} \rrbracket^f = \lambda p \lambda i. \forall b \ni i [b \in \cap f(i) \rightarrow \exists i' : i' \in b \wedge p(i')]$   
*must*  $p$  is true if, along all the branches through  $i$  that are selected by the modal base  $f(i)$ , there is a branchmate  $i'$  such that  $p$  holds at  $i'$ .
- b.  $\llbracket \text{can} \rrbracket^f = \lambda p \lambda i. \exists b \ni i [b \in \cap f(i) \wedge \exists i' : i' \in b \wedge p(i')]$   
*can*  $p$  is true if, there is some branch running through  $i$ , which is selected

<sup>15</sup>This same function is sometimes also given as **max** (e.g. von Fintel & Heim 2011; von Fintel & Iatridou 2008; Hacquard 2006, a.o.) or **O(pt)** (Schwager 2006:247).

<sup>16</sup>Ordering sources can be added back in straightforwardly (i.e., again as sets of propositions which induce an order over a modal base.) They are not given in these entries for the sake of exposition.

by the modal base  $f(i)$  and along that branch there is an index  $i'$  such that  $p$  holds at  $i'$ .

As mentioned above, the vast majority of work in the formal semantic program has taken European languages as its object of study. If model-theoretic approaches to semantics are to provide a complete theory of natural language phenomena, it is incumbent upon the field to demonstrate the applicability of these tools and principles to all possible human languages. This enterprise includes modelling and precisely describing the diversity of temporal and modal systems cross-linguistically.

For example, recent work on cross-linguistic semantics has shown how the semantics for English modals – where quantificational force is lexically encoded and conversational backgrounds are provided by context – does not provide the correct semantics for other languages’ modal systems. Rullmann et al. (2008), for example show that, in Státimcets (Salish: British Columbia), deontic and epistemic modal clitics are separately lexified whereas quantificational force is contextually determined (*viz.*  $ka$  ‘IRR’,  $k^2a$  ‘EPIST’ and  $kelh$  FUT’) (see also Matthewson 2010; Peterson 2010). They model this with a choice function  $f_c$ , pragmatically provided that restricts the size of the set (*sc.* modal base) which is being universally quantified over (18).

- (18) Semantics for  $k^2a$  ‘EPIST’ (Státimcets epistemic variable-force modal, from Rullmann et al. 2008:340)

$$\begin{aligned} & \llbracket k^2a \rrbracket^{c,w} \text{ presupposes an epistemic modal base } m \text{ \& } \\ & \llbracket k^2a \rrbracket^{c,w} = \lambda f_c \lambda p. \forall w' [w' \in f_c(m(w)) \rightarrow p(w')] \end{aligned}$$

Building on other insight on usage of possibility modals (notably Klinedinst 2007), for Rullmann et al. (2008) the “appearance” of force variability in Státimcets modals is a result of the relative size of the subset of the modal base picked out by  $f_c$  (that is, quantifying over a smaller subset makes a commensurately weaker modal claim.) Numerous authors have since pointed out that this appeal to  $f_c$  seems to be actually equivalent to deploying an ordering source as described above (and similarly to von Stechow & Iatridou’s 2008 treatment of *ought* “strong necessity” — see Matthewson 2010; Peterson 2008; Portner 2009.) A similar phenomenon (*viz.* force variability) is exhibited in Western Dhuwal(a); see Part III, which will deploy components of this analysis. As we will see through this dissertation, additional elaborations and assumptions will permit us to capture facts about the grammars of these Australian languages.

### 1.3 A note on the “amphichronic program”

Due to Kiparsky (2006 *et seq.*), *amphichronic* linguistics is an approach to linguistic theory that assumes that synchronic and diachronic levels of explanation “feed

each other” (see also Bermúdez-Otero 2015). This research program is motivated by the necessity to dissociate *typological generalisations* from *language universals*. Are the phenomena that we see (or don’t see) expressed in natural language a function of universal design features and constraints on the human language faculty? Or are they derivable “by-products” from tendencies of language change? (see also

further elaboration;  
 explanation of  
 “diachronic level of  
 explanation”

Anderson 2016, 2008). In the semantic domain, for Kiparsky, “[grammaticalisation] reveals the language faculty at work. Formal renewal engenders new categories that conform to cross-linguistic generalisations regardless of their source” (Kiparsky 2015:73). Over past decades, research on meaning change has led to the discovery of regular grammaticalisation “clines/pathways/trajectories”: that is, a given lexical expression with meaning  $\alpha$  comes to denote  $\beta$ , then  $\gamma$  *etc.* as an independent development across languages separated in space and time (see Deo 2015; Eckardt 2011). In view of these robust cross-linguistic tendencies emerges the question of what is driving this change and *why*. In this dissertation, I apply a methodology where the precise synchronic meaning of particular linguistic expressions is analysed while simultaneously attending to changes in the interpretive conventions associated with these expressions.<sup>17</sup> It is a goal of the current research, then, to contribute insights into the ætiology of these changes and to consider what light, if any, they may shed on the universal “structure” of the semantic domains that are investigated here.

## 1.4 Languages

Some three hundred Australian languages have been reconstructed to a single family, Pama-Nyungan, spoken across Australia except for some regions in the north of the continent. The most recent common ancestor of these languages is estimated to have been spoken roughly five to six thousand years BP (a similar time depth to Indo-European, see Bouckaert et al. 2018:742). Many of these languages remain underdescribed, and consequently, poorly integrated into (model-)theoretic treatments of cross-linguistic semantics...

ARnhem land more generally (esp given the survey Roper languages in the appr chapter)

## 1.5 Data & glossing conventions

Each subpart of this dissertation makes use of (novel and published) data from different sources. Example sentences are glossed following (modified) Leipzig conventions (all adopted conventions listed on pg. ??).

<sup>17</sup>See also James Leow’s recent (2020) dissertation where he reports change in the modal necessity domain of Cuban Spanish.

Much of the Australian Kriol and Yolŋu Matha dataset was elicited between 2016 and 2019 from native speakers in Arnhem Land (in particular the Ngukurr and Ramingining communities) and Darwin. Where data are sourced from published material, a numbered bibliographic citation is provided. Where data is sourced from original fieldwork, the consultant's initials and date of recording are provided in square brackets — *e.g.*, [JP 20201216].

## **Part I**

# **The emergence of apprehensionality in Australian Kriol**

## Chapter 2

### *bambai* as an apprehensional

‘Apprehensional’ markers are a nuanced, cross-linguistically attested grammatical category, reported to encode epistemic possibility in addition to information about speakers’ attitudes with respect to the (un)desirability of some eventuality. Taking the meaning of Australian Kriol particle *bambai* as an empirical testing ground, this paper provides a first semantic treatment of apprehensionality, informed by a diachronic observation (due to Angelo & Schultze-Berndt 2016) in which apprehensional readings emerge from erstwhile temporal frame adverbials that encode a relation of SUBSEQUENTIALITY between a discourse context and the eventuality described by the prejacet predicate.

Consider the contributions of *bambai* in the Australian Kriol sentence pair in (19):

(19) **Context:** I’ve invited a friend around to join for dinner. They reply:

a. SUBSEQUENTIAL reading of *bambai*

*yuwai! bambai ai gaman jeya!*  
yes! *bambai* 1s come there

‘Yeah! I’ll be right there!’

b. APPREHENSIONAL reading of *bambai*

*najing, im rait! bambai ai gaan binijim main wek!*  
no 3s okay *bambai* 1s NEG.MOD finish 1s work

‘No, that’s okay! (If I did,) I mightn’t (be able to) finish my work!’

[GT 20170316]

While the reading of *bambai* in (19a) roughly translates to ‘soon, in a minute’, this reading is infelicitous in (19b), where *bambai* is a discourse anaphor which contributes a shade of apprehensional meaning (*i.e.*, indicates that the Speaker’s hypothetically joining for dinner may have the undesirable possible outcome of him not finishing his work.)

## 2.1 Background

Having entered into their lexicons predominantly via the contact pidgin established in colonial New South Wales (NSW) in the late eighteenth century (Troy 1994), cognates of the English archaism *by-and-by* are found across the English-lexified contact languages of the South Pacific.

(20) *baimbai*, translated as ‘soon, eventually, (in the) FUTURE’ in Troy (1994)

- a. *stopabit massa baimbai mi paiala dat agen aibliv*  
 ‘Wait, master, soon I’ll speak to them again, I think.’ (252)
- b. *Baimbai Potfilip blakfela Waworong blakfela kwambi ded olgon*  
 ‘Soon Port Phillip ( $\approx$  Melbourne) Aboriginal people, the Waworrong, will be “asleep”: dead and completely gone.’ (420)
- c. *Wool Bill been choot him kangaroo; by and bye roast him*  
 ‘Old Bill shot a kangaroo, then cooked it.’ (575)

Additionally, Clark (1979) describes *by-and-by* as a particularly broadly diffused feature of the *South Seas Jargon* that served as a predominantly English-lexified auxiliary means of communication between mariners of diverse ethnolinguistic backgrounds and South-Pacific islanders (21, cited in Harris 1986:262ff a.o.). The cognates across these contact languages have preserved the function of *by-and-by* as encoding some relationship of temporal subsequentality between multiple eventualities.<sup>18,19</sup> Clark takes this shared feature (along with other cognates) to be a retention, evincing a shared history between these varieties (see also fn 20 below.)

As shown in 19, Australian Kriol (hereafter Kriol *simpliciter*) has retained this function: below, in (21), *bambai* serves to encode a temporal relation between the two clauses: the lunch-making event occurs at some point in the (near) future of the speaker’s father’s trip to the shop: *bambai* might well be translated as ‘then’ or ‘soon after’.

<sup>18</sup>*baimbai* (sic) is described as a ‘future tense marker’ by Troy (1994:112,418,711) and Harris (1986:268). Indeed it appears to be a general marker of futurity in the textual recordings of NSW pidgin that these authors collate, although still retains a clear syntactic function as a frame adverbial. Their description of *bambai* (along with *sun*, *dairekli*, etc) as a tense marker is possibly due to the apparent lack of stable tense marking in the pidgins, although is likely used pretheoretically to refer to an operator that is associated with future temporal reference. This is discussed further in § 2.3.1 below.

<sup>19</sup>Clark (1979:10-11) lists cognates of *bambai* (transcribed as *baymbay* for Roper Kriol) in the contact languages of New Guinea, Solomon Islands, Vanuatu, Cape York, Norfolk Island and Hawai’i. According to Romaine (1995), in Tok Pisin *baimbai* grammaticalised into a general future tense marker. On the basis of a corpus of Pacific Jargon English, she also hypothesises emergent irrealis-type readings in admonitory contexts. (this claim is discussed further in Ch. 3.) See also Angelo & Schultze-Berndt 2016 for further review of cognates of *bambai* across other Pacific contact varieties.



- (21) *main dedi imin go la det shop ailibala bambai imin*  
 my father 3S=PST go LOC the shop morning **bambai** 3S=PST  
*kambek bla gugum dina bla melabat*  
 come.back PURP cook dinner PURP 1p.EXCL

‘My dad went to the shop this morning, **then** he came back to make lunch for us.’ [A] 23022017]

In addition to the familiar ‘subsequential’ use provided in (21), *bambai* appears to have an additional, ostensibly distinct function as shown in (22) below.<sup>20</sup>

- (22) **Context:** It’s noon and I have six hours of work after this phonecall. I tell my colleague:

*ai-rra dringgi kofi bambai mi gurrumuk la desk iya gin*  
 1S=IRR drink coffee **bambai** 1s fall.asleep LOC desk here EMPH

‘I’d better have a coffee **otherwise** I might pass out right here on the desk.’ [GT 28052016]

In (22), the speaker asserts that if he doesn’t consume coffee then he may subsequently fall asleep at his workplace. In view of this available reading, Angelo & Schultze-Berndt (2016) describe an ‘apprehensive’ use for Kriol *bambai* — a category that is encoded as a verbal inflection in many Australian languages and is taken to mark an ‘undesirable possibility’ (256). In this case, *bambai* is plainly not translatable as an adverbial of the ‘soon’-type shown in (21). Rather, it fulfills the function of a discourse anaphor like ‘otherwise’, ‘or else’ or ‘lest’ (see also Phillips & Kotek; Webber et al. 2001).

This chapter proposes a diachronically-informed and unified semantics for Australian Kriol *bambai*, concerned especially with the apparent emergence of AP-PREHENSIONAL readings in this (erstwhile) temporal frame adverbial. The current chapter reviews and motivates the grammatical category of ‘apprehensional epistemics’ as described in typological literatures (§ 2.2). Section 2.2.3 describes the function and distribution of Kriol *bambai*, both in its capacity as a subsequential temporal frame adverbial (§2.3.1) and its apparent apprehensional functions (§2.3.2).

<sup>20</sup>Note though that Clark also observes that the Pitkern cognate appears to have developed LEST/IN CASE-type readings (*i.e.*, an APPR reading) as in (22). Pitkern – the variety spoken by *Bounty* mutineers – is generally described as an outlier among other Pacific contact varieties (*i.e.*, not a descendant of the South Seas Jargon, see Clark 1979: 48); this is likely to be an entirely independent innovation.

- (22’) Apprehensional-like cognate in Pitkern-Norfolk (Clark 1979:15)

*kam daun bembæ ju fɔl*  
 ‘Come down, lest you fall.’

In the data we have seen so far, *bambai* appears to connect two propositions. In Chapter 3, we consider how *bambai* is interpreted in view of the relationship between these two propositions: specifically how the prejacent of *bambai* is **modally subordinate** to material accommodated in a discourse context. *Somewhere we put in the diachronic story... probably here. Flowing from the use conditional discussion. These can maybe all be taken to motivate components of the analysis chapter?*

Finally, Chapter 4 comprises a proposal for a unified semantics for *bambai*.

## 2.2 Apprehensibility cross-linguistically

While descriptive literatures have described the appearance of morphology that encodes “apprehensibility” meaning, very little work has approached the question of their semantics from a comparative perspective. Particles that encode negative speaker attitude with respect to some possible eventuality are attested widely across Australian, as well as Austronesian and Amazonian languages (Angelo & Schultze-Berndt 2016:258). While descriptive grammars of these languages amply make use of these and similar categories,<sup>21</sup> Lichtenberk (1995), Angelo & Schultze-Berndt (2016, 2018) and Vuillermet (2018) represent the few attempts to describe these markers as a grammatical category.<sup>22</sup>

### 2.2.1 Apprehensibility as a semantic domain

In the first piece of published work dedicated to the properties of apprehensibility marking (“apprehensibility-epistemic modality”), Lichtenberk (1995) claims that the To’abaita ([mlu] Solomonic: Malaita) particle *ada* has a number of functions, though generally speaking, serves to modalise (“epistemically downtone”) its prejacent while dually expressing a warning or otherwise some negative attitude about its prejacent. The symbol ♦ is used throughout to signify these two ‘APPREHENSIBILITY’ properties. Shown here in (23), Lichtenberk distinguishes: (a) **apprehensive-epistemic** function, (b) a **fear** function and (c-d) **precautioning** functions.

<sup>21</sup>TIMITIVE and particularly EVITATIVE a.o are also cited in these descriptive literatures.

<sup>22</sup>An edited collection on *Apprehensibility constructions*, edited by Marine Vuillermet, Eva Schultze-Berndt and Martina Faller, is forthcoming via Language Sciences Press. The papers collected in that volume similarly seek to address this gap in the literature.

(23) **Apprehensional marking in To'abaita: four uses of *ada* 'APPR'**a. ***Apprehensive modal***  $\blacklozenge p$ 

**CONTEXT.** Dinner's cooking in the clay oven; opening the oven is a labourious process.

*ada bii na'i ka a'i si 'ako ba-na*  
APPR oven\_food this it:SEQ NEG it:NEG be.cooked LIM-its

'The food in the oven may not be done yet' (295)

b. ***Embedding under predicate of fearing*** ***FEAR***( $\blacklozenge p$ )

*nau ku ma'u 'asia na'a ada to'an na'i ki keka lae*  
1s FACT be.afraid very APPR people this PL they:SEQ go  
*mai keka thaungi kulu*  
hither they:SEQ kill 1p.INCL

'I'm scared the people may have come to kill us.' (297)

c. ***Precautioning ("AVERTIVE" reading)***  $\neg p \rightarrow \blacklozenge q$ 

*riki-a ada 'oko dekwe-a kwade'e kuki 'ena*  
see-it APPR 2s:SEQ break-it empty pot that

'Look out; **otherwise** you may break the empty pot.' (305)

d. ***Precautioning ("in-case" reading)***  $\neg p \rightarrow \blacklozenge(\tau(q))$ 

*kulu ngali-a kaufa ada dani ka 'arungi kulu*  
1p.INCL take-PL umbrella APPR rain it:SEQ fall.on 1p.INCL

'Let's take umbrellas **in case** we get caught in the rain' (298)

(23a) functions as a possibility modal encoding negative speaker attitude vis-à-vis the eventuality described in its prejacent (i.e. opening the oven in vain). This reading also obtains under the scope of a predicate *ma'u* 'fear' in (23b). Lichtenberk analyses this use of *ada* as a complementizer, introducing a subordinate clause (1995:296).

In each of (c-d), meanwhile, *ada* appears to link two clauses. In both cases it expresses negative speaker attitude with respect to its prejacent (the following clause), which is interpreted as a possible future eventuality, similarly to the English archaism *lest*. On the *avertive* reading  $p \text{ ada } q$  — translated as ' $p$  otherwise/or else  $q$ ' — a conditional-like interpretation obtains: if  $p$  doesn't obtain, then  $q$  may ( $\neg p \rightarrow \blacklozenge q$ ). On "in-case" readings, while  $q$  is interpreted as a justification for the utterance of  $p$ , there is no reasonably inferrable causal relation between the two clauses — Lichtenberk is somewhat ambivalent about whether these whether these two readings constitute a single or multiple readings (1995:298-302). For AnderBois & Dąbkowski (2020), "in-case" uses involve some distinct "contextually

inferred" proposition  $r$  from which  $q$  follows ( $\tau(q)$ ). Effectively, if  $p$  doesn't obtain, then some  $r$  (a consequence of  $q$ ) may. In (23d), the failure to take umbrellas ( $\neg p$ ) might result in getting wet ( $r$ ) (should we get caught in the rain – ( $q$ )). They appeal to a number of pragmatic factors (reasoning about the plausibility of relations between  $p$  and  $q$ ) in adjudicating between these two readings. This treatment is discussed in some further detail below.

Of particular interest for present purposes is the categorical co-occurrence of SEQ-marking *ka* in the preadjacent to *ada*. Lichtenberk notes that the sequential subject-tense portmanteau *appears categorically in these predicates*, independent of their 'temporal status.' He claims that this marking indicates that the encoded proposition '*follows the situation in the preceding clause*' (296, emphasis my own). Relatedly, Vuillermet tentatively suggests that the Ese Ejja ([ese] Tanakan: SW Amazon) AVERTIVE marker (*kwajejje*) may derive from a non-past-marked auxiliary with "temporal subordinate" marking (2018:281). The analysis appraised in this chapter proposes a basic semantical link between the expression of the **temporal sequentiality** of a predicate and **apprehensional** semantics.

Subsequent typological work has concentrated on fine-tuning and subcategorising apprehensional markers. Notably, Vuillermet (2018) identifies three distinct apprehensional items in Ese Ejja, which she refers to as realising an APPREHENSIVE (*-chana*), AVERTIVE (*kwajejje*) and TIMITIVE (*-yajjajo*) function. These three apprehensionals respectively scope over: entire clauses (as a verbal inflection), subordinate clauses (as a specialised complementiser) and noun phrases (as a nominal enclitic). Similarly to Lichtenberk, Vuillermet suggests that these data provide evidence for a "morphosemantic apprehensional domain" (287).

Adopting this taxonomy, AnderBois & Dąbkowski (2020) focus their attention on the "adjunct" uses of the A'ingae ([con] NW Amazon) apprehensional enclitic *-sa'ne*. That is, they model the contribution of *-sa'ne* in its functions as • a *precautioning/avertive* marker, analysed as encliticising to (subordinate) clauses (24a-b), compare To'abaita (23c-d), in addition to • a TIMITIVE function, where the APPR functions as a DP enclitic (*e.g.*, c). Adapting treatments of the semantics of rationale/purposive clauses, they propose the core meaning given in (25).

(24) Adjunct uses of apprehensional *-sa'ne* in A'ingae

(AnderBois & Dąbkowski 2020)

a. AVERTIVE use

*sema'-je=ngi dū'shū=ndekhū khiphue'sū=sa'ne*  
work-IPFV=1 child=PL starve=APPR

'I'm working lest my children starve.'

(381)

## b. IN-CASE use

*tša'khû=ma=ngi guathian-'jen [ña yaya khuvi=ma i=sa'ne]*  
 water=ACC=1 boil-IPFV 1SG father tapir=ACC bring=APPR

'I am boiling water in case my father brings home a tapir.' (383)

## c. TIMITIVE use

*anae'ma=ni=ngi phi [thesi=sa'ne]*  
 hammock=LOC=1 sit jaguar=APPR

'I'm in the hammock for fear of the jaguar.' (374)

- (25) AnderBois & Dąbkowski's (2020:382) semantics for A'inge apprehensional adjunct uses of =sa'ne (on its avertive/*lest*-like reading)

$$\llbracket =sa'ne \rrbracket = \lambda q. \lambda p. \lambda w : \exists i [\text{RESP}(i, p)]. p(w) \wedge \forall w' \in \text{GOAL}_{i,p}(w) : \neg q(w')$$

Supposing that some entity  $i$  is the agent of  $p$ , =sa'ne takes a proposition  $q$  as its input and outputs a propositional modifier, asserting that, in  $w$ , both  $p$  holds and the (relevant) GOAL worlds of the agent  $i$  are those where  $q$  doesn't hold.

For AnderBois & Dąbkowski, the semantics for this *lest*-type usage can be extended to other precautioning ("in-case") uses and timitive uses by appealing to an third, "inferred" proposition  $r$ . That is, on the IN-CASE reading, all  $\text{GOAL}_{i,p}$ -worlds are such that  $\neg r(w')$  — as they point out, on this analysis, AVERTIVE is a special case of the precautioning use where  $r \Leftrightarrow q$ . On the TIMITIVE reading, =sa'ne takes an argument  $x \in \mathcal{D}_e$  (instead of  $q \in \mathcal{D}_{\langle s,t \rangle}$ ), now asserting that  $\bullet x$  "is involved in"  $r(w')$  and that  $\bullet \neg r(w')$ .<sup>23</sup>

On the basis of the apparent loosening of morphosyntactic restrictions between each these three uses, the authors additionally predict that an implicational hierarchy of the form AVERTIVE  $\gg$  IN-CASE  $\gg$  TIMITIVE holds (2020:386-87), and provide some cross-linguistic data in support of this conjecture.<sup>24</sup>

<sup>23</sup>AnderBois & Dąbkowski (2020:15) retain a lexical entry for =sa'ne<sub>TIMITIVE</sub> distinct from the precautioning uses. They suggest that an alternative to avoid this polysemy would be to adopt a "coercion" style analysis or (less plausibly) an ellipsis one.

A fourth possibility which they do not address would be to reanalyse the timitive DP as a (verbless) existential proposition (see Part II of the current dissertation.) It is unclear whether this accords with available strategies of existential predication in A'ingae, although there is a reserved negative existential predicate (*i.e.*, one not derived from a (positive) existential one) *me'i* 'NEG PREP' (according to Hengeveld & Fischer 2018). In this case,  $\text{EXIST}(x) = r$ . Typological support for such a strategy might be found in Pitjantjatjara *pjt*, where again, a single formative *-tawara* 'APPR' attaches to nouns and verbs. When functioning as a nominal suffix, *-tawara* selects for a LOC marked noun. Pintjupi [piu] deploys similar strategies (Zester 2010:16-9). Locative-marking of NPs is a strategy related to/often used in existential predication.

<sup>24</sup>Beyond the adjunct uses (24) analysed in AnderBois & Dąbkowski 2020, A'inge =sa'ne, Dąbkowski & AnderBois (forthcoming) additionally report uses corresponding to the APPREHENSIVE and COMPLEMENTIZER uses described above. Examples are replicated below (24'). It is not

Finally, on the basis of a comparison with the neighboring Lau language ([11u] Solomonian: Malaita) and other SE Solomonian languages, Lichtenberk argues that the apprehensional functions of To'abaita *ada* are a result of the grammaticalisation of an erstwhile lexical verb with meanings ranging a domain 'see, look at, wake, anticipate' that came to be associated with warning and imprecation for care on the part of the addressee, before further developing the set of readings associated with the present day APPR marker (1995:303-4). According to Lichtenberk, Lau *ada* admits of an *appr* reading while also functioning as a fully-inflected predicate. Its To'abaita cognate has lost this function, recruiting a new verb *riki* 'see, look', which apparently has shown signs of being recruited into apprehensional space (evinced a possible grammaticalisation cycle from perception verbs to apprehensionals.)

## 2.2.2 Apprehensionality in the context of Australian Kriol

Dixon (2002:171) refers to the presence of nominal case morphology that marks the AVersive as well as the functionally (and sometimes formally, see Blake 1993:44) related verbal category of apprehensionals as 'pervasive feature of Australian languages' and one that has widely diffused through the continent.<sup>25</sup> Lichtenberk (1995:306) marshalls evidence from Diyari ([dif] Karnic: South Australia) to support his claim about a nuanced apprehensional category, drawing from Austin's 1981 grammar. The Diyari examples in (26) below are all adapted from Austin (1981), labelled for the apprehensional uses described in the previous section.

immediately clear what alterations to the semantics in (25) would be needed to account for these uses.

The analysis of Kriol *bambai* that follows shares a number of properties with this treatment of A'ingae apprehensive *-sa'ne* — notably the (possibly) indirect relation between clauses connected by apprehensional morphology. As we will see, however, the numerous distributional and morphosyntactic differences between these two items (in addition to a number of diachronic concerns) will lead us down a somewhat different path.

(24') Non-adjunct uses of *-sa'ne* (Dąbkowski & AnderBois forthcoming:3)

d. COMPLEMENTISER use

*tsai-ye-sa'ne*

bite-pass=APPR

'You might get bitten.'

e. APPREHENSIVE use

*tsama ña dañu-sa'ne-khe dyuju-je-ya*

but 1s be hurt=APPR-thus be afraid-IPFV=VERID

'I was afraid I'd get hurt.'

<sup>25</sup>Aversive case is taken to indicate that the aversive-marked noun is "to be avoided." This corresponds to the TIMITIVE for other authors (e.g., AnderBois & Dąbkowski 2020; Vuillermet 2018)

## (26) Apprehensional marking in Diyari

## a. Avertive (precautioning)

**wata** *yarra wapa-mayi, nhulu yinha parda-yathi, nhulu*  
 NEG that way go.IMP.EMPH 3s.ERG 2s.ACC catch-APPR 3s.ERG  
*yinha nhayi-rna*  
 2s.ACC see-IPFV<sub>SS</sub>

‘Don’t go that way or else he’ll catch you when he sees you!’ (230)

## b. In-case (precautioning)

**wata** *nganhi wapa-yi, karna-li nganha nhayi-yathi*  
 NEG 1s.NOM go-PRES person-ERG 1s.ACC see-APPR

‘I’m not going in case someone sees me’ (228)

## c. Fear complementizer

*nganhi yapa-li ngana-yi, nganha thutyu-yali matha~matha-thari-yathi*  
 1s.NOM fear-ERG be-PRES 1s.ACC reptile.ERG ITER~bite-DUR-APPR

‘I’m afraid some reptile may bite me’ (228)

## d. Apprehensive use

*nhulu-ka kinthala-li yinanha matha-yathi*  
 3s.ERG-DEIC dog-ERG 2s.ACC bite-APPR

‘This dog may bite you’ (230)

The sentences in (26) shows a range of syntactic contexts in which Diyari apprehensional *-yathi* ‘APPR’ appears. The *-yathi*-marked clause appears to be evaluated relative to a prohibitive in (a), a negative-irrealis predicate in (b) and predicate of fearing in (c), or alternatively occurs without any overt linguistic antecedent in (d).<sup>26</sup> In all cases, the predicate over which *-yathi* scopes is **modalised** and expresses a proposition that the speaker identifies as ‘unpleasant or harmful’ (Austin 1981:227). Little work has been undertaken on the grammaticalisation of apprehensionality.<sup>27</sup>

As we will see in the following sections, apprehensional uses of preposed *bam-bai* in Kriol have a strikingly similar distribution and semantic import to the apprehensional category described in the Australianist and other typological literatures. Angelo & Schultze-Berndt (2016) focus their attention on demonstrating the cross-

<sup>26</sup>Austin claims that these clauses are invariably ‘structurally dependent’ (230) on a ‘main clause’ (viz. the antecedent.) We will see in what follows a series of arguments (to some degree foreshadowed by Lichtenberk (1995: 307)) to eschew such a description.

<sup>27</sup>Dixon (2002:171) and Blake (1993:44) are partial exceptions although these both focus on syncretism in case marking rather than dealing explicitly with the diachronic emergence of the apprehensional reading.

linguistic attestation of a grammaticalisation path from (sub)sequential temporal adverbial to innovative apprehensional marking. They suggest that, for Kriol, this innovation has potentially been supported by the presence of like semantic categories in Kriol's Australian substrata. Note that for (almost all of) these languages, there are attested examples of the apprehensional marker appearing in both bi-clausal structures – the **precautioning**-type uses described in the previous section (*p* LEST *q*), as well as “apprehensive” (monoclausal) ones (**◆***p*). Data from virtually all attested languages of the Roper Gulf are shown in (27).

(27) **Apprehensional/aversive marking in Roper Gulf languages**

a. **Wubuy**

*numba:-'da-ya:::-ŋ gada, nama:='ru-ngun-magi*  
2s>1s=spear.for-go-NPST oops 1d.INCL>ANIM=leave-**APPR-APPR**

‘Spear it! Ey! Or it will get away from us!’

(Heath 1980b:86, interlinearised)

b. **Ngandi**

*a-dangu-yun ŋara-waŋi-ji, a-waŋu-đu agura-mili?-ŋu-yi*  
NCL-meat-ABS 1s>3s-leave-NEG:FUT NCL-dog-ERG 3s>3s-**APPR**-eat-**APPR**

‘I won’t leave the meat (here), lest the dog eat it.’

(Heath 1978:106, interlinearised)

c. **Ngalakan**

*garku buru-ye mele-ŋun waŋŋ'waŋŋ'-yi?*  
high 3ns-put **APPR**-eat.PRES crow-ERG

‘They put it up high lest the crows eat it.’

(Merlan 1983:102)

d. **Rembarrnga**

*ŋaran-mə?-ŋam? ŋa-na laŋə ɾalk*  
3s>1p.INCL-**APPR**-bite.PRES 1s>3-see.PST claw big

‘He might bite us! I saw his big claws.’

(McKay 2011:182)

e. **Ritharrŋu**

*gurrupulu rranha nhe, wanga nhuna rra buŋu*  
give.FUT 1s.ACC 2s **or else** 2s.ACC 1s hit.FUT

‘Give it to me, or else I’ll hit you.’

(Heath 1980a, interlinearised & standardised to Yolŋu orthography)



f. **Marra**

*wu-la* *ɲariya-yur*, **wuniŋgi** *ɲula* *ɲingu-way*  
 go-IMP 3s-ALL **lest** NEG 3s>2s-give.FUT

‘Go to him, or else he won’t give it to you.’

(Heath 1981:187, cited also in A&SB:284)

g. **Mangarayi**

*bargji* *Ø-ɲama* **balaga** *ɲa-way-(y)i-n*  
 hard 2s-hold **lest** 2s-fall-MOOD-PRES.

‘Hold on tight lest you fall!’

(Merlan 1989:147, cited also in A&SB:284)

As shown in (27), there is a diversity of formal strategies deployed (or combined) in these languages to realise apprehensional meaning: suffixation inside the verbal paradigm (27a-b), prefixation to the verb stem (27b-d) and a separate apprehensional particle (27e-g).<sup>28</sup> While detailed work on the expression of apprehensionality in these languages (including the syntactic status of apprehensional clauses) is not currently available,<sup>29</sup> a number of generalisations can be made on the basis of the data in (27). In all cases, the apprehensional appears to modify a fully-inflected (finite) clause, in most cases, ostensibly linking two (the *p* LEST *q*-type usage, see discussion above) predicates, each completely inflected for agreement/TMA information. Conversely, the Rembarrnga datum in (d) provides an example of an apprehensive (monoclausal/♦*p*) type use. It is unclear at this stage whether/for which languages the apprehensional-marked clauses invite an analysis as syntactically subordinate, although in all cases, the prejacents to APPR can be shown to be modally subordinate to information in the discourse context (often constrained by *p*, see Ch. 3).

In view of better understanding the semantical unity of these categories and the mechanisms of reanalysis which effect semantic change in *bambai* and its TFA counterparts in other languages, the distribution and meaning of the ‘subsequential’ and apprehensional usages of *bambai* are described below.

### 2.2.3 Temporal frame adverbs and apprehensionality

Angelo & Schultze-Berndt (2016, 2018) provide convincing cross-linguistic evi-

<sup>28</sup>Nominal suffixes are also reported in Australian languages, often described as EVITATIVES, AVERSIVES, ADVERSATIVES in the Australian descriptive literature (Zester 2010:9, Browne et al. forthcoming).

<sup>29</sup>Although see Zester (2010) for a typology and Browne et al. (forthcoming) for an overview of apprehensional morphosyntax in Australian languages. The latter includes a detailed description of the variety of strategies deployed across the Ngumpin-Yapa family — viz. nominal marking, specialised complementisers and apprehensional auxiliaries. They argue that the precautioning-type apprehensional constructions in these languages are syntactically coordinate.

dence of the apparent lexical relationships between temporal frame adverbs and apprehensional markers. This can be taken, *prima facie*, to provide evidence of markers of temporal relations for recruitment as lexicalised modal operators. Table 2.1 (partially adapted from Angelo & Schultze-Berndt (2016, 2018)) summarises examples from a number of languages where temporal frame adverbials also appear to display a robust apprehensional reading. Further, Angelo & Schultze-Berndt (2016:288) additionally suggest that there is some evidence of apprehensional function emerging in the *bambai* cognates reported in Torres Strait Brokan, [tcs], Hawai'ian Creole [hwc] and Norf'k (see fn 20).

**Table 2.1.** Etyma and polysemy for apprehensional modals

Language	Adverbial	Gloss <sup>30</sup>	Author (grammar)
Std Dutch [nld]	<i>straks</i>	soon	Boogaart (2009, 2020)
Std German [deu]	<i>nachher</i>	shortly, afterwards	A&SB (2018)
Marra [mec]	<i>wuninggi</i>	further	Heath (1981)
Mangarayi [mpc]	<i>baɭaga</i>	right now/today	Merlan (1989)
Kriol [rop]	<i>bambai</i>	soon, later, then	

Compare these uses of Mangarayi *baɭaɭaga~baɭaga* in (28) to (27g) above. In (28a), Merlan (1989:138) notes that the temporal frame uses of *baɭaɭaga*—while often translated as ‘today’—appears to correspond to ‘right now’ (she also notes that “Pidgin English informants use [...the reduplicated form] *today-today* to mean ‘now’ as well as ‘today’ in the English sense”). In all of these Mangarayi data, *baɭaga* appears to indicate that the event described in the clause that it introduces obtains (or may obtain) subsequently to some time established in the previous clause.<sup>31</sup>

(28) **Mangarayi**

- a. *ɖayi ɲa-yirri-wa-ya-b gurrji, baɭaɭaga ga-ɲa-wa-n*  
 NEG 1s>3s-see-AUG-PNEG long.ago **today** 3-1s>3s-go.to.see-PRES  
 ‘I hadn’t seen it before, today I’m seeing it.’  
 (Merlan 1989:138, cited also in A&SB 2018:13)
- b. *galaji ɲan?-ma baɭaga yag*  
 quickly ask-IMP **before** go  
 ‘Ask him quick before he goes.’  
 (Merlan 1989:147, cited also in A&SB: 284)

<sup>30</sup>This isn’t to suggest that the semantics of those words provided in the ‘GLOSS’ column in the table above ought to be treated as identical identical: the definitions seek to capture a generalisation about sequentiality. A prediction that falls out of this generalisation is that TFAs like ‘later, soon, afterwards, then’ might be best interpretable as subsets of this category.

<sup>31</sup>Note that *baɭaga* is glossed by Merlan as ‘before’ in the imperative sentences (28b-c). In both cases, the speaker appears to indicate that event described in the following clause is imminent (note that in declarative contexts this might be translated as ‘then’)

- c. *a-ŋaḷa-yag*      ***baḷaga*** *miḷilitma*  
 HORT-1p.INCL-go **before** sunset  
 ‘Let’s go before the sun sets.’ (Merlan 1989:147)
- d. *bargji nama*      ***balaga*** *iia-way-(y)i-n*  
 hard 2s.hold.IMP **lest** 2sf  
 ‘Hold on tight lest you fall!’ (Merlan 1989:147)
- e. *ŋiñjag* *ŋaḷa-bu-n*      *guṛuugguṛug-bayi*, ***wuṛay*** *ḍo?*  
 PROH 1p.INCL-kill-PRES white.people-FOC **later** shoot  
*a-ŋayan-ma*  
 IRR-3s>1p.INCL-AUX  
 ‘We can’t kill white people. Later on they might shoot us.’  
 (Merlan 1989:147)

Merlan (1989:147) glosses *baḷaga* as ‘EVITATIVE/ANTICIPATORY’, commenting that these two notions are “sometimes indistinguishable.” She also notes the formal (reduplicative) relation to frame adverbial *baḷaḷaga* ‘right now, today’, commenting on the shared property of “immediacy” that links all these readings.<sup>32</sup> Note additionally the apparently apprehensional use of *wuṛay* ‘later’ in a prohibitive context in (28e). While Merlan makes no mention of any conventionalised “evitative/anticipatory” uses of this adverb, this type of use context is a likely source for the type of apprehensional and causal/elaboratory inferences invited by temporal frame adverbials. A similar pattern is attested in Marra (29):

(29) **Marra *wuningi*** (Heath 1981:360, interlinearised)

a. Subsequential use

*wayburi* *jaj-gu-yi*      ***wuningi***: *gaya bayi* *gal-u-jingi*  
 southward chase-3s>3s.PST **more** there in.south bite-3s>3s-did

‘Then [the dingo] chased [the emu] a bit more in the south.’

b. Apprehensional use (see also 27f above)

*ŋa-nan̄gu-wa*, ***wuningi*** *ṛag-ṇing-an̄jiyi*  
 2s>1s-give.IMP **lest** hit-1s>2s-AUX(EVIT)

‘Give it to me, otherwise I’ll hit you!’

Per Heath’s analysis (1981:308), Marra has an inflectional apprehensional category (his ‘EVITATIVE’) which is realised only in positive *lest*-type clauses (29b).

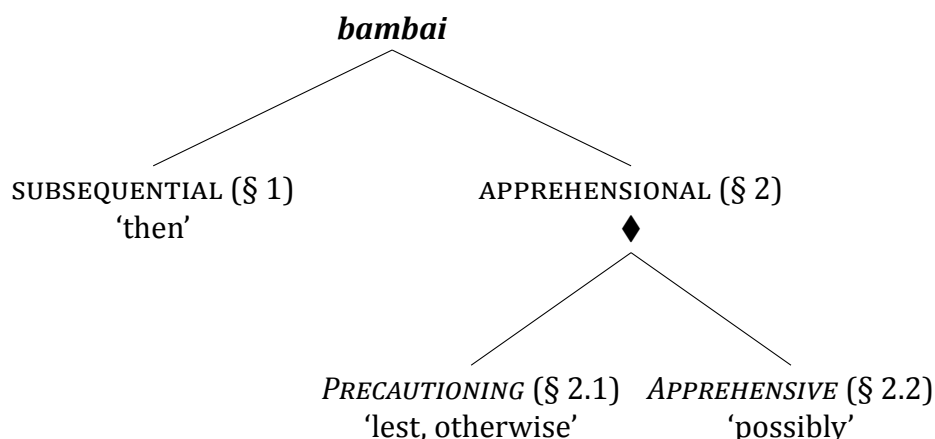
<sup>32</sup>Common in Australian languages, Mangarayi reduplication frequently functions as an property intensifier (Merlan 1989:166-7). In this sense, *baḷaḷaga* ‘imminently/right now’ can be read as an intensified form of *baḷaga* ‘soon, later.’

These frequently co-occur (in elicitation) with the adverbial *wuniŋgi* ‘farther along, furthermore, in addition’ (common in text translations.) Heath suggests that negative *lest*-clauses are “conveyed by the future negative along with *wuniŋgi*” (187). He explicitly notes the similarity between this strategy/apparent polysemy between subsequential-type TFAs and apprehensionals in neighbouring languages, including Kriol *bambai* (*sic*; 187, 308). Further discussion and a diachronic account of this apparent polysemy is given in § 3.2.

## 2.3 The distribution of Kriol *bambai*

This section (informally) describes the distribution and meaning of both temporal-frame and apprehensional readings of *bambai* in the data. The Kriol data cited here draws from Angelo & Schultze-Berndt ([A&SB], 2016) and the Kriol Bible ([KB], The Bible Society in Australia 2007) in addition to elicitations from, and conversations with, native speakers of Kriol recorded in Ngukurr predominantly in 2016 and 2017 (see Ch. 1). Figure 2.1 represents a coarse taxonomy of the readings available to *bambai*, cross-referenced for the subsection in which each is discussed<sup>33</sup>

**Figure 2.1.** Range of functions for *bambai*



### 2.3.1 Temporal frame reading

*Temporal frame adverbials* (TFAs) are linguistic expressions that are used to refer a particular interval of time, serving to precise the *location* of a given eventuality on a timeline. As an example, TFAs include expressions like *this morning* or *tomorrow*, which situate the eventuality that they modifies within the morning of the day of utterance or the day subsequent to the day of utterance respectively (see Binnick 1991:307).

<sup>33</sup>As we will see, uses corresponding to Lichtenberk’s FEAR function (discussed above) and co-occurrences of *bambai* with *if*-clauses are taken to be subsumed under the *bambai*’s APPREHENSIVE function.

As shown in Chapter 1, formally, we can model the contribution of temporal expression by assuming a set (chain)  $\mathcal{T}$  of points in time which are all strictly ordered with respect to each other chronologically. This is represented by a PRECEDENCE RELATION  $\prec$  (where  $t_1 \prec t_2 \leftrightarrow t_1$  precedes  $t_2$ ). A TFA like *today*, then, is a predicate of times: it picks out a temporal *frame* for the predicate — that is, all the points in time between the beginning and the end of the day of utterance. In the sentence *Mel ate today*, the TFA restricts the instantiation time of the eating event ( $t_e$ ) to this interval. That is, *Mel ate today* is true iff Mel ate at  $t_e$  and 
$$\underset{\text{start-of-day}}{t_1} \prec t_e \prec \underset{\text{end-of-day}}{t_2}.$$
 This can be represented using an interval notation as  $t_e \in [t_1, t_2]$ .

Mentioned in § 2.1, Kriol *bambai* is derived from an archaic English temporal frame adverbial, *by-and-by* ‘soon’, a lexical item with some currency in the nautical jargon used by multiethnic sailing crews in the South Pacific in the nineteenth century. The general function of *by-and-by* has been retained in contemporary Kriol, namely to temporally advance a discourse, much as Standard Australian English uses expressions of the type ‘soon/a little while later/shortly after(wards)’ or ‘then.’ These expressions represent a subset of ‘temporal frame adverbials’: clause modifiers that delimit the temporal domain in which some predicate is instantiated. In this work, I refer to the relevant set of TFAs as *subsequentiality* (‘SUBSEQ’) adverbials. The motivation for describing this as a semantic subcategory (a special case of the prospective) is the robust intuition that, in addition to temporally advancing the discourse (*i.e.*, marking the instantiation of the preadjacent predicate posterior to a given reference time), SUBSEQ TFAs give rise to a salient, truth-conditional expectation that the predicate which they modify obtain in non-immediate sequence with, but in the **near future** of a time provided by the context of utterance. This general function of *by-and-by* is attested in the contact varieties (*i.e.*, pidgins) spoken in the nineteenth century in Australia; this is shown in (30).

- (30) An excerpt from a (diagrammatic) explanation of betrothal customs and the genealogy of one couple as given to T A Parkhouse by speakers of a Northern Territory pidgin variety from the Larrakia nation in the late nineteenth century. (Parkhouse 1895:4, also cited in Harris 1986:299. My translation, incl. subscript indexation)

... *that fellow lubra him have em nimm.*

that ATTR woman 3s have TR boy

**by-and-by** *him catch him lubra, him have em nimm.*

**bambai** 3s catch TR woman 3s have TR boy

*Him lubra have em bun-ngilla. By-and-by girl big fellow, him*

3s woman have TR girl **bambai** girl big ATTR 3s

*nao'wa catch him, him méloa have em bun-ngilla.*

husband catch 3s 3s pregnant have TR girl

**By-and-by** *nimm big fellow, by-and-by bun-ngilla big fellow, him*

**bambai** boy big ATTR **bambai** girl big ATTR 3s

*catch him.*

catch 3s

'...That woman<sub>h</sub> had a son<sub>i</sub>. Later, he<sub>i</sub> got a wife and had a son<sub>j</sub>. This woman<sub>k</sub> had a daughter<sub>ℓ</sub>. Then, when the girl<sub>ℓ</sub> had grown up, her husband got her<sub>ℓ</sub> pregnant, she<sub>ℓ</sub> had a daughter<sub>m</sub>. Then, when the boy<sub>j</sub> was grown and the girl<sub>m</sub> was grown, he<sub>j</sub> got her<sub>m</sub>.'

Note that, according to Parkhouse, (30) constitutes a description of the relationship history of one couple; each sentence is past-referring. There is no tense marking in the Pidgin narrative. In each of the *by-and-by* clauses in (30), the speaker asserts that the event being modified is *subsequent* to a reference time set by the previous event description. In this respect, *by-and-by* imposes a temporal frame on the event description that it modifies.

As we have seen above (*e.g.*, 21), the SUBSEQ-denoting function of *bambai* shown here has been retained in Kriol. This reading is shown again in the two sentences in (31). The schema in (31c) provides an informal representation of this context-dependent, "subsequential" temporal contribution.

- (31) a. **Context:** During a flood a group of people including the speaker have moved to a dry place up the road

*mela bin ol mub deya na, jidan deya na, bambai*  
 1p.EXCL PST all move there now sit there now **bambai**  
*elikopta bin kam deya na, detlot deya na garra kemra*  
 helicopter PST come there now DET:PL there now have camera  
 ‘We all moved there, **then** a helicopter came, the people there had cameras’

[A&SB: 271]

- b. **Context:** Eve has conceived a child.

**Bambai** *imbin abum lilboi*  
*bambai* 3s.PST have boy

‘Subsequently, she had (gave birth to) a boy’

[KB: Jen 4.1]

- c. **Instantiation for subsequential reading**

(to be revised)

$t_r$  —————  $t_e$  .....  $t^+$

The eventuality described by the predicate is instantiated at some time  $t_e$  in the future of a reference time  $t_r$ .  $t_r$  is contextually determined—by an antecedent proposition if present—or otherwise established by the discourse context. Further, *subsequential* TFAs impose a requirement that  $t_e$  obtain within some constrained interval subsequent to  $t_r$  (that is, before  $t^+$ ).

As shown in (31a) above, the arrival of the helicopter (and its associated camera crew) is modified by *bambai qua* TFA. This has the effect of displacing the instantiation time forward with respect to the reference time provided by the first clause. *Bambai* has the effect of displacing the instantiation of helicopter-arrival forward in time with respect to the reference time provided by the first clause (*sc.* the time that the group had moved to a dry place up the road).

Similarly, (b) asserts that the eventuality described by the prejacet to *bambai* (namely the birth of Cain) is instantiated in the near future of some reference time  $t_r$  provided contextually, albeit not by a linguistically overt antecedent clause. That is, Eve gave birth at some  $t_e \in \{t'_e : t_r \prec t'_e \prec t^+\}$ .<sup>34</sup> The subsequent verse: *Bambai na Ib bin abum najawan lilboi* (KB Jen 4:2) ‘Soon after *that*, Eve had another boy’ further forward-displaces the birth event of Abel. Subsequential TFAs are distinguished by this ‘near future’ restriction, underpinned by a set of conversational

<sup>34</sup>This is not to suggest the referability of some ‘latest bound’ reference time  $t_r^+$ . The latter merely represents a (vague) contextual expectation by which the event described by the prejacet had better have obtained for the whole sentence to be judged true. See §?? for further discussion of this device.

expectations over reasonable degrees of “soonness.”

**Narrative cohesion** *bambai* additionally occurs with an undoubtedly related endophoric use (along with the apparently phatic discourse particle *na* < ‘now’).<sup>35</sup> This function is particularly frequent in the Kriol Bible and can be taken to rely on a metonymic relationship between the structure of time and the structure of a text/discourse (compare English *now then* or *so next*).

(32) **Discourse cohesion uses of SUBSEQUENTIAL *bambai***

- a. *Wal deya na deibin jidan longtaim. **Bambai na** wen imbin brabli olmen, Tera bin dai.*

‘So they lived there for a long time. And then, when he was very old, Terah died.’ [KB Jen. 11.32]

- b. *Longtaim God bin meigim det pramis garram Eibrahem, en imbin tok im garra kipum det pramis. **En bambai na** 430 yiyastaim God bin gibit det lowa langa Mosis.*

‘Long ago, God made a covenant with Abraham and said that he would keep the promise. **Now then**, 430 years later, God gave Moses the laws...’ [KB Gal. 3:17]

In this subsection, we have seen an overview of the semantic contribution of *bambai* in its capacity as a ‘subsequential’ TFA. A discussion of apprehensional uses follows.

### 2.3.2 Apprehensional reading

In his survey of ‘apprehensional epistemics’ (reviewed in §2.2.1 above), Lichtenberk describes apprehensionals like To’abaita *ada* as having a dual effect on their prejacent (“mixed modality”): • *epistemic downtoning* — i.e., ‘signal[ling] the [speaker’s] relative uncertainty [...] about the factual status of the proposition’ — and • (a shade of) *volitive modality* — ‘the fear that an undesirable state of affairs may obtain’ (1995:295-6). While we are not at this stage committed to Lichtenberk’s metalinguistic labels, a modal semantics for Kriol *bambai* is suggested on the basis of the data below. We will see how this use diverges from the subsequential/temporal frame readings described above, broadly dividing *bambai*’s apprehensional contribution into two main subtypes that align with the *avertive* (§ 2.3.2.1) and *apprehensive* (§ 2.3.2.2) functions identified in previous literature (Lichtenberk 1995; Vuillermet 2018) and described above.

<sup>35</sup>There are 455 tokens of clause-initial *Bambai na* in the Kriol Bible.



### 2.3.2.1 *p bambai q* : the precautioning/conditional use

The “precautioning” uses of apprehensional morphology are characterised by serving to “connect a clause encoding an apprehension-causing situation to a preceding clause encoding a precautionary situation” (Lichtenberk 1995:298). The data provided below show *bambai*’s function in conditional-like constructions, where it precedes both indicative and counterfactual consequent clauses.<sup>36</sup>

**Indicative ‘nonimplicational.’** Apprehensional *bambai* occurs in situations where the speaker identifies some undesirable eventuality as a potential outcome of the discourse situation. Angelo & Schultze-Berndt (2016:272ff) observe that these readings may or may not constitute “admonitory” speech acts — *i.e.*, can serve as direct warnings or threats (directive illocutionary force in 33a-b), or merely as predictions of a negative outcome for the subject (*e.g.*, 33c).

The sentence data in (33) demonstrate how *bambai*-sentences are used to talk about undesirable possible future eventualities. Extending the model introduced above to modelling this (following the “possible worlds” semantic framework introduced in chapter 1), we postulate a set  $\mathcal{W}$  of *possible worlds*. On standard assumptions, a “proposition” ( $p \in \mathcal{W} \times \{\mathbb{T}, \mathbb{F}\}$ ) is a set of possible worlds, namely those in which it is true (*e.g.*, Kratzer 1977; Kripke 1963; Stalnaker 1976, a.o.)

Generally speaking, the “precautioning” construction — *i.e.*, *p bambai q* on its apprehensional reading — appears to convey converse nonimplication between *p* and *q*: ‘if some situation described in *p* doesn’t obtain in *w*, then the (unfortunate) situation described in *q* might’ — *i.e.*,  $\neg p(w) \rightarrow \blacklozenge q(w)$ .

(33) a. **Context:** Two children are playing on a car. They are warned to stop.

*Ey! bambai<sub>1</sub> yundubala breikim thet motika, livim. bambai<sub>2</sub> dedi*  
 Hey! **bambai** 2d break DEM car leave **bambai** Dad  
*graul la yu*  
 scold LOC 2s

‘Hey! You two might break the car; leave it alone. Otherwise Dad will tell you off!’ [A&SB: 273]

<sup>36</sup>Given the availability of these counterfactual LEST-type uses of *bambai*, Lichtenberk’s “precautioning” label may be less appropriate. Lichtenberk doesn’t provide evidence of counterfactual uses for To’abaita *ada*, although his discussion of colloquial Czech *aby* ‘APPR’ shows that this item is apparently compatible in counterfactual contexts (1995:309). In any case, I continue to describe all LEST-type uses as *precautioning* given this term has been adopted by other authors (AnderBois & Dąbkowski 2020; Vuillermet 2018).

- b. *yu stap ritjibat mi na bambai ai kili yu ded en mi nomo*  
 2s stop chase.IPFV 1s EMP **bambai** 1s kill 2s dead and 1s NEG  
*leigi meigi yu braja jeikab nogudbinji*  
 like make 2s brother jacob unhappy

‘Stop chasing me or I’ll kill you and I don’t want to upset your brother Jacob (*sic*)’ [GT 22062016-21’, retelling KB 2Sem 2.22]

- c. *ai garra go la shop ba baiyim daga, bambai ai (mait) abu*  
 1s IRR go LOC shop PURP buy food **bambai** 1s (MOD) have  
*no daga ba dringgi main medisin*  
 no food PURP

‘I have to go to the shop to buy food **otherwise** I may not have food to take with my medicine.’ [A] 23022017]

- d. *ai-rra gu la det airport ailibala, bambai mi mis det erapein*  
 1s=IRR go LOC the airport early **bambai** 1s miss the aeroplane

‘I’ll go to the airport early, **otherwise** I could miss my flight.’ [GT 16032017-21’]

In (33a), there are two tokens of apprehensional *bambai*. The second (*bambai*<sub>2</sub>) appears to be anaphoric on imperative *livim!* ‘leave [it] alone!’ Notably, it appears that the Speaker is warning the children she addresses that a failure to observe her advice may result in their being told off:  $\neg(livim) \rightarrow \blacklozenge(dedi\ graul)$ . Unlike the uses of *bambai* presented in the previous subsection, *bambai* here is translatable as ‘lest/otherwise/or else.’ *bambai*<sub>1</sub>, the first token in (33a), appears to have a similar function, although has no overt sentential antecedent.<sup>37</sup> In this case, the Speaker is issuing a general warning/admonition about the children’s behaviour at speech time. In uttering the *bambai*<sub>1</sub> clause, she asserts that, should they fail to heed this warning, an event of their breaking the car is a possible outcome. (33b) shows a similar use.

(33c) provides an example of an apprehensional/LEST-type reading occurring in a narrative context (that is a representational/predictive-type illocutionary act). Here, the Speaker identifies a possible unfortunate future situation in which she has no food with which to take her medicine. Here, in uttering the *bambai* clause, she asserts that such an eventuality is a possible outcome should she fail to go to the shop to purchase food:  $\neg(go.shop) \rightarrow \blacklozenge(foodless)$ . This reading is robustly attested in contexts where the antecedent is modified by some irrealis operator. For example, in (34) – repeated here from (22) above – *bambai* makes a similarly modal claim: if  $\kappa$  is a set of worlds in which I drink coffee at  $t'$  (and  $\bar{\kappa}$  is its complement),

<sup>37</sup>In reconstructing this sentence context, a consultant unprompted introduced an explicit antecedent: *gita burru det mutika, bambai yu breigim im* ‘get off the car! Otherwise you might break it!’ [GT 20170316]

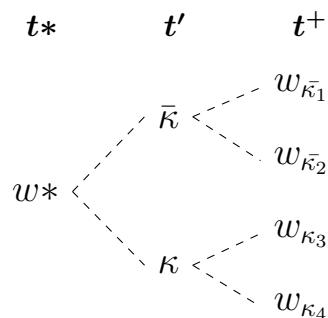
then an utterance of (34) asserts that  $\exists w \in \bar{\kappa} : \text{I sleep by } t^+ \text{ in } w$ .

- (34) a. **Context:** It's noon and I have six hours of work after this phonecall. I tell my colleague:

*ai=rra dringgi kofi bambai mi gurrumuk la desk iya gin*  
 1S=IRR drink coffee *bambai* 1s fall.asleep LOC desk here EMPH

'I'd better have a coffee otherwise I might pass out right here on the desk'  
 [GT 28052016]

- b. **Instantiation schema for apprehensional reading in (a)**



In the reference world  $w^*$  at speech time  $t^*$ , the Speaker establishes a partition over possible futures: they are separated into those in which, at time  $t'$ , he drinks coffee  $\{w' \mid w' \in \kappa\}$  and those in which he doesn't  $\{w' \mid w' \in \bar{\kappa}\}$ . In those worlds where he fails to drink coffee, there exist possible futures  $(w_{\bar{\kappa}_1} \vee w_{\bar{\kappa}_2})$  by which he's fallen asleep by some future time  $t^+$ .

Of particular note is this behaviour where *bambai* appears to be anaphoric on **the negation** of a proposition that is calculated on the basis of a linguistically represented antecedent (that is, the preceding clause.) Demonstrated in (35), This appears to be categorical. where a SUBSEQ reading of *bambai* — viz.  $\#watch.movie(t_2) \wedge sleep(t_3)$  — is infelicitous. That is: only an APPREHENSIONAL reading is available: watching a film is a measure taken to avert asleep  $\neg(watch.movie) \rightarrow \blacklozenge(sleep)$ .

- (35) **Context:** The Speaker is experiencing a bout of insomnia

*# airra wotji muvi bambai mi gurrumuk*  
 1S=IRR watch film *bambai* 1s fall.asleep

**#Intended:** 'I'll watch a film, then I'll (be able to) fall asleep.'

**Available reading:** 'I'll watch a film, otherwise I may fall asleep.'

[AJ 23022017]

The relationship between the antecedent clause and the context on which (apprehensional) readings of *bambai* is anaphoric is further discussed below in chapter 3.

**Counterfactual ‘nonimplicationals’** *bambai* similarly receives an apprehensional reading in subjunctive/counterfactual contexts: those where an alternative historical reality is considered.<sup>38</sup> The occurrence of apprehensionals in these contexts is little-reported cross-linguistically (described as “rare” in Angelo & Schultze-Berndt 2018 for German *nachher*.)

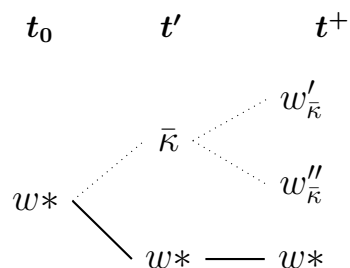
In (36), the Speaker identifies that in some alternative world (say  $w'$ ) in which he behaved differently to the way in which he did in the evaluation world ( $w' \not\approx_{t^*} w^*$ )<sup>39</sup> — namely one in which the event described in the antecedent failed to obtain — there is a (significant) possibility that he would have slept at work. Consequently, and comparably to the example (35) above, *bambai* modalises its prejacent: it asserts that  $\exists w'[w' \notin \kappa \wedge \text{I sleep by } t^+ \text{ in } w']$ .

- (36) a. *ai=bin dringgi kofi nairram bambai ai bina silip~silip-bat*  
 1s=PST drink coffee night ***bambai*** 1s PST:IRR sleep~DUR-IPFV  
*la wek*  
 LOC work

‘I had coffee last night **otherwise** I might have slept at work’

[A] 23022017]

- b. **Instantiation schema for apprehensional reading in (a)**



Here, the Speaker considers a set of worlds that historically diverge from the evaluation world  $w^*$ , namely the set of worlds where, unlike the evaluation world, the Speaker did not drink coffee at  $t'$  —  $\{w' \mid w' \in \bar{\kappa}\}$ . The Speaker asserts that there are some possible near futures to  $\langle t', w_{\bar{\kappa}} \rangle$  in which he falls asleep by some time  $t^+$ , posterior to  $t'$ .

The Kriol apprehensional data described so far is intuitively unifiable insofar as it bears some resemblance to more familiar conditional constructions — (i.e., that of an “infix” two-place relation between two propositions.) Unlike *if... then*-conditionals, in all the apprehensional data, we have seen so far, *bambai* introduces a predicate describing some eventuality which construes as undesirable for the speaker. It appears to that this eventuality is a *possible, foreseeable* future consequence of some other contextually provided proposition — in the examples dis-

<sup>38</sup>See von Stechow 2012 for a general overview of counterfactual conditionals.

<sup>39</sup>A definition and further discussion the  $\approx$ -relation (“historical alternative to”) is given in (8). A formal account is further developed below.

cussed so far, this proposition is often interpreted as that of the non-instantiation of  $q$  (see Ch. 3).

The ‘indicative’ and ‘counterfactual’ uses presented here can be unified by appealing to the notion of “settledness” presuppositions (*e.g.*, Condoravdi 2002:82, *passim*). In all sentences of the form  $p$  *bambai*  $q$ , a reference world and time are provided by some (perhaps modalised) antecedent proposition. In those contexts where  $q$  is understood to be being asserted of a future time ( $t_e \succ t_*$ ) or a different world ( $w' \not\approx_{t_*} w_*$ ); the entire proposition construes as modalised. This intuition will be spelled out in detail in Ch 4).

In effect, the contribution and distributional properties of *bambai* examined in this subsection — the conditional-like or so-called *precautioning* uses, in Lichtenberk’s typology — resembles that of English *otherwise* (and parallels that of *lest*.) All of these observations are further spelled out in chapters 3 and 4 below.

We turn first, however, to a description of additional “apprehensive” uses of *bambai*.

### 2.3.2.2 *bambai* as a modal adverbial: the APPREHENSIVE use

In contrast to the ‘nonimplicational’ or PRECAUTIONING (*i.e.* LEST/‘in case’-type) readings presented above (§ 2.3.2.1), *bambai* also functions as an epistemic adverbial with apprehensional use conditions; a usage corresponding to Lichtenberk’s ‘*apprehensional-epistemic*’ function and to Vuillermet’s *apprehensive* (proper).<sup>40</sup> As we will see, this function of *bambai* arises in monoclausal contexts in addition to within conditional constructions. Note that this distributional fact can be taken as evidence that *bambai* is **not** a (syntactic) subordinator: that is, it doesn’t introduce a dependent clause (unlike other purposive/apprehensional expressions cross-linguistically.)<sup>41</sup> Consider first an elaboration of (34), provided as (37) below. Here there is no explicit linguistic antecedent for *bambai*, whereas its preja-cent encodes an unfortunate future possibility.

(37) **Context:** Grant’s heading to bed. Josh offers him a cuppa.

J. *yu wandi kofi muliri?*  
 2s want coffee KINSHIP.TERM  
 ‘Did you want a coffee, *muliri*?’

<sup>40</sup>The first token of *bambai* in (33a) also represents an apprehensive use like this.

<sup>41</sup>See, *e.g.*, Blühndorn 2008; Cristofaro 2005 for overviews of subordination.

- G. *najing, im rait muliri! bambai ai kaan silip bobala! Ai*  
 no 3s okay KINSHIP.TERM **bambai** 1s NEG:IRR sleep poor 1s  
*mait weik ol nait... garram red ai...*  
 might awake all night POSS red eye

‘No it’s fine *muliri!* *bambai* I might not sleep, I could be awake all night...  
 be red-eyed (in the morning)...’ [GT 16032017 17’]

Similarly, in the exchange in (38) below, **B** deploys *bambai* to the same effect in two single-clause utterances; each encoding an unfortunate future possibility — namely an unsuccessful trip ( $\blacklozenge$ *no.meat*) in the event that the two *gajins* permit their young relative to join in.

- (38) **Context:** Two relatives (A, B) are planning a hunting trip; a younger relative wants to join.

- A. *im rait, yu digi im then gajin.*  
 3s okay 2s take 3s then KINSHIP  
 ‘It’s fine, bring him along poison-cousin’

- B. **Bambai** *yunmi gaan faindi bip*  
**bambai** 1d.INCL NEG:IRR find meat  
 ‘But then we may not be able to find meat’

- A. *Yunmi garra digi im*  
 1d.INCL IRR take 3s  
 ‘We’ll take him’

- B. **bambai** *im gaan gibi la yunmi.*  
**bambai** 3s NEG:IRR give LOC 1s.INCL

‘But then [the country] may not provide for us.’ [DW 20170712]

Finally, (39) below provides a clear example of Lichtenberk’s (1995) “epistemic downtoning” function for apprehensionals. Here, *bambai* clearly behaves as an epistemic possibility modal ( $bambai\ q = \overset{\text{EPIST}}{\blacklozenge} q$ ). In this case, where the speaker doesn’t *know* who’s at the door, she makes a claim about how—in view of what she *does* know and might expect to be happening—the (present-tensed) situation described in the prejacent is a distinct possibility (and a distinctly undesirable one at that.)

- (39) **Context:** Speaker is at home to avoid running into her boss. There's a knock at the door; she says to her sister:

*Gardi! **Bambai** im main bos iya la det dowa rait na*  
 Agh **bambai** 3s my boss here LOC the door right now

'Oh no! That could be my boss at the door.' [AJ 02052020]

In these apprehensional-epistemic occurrences, *bambai* has entered into the functional domain of other epistemic adverbials (notably *marri~maitbi* 'perhaps, maybe'.) Note that the availability of apparently epistemic readings to linguistic expressions with future-orientation is well-attested in English cross-linguistically (e.g., *the bell just rang, it'll be Hanna/that's gonna be Hanna*, see also Condoravdi 2003; Werner 2006; Winans 2016.) Giannakidou & Mari (2018), for example, defend an analysis of that unifies future tense morphology with epistemic modality, appealing to data like the English epistemic future and its corollaries in Greek and Italian to argue that future markers in these languages in fact always encode epistemic necessity (sc. that its *epistemic modals* that perform the work of signalling predictive illocutionary force.) We will have further observations to make on these facts in the chapters that follow (ch. 3 for a discussion of pragmatic competition with *marri* and ch. 4 for presentation of an analysis that unifies these uses.)

**Apprehensive counterfactual** The relation between the counterfactual preja-cent to *bambai* and the content of the preceding clause appears to diverge from the patterns of data described in the previous subsection. As with the epistemic adverb uses above, in (40), *bambai* appears to introduce a modalised assertion and expresses negative speaker affect. Its interpretation doesn't appear to be restricted by the preceding question. Similarly to the uses shown above, *bambai* appears to behave here as an apprehensive modal insofar as it encodes an unfortunate possible eventuality. Unlike the above examples, however, the preja-cent (*viz.* one of the Philistines committing adultery with Rebekah) is taken to describe a counterfactual event in view of Isaac's deception.

- (40) **Context.** Abimelek (king of the Philistines) chides Isaac for having earlier identified his wife Rebekah as his sister.

*Wotfo yu nomo bin jingabat basdam, bambai ola men bina*  
 why 2s NEG PST think before, **APPR** all man PST:IRR  
*silipbat garram yu waif? Yu bina meigim loda trabul blanga*  
 sleep.IPFV with 2s wife 2s PST:IRR make much trouble DAT  
*melabat*  
 1p.EXCL

‘Why didn’t you think [to say something] earlier? The men might have slept with your wife! You could have caused many problems for us!’

[KB Jen 26.10]

**Apprehensives with *if*-restrictors** Contrasting with the ‘nonimplicational’ (*i.e.*, precautioning/LEST-type) readings in § 2.3.2.1 above, Kriol also forms conditional sentences using an English-like *if... (then)* construction. The two sentences in (41) give examples of an indicative and subjunctive *if*-conditional, where *bambai* modifies the consequent clause (the “apodosis.”)

- (41) a. *if ai dringgi kofi bambai mi <sup>#</sup>(nomo) gurrumuk*  
 if 1s drink coffee **bambai** 1s <sup>#</sup>(NEG) sleep

‘If I drink coffee then I might not sleep’

[A] 23022017]

- b. *if ai=ni=min-a dringgi det kofi bambai ai(<sup>#</sup>=ni)=bin-a*  
 if 1s=NEG=PST-IRR drink the coffee **bambai** 1s(<sup>#</sup>=NEG)=PST-IRR  
*gurrumuk jeya*  
 be.asleep there

**Intended:** ‘If I hadn’t drunk coffee then I may well have fallen asleep there’

(This reading is available if =no(m)o ‘NEG’ is omitted) [GT 16032017]

The contrast between (41a,b) and their *if*-less counterparts in (34a and 36a) respectively (pp. 40-41), evinces some restriction that *if*-clauses apparently force on the interpretation of *bambai*. Whereas the *if*-less sentences presented previously assert that a particular eventuality may obtain/have obtained just in case the antecedent predicate **fails**/failed to instantiate (*i.e.*, the LEST readings), the sentences in (41) diverge sharply from this interpretation. That is, each of the *if p, bambai q* sentences in (41) asserts a straightforward conditional  $p \rightarrow \blacklozenge q$ : should the antecedent proposition hold (have held), then *q* may (have) obtain(ed).

In this respect, *bambai* appears to be behaving truth conditionally as a modal expression encoding possibility — *sc.* a modal adverbial — similarly to the monoclausal uses presented above in this subsection. The MODAL BASE (*i.e.*, those worlds



over which *bambai* quantifies) is explicitly restricted by the (syntactically subordinate) *if*-clause, whose sole function can be taken to involve the restriction of a domain of quantification (cf. von Stechow 1994; Kratzer 1979; Lewis 1975; Roberts 1989, 1995). Additional argumentation to this effect is included in ch. 3.

### 2.3.3 Summary

In the preceding sections, we have seen clear evidence that *bambai* has a number of distinct readings. Nevertheless, we can draw a series of descriptive generalisations about the linguistic contexts in which these readings emerge. These are summarised in (42).

(42) **Semantic conditions licensing readings of *bambai*.**

- a.* *bambai* is interpreted as a **subsequential temporal frame** when the state-of-affairs being spoken about is **settled**/the same as the actual world ( $w' \approx_{t_*} w^*$ ) (i.e., in **factual, nonfuture** contexts).  
Consequently, *bambai*'s prejacent generally contains past marking (*bin*) in subsequential contexts
- b.* In other (**nonfactual/future**) contexts (that is, in predications that fail to satisfy SETTLEDNESS) apprehensional readings “emerge”.
- c.* In apprehensional contexts, precautioning (LEST-type) readings occur in a *p bambai q* construction. That is, in a sentence of the form *p bambai q* is interpreted as an admonition that  $\neg p \rightarrow \blacklozenge q$

As discussed in the preceding sections, **nonfactual** utterances are those in which (a) a predicate is understood to obtain in the future of evaluation time  $t_*$ /**now** or (b) the predicate is understood as describing some  $w'$  which is not a historic alternative to the evaluation world  $w^*$ . It is in exactly these contexts that *bambai* gives rise to a modalised reading. In Kriol, a number of linguistic operators (which we have seen in the data presented above) appear to “trigger” predication into an unsettled timeline. A selection of these is summarised in Table 2.2 below.<sup>42</sup>

<sup>42</sup>This is not intended to suggest that these operators are in any way semantic primitives, Table 2.2 is to be read as a non-exhaustive list of linguistic devices that appear to associate with nonfactual mood.

**Table 2.2.** Semantic operators co-occurring with modal (apprehensional) readings of *bambai*

GLOSS	Form	Example
IRREALIS	<i>garra</i>	<i>airra dringgi kofi bambai mi gurrumuk</i> 'I'll have a coffee or I might fall asleep'
NEG IRREALIS	<i>kaan</i>	<i>ai kaan dringgi kofi bambai mi nomo silip</i> 'I won't have a coffee or I mightn't sleep'
C'FACTUAL	<i>bina</i> PST:IRR	<i>aibin dringgi kofi nairram bambai aibina gurrumuk</i> 'I had a coffee last night or I might've passed out'
IMPERATIVE	∅	<i>yumo jidan wanpleis bambai mela nogud</i> <sup>43</sup> 'Youse sit still or we might get cross'
PROHIBITIVE	∅ [nomo] IMPR	<i>nomo krosim det riba, bambai yu flodawei</i> 'Don't cross the river or you could be swept away!'
GENERIC	∅	<i>im gud ba stap wen yu confyus, bambai yu ardim yu hed</i> 'It's best to stop when you're confused; you could get a headache'
NEG GENERIC	∅ [nomo] GEN	<i>ai nomo dringgi kofi enimo, bambai mi fil nogud</i> 'I don't drink coffee anymore or I'd feel unwell'
CONDITIONAL	<i>if</i>	<i>if ai dringgi kofi, bambai ai kaan silip</i> 'If I have coffee, then I mightn't sleep'

<sup>43</sup>This example due to Dickson (2015:168 [KM 20130508]).

## Chapter 3

# An apprehensional pragmatics

Chapter 2 provided a detailed account of the distribution of the Kriol adverb *bambai*, the numerous syntactic environments in which it surfaces and the numerous interpretations that it appears to license. The current chapter proposes a way of understanding the synchronic relationship that holds between these different uses and readings of *bambai*, crucially interrogating the relationship between clauses of the type *bambai q* and the context in which they're embedded/their “matrix discourse” (§ 3.1).

In developing this understanding of the crucial role of context in the interpretation of *bambai*, § 3.2 proposes an account of the diachronic emergence of apprehensional expressions from temporal frame adverbials (*sc.* devices that encode SUBSEQUENTIALITY.) Deploying insights from the diachronic semantics literature, we will see that this apparent meaning change arises from the conventionalisation of a (subtype) of *post hoc ergo propter hoc*-type conversational implicatures.

In contemporary Roper Kriol — due to the developments described in this chapter (and the distribution described in ch. 2) — *bambai*, the erstwhile TFA, can be shown to function as a modal adverb. Consequently, it has entered into the functional domain of other possibility adverbials, notably *marri* ‘perhaps.’ Incidentally, the competition between *marri* and apprehensive *bambai* provides a frame to investigate the attitudinal component of apprehensionality, the key distinguishing feature of this category. § 3.3 compares Kriol data with that of other apprehensionals and proposes a treatment of the “undesirability” component of apprehensional meaning as *use-conditional* or *expressive* content.

### 3.1 A modal subordination account

The first examples presented in Chapter 2 are repeated below in (43):

(43) **Context:** I've invited a friend around to join for dinner. They reply:

- a. SUBSEQUENTIAL reading of *bambai*

*yuwai! bambai ai gaman jeya!*  
yes! **bambai** 1s come there

'Yeah! I'll be right there!'

- b. APPREHENSIONAL reading of *bambai*

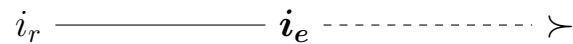
*najing, im rait! bambai ai gaan binijim main wek!*  
no 3s okay **bambai** 1s NEG.MOD finish 1s work

'No, that's okay! (If I did,) I mightn't (be able to) finish my work!'

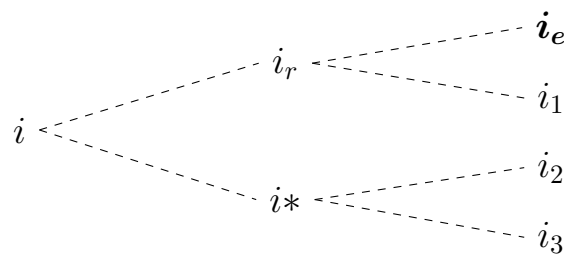
[GT 20170316]

As we have seen, an important way in which the range of uses of *bambai* are united is in the fact that they appear to modify the proposition that they precede (the PREJACENT), crucially relating it to some component of the discourse context. For clarity, paraphrases and schemata for (43a-b) are provided below.

- (43) a'. The prejacent (that the subject comes to dinner) is taken to hold at  $i_e$ , SUBSEQUENTLY to (i.e., in the near future of) some contextually-specified reference time ( $i_r$  = speech time  $i_*$  in this case.)



- b'. In (43b), the prejacent (the subject's failure to complete his work) is taken to represent a possible outcome (e.g., at  $i_e$ ) of (the negation of) some contextually-supplied proposition (e.g., the subject's not declining their addressee's dinner invitation at  $i_r$ .)



Craige Roberts (1995:663) draws an explicit connection between the retrieval of a "Reichenbachian reference time" and the retrieval of a reference "situation", both of which she identifies as "species of domain restriction on an operator" (over intervals/possible worlds respectively.) She therefore analogises the logical structure of temporal and modal (incl. conditional) operators to other types of quantifiers (44).

- (44) The logical structure of quantificational expressions in natural language  
[Operator, Restriction, Nuclear Scope] following Roberts (1995:665)

$$\lambda Q[\text{OPERATOR } \mathcal{R} Q]$$

$Q$  represents the nuclear scope of some quantificational OPERATOR. The first argument  $\mathcal{R}$  represents a “restrictor clause” – a free variable that is furnished by context and restricts the domain of the quantificational operator.

We have clear evidence, then, that the interpretation of *bambai* is constrained by and dependent on elements of the foregoing discourse that, crucially, **need not be linguistically explicit**/overt. The phenomenon of interest is that of *discourse anaphora* and the observation that particular linguistic expressions (incl. lexical items) “specify entities in an evolving model of discourse” (see Webber 1988). The uses of *bambai* in 19 exhibit this property: this lexical item apparently an intensional operator whose domain is restricted by entities (prima facie of different types) in its SUBSEQUENTIAL (temporal entities?) and APPREHENSIONAL uses (eventive? propositional entities?)

In order to account for these types of anaphor phenomena (particularly in the modal domain), Roberts (1989, 1990, 2020) develops the notion of MODAL SUBORDINATION, definedC in (45):

- (45) MODAL SUBORDINATION is a phenomenon wherein the interpretation of a clause  $\alpha$  is taken to involve a modal operator whose force is relativized to some set  $\beta$  of contextually given propositions. (Roberts 1989:718)

In *bambai*’s ‘AVERTIVE’-type uses (sc. those of the form  $p \text{ bambai } q$ , described in § 2.3.2.1), *bambai*  $q$  often functions to introduce an eventuality which is interpreted as a possible consequence of the antecedent subject’s failure to attend to some situation which is described in the antecedent clause — what we had above represented as  $\neg p(w) \rightarrow \blacklozenge q(w)$ . In other words, these uses of *bambai* have usually been translated as, and strongly resemble, uses of the English adverb *otherwise* (albeit with possible differences in modal force and the conventionalised expressive (apprehensional) content described in §3.3.) Phillips & Kotek provide an account of the interpretation (and meaning contribution) of utterances of the form  $p \text{ otherwise } q$ , whereby *otherwise* is analysed as a discourse anaphor that triggers modal subordination. In the subsections below, their (our) analysis of *otherwise* as (1) invoking modal subordination and (2) sensitive to information structure is adapted to account for analogous components of the behaviour of *bambai*.

### 3.1.1 Accommodation and restriction

Introduced above (and informally defined in (45)) the notion of MODAL SUBORDINATION captures the idea that a modal operator scoping over a clause has visibility

of elements of the foregoing discourse.<sup>44</sup> Roberts’s schematisation of this type of relation is reproduced in (46) and a classic operationalisation is given in (47).

- (46) The general logical form of a modal subordination relation — given two (syntactically independent) clauses  $K_1, K_2$  — where the preajacent to a modal operator ( $\text{MOD}_2$ ) is “modally subordinate” to the content in the scope of  $\text{OP}_1$ , another (intensional) operator (Roberts 2020).

$$[_{K_1} \dots \text{OP}_1[\dots X \dots] \dots] \dots [_{K_2} \dots \text{MOD}_2[\dots Y \dots] \dots]$$

1.  $Y$  is a presupposition trigger and only the content  $X$  (under the scope of  $\text{OP}_1$ ) would satisfy this presupposition.
2.  $\text{MOD}_2$  is a modal operator scoping over  $Y$ .
3. The constituent in  $K_2$ , headed by  $\text{MOD}_2$ , has an interpretation wherein part of its restriction consists of  $X$ .

- (47) An example of modal subordination in discourse. (Roberts 2020:1)  
**CONTEXT.** Hansel & Gretel are arguing about whether to lock the door.

**G.** A wolf ***might*** come in. It ***would/will*** eat you first!

$$\underset{\text{OP}_1}{\Diamond} \exists x [\text{Wolf}(x) \wedge \text{Come.in}(x)] \ \& \ \underset{\text{MOD}_2}{\Box} \text{Eat.you}(y)$$

This schema is straightforwardly reflected in Gretel’s two sentence utterance in (47) below where, crucially:

- the domain of  $\text{MOD}_2$  is somehow restricted to those worlds in which ‘a wolf come[s] in’ (sc. the proposition in the scope of  $K_1$ ’s possibility modal— $\text{OP}_1$ ) and
- the presuppositions associated with the pronoun *it* in  $K_2$  are satisfied by the (hypothetical) wolf bound, existentially bound in  $K_1$  (i.e.,  $y = x$ ).

That is, in (47),  $K_2$  is **modally subordinate** to  $K_1$  (and material in  $K_1$  is consequently accessible to  $K_2$ .) According to Phillips & Kotek, the English adverb *otherwise* is a discourse anaphor and sentences containing this lexical item are taken to rely on a similar logic. Given that the AVERTIVE uses of *bambai* are taken to have a similar meaning contribution to *otherwise*, pertinent details of Phillips & Kotek’s analysis are adapted here (which in themselves are an implementation of Craige Roberts’s

<sup>44</sup>Much of the content of this subsection draws on the presentation of a similar analysis for *otherwise* in Phillips & Kotek; ?, available at [lingbuzz/004800](http://lingbuzz/004800). The arguments in this analysis are summarised and modified in view of accounting for *bambai*’s different properties. The introduction to Discourse Representation Theory and modal subordination are particularly close to the text in :§4.

extended DRL for modal subordination.) An overview of the basic assumptions of this version of Discourse Representation Theory (DRT) are given in § 3.1.1.1, which are then used to model the contribution of *bambai* in the subsequent sections.

### 3.1.1.1 A modal discourse representation language

Discourse Representation Theory (originating simultaneously with Kamp 1981 and the related system of Heim 1982) is a framework for modelling the development of participants’ “mental representations” of a given situation as a discourse unfolds (see Geurts et al. 2016).<sup>45</sup> Because it models the accretion of information over the course of a discourse, DISCOURSE REPRESENTATIONS — effectively “pictures of the world [ $\approx$  partial models] described by sentences that determine them” — are the basic meaning-bearing units in a discourse, mediating between syntactic units (*i.e.*, sentences) and the determination of truth.

For a given DRS  $K$ ,  $K$  denotes a pair  $\langle X_K, C_K \rangle$ , where  $X$  represents a *local domain* – a finite set of variables that represent discourse objects relevant in the context (including participants, eventualities, and times etc.); and  $C$  is a finite set of ‘satisfaction conditions’ that eventually determine the truth value of a given proposition. For diagrams where a DRS  $K$  is represented as a box, the top of the box lists the variables  $X_K$  and the bottom represents the satisfaction conditions  $C_K$ .

For a simple discourse as in (48), we provide a DRS below. Notice that the indefinite is treated as a variable here, and is eventually existentially closed (Heim 1982): any variable that is not locally bound by another operator is assumed to be existentially bound by a global operator that applies to variables that remain free by the end of the derivation. DRT allows us to model continued reference to a variable introduced earlier in a discourse as long as it is still accessible. The first sentence of 48 introduces a discourse referent and condition set, represented as (a), expanded in the second (b).<sup>46</sup>

(48) A duck entered the room. It quacked.

a.

$x$
$duck(x)$ $entered-room(x)$

b.

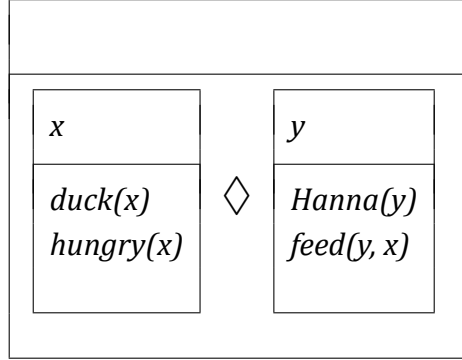
$x \quad y$
$duck(x)$ $entered-room(x)$ $x=y$ $quacked(y)$

<sup>45</sup>While these frameworks are often described as empirically equivalent, Heim’s *File Change Semantics* differs crucially insofar as it denies or makes no claim about mental representation and or the “procedural aspects” of interpretation (Kamp 1988:102, this property also addressed in Geurts et al. 2016:§ 6.) Nothing in the current work hinges on commitment to a particular dynamic semantics/pragmatic framework.

<sup>46</sup>These representations are somewhat abbreviated in subsequent diagrams. See Kamp & Reyle (1993) for further detail.

A given DRS  $K$  contains atomic conditions of the form  $P(x_{i_1} \dots x_{i_n})$  (where  $P$  is an  $n$ -place predicate). In a given model  $\mathcal{M}$ , if a world/variable-assignment pair  $\langle w, f \rangle$  **satisfies** ( $\models_{\mathcal{M}}$ ) all of the conditions in  $K$ , then that pair **verifies** ( $\models_{\mathcal{M}}$ )  $K$ . Additionally, DRSs are recursively closed under the operations  $\neg, \vee, \Rightarrow, \Box, \Diamond$ . That is, if  $K_i, K_j$  are DRSs and  $\circ$  is one of these (2-place) operators, then  $K_i \circ K_j$  can represent a *complex condition* in  $K$ . This complex condition needs to be satisfied by  $w$ , if  $K$  is to be verified in  $w$ .<sup>47</sup> (49) is an example containing a possibility modal, illustrating that the variable  $x$ , which is introduced in the box to the left of the operator, remains accessible in the box on the right:

(49) If a duck is hungry, Hanna may feed it.



Crucial to the theory is the notion of an “accessible domain”  $A_{K_i}$  – a superset of the local domain ( $X_{K_i}$ ) for any given  $K_i$ . As a discourse proceeds, the set of objects that can be referred to expands. The notion of ‘accessibility’, then, allows us to predict which objects can be referred to at a given stage in a discourse.

(50) The accessible domain  $A_{K_i}$  contains all the variables that occur:

- a. In  $K_i$ ’s local domain ( $X_{K_i}$ )
- b. In the domains of all DRSs that graphically *contain*  $K_i$
- c. If  $K_i$  is the right element of a (binary) modal condition ( $\Rightarrow, \Box, \Diamond$ ),  $A_K$  also contains all the elements of the antecedent’s (the DRS on the left’s) local domain.

*I.e.*  $K_\ell \Box K_i \rightarrow K_\ell \leq K_i$  where ‘ $\leq$ ’ reads “is accessible from.”

In (49), the consequent box of the conditional makes reference to a variable introduced in the antecedent. Furthermore, the entire conditional statement is embedded inside a larger discourse, so that we are not committed to the existence of any dog in the context: the *feeding*-worlds are a subset of *hungry-dog*-worlds.

Based on the assumptions introduced in (50), a given DRS  $K$  that is interpreted in the scope of a modal operator can be *modally subordinate* to those DRSs whose

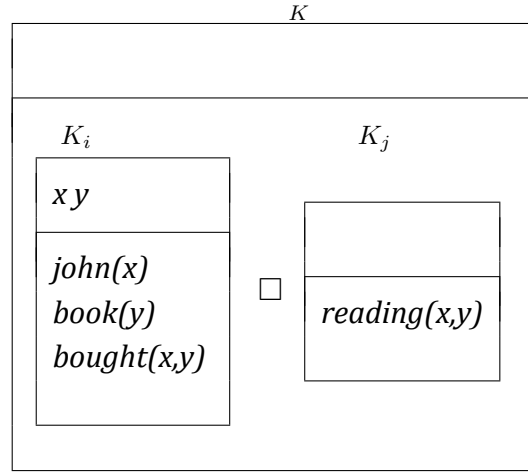
<sup>47</sup>The semantics and interpretation of these operators is further discussed below, though Roberts (1989:714) provides formal satisfaction conditions for all condition types that she defines. See also the appendix to this paper for some additional detail.



domains it has access to. Example (51) illustrates such a case, from Roberts (1989:701). Here, the consequent clause is *modally subordinate* to the antecedent *in a given conversational background*. That is, the entire conditional is taken to assert that the speaker predicts that ‘John will be at home reading a book’ in those worlds (*that best conform with the speaker’s expectations*) in which he bought a book. Like in (50), we need not be committed to the fact that John bought a book in the actual world; in other words, the entire statement is not a part of the matrix DRS  $K$ ; it is further embedded.

(51) *A DRS illustration of modal subordination in a conditional sentence:*

If John bought a book, he’ll be at home reading it by now.



In (51), the DRS representing the consequent clause ( $K_j$ ) is *modally subordinate* to its antecedent  $K_i$  and, as a result, can access the discourse entities introduced in  $K_i$  (i.e.  $K_i \leq K_j$ ). Moreover, both  $K_i$  and  $K_j$  are subordinate to the matrix DRS  $K$  (i.e.  $K \leq K_i \leq K_j$ ); had any variables been introduced in  $K$ , they would have been accessible to both  $K_i$  and  $K_j$ .

### 3.1.1.2 *p bambai q* and discourse representation

On the basis of this framework, we can propose an account for the apparent clause-linking (avertive/precautioning) uses of *bambai*, representing each clause as a discourse representation structure (DRS) — *sc.  $K_1 bambai K_2$* . On the basis of the description given in chapter 2, (52) enumerates some key properties of these uses.

(52) **In sentences of the form  $K_1 bambai K_2$  :**

- a** *bambai* functions as an intensional operator encoding a type of conditional modality; it asserts that – in a set of worlds (according to some criterion), some condition holds ( $q$ ).
- b** The (modal) domain of *bambai* is restricted to some nonfactual proposition derived from  $K_1$ : that is, the **negation** of a “basic proposition”

(which may be in the scope of another other modal operator.)<sup>48</sup>

- c The speaker asserts  $K_1$ .

For clarity, the three sentences in (53) illustrate these interpretation conventions for precautioning uses of *bambai* and different relations between the syntactic antecedent  $K_1$  and the prejacent to *bambai*  $K_2$ , recalling (46), the modal subordination schema from Roberts (2020).

(53) **Modal subordination with *bambai***

- a. The negation of  $K_1$  restricts the domain of *bambai*

[ $K_1$  *ai~bin dringgi kofi nairram*] ***bambai*** *ai bina silip~silip-bat*  
 1S=PST drink coffee night *bambai* 1S PST:IRR sleep~IPFV  
*la wek*  
 LOC work

‘I drank coffee last night otherwise I would have fallen asleep at work’  
 $\approx$  ‘If I hadn’t had coffee, I might’ve fallen asleep’ [AJ 23022017]

- b. The negation of the proposition in the scope of *garra* ‘must, will’ restricts the domain of *bambai*

[ $K_1$  *ai~rra dringgi kofi*] ***bambai*** *mi gurrumuk la desk iya*  
 1S=IRR drink coffee *bambai* 1S fall.asleep LOC desk here  
*gin*  
 EMPH

‘I’ll/ought to have a coffee; otherwise I might pass out right here on the desk’ [GT 28052016]  
 $\approx$  ‘If I don’t have coffee, I might fall asleep’  
 $\not\approx$  # ‘If I need not have a coffee, I might fall asleep’

- c. *kaan*  $\varphi$  ‘won’t/can’t/mustn’t  $\varphi$ ’ has the logical form  $\Box[\neg[\varphi]]$ . The negation of the proposition in the scope of  $\Box$  restricts the modal.

[ $K_1$  *yu kaan gu la shop*] ***bambai*** *yu spendim yu manima*  
 3S IRR.NEG go LOC shop *bambai* 2S spend 2S money

‘You mustn’t go to the shop; (otherwise) you could end up spending all your money.’ [AJ 23022017]  
 $\approx$  ‘If you don’t not go to the shop, you might spend all your money.’  
 $\not\approx$  # ‘If it’s not the case that you mustn’t go to the shop...’

<sup>48</sup>Operationalised below, where some sentence  $K_1$  is of the form  $\text{OP}_1\varphi$  (i.e., headed by a modal operator), the corresponding *basic proposition* is  $\varphi$ .

- d. The negation of the (generic) complement of a propositional attitude

*bi gud* ‘be good to’ restricts the domain of *bambai*//

[<sub>K<sub>1</sub></sub> *im gud ba stap wen yu konfyus* ] ***bambai*** *yu ardim*  
 3s good PURP stop when 2s confused *bambai* 2s hurt  
*yu hed*  
 your head

‘It’s best to stop when you’re confused, (otherwise) you’ll get a headache!’

≈ ‘If you don’t stop when you’re confused, you might get a headache!’

≠ # ‘If it’s not best to stop when you’re confused, then you might get a headache!’

As the infelicitous paraphrases in (53b-d) make clear, *K<sub>1</sub> bambai K<sub>2</sub>* doesn’t have a straightforward conditional semantics. It is **not** the negation of *K<sub>1</sub>*, but rather material under the scope of some modal (or otherwise intensional) operator within *K<sub>1</sub>* (viz. *OP<sub>1</sub>*) whose negation ends up being accommodated.

Again, following the analysis laid out in Phillips & Kotek, the possible sets of propositions that are available to constrain the interpretation of “*bambai K<sub>2</sub>*” are calculated on the basis of those discourse representations which **have access to** (i.e., are contained within) the pronounced antecedent to *otherwise*, which will refer to throughout as *K<sub>1</sub>*. A new operator over DRSs  $\ominus$  (and hence the complex condition  $K_i \ominus K_j$ ) will represent the (truth-conditional) contribution of *bambai*:

(54) *Proposal: A dynamic semantics for bambai*

$$K_i \ominus K_j \iff (K_i) \wedge (\neg K_{i_{\text{sub}}} \Diamond K_j)$$

In words:  $K_i \ominus K_j$  is satisfiable iff both  $C_{K_i}$  and  $(\neg K_{i_{\text{sub}}} \Diamond K_j)$  are satisfiable, where  $K_{i_{\text{sub}}}$  is some DRS that is contained within  $K_i$ .<sup>49</sup>

This proposal can be paraphrased as the claim that: “the conditions of  $K_i$  hold; however, in case (some of) these conditions — those of  $K_{i_{\text{sub}}}$  — do not hold, the conditions in  $K_j$  may then hold.” Notice that this treatment takes precautioning apprehensionals to be akin in their (logical) structure to a conditional as

Notice additionally that we employ the possibility operator ( $\Diamond$ ) from Roberts’ DRL (1989:695, 715), building on the observation throughout that apprehensionals (incl. *bambai*) involve a modal (possibility) component. A primary contribution of Roberts 1989 is an expansion of the ontology of the discourse representation theory of Kamp 1981 to include possible worlds, in view of modeling modality. In effect,  $\Diamond$  is an existential quantifier which also builds in “conversational backgrounds”—sets of propositions: a modal base  $m$  and ordering source  $o$ —in order to capture the observations made by Kratzer (1981b:§2.7) regarding different “flavors” of modality.

<sup>49</sup>More precisely, these conditions will be satisfied by the same set of world-assignment pairs  $\langle w, g \rangle$ . See below for more discussion of the determination of  $K_{i_{\text{sub}}}$ .

A complex condition of the form  $K_i \Diamond_{m,o} K_j$  then, is satisfiable iff  $K_j$  can be verified in some worlds in the conversational background (as determined by  $m, o$ ) in which  $K_i$  can be verified. Consequently a DRS containing the condition  $K_i \Diamond_{m,o} K_j$  can be instructively rewritten as in (55):<sup>50,51</sup>

(55) *Satisfaction conditions for Roberts' possibility operator  $\Diamond$  as an existential quantifier, given a world  $w$ :*

$$K_i \Diamond_{m,o} K_j \iff \exists w' [w' \in \text{BEST}_{o(w)}(\bigcap [m(w) \cup \{w'' \models K_i\}]) \wedge w' \models K_j]$$

In words: The condition  $K_i \Diamond_{m,o} K_j$  is satisfied in  $w$  if there's some world  $w'$  in the "best worlds" (according to  $o$ ) within  $m$  and verifying  $K_i$  which also satisfies the conditions of  $K_j$ .

### 3.1.1.3 Modal subordination in action

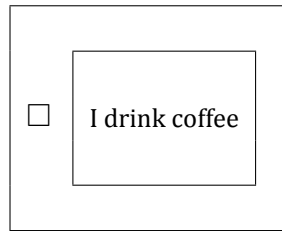
Described above, the second (*bambai*) clause of (53b) is interpreted as *modally subordinate* to antecedent material. Following the discussion of the previous subsection, its discourse representation structure can be diagrammed as in (56). In (a),  $K_1$  is asserted. In (b), the content in the scope of  $\text{OP}_1$  (*viz.*  $K_{1\text{sub}}$ ) is accommodated; its negation restricts the domain of the possibility modal encoded in *bambai*.

(56) Discourse representation structure for (53b)

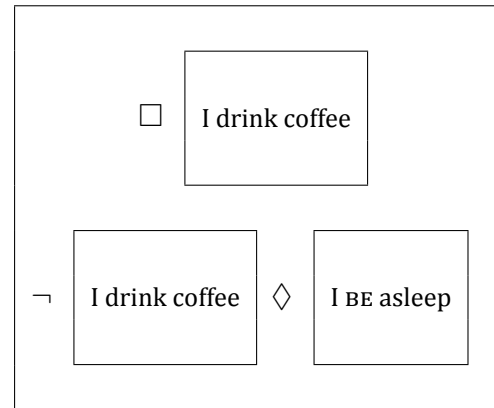
$[_{K_1} \text{airra dringgi kofi} ] \text{ bambai mi gurrumuk}$

'I'll have a coffee, otherwise I may (fall) sleep.'

$K_1$ . DRS first clause



$K_2$ . DRS full sentence



<sup>50</sup>See Chapter 1 for a definition of BEST and a brief overview of ordering semantics.

<sup>51</sup>Roberts (1989) in fact equivalently defines the satisfaction conditions for 'possibility (in view of)'  $K_i \Diamond_{m,o} K_j$  as the dual of 'necessity (in view of)'  $\neg(K_i \Box_{m,o} \neg K_j)$ . Relevant adjustments are made here. Mentioned in the previous section, satisfaction (verification) is a property that holds between a 4-tuple: a model, world, assignment and set of conditions (DRS). This is simplified here for perspicuity.

Crucially, when *airra dringgi kofi* ‘I’ll have a coffee’ is asserted, its prejacent is presumed unsettled at speech time (that is, the sentence presupposes that at the relevant (future) time, the subject’s drinking coffee (or failure to do so) is not a settled fact of the world (Roberts’s NONFACTUAL mood.) Because of this, NEG(‘I drink coffee’) is available as a restrictor to *bambai* — in other words  $K_2$  is **modally subordinate** to  $K_1$ . Similarly, in (c), it is presumed unsettled that the addressee go to the shop (again at some future time, retrieved from context). The negation of the prejacent of the modal — NEG(‘You don’t go to the shop’) — restricts the domain of *bambai*.

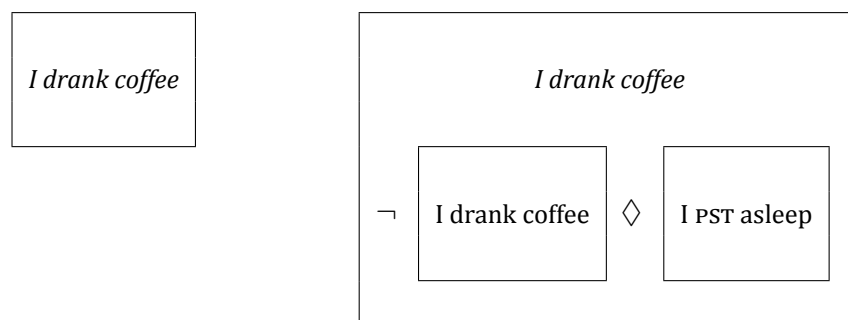
The second clause of (53a) is interpreted as a counterfactual (while it has past temporal reference, *bina* explicitly marks its nonfactual status.) Consequently, *bambai* needs a nonfactual antecedent and the negation of the foregoing proposition is accommodated to restrict its domain. Reminiscent of standard treatments of counterfactuals (*i.e.*, where worlds in a nonrealistic proposition are ranked by their “similarity” to the actual world, see von Fintel 2001, 2012; Kratzer 1981b; Lewis 1973). This is represented in (57) below: the first clause (coffee-drinking) is asserted as actual, the second a nonrealised possible outcome had the coffee-drinking not obtained.

(57) Discourse representation structure for (53a)

$[_{K_1}$  *aibin dringgi kofi* ] *bambai aibina silip*

‘I had a coffee, otherwise I might’ve slept.’

$K_1$ . DRS first clause       $K_2$ . DRS full sentence



Unlike *otherwise* (as examined in Phillips & Kotek), possible antecedents appear to be predictably constrained by the form of the foregoing linguistic material. The “Red Light” sentence pair is translated in (58); accommodation of the entire conditional as an antecedent appears to be infelicitous (*cf.* Kruijff-Korbayová & Webber 2001; Phillips & Kotek; Webber et al. 2003).<sup>52</sup> A DRS for (58a) is additionally provided in (59).

<sup>52</sup>These judgments have only been tested on a single speaker and bear confirmation of a negative judgment/further investigation. Of course the felicity of (58b) would also be predicted to be independently degraded without establishing negative speaker attitude vis-à-vis the prejacent.

(58) *bambai* accommodates the smallest antecedent: the *Red Light* examples

- a. *If det lait im redwan, stap; bambai yu gaji tiket.*  
 if the light 3s red stop *bambai* 2s catch ticket

‘If the light’s red, stop; otherwise you might get a ticket.’

- b. *If det lait im redwan, stap; if najing, kipgon.*  
 if the light 3s red stop if no CONT

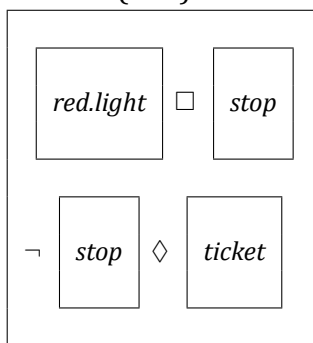
‘If the light’s red, stop; otherwise continue.’

[GT 19032017]

In both Red Light sentences, the *bambai*-clause is modally subordinate to a conditional imperative ‘If the light’s red, stop!’ As with the other precautioning uses analysed above, the “simple” satisfaction conditions (*i.e.*, the conditions of  $K_i$  stripped of its own modal restrictions (*viz.* the conditional modality) are accommodated as the restrictor to *bambai*.

(59) DRS for (58a)

$$K_i \ominus K_j \Leftrightarrow K_i \wedge K_{i_{\text{sub}}} \Diamond K_j$$



**summary.**

$$K_i = \text{red light} \Box \text{stop}$$

$$K_{i_{\text{sub}}} = \text{stop}$$

$$K_j = \text{get ticket}$$

In this subsection, we have considered the relation between the two clauses involved in “precautioning” uses of *bambai* — that is, those uses occurring in *p bambai q* ‘*p*, otherwise *q*’ contexts. Crucially, we have considered evidence that *q* — *bambai*’s prejacent — is **modally subordinate** to material in the foregoing discourse. As shown in Roberts (1989:§ 2.2), this operation involves a process which she calls “accommodation (of the missing antecedent)”, that is, given a non factual assertion (*i.e.*,  $[_{S_2} \text{MOD}_2 \dots Y \dots]$ ), an antecedent (*X*) that determines the modal domain must be found among accessible discourse referents (*i.e.*,  $[_{S_1} \text{OP}_1 \dots X \dots]$ ).

In this chapter, I defend an analysis that treats all APPREHENSIONAL uses of *bambai* invariably as a modal operator that takes a single, nonfactual propositional argument (*q*).<sup>53</sup> When (as in *precautioning* contexts) *bambai q* immediately follows a (conjunct) sentence *p*, it accommodates the negation of the basic proposition associated with that sentence (that is, the prejacent of an imperative or modal operator/the content of *p*, stripped of any mood/modal information.)

The next subsection (§ 3.1.2) contains a discussion of the pragmatic mechanisms by which an antecedent is selected.

<sup>53</sup> Additionally, a proposal for unifying *bambai*’s range of apprehensional uses with its subsequent use is detailed in Ch. 4.

### 3.1.2 Information structure

In the previous subsection, we saw how (when it is interpreted as nonfactual),  $p$  — the prejacent to *bambai* — is obligatorily modally subordinate to some antecedent proposition. Again following the proposal of Phillips & Kotek, and modulo the constraints in precautioning uses described above, “accommodation of the missing antecedent” operates on a pragmatic basis with reference to prior discourse and the content of the prejacent.<sup>54,55</sup>

By deploying information-structural notions developed in Carlson (1983) and Roberts (1996/2012), we can conceptualize of *otherwise* as representing a DISCOURSE MOVE ( $m_n$  : in effect, a temporally-ordered stage in a given discourse), which adds to the QUESTION UNDER DISCUSSION (QuD) in a given discourse context  $\mathcal{D}$ .

(60) An information structure for  $\mathcal{D}$  (INFOSTR $_{\mathcal{D}}$ ) includes:

- a. The **common ground** is a set of mutually assumed background information. The *cg* is often modeled as a set of propositions, *i.e.*, a set of sets of possible worlds (*e.g.*, Stalnaker 1978 *a.o.*, also introduced in § 1.2.1).
- b. A totally ordered set of discourse moves  $m \in \mathbf{M}$ , partitioned into questions (setup moves) and answers (payoff moves). A subset of  $\mathbf{M}$  is **Accepted** in  $\mathcal{D}$ .
- c. The **QuD** is a partially structured set of questions which discourse participants are mutually committed to resolving at a given point in time. It is often modeled as a stack, consisting of ordered subsets of accepted question moves, the answers to which are not entailed by the *cg* (*i.e.*, the QuD is a set of “open” questions at a given stage  $m$  in  $\mathcal{D}$ )

An important consequence of the conceit of a *QuD stack* is that its structure and management are governed by *strategies of inquiry* (Roberts 1998, 2004, 2012). A (segment) of  $\mathcal{D}$  is associated with a *discourse question* (DQ) (or “Big Question.”) Subsequent discourse moves (including additional questions) are appropriate iff they are taken to “constitute a reasonable strategy of inquiry” for answering the DQ (Simons, Beaver, Roberts & Tonhauser 2017).

These concepts provide a way of representing the ‘flow’ of information and changes in the interlocutors’ information states over time. Again beginning with *bambai*’s precautioning uses, take an utterance  $p \text{ bambai } q$  to consist of (at least) three discourse moves. A discourse anaphor, *bambai* represents a “setup” move with the effect of adding to the QuD.

<sup>54</sup>This claim bears some similarity to the notion of an “anaphorically-derived contextual parameter” that features in the analysis of Webber et al. (2001:14).

<sup>55</sup>Relatedly, Corblin (2002) notes the possibility of *negative accommodation* without *otherwise* in *I didn’t buy the car. I wouldn’t have known where to put it (otherwise) and I should have accepted. I wouldn’t have been fired.* (author’s translation: 256, 258).

- (61) *Proposal: the pragmatics of bambai*  
*bambai* represents a discourse “setup” move with the effect of adding to the QuD stack a question about the COMPLEMENT of a set of worlds calculated on the basis of the discourse in which a *bambai* sentence is uttered .

The role of this information-structural aspect to the interpretation of *bambai* is shown in (62). Crucially, this treatment takes the role of *bambai* to be the “introduction of a question” into the discourse (62- $m_j$ ): an approach that converges with observations of formal and conceptual links between conditionals, interrogatives and “topichood.” That is: an utterance *q if p* links the assertion of  $\llbracket q \rrbracket$  to the raising of a question  $\llbracket ?p \rrbracket$  (Starr 2010:36). For discussion of these links, see especially Starr (2010, 2011, 2014), containing a proposal for a unified (dynamic/inquisitive) semantics for conditional and interrogative-embedding uses of *if*.<sup>56</sup> The information-structural analysis of *p bambai q* in (62) provides a heuristic to capture some of these insights.

- (62) INFORMATIONSTRUCTURE<sub>D</sub> and precautioning *bambai*  
 $[airra\ dringgi\ kofi]_{m_i}, \mathbf{bambai}_{m_j} [mi\ silip!]_{m_k}$

$m_i$  This is the pronounced antecedent. It represents a modalized assertion: the addressee has a coffee in all worlds in some unspecified conversational background (here, potentially some teleological ordering source containing the subject’s work goals / expected office behaviour at the Ngukurr Language Centre — e.g.,  $\text{BEST}_{tel(w)}(\cap_{CIRC} m(w))$ )

$$\forall w' [w' \in \text{BEST}_{tel(w)}(\cap_{CIRC} m(w)) \rightarrow \text{HAVE.COFFEE}(w')]$$

$m_j$  Per (61) and the discussion that follows, *bambai* can be understood to encode an instruction to consider the COMPLEMENT of some set of worlds *p* that has been made contextually discourse-salient. This set-up move can be thought of as signalling the addition of a question to the QuD stack of the form:<sup>57</sup>

what could (unfortunately) happen next in  $w \in \bar{p}$ ?

<sup>56</sup>For a clear demonstration of this fact, compare the notion of the “advertising conditional”: e.g., *Single? You haven’t visited Match.com*, where an affirmative answer to the question is “supposed”, much as a conditional antecedent would be (Starr 2014:4). Relatedly, the “conditional question under discussion (cQuD)” in Ippolito 2013, following insights from Isaacs & Rawlins’ 2008 dynamic treatment of conditional questions. These accounts similarly take a conditional antecedent/*if*-clause to induce a temporary restriction over the common ground—“the answer to the question is an answer to the modally subordinated question” (Ippolito 2013:200). These observations are picked up again in § 3.2

<sup>57</sup>As in the previous chapter, I use the overline notation to denote a function that maps a set of worlds to its complement.



In this case, a plausible candidate is: what if we are in a world s.t. the speaker doesn't have a coffee in that world?

$m_k$  The second clause – *bambai*'s **prejacent** – is necessarily interpreted as proffering a (partial) answer to the CQ (current QUD, a reflex of the maxim of RELEVANCE.)<sup>58</sup> Here, the speaker predicts that he may pass out as his desk in  $\bar{p}$ : the set of worlds made available to *bambai*. In this case,  $\bar{p}$  is the complement of the set of worlds in which he has a cup of coffee.

$$\exists w'' [w'' \in \underset{s' \text{ typ}(w)}{\text{BEST}} \left( \cap \underset{\text{CIRC}}{\{m(w) \cup \overline{\text{DRINK.COFFEE}(w'')}\}} \right) \wedge \text{SLEEP}(w'')]$$

### 3.1.3 Apprehensive domain restriction

So far, this section has focussed on theorising the relationship between the two clauses in *precautioning* uses of *bambai* — utterances of the form  $p \text{ bambai } q$  are interpreted as  $p \wedge \blacklozenge q$ . § 3.1.1 showed that the assertion of  $\blacklozenge q$  (in utterances of the form is interpreted relative to (*sc.* modally subordinate) to some antecedent derived from  $p$ . § 3.1.2 has shown how appeal to information-structural notions (*viz.* the QUD) is helpful in understanding how this antecedent is accommodated. Here, the accommodation analysis is extended to other apprehensional uses described in Chapter 2 (*e.g.*, Figure 2.1), again by appealing to pragmatic notions.

In describing her notion of relevance – introduced in (62- $m_k$ ) & fn 58 above – Roberts additionally notes that, just as assertion moves are felicitous iff they constitute a (partial) “answer” to the QUD: “a question can only be accepted **if it furthers answering those [questions] to which the interlocutors are already committed**” (2012:21, emphasis added). The *apprehensive* uses of *bambai*, are distinguished insofar as there need not be an explicit, pronounced  $p$  to constrain the option space for an antecedent to  $\blacklozenge q$ .<sup>59</sup> Consider again, for example, (38) from § 2.3.2.2, repeated here as (63).

(63) **Context:** Two relatives (**A, B**) are planning a hunting trip; a younger relative (say, **C**) wants to join.

<sup>58</sup>For Craige Roberts, the notion of *Relevance* — a derivative of the Gricean maxim — she defines it as follows (boldface added):

A [discourse] move  $m$  is **RELEVANT to the question under discussion  $q$**  (*i.e.*, to the last QUD( $m$ )), *iff*  $m$  either **introduces a partial answer to  $q$**  ( $m$  is an assertion) or is part of a strategy to answer  $q$  ( $m$  is a question). (Roberts 2004:216)

<sup>59</sup>The Robertsonian model permits for “[q]uestions [to be] raised explicitly, with interrogatives; implicitly, by question-introducing assertions; or by real world goals” (Simons et al. 2017:200).

- A. *im rait, yu digi im then gajin.*  
3s okay 2s take 3s then KINSHIP

‘It’s fine, bring him along poison-cousin’

- B. ***Bambai** yunmi gaan faindi bip*  
***bambai** 1d.INCL NEG.IRR find meat*

‘But then we may not be able to find meat’

- A. *Yunmi garra digi im*  
1d.INCL IRR take 3s

‘We’ll take him’

- B. ***bambai** im gaan gibi la yunmi.*  
***bambai** 3s NEG.IRR give LOC 1s.INCL*

‘But then [the country] may not provide for us.’ [DW 20170712]

In each of **B**’s utterances in (63), there is no “pronounced antecedent.” In view of our account of *bambai* as adding to the QUD stack and the (relevance) constraints on felicitous question moves (*i.e.*, any additional questions must form part of a strategy of inquiry for a given *discourse question*), accommodation is guided by pragmatic principles in concert with salient extralinguistic context.

- (64) **Context.** The speaker is looking at a high-end stereo in an electronics store.  
*My neighbors **would** kill me* (Stone 1997:5-6)

While likely uninterpretable in an “out of the blue”-type context, note that the modal proposition in (64) is felicitous on a reading where the speaker’s neighbours would be furious in the event that the speaker bought an expensive stereo and played it sufficiently loudly (compare fn 59).

Similarly, the uses of *bambai* are interpretable in (63) in view of pragmatic calculations on the basis of the development of each speakers’ information state through this dispute ( $\mathcal{D}_{(63)}$ ). In this context, the DQ is  $\langle$  Should **C** accompany **A** & **B** on their hunting trip?  $\rangle$ . Additionally, the perspective of each speaker has been established — *i.e.*, **A** favours a situation where their younger relative accompanies them on the hunt, **B** disfavours this eventuality and both are arguing in favour of these domain goals (compare Roberts 2004:215). As a consequence of this, both of **B**’s utterances are likely to be interpreted as justifications for his perspective: that is, in both instances *bambai q* is modally subordinate to a sentence similar in content to: ‘we shouldn’t permit **C** to accompany us.’ This is spelled out in (65).

- (65) INFORMATIONSTRUCTURE $\mathcal{D}_{(63)}$  and apprehensive *bambai*  
***bambai**<sub>*m<sub>j</sub>*</sub> [*im gaan gibi la yunmi!*]<sub>*m<sub>k</sub>*</sub>*

$m_j$  As shown previously, *bambai* signals the addition of a question: *what could (unfortunately) happen next in  $w \in \bar{p}$ ?* to the QUD stack. Per Roberts’ felicity condition on questions, admissible questions have to contribute to a “strategy” to answering the questions to which the speakers are already committed” — viz. *Should  $\mathbf{c}$  come hunting?*

That  $\mathbf{B}$  is opposed to this idea (sc. the proposition  $\mathbf{B}$  believes that  $\mathbf{c}$  should not come hunting) is in the common ground.

$m_k$  As previously argued, the prejacant is interpreted as a response to the current QUD (cQ). Here the speaker predicts that a unsuccessful hunting trip (“the country may not provide) in  $\bar{p}$ . In this case  $\bar{p}$  is the complement of the set of worlds in which  $\mathbf{c}$  does not join the hunting expedition.

$$\exists w'' [w'' \in \underset{s'typ(w)}{\text{BEST}} \left( \cap \underset{\text{CIRC}}{\{m(w) \cup \neg \mathbf{c}.\text{COMES.HUNTING}(w'')\}} \right) \wedge \text{HUNTING.FAILURE}(w'')]$$

Ultimately, this section has sought to demonstrate that an appeal to modal subordination (particularly the accommodation of an antecedent) and information structural notions (the relevance of the QUD) allows for a unified account of the pragmatics of apprehensional uses of *bambai* – that is, in all cases, *bambai*  $q$  represents a modal claim —  $\blacklozenge q$  — against a predictive conversational background restricted by (the negation of) some salient proposition accommodated from the (explicit or implicit) discourse context.

The following section provides a diachronic perspective on the relationship between  $p$  and  $q$  in view of better understanding the relationship between these apprehensional uses and the subsequential (temporal frame) meaning from which they are understood to have arisen.

## 3.2 Apprehensional readings emerge in subsequential TFAs

Of course borderline cases can arise because language changes. Something that was not originally employed as a means of expressing a thought may eventually come to do this because it has constantly been used in cases of the same kind. A thought which to begin with was only suggested by an expression may come to be explicitly asserted by it.

(Frege 1897/1979, cited in Horn 2013:241)

Here I consider a number of linguistic factors that appear to have contributed to the emergence of apprehensional readings of TFAs. As shown in § 2.2.3, this meaning change pathway (and the apparent synchronic polysemy between temporal and apprehensional uses) has been observed by a handful of other authors (Angelo &

Schultze-Berndt 2016, 2018; Boogaart 2020) on the basis of data including analyses of German *nachher* and Dutch *straks*, in addition to Kriol *bambai* (see also Kuteva et al. 2019:427-8). Parallels between *bambai* and *straks* are shown in (66) below for example, where the contrast between a subsequential (a) and apprehensional (b) reading is apparent.

(66) Subsequential and apprehensive readings of the *straksconstructie* in Dutch

- a. **Context.** It's 3.30, the shop closes at 4. I tell my friend:

*de winkel is straks gesloten*  
the shop is *straks* closed

'The shop will be closed soon.'

- b. **Context.** It's 4.10, the shop closes at either 4 or midnight, I'm unsure which. I say to my friend:

*straks is de winkel gesloten!*  
*straks* is the shop closed

'The shop may (already) be closed!' [Mireille L'Amie, *p.c.* 20200130]

### 3.2.1 Temporal sequence & conditional modality

Many authors (*e.g.*, Blühdorn 2008; Culicover & Jackendoff 1997; Harder 1995; Klinedinst & Rothschild 2012; Schmerling 1975; Stukker & Sanders 2012 a.o.) have investigated the semantic dependencies that often obtain between clauses that are *syntactically coordinate*. These include the "conditional readings" of *and* and *or*, in addition to asyndetic constructions of the type: *Matt comes, I leave*. In these cases, although there is no explicit conditional morphology, it is R-implicated that the second sentence should be interpreted as modally subordinated to the first: that is, my departure is a consequence of John's arrival. As mentioned above in fn 55, Corblin (2002) also additionally notes the possibility of *negative accommodation* in coordinate sentences:

(67) **Negative accommodation of a modal antecedent**

- a. *Je n'ai pas achetée la voiture. Je ne saurais pas où la mettre.*

'I didn't buy the car. I wouldn't have known where to put it.' (256)

- b. *J'aurais dû accepté. On ne m'aurait pas viré.*

'I should have accepted. I wouldn't have been fired.' (258)

In §3.1.2, we considered the formal and conceptual links between conditional and interrogative clauses. It was claimed that a functional motivation for these appears to be that conditional apodoses (consequent clauses) can be understood as

answering a “question” posed by the antecedent/protasis. The illocutionary effect of both interrogatives and conditionals is often taken to be the “supposition” of a proposition: that is, adding a proposition to the common ground (or partitioning contextual possibilities, see Starr 2010). These conceptual parallels have clear linguistic reflexes, shown clearly for Danish, *e.g.* by Harder (1995:100-2), replicated in (68) below.

(68) **Conditionals as “telescoped” discourse** (Harder 1995)

- a. A two-participant discourse (101)

A. *Kommer du i aften?*

Are you coming tonight?

B. *ja*

Yes

A. *Så laver jeg en lækker middag*

Then I’ll cook a nice dinner.

- b. *Kommer du i aften, (så) laver jeg en lækker middag*

‘If you’re coming tonight, (then) I’ll cook a nice dinner.’ (101)

Harder (1995:101) suggests that “the conditional can be seen as a way of *telescoping a discourse sequence into one utterance* so that **B** has to respond not only on the basis of the present situation, but also on the basis of a possible future.”

In view of the data presented in (67-68), consider the discourses in (69-71) below.

(69) **Context:** A child is playing on a car and is told to stop.

- A. *gita la jeya!* [compare (33a)]  
get off LOC there!

- B. *ba wani?*  
why?

- A. *bambai yu breigim motika*  
**bambai** 2s break car

‘Get off of there [...why?...] You’re **about to** break the car!’

[GT 16032017]

(70) **Context:** It’s the wet season and the Wilton River crossing has flooded.

- A. *nomo krosim det riba!*  
NEG cross.TR the river

- B. *ba wani?*  
why?

- A. *bambai* *yu flodawei!*  
*bambai* 2s float away

'Don't cross the river [...why not?...] You're **about to** be swept away!'  
 [GT 16032017]

(71) **Context:** A snake slithered past A's leg.

- A. *det sineik bin bratinim mi!*  
 the snake PST frighten.TR me
- B. *ba wani?*  
 why?

- A. *bambai imina baitim mi!*  
*bambai* 3s.IRR:PST bite.TR 1s

'The snake scared me [...why?...] It might've been **about to** bite me!'  
 [GT 01052017]

In each of the short discourses above, the translation provided elucidates: **(a)** that each of these dialogues can be “telescoped” onto a single utterance, and that **(b)** the capacity of the temporal properties of *bambai* qua sequential TFA to implicate additional nontemporal properties of the relation between the clauses it links — that is, the *bambai* clause is modally subordinate to the content of A's first utterance. In each of the examples, A's response identifies an eventuality that might obtain in the near future (of the speech-time for (69-70) and of the slithering/frightening-time for (71)).

Further, in all three cases, this *bambai* clause is obligatorily interpreted as non-factual. In the first two cases it describes an eventuality that is posterior to a possible future event (the one described by the previous imperative and one that is therefore only felicitous if it is presumed unsettled.) In (71), the *bambai* clause has explicit irrealis marking, indicating its cocounterfactual status: it expresses that A's psychological state at the event time was such that biting was an unsettled, possible future.

Via pragmatic strengthening (*viz.* an inference of the form *post hoc ergo propter hoc*), *bambai* can be understood to assert that there exists some type of logical (*e.g.*, etiological) relation between the predicate contained in the first proposition and the eventuality described in *bambai*'s prejacent: the second clause. In (69), for example, the child's failure to comply with A's (precautioning) instruction could contribute causally to the car's breaking. Inferencing-based theories of meaning change will hold that, while there is no lexical item that encodes causality, in many contexts, reasoning about informativity and relevance “invite” the *propter hoc* inference (*e.g.*, Geis & Zwicky 1971:564).

This type of implicature is well-documented in cross-linguistic studies of meaning change (see also Kuteva et al. 2019:403); the extension of English *since* (*sibpan*)

Does this  
 need more  
 capacity?  
 main idea  
 in ( )

from encoding subsequentity (they report ostensibly similar shifts in numerous other language) to causality (particularly when talking about past events) is discussed by Traugott & König (1991):

- (72) a. I have done quite a bit of writing **since** we last met (temporal)  
 b. **Since** Susan left him, John has been very miserable (temporal, causal)  
 c. **Since** you are not coming with me, I will have to go alone (causal)  
 d. **Since** you are so angry, there is no point in talking with you (causal)

Traugott & König go on to say

With *since*, when both clauses refer to events, especially events in the past, the reading is typically temporal, as in [72a] When one clause refers to a non- past event or to a state, the reading is typically causal, as in [72c] and [72d], but the causal reading is not required, as [72b] indicates. The contrastive readings in [72b] signal polysemy, i.e. **conventionalized meanings, not just conversational**. (Traugott & König 1991:195, emphasis added)

It appears, then, that precautioning type uses of *bambai* arise from a related inference, namely the conventionalisation of an inference that emerges on the basis of reasoning about relevance: "if A is alerting me that a possible event  $e_1$  may be followed by another possible event  $e_2$ , it's likely that they're drawing a causal connection between these two possible events" (So  $e_1$  causes  $e_2$ ). § 3.3 below further investigates this process in view of the expressive/speaker attitude component of *bambai*'s conventional meaning.

### 3.2.2 conventionalized...not just conversational

*Subjectification* — associated especially with related concepts from the work of Elizabeth Traugott (1989; Traugott & Dasher 2002) and Ronald Langacker (e.g., 1989) — refers to an observed meaning change tendency whereby linguistic expressions diachronically come to encode increasingly "subjective" meanings — those concerning the private beliefs and attitudes of the speaker in a given context. Definientes are provided in (73).

- (73) **The loci of SUBJECTIVITY in according to Finegan (1995:4) are**

A LOCUTIONARY AGENT'S:

1. PERSPECTIVE as shaping linguistic expression;
2. expression of AFFECT towards the propositions contained in utterances;
3. expression of the MODALITY or epistemic status of the propositions contained in utterances.

Bring in  
Gricean  
reasoning to  
more  
explicitly?

unpack  
a little  
that is  
speaker's  
perspective  
(unsurprisingly)  
is both encoded in  
ling output &  
shapes it... etc

To my knowledge, at the time of writing no work has explicitly interrogated (inter)subjectification from a formal perspective (Eckardt acknowledges this in her 2006 monograph (239)).<sup>60</sup> As a driver of meaning change, *subjectification* has been evoked especially in view of explaining the development of modal readings of verbal and adverbial elements, where these expressions come to encode the epistemic status of a speaker vis-à-vis a given proposition (Finegan 1995; Traugott 1989, 1995, 2003, 2006).

The meaning change pathway that *bambai* has traced — *i.e.*, the trajectory from temporal frame adverbial to (multifunctional) apprehensional modal — clearly can be characterised as conforming with generalisations about subjectification in meaning change in each of the criteria in (73). — *! more para showing that*

In chapter 4, a unified lexical entry for *bambai*'s temporal and apprehensional uses is proposed. This proposal relies on the “emergence” of modal readings in **nonfactual contexts** as a function of reasoning about discourse context, a reflex of what I've called the “omniscience restriction” (a component of the asymmetry of past and future/the “problem” of future contingents: outlined in § 1.2.1.) This condition is described in (74) and resembles the epistemic constraints identified in Kaufmann (2002), to be further discussed in Ch. 4.

#### (74) The omniscience restriction

Predications of subsequentality (near-future instantiation, see ch. 4) are interpreted as carrying predictive illocutionary force (*i.e.*, modalised or “epistemically downtoned”) when they are presumed unsettled.

In view of this general pragmatic principle, when a *bambai* clause is interpreted as making an unsettled claim — that is, some future-oriented claim that the discourse participants know that the speaker cannot possibly know the truth of — a modal (predicted possibility) interpretation is invited. This implicature can be understood as resulting from reasoning on the part of language users: discourse participants mutually understand that the *bambai* predication is unsettled and therefore must represent a prediction.<sup>61</sup>

<sup>60</sup>Jucker (2012) (cited in Traugott 2012:562) expresses skepticism that a “cognitive-inferential conceptualization” (what he refers to as the “Anglo-American” approach, apparently including (neo)-Gricean theories) is capable of accounting for these types of phenomena, which apparently invite a “performance-based”/“socio-interactional” pragmatics (which he associates with European research programs.) It is not clear that this is a thoroughly fair assessment (see *e.g.*, discussions of the social motivations for **R**-based implicata in Horn 1984, 1993, 2007; Horn & Bayer 1984 a.o.) Eckardt (2006:43) does also suggest a role for semanticisation of implicatures in apparently subjectivisation-driven changes.

<sup>61</sup>A related account might appeal to Eckardt's AVOID PRAGMATIC OVERLOAD principle (2009), where, faced with an utterance that carries an unaccommodable presupposition (*pragmatic overload*), a (charitable) hearer/reader surmises that the speaker has “used words or phrases in a sense that were formerly unknown to the hearer” (22) and “hypothesize[s] a new meaning...for the item that gave rise to the problematic presupposition” (35). In the present case, *bambai q* asserts *q* in the future of some presupposed reference index (see ch. 4). Given the infelicity of making non-modal assertions about nonactual events, the domain accessible to *bambai*, pragmatic overload is “avoided” by expanding the modal domain of *bambai*.

also as a way of getting social knowledge expected into the lexicon + grammar

main text?



More specifically, given the apparently frequent use of *bambai* *q<sub>nonreal</sub>* in directive contexts and under fear predicates, encoding an “apprehension-causing situation” (Lichtenberk 1995:298) and the justification for an utterance of *p bambai* has come to be associated with *admonitory* predictions. Similarly, Angelo & Schultze-Berndt (2016) propose that:

1285

The conventionalisation of the implicature of undesirability may come about through frequent use of a clausal sequence in which the first clause has the illocutionary force of a directive and the second is introduced by the temporal marker.

(285)

The status and emergence of this “undesirability implicature” is further investigated directly below, in § 3.3.

In this section, I have proposed that the apparent subjectification of *bambai* is unifiable with observations about the diachronic conventionalisation of conversational implicature (*e.g.*, Cole 1975:273ff and especially Traugott’s invited inferring theory of semantic change (1980 *et seq.*)). The frequent occurrence of *bambai* in admonitory contexts and consequent generalisation and conventionalisation of these **R**-implicatures<sup>62</sup> is the source of *bambai*’s apparent (epiphenomenal) subjectification trajectory and present day “lexically denoted information.”

### 3.3 *bambai* and apprehensional expressive content

Of course, a crucial, characterising meaning component for apprehensionals is that they express information about the Speaker’s attitude vis-à-vis their prejacent. This contrast is demonstrated by the minimal pair in (75), where the utterance in (b) is not “expressively correct” (*cf.* Kaplan 1999) because the conditions on speaker attitude are not satisfied.

#### (75) Apprehensional use conditions for *bambai*

- a. *mi nomo wandi gu la mataranka bambai mi luk la main*  
 1s NEG want go LOC Mataranka **bambai** 1s look LOC my  
*banjimob.*  
 cousin.ASSOC

‘I don’t want to go to Mataranka, (because) then I might see my cousins.’

<sup>62</sup>That is, implicatures following from conversational principles of relevance and avoidance of “overinformativeness” (Horn 1984 *et seq.*) •

b. ?? *mi wandi gu la mataranka bambai mi luk la main*  
 1s want go LOC mataranka **bambai** 1s look LOC my  
*banjimob.*  
 cousin.ASSOC

**Intended:** ‘I want to go to Mataranka so/then I’ll see my cousins.’

[A] 072017]

As suggested above (see also Angelo & Schultze-Berndt 2016), the apprehensional reading frequently occurs embedded under a predicate of fearing or in conjunction with a directive (prohibitive) antecedent: corresponding to Lichtenberk’s FEAR and *precautioning* uses respectively (shown in exx. 69-71 above).

Incidentally, Boogaart (2020:192ff) suggests (of Dutch) that it is the “sense of immediacy” of this class of adverbials that associates with notions of “urgency” and that this is the source of the “expressive nature” of subsequential TFAs. Consequently, we might hypothesise that the frequent association of sequential TFAs with these discourse contexts (situations of urgent warning) has resulted in the **conventionalisation** of apprehensional use-conditions for *bambai q*.

In contemporary Kriol, then, the selection of an erstwhile subsequential TFA when making some unsettled predication (instead of a different epistemic adverbial) conventionally implicates that the Speaker is negatively disposed to the event described in the prejacent.

### 3.3.1 The status of apprehensional “attitude conditions”

Marshalling cross-linguistic evidence of this path of change for German and Dutch respectively, an utterance *nicht jetzt, nachher! / niet nu, straks!* ‘not now, later’ is reported to involve a higher degree of intentionality and immediacy than the less specialised *nicht jetzt, später! / niet nu, later!* ‘not now, later.’<sup>63</sup> What’s more, tracking the facts for *bambai* presented above, these TFAs appear to have encroached into the semantic domain of epistemic/modal adverbials, where they are reported to encode negative speaker affect with respect to their prejacent (relative to the other members of these semantic domains.)<sup>64, 65</sup>

<sup>63</sup>See also Angelo & Schultze-Berndt 2018 for these observations and insightful comments about the properties of these adverbials in Kriol and German. Related observations are made for Dutch by Boogaart (2020).

<sup>64</sup>Thanks to Hanna Weckler and Mireille L’Amie for discussion of German and Dutch intuitions respectively.

<sup>65</sup>Compare also the colloquial English expression (*and*) *next thing you know, q* As with the other subsequential TFAs we have seen, it appears that this adverbial tends reads less felicitously (or indeed invites an ironic reading) when *q* is not construed as an undesirable proposition.)

(i) *The fields dried up, and the next thing you know our fleet dropped from 68 drivers to six in the matter of a few months.* [Google result]

As a  
parallel  
consequence

As with *straks* (e.g., 66), *nachher* appears to have a similar distribution to *bambai*,<sup>66</sup> shown by its felicity in the discourse in (76) where it represents an alternative to *vielleicht* ‘perhaps.’ In these contexts, *nachher* asserts negative speaker attitude with respect to its prejacent (Hanna Weckler, p.c.).

(76) **German apprehensional *nachher* and the not-at-issueness of speaker attitude**

**Context.** A two-participant discourse in German

**A** *ich hoffe, dass es heute nicht regnet*  
I hope COMP it today NEG rain

**B** *warum?*  
why?

**A<sub>2</sub>** *nachher wird die Party noch abgesagt!*  
**nachher** INCH the party noch cancelled

‘I hope it doesn’t rain today [...why?...] Then the party might be cancelled!’

*sp* → **B<sub>2</sub>** *nein, das ist nicht möglich*  
no, that is not possible

**B'<sub>2</sub>** *#nein, das wäre gut!*  
no, that would.be good

**B''<sub>2</sub>** *ja, das ist möglich aber das wäre nicht so schlimm!*  
yes, that is possible but that would.be NEG so bad!

Similarly to the Kriol data, German *nachher*, a TFA encoding imminence or “sub-sequentiality”, has developed the characteristics of an apprehensional epistemic, a likely consequence of frequent embedding in the discourse contexts discussed above (§ 3.2). Crucially, the contrast between the possible responses (in particular the infelicity of 76B'<sub>2</sub>) illustrates that, while the use of *nachher* in A<sub>2</sub> does commit the speaker to the proposition ‘I am negatively disposed to the possibility of rain today’, this commitment has the status of a conventional implicatum (not-at-issue).<sup>67</sup>

Following insights from the literature on expressive content and use-conditional semantics (e.g., Gutzmann 2015; Kaplan 1999; McCready 2010; Potts 2007, ostensibly developing Karttunen & Peters’s 1979 proposed extension to PTQ), it is fruitful to model the ‘negative speaker attitude’ component of the meaning of apprehen-

- (ii) *The Supreme Court ruled that disabled golfer Casey Martin has a legal right to ride in a golf cart between shots at PGA Tour events. Man, **the next thing you know**, they’re going to have some guy carry his clubs around for him.* [Jon Stewart]

<sup>66</sup>Although see Angelo & Schultze-Berndt (2018:30) for a discussion of distributional differences between these two items.

<sup>67</sup>I.e., “there is no simple way to indicate just the rejection of something that is conventionally implicated (Karttunen & Peters 1979:14).

sionals as a conventional implicature, inhabiting a second semantic “dimension” — connected to but distinct from the truth conditional contribution (see ch. 4). The infelicity of (76B<sub>2</sub>)’s utterance shows that negation cannot target this component of Speaker meaning: an argument for the treatment of this component of its semantics as non-truth-conditional/not-at-issue component. These proposals (variants of a “logic of conventional implicature”  $\mathcal{L}_{CI}$ ) develop a formalism that conceives of the semantic information contained in a given linguistic expression as a pair of truth- and use-conditional content.

Gutzmann (2015) proposes a compositional “hybrid semantics” that is capable of handling these “two dimensions” of meaning — viz. distinct truth- and use-conditional content. On this type of account, the semantics of a lexical item like *bambai* might be modelled as a “mixed use-conditional item” — a lexical item whose meaning can be represented as a pair of metalinguistic formulæ. The previous section discussed the truth-conditional contribution of *bambai*, providing the lexical entry in (89) above. Following the proposal in Kaplan (1999) where a “use-conditional proposition” is understood to denote a set of contexts, Gutzmann (2015), appeals to a model with parallel types, interpretation functions (i.e.,  $\llbracket \cdot \rrbracket^t$  and  $\llbracket \cdot \rrbracket^u$ ) and composition rules for both truth- and use-conditions that allow for the interaction of these condition types while distinguishing these two “dimensions” of meaning.<sup>68</sup>

Borrowing the informal “fraction notation” deployed by some of these authors, we can tease apart the implicated and asserted meaning components of the *bambai* clause in (71) – this is given in (77).

(77) 
$$\frac{S \text{ is worried about/negatively disposed to snake bites}}{S \text{ might have been about to be bitten by a snake}}$$

If this mode of thinking about the speaker attitude implications of *bambai*  $q$  is on the right track, then, in addition to asserting  $\Diamond q$ , a speaker’s utterance of *bambai*  $q$  at  $t$  in  $w$  can be thought of as creating an updated context in which ‘it registers that [they regard  $q$ ] negatively somehow’ (Potts 2007:175). The use-conditional contribution of *bambai* can then be informally stated as (78).<sup>69</sup>

(78) **A use-condition for *bambai***

$$\llbracket bambai\ q \rrbracket^u = \{c : c_s \text{ is negatively disposed to } q \text{ in } c_w\}$$

*bambai*  $q$  is expressively correct in a context where the speaker  $c_s$  is negatively disposed to  $q$  in  $w^*$

<sup>68</sup>This system closely resembles the proposal of Karttunen & Peters (1979), which these authors attribute (their fn 17) to the “two-dimensional logic” apparently discovered by Herzberger (1973).

<sup>69</sup>This use condition is comparable to the condition proposed by AnderBois & Dąbkowski (2020):  $\forall w' \in \text{GOAL}_{i,p}(w) : \neg q(w')$  (I.e. that some proposition  $p$  is performed/caused by  $i$  in order to achieve the speaker’s goals (in which  $\neg q$  holds))

repeat  
to remind  
reader

In this sense, *bambai* *p* can be taken to conventionally implicate a proposition of the form given in (78).

I propose a formal analysis of both of these components of *bambai*'s semantics (*sc.* the asserted and the conventionally implicated content) in the following section.

### 3.3.2 Competition in the modal-adverb domain

A predicted consequence of this meaning change — that is the “encroachment” of *bambai* into the modal adverbial domain — is that *bambai* enters into competition with other modal adverbs.

One arena in which this is made particularly clear is in *bambai*'s *apprehensive function* (§ 2.3.2.2) — that is, where it realises a possibility modal whose domain can be restricted by the presence of an *if*-clause. In these contexts *bambai* has entered into the semantic domain of other Kriol lexical items including *marri*/*maithi* ‘maybe’. The examples in (79-80) below show the perseverance of apprehensional expressive content in these syntactic frames. In (79a), consultants reported that apprehensive *bambai* gives rise to an implication that the speaker may not go on holiday, where the minimally different (b) fails to give rise to this implication.<sup>70</sup>

(79) **Context:** I’m planning a trip out to country but Sumoki has taken ill...

- a. *if ai gu la holiday, bambai main dog dai*  
if 1s go LOC holiday **bambai** 1s dog die

‘If I go on holiday, my dog may die’  $\rightsquigarrow$  I’m likely to cancel my holiday

- b. *if ai gu la holiday, marri main dog (garra) dai*  
if 1s go LOC holiday **perhaps** 1s dog (IRR) die

‘If I go on holiday, my dog may die’  $\nrightarrow$  I’m likely to cancel my holiday

[A] 04082017]

Here, the contrast between (a) and (b) is attributable to the expressive content of *bambai*. That *bambai* licenses an implicature that the Speaker is considering cancelling her holiday to tend to her sick pet, an inference that isn’t invited by neutral epistemic counterpart *marri* provides strong evidence of the semanticisation of *bambai*'s expressive content (similar to ‘sincerity’- or ‘use-conditions’ for a given lexical item.) The extent of this process is further evinced in (80) below, where the selection of *marri* instead of *bambai* gives rise to a conventional implicature that the Speaker’s utterance of (80) ought not be interpreted as the expression of a desire to prevent her daughter’s participation in the football game.

<sup>70</sup>In this second example with *marri*, the consultant suggests that (in contrast to (a)): *tharran jeya im min yu garra gu la holiday* ‘that one means you’ll go on your holiday.’

main text

(80) **Context:** I am cognizant of the possibility that my daughter injures herself playing football.

**#Context:** I am uncomfortable with the likelihood of my daughter injuring herself playing football.

*if im pleiplei fudi, marri main doda breigi im leig*  
 if 3s play footy perhaps my daughter break her leg

‘If she plays footy my daughter may break her leg’ ↗ [so she shouldn’t play]  
 [AJ 04082017]

Based on this evidence, we may conclude that the ostensible encroachment of *bambai* into the domain of modal/epistemic adverbials has given rise to a dyad (i.e., “Horn scale”, Horn 1984) with the form  $\langle \textit{marri } p, \textit{bambai } p \rangle$  — selection of the “weaker” expression *marri p* *Q*-implicates that the Speaker was not in a position to utter its stronger (more specific) scalemate, *bambai p*. That is, the meaning of the ‘weaker’ expression comes to represent the relative complement of the stronger in a given semantic domain. In this case, use of the neutral modal adverb *marri* comes to conversationally implicate **non-apprehensional** readings/modalities.

#### (81) Competition in the modal adverbial domain

$$\llbracket \textit{marri} \rrbracket \approx \diamond \setminus \llbracket \textit{bambai} \rrbracket$$

Situations in which *marri* is felicitous are those in modal possibility claims in which *bambai* is inappropriate/expressively incorrect.

### 3.4 Summary

This chapter has considered a number of crucial issues relating to the interpretation of apprehensional *bambai*, particular as it relates to the role of context in the synchronic interpretation and the diachronic reanalysis of this lexical item. In view of the emergence of *bambai*’s modal readings, § 3.1 developed an account of the interpretation of *bambai* clauses as involving modal subordination to some accommodated antecedent. Appealing to basic principles of communication (RELEVANCE and the implementation of this notion as the QUESTION UNDER DISCUSSION), *bambai*’s prejacents are taken to encode a response (specifically a prediction) to a question about a salient eventuality.

In § 3.2, we saw how the development of apprehensional readings of *bambai* (both its modal and expressive content) appears to be a result of its (as with subsequent-TFAs in other languages) frequent occurrence in contexts of “precautioning” and fearing. These contexts gave rise to inferences creating the conditions for the reanalysis of *bambai* as conventionally encoding apprehensional meaning. The

reanalysis of *bambai* as a modal adverb permits for the set of uses that correspond to its *APPREHENSIVE* function.

Further developing these observations, the final section — § 3.3 — considered data from other two other languages in which a subsequential TFA appears to have undergone similar functional change, developing apprehensional expressive content (*viz.* Dutch *straks* and German *nachher*). These data support an analysis of the distinctive negative attitude reading that is associated with apprehensionals as NOT-AT-ISSUE CONTENT. As with the diachronic emergence of modal readings of erstwhile TFAs, this expressive content/use condition is understood to have arisen as a result of the conventionalisation of an implicature arising under certain frequent (*sc.* future-oriented + admonitory) discourse contexts.

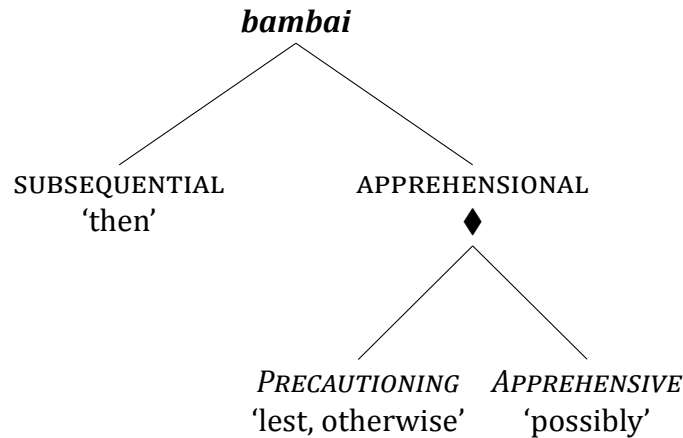
This chapter has shown that the interpretation of *bambai* is highly context-dependent. An utterance of the form *bambai q* in a discourse context  $\mathcal{D}$  asserts that *q* could happen (in a  $\mathcal{D}$ -provided modal base and as a consequence of the non-obtention of some  $\mathcal{D}$ -salient eventuality) and conventionally implicates that *q* would undesirable. Drawing on these observations, chapter 4 proposes a lexical entry for *bambai* which unifies its two distinct readings — *viz.* SUBSEQUENTIALITY and APPREHENSIONALITY.

## Chapter 4

### A semantics for *bambai*

This section seeks to provide a semantics for Kriol *bambai* that unifies the available SUBSEQUENTIAL and APPREHENSIONAL readings discussed above and explains how a given reading is privileged in particular linguistic contexts. Figure 2.1 is repeated here for reference.

**Figure 4.1.** Possible readings of *bambai*



In order to settle on a unified semantics, we assume a version of a Kratzerian treatment of modal operators (*e.g.*, Kratzer (1977, 1981b) *et seq.*, see § 1.2). The primary insight of Kratzer’s treatment is that modal expressions are lexically underspecified for modal “flavour”; different readings emerging as a consequence of a contextually-provided conversational background (see also Hacquard 2011:1490ff for an overview.)

#### 4.1 Subsequentiality

In § 2.3.1, we saw how Kriol has retained the temporal frame uses of *bambai* derived from archaism ‘by-and-by.’ For Dowty (1979, 1982), time adverbials are taken to denote predicates of times/sets of temporal intervals — that is, the set of all those intervals that intersect with the interval specified by the adverb (82).



- (82) A lexical entry for the (indexical) TFA *today* (adapted from Dowty 1979:328, cited in Ogihara 1996:43)

$$\llbracket \text{today} \rrbracket^c = \lambda P_{\langle i, t \rangle} \exists t_i [t \subseteq \text{today}' \wedge P(t)]$$

*today* holds of some property of times  $P \in \mathcal{D}_{\langle i, t \rangle}$  if there there is some time  $t$  at which  $P$  holds which is a subinterval of the day-of-utterance (*today'* is an interval supplied by context — viz. the timespan of the day in which utterance time ( $t_*$ ) is located.)

A frame adverbial, then, takes a predicate and says that its instantiation is contained within a given temporal interval.<sup>71</sup> Following assumptions made by Kamp (1971:238ff) and Johnson (1977:115), Dowty (1982:29ff) sees fit to appeal to a notion of truth which is relativised to an index containing two intervals of time. These roughly correspond to the notions of *reference time* and *speech time* familiar from Reichenbach (1947). I will use  $t_*$  and  $t_r$  to refer to each of these.

As we saw, the function of (what I have referred to as) the SUBSEQUENTIALITY class of frame adverbials is to effect the constrained forward-displacement of the reference time of their prejacent with respect to some contextually-provided reference time. (83) represents a proposal to capture this relation.

(83) **SUBSEQUENTIAL INSTANTIATION**

$$\text{SUBSEQ}(p, t_r, w) \stackrel{\text{def}}{=} \exists t' : t_r \prec t' \wedge P(t')(w) \wedge \mu(t_r, t') \leq s_c$$

A subsequenceality relation SUBSEQ holds between a predicate  $P$ , reference time  $t_r$  and reference world  $w$  iff  $P$  holds in  $w$  at some time  $t'$  that follows  $t_r$ . Additionally, it constrains the temporal distance  $\mu(t_r, t')$  between reference and event time to some value below a contextually-provided standard of ‘soon-ness’  $s_c$ .

The relation between a contextually-provided standard and measure function  $\mu(t_1, t_2)$  analysis builds in a truth-condition that captures variable intuitions about the falsity of subsequential claims in context (84-85).<sup>72</sup>

- (84) a. The birth of Cain succeeded Eve’s pregnancy by some contextually inappropriate length of time (*e.g.*, ninety years.)

$\mathbb{R}$  *Eve fell pregnant then shortly afterwards gave birth to a son*

- b. **Context.** Dad went to the shop on Monday and returned to make lunch the following week.

$\mathbb{R}$  *main dedi bin go la det shop, bambai im=in gugum dina*  
my father PST go LOC the shop **bambai** 3s=PST cook dinner

‘My dad went to the shop, **then** he made lunch’ [A] 23022017]

<sup>71</sup>The term “temporal frame adverbial” due to Bennett & Partee 2004, and equivalent to Kamp & Reyle’s “locating adverbial” (1993:613).

<sup>72</sup>Given that  $\mathcal{T}$  is isomorphic with  $\mathbb{R}$ , formally  $\mu : \mathcal{T}^2 \rightarrow \mathbb{R}$  represents a Lebesgue measure function that maps any interval  $[t_1, t_2]$  to its length  $t_2 - t_1$ .

That is, the category of “subsequential” TFAs makes explicit reference to a time provided by the discourse context (e.g., identified with the instantiation time of a previous clause.) The assertion of a relation between this reference time and the instantiation of the prejacent is a component of these items’ semantics.

An additional advantage is that, in appealing to a pragmatically retrieved standard for subsequentials, we allow for faultless disagreement between interlocutors, in case speaker and addressee retrieve divergent standards of soonness from the discourse context (as in (85) below).

(85) **Fry.** When will that be?

**Glurmo.** Soon enough.

**Fry.** That’s not soon enough.

(‘Fry and the Slurm Factory’, *Futurama*)

In (85), the source of the disagreement between Glurmo and Fry appears to be the contextual standard ( $s_c$ ) that each of them retrieves.

In its capacity as a TFA then, *bambai* can be thought of as realising a subsequential instantiation relation, as shown in (86) below.

(86) **Lexical entry for *bambai* (TFA)**

$\llbracket bambai \rrbracket^c_{\text{def}} = \lambda P. \text{SUBSEQ}(P, t_r, w)$

*bambai* asserts that the property described by its prejacent ( $P$ ) stands in a SUBSEQ relation with a time and world provided by the discourse context.

## 4.2 ‘Settledness’ & intensionalisation

A primary motivation for the current work is to better understand the linguistic reflex that underpins the availability of apprehensional/apprehensive-modality readings of *bambai*. The TFA treatment formalised in the subsection above fails to capture this readings, although, as I will show, provides an essential condition for understanding *bambai*’s synchronic semantics and diachronic trajectory.

In § 1.2 above, the notion of **settledness** was introduced, as deployed by Condoravdi (2002) (and Kaufmann 2005) using  $\mathcal{W} \times \mathcal{T}$  frames, where it is cast as derived from the concept of *historical necessity* (Thomason 1970).

Settledness/historical necessity is normally expressed in terms of **historical alternatives**. This refers to the notion of equivalence classes ( $\simeq_t \subseteq \mathcal{W} \times \mathcal{W}$ ) of possible worlds: those worlds which have identical ‘histories’ up to and including a reference time  $t$ . The properties of the *historical alternative* relation are given in (87) and, on the basis of this, a formal definition of settledness is given as (88).

need a  
ref?  
or still  
Thomas up?

(87) **Historical alternatives**  $\simeq \subset \mathcal{T} \times \mathcal{W} \times \mathcal{W}$

- a.  $\forall t \in \mathcal{T} [\simeq_t \text{ is an equivalence relation}]$   
 All world-pairs in  $\simeq_t$  (where  $t$  is an arbitrary time) have identical pasts up to that time.  
 Their futures may diverge.  
 The relation is symmetric, transitive and reflexive (*i.e.*, an equivalence relation).
- b. **monotonicity**  
 $\forall w, w', t, t' [(w \simeq_t w' \wedge t' \prec t) \rightarrow w \simeq_{t'} w']$   
 Two worlds that are historical alternatives at  $t$  are historical alternatives at all preceding times  $t'$ .  
 That is, they can only differ with respect to their futures.

(Thomason 1984:146)

Formally then, the truth value of proposition  $p$  is settled at  $t$  iff it is uniformly true or false at all historical alternatives to  $w$  at  $t$ . Also shown in § 1.2.1, Condoravdi and Kaufmann *i.a.* additionally derive a related property, *viz.* PRESUMED SETTLEDNESS/DECIDEDNESS, repeated here as (88). The presumption of settled is effectively understood to be a relation between a discourse context and a predicate (or proposition). Following standard pragmatic assumptions, the *common ground* (**cg**) represents the set of propositions taken to be mutually understood by participants in a discourse context (see 11a). The intersection of these propositions ( $\cap cg$ ) — the *context set* — is modelled as the set of worlds that is compatible with the **cg** (those worlds in which all propositions in the common ground are true.)

(88) **Presumption of settledness for  $P$ .**

- $\forall w' : w' \in \cap cg, \forall w'' : w' \simeq_{t*} w'' :$   
 $AT([t*, \_], w', P) \leftrightarrow AT([t*, \_], w'', P)$  (Condoravdi 2002:82)  
 A property  $P$  is presumed settled if it uniformly holds or does not hold in all historic alternatives to worlds compatible with the discourse participants' beliefs.

As indicated in § 3.2, in this dissertation I defend a claim that the modalised meaning component of apprehensional *bambai* arises as a consequence of a diachronically-conventionalised implicature that claims that SUBSEQ holds of a predicate represent predictions when that predicate is interpreted as nonfactual. This explains the “*epistemic downtoning*” function which characterises apprehensionals on Lichtenberk’s description (1995). ↗

Specifically, given notions of RELEVANCE (*e.g.*, Horn’s  $\mathcal{R}$ -principle “SAY NO MORE THAN YOU MUST” (1984:13), an utterance of *bambai*  $P$  licenses the (speaker-based) implicature that the Speaker is basing a predication (specifically an premonitory one, *cf.* § 3.2) about some unsettled eventuality on its possible truth in view of

(perceived compatibility with) a the set of facts that they know of the world. The locus of this implicature is that the Speaker can rely on her hearer's knowledge of the world to reason that an unsettled subsequentality predication has the valence of a prediction.

Appealing to a Kratzerian framework, we can modalise our entry for *bambai* in order to capture the “epistemic downtoning” effect associated with apprehensionals. A principal component (and advantage) of Kratzer's treatment of modals (1977; 1981b; 2012) lies in the claim that the interpretation of modalised propositions relies on ‘conversational backgrounds’: that they quantify over sets of worlds retrieved by an ‘accessibility relation’ which is *contextually* made available. The entry in (89) gives an intensionalised (modal) semantics for *bambai*.

dregli, streidaway

(89) ***bambai* includes a modal expression**

$$\llbracket \textit{bambai} \rrbracket^c = \lambda P. \exists w' [w' \in \underset{o(w)}{\text{BEST}}(\cap m(w)) \wedge \text{SUBSEQ}(P, t_r, w')]$$

*bambai* asserts that there exists some world  $w'$  in a set of worlds that are optimal with respect to a contextually-determined modal base  $m$  and ordering source  $o$  in the reference context  $c = \langle t^*, t_r, w^* \rangle$ . It additionally asserts that the SUBSEQUENTIAL INSTANTIATION relation (as defined in (83) above) holds between that world  $w'$ , the prejacent  $P$ , and a reference time provided by the utterance context  $t_r$ .

With the entry in (89), we can formalise the intuition that, when (and only when) *bambai*  $p$  is understood as making a nonfactual predication, it constitutes a prediction of a possible — but unverified/unverifiable — state-of-affairs; that is, one that is presumed unsettled.

As a consequence, the apparent subsequential/apprehensional polysemy exhibited by *bambai* is modelled as deriving from a single core meaning, where different contexts make different conversational backgrounds available (cf. Kratzer 2012:55ff). We can conceive of this in terms of a pragmatically-enforced omniscience restriction.

### 4.3 A pragmatic ambiguity:

#### *The omniscience restriction*

Crucially, in the apprehensional cases we've seen, *bambai*'s prejacent is understood to encode a predication about an unsettled state of affairs. That is, it involves reference (by means of existential quantification) to either • some time succeeding utterance time  $t' \notin \cap \preceq_{t^*}$  (the indicative cases) OR • some world that is not a historic alternative of the actual world  $w' \notin \cap \approx_{t^*} w^*$  (the subjunctive cases.) These two types of contexts can be unified as involving a NON-ACTUAL/NONFACTUAL predication — one without the presumption of settledness. Recalling the discussion

reminding  
of  
exs

of branching-time models in § 1.2.1, the non-actual property can be easily stated over indices as  $\{i' \mid i' \not\prec i^*\}$ .<sup>73</sup> In Kriol, the preajcent of *bambai* is interpreted as actual iff *bin*/past marking is present, and *bina*/explicit counterfactual marking is absent. These contexts were summarised in Table 2.2 (p. 47 above.)

The *omniscience restriction*, then, introduced in (74) is a pragmatic principle implementing the ACTUAL/NONACTUAL distinction to explain the distribution of SUBSEQUENTIAL VS. APPREHENSIONAL *bambai*.

- (90) **The omniscience restriction.** Predications of subsequentuality (posterior instantiation) are interpreted as carrying predictive illocutionary force (*i.e.*, modalised or “epistemically downtoned”) when they are presumed unsettled.

what does this mean? The idea here is that a speaker who makes a predication about the temporal properties of a non-settled eventuality cannot reasonably select for a totally realistic conversational background. Such an operation would require the participants to be able to retrieve all propositions that are true in and characteristic of worlds with respect to a vantage point in the future or to be able to calculate all the ramifying consequences of eventualities that might have obtained in the past (in the case of counterfactual uses.)

This restriction reflects a pragmatic reflex of Condoravdi’s (2002:83) diversity condition<sup>74</sup> and the twin epistemic constraints on the relations between doxa and settledness given in Kaufmann 2002, 2005; Kaufmann et al. 2006 (*viz.* historicity/lack of foreknowledge), axioms which guarantee that “only what is settled can already be known” (Kaufmann et al. 2006:101). Consider again the truth conditions of *bambai* in (91) with the SUBSEQ relation spelled out. The entry in (91) is translated into a branching-times formalism in order to draw the parallel treatment of “indicative” and “subjunctive” uses of *bambai*.

hfn. back to intro Ch1 + discussion

- (91)  $\llbracket \textit{bambai} \rrbracket^c = \lambda P. \exists b [b \in \text{BEST}_{o(w)}(\cap m(i^*)) \wedge \exists i'_b [i'_b \succ i_r \wedge P(i') \wedge \mu(i_r, i') \leq s_c]]$   
*bambai* asserts that *P* is instantiated at some index *i'* which is **posterior** (temporally subsequent) to some contextually-retrieved reference index *i<sub>r</sub>* according to a possible branch accessible via a (contextually-supplied pair of) conversational background(s)  $\langle m, o \rangle$ .

This condition allows us to unify the modalised and non-modalised readings of *bambai* — in view of the constraints discussed above, retrieval of a proper reading

<sup>73</sup>See also the Rumberg/von Prince partition in (12).

<sup>74</sup>That is, a property holding between properties *P* and modal bases  $m : \mathcal{W} \times \mathcal{T} \rightarrow \wp(\mathcal{W})$  that they be unsettled w/r/t the instantiation of *P* (Condoravdi 2002:83):

$$\exists w [w \in cg \wedge \exists w', w'' [w', w'' \in m(w, t) \wedge \text{AT}([t, \infty), w', P) \wedge \neg \text{AT}([t, \infty), w'', P)]]$$

**Table 4.1.** *bambai* clauses relate three semantical indices: the instantiation time of the prejacent ( $i'$ ), the utterance index ( $i_*$ ) and a contextually-retrieved reference index ( $i_r$ ). *bambai* requires that  $i_r \prec i_*$

FUNCTION	relations	Text
a. SUBSEQ	$i_r \prec i' \preceq i_*$	'I had coffee <sub><math>i_r</math></sub> <b>then</b> fell asleep' <sub><math>i' \prec i_*</math></sub>
b. INDIC	$i_* \prec i_r \prec i'$	'I'll have coffee <sub><math>i_r</math></sub> <b>otherwise</b> may fall asleep' <sub><math>i' \succ i_*</math></sub>
c. SBJV	$i_r \prec i'$ $i_r \prec i_*$	'I had coffee <sub><math>i_r</math></sub> <b>otherwise</b> may've fallen asleep' <sub><math>i' \not\prec i_*</math></sub>

for *bambai* in a given context is a function of the relation between evaluation indices. Summarised in table 4.1, a subsequential reading obtains *only if* the instantiation of the prejacent is ACTUAL w/r/t the utterance index — that is *bambai* receives its *subsequential reading/apprehensionality* “fails to emerge” when  $i' \preceq i_*$ .

Conversely, if the prejacent's instantiation index ( $i'$ ) is understood to be *posterior* to  $i_*$ , a subsequentiality claim is subject to the omniscience restriction.

This can be modelled by assuming that context provides a species of *metaphysical* (circumstantial) modal base. Recall, among the ontological metaphysical assumptions reflected in branching-times structures is *left linearity* (7) — representing historical necessity — and *right branching*, reflecting the problem of future contingency. It will be a property, then, of all metaphysical conversational backgrounds, that all branches undivided at  $i_n$  will also be undivided at  $i_{n-1}$  ( $\because B_{i_n} \subseteq B_{i_{n-1}}$ )<sup>75</sup>

## (92) The structure of the modal base

- Undividedness-at- $i$*  (Müller 2014; Rumberg 2016b)  
 $b \equiv_i b' \triangleq \exists i' [i' \succ i \wedge i' \in b \cap b']$   
That is: two branches are undivided at some index  $i$  iff they both run through some successor index  $i'$ .
- A metaphysical modal base ( $\approx$ ) contains all metaphysically possible propositions at an evaluation index  $i$ .
- Metaphysical modal bases therefore assume actualness/fixity of the past.  
 $\forall i, j [i \succ j \rightarrow \forall b, b' [b \approx_i b' \rightarrow b \equiv_j b']]$  (compare 8/87b)  
That is: metaphysically-accessible branches are undivided at any evaluation index  $i$  and at all indices preceding that evaluation index.

[Shown above (e.g., table 4.1),] subsequential readings of *bambai* are limited to contexts where instantiation time is taken to precede utterance time. Against a metaphysical modal base then, the instantiation of the prejacent is presumed settled at utterance time (93).

<sup>75</sup>See Rumberg (2016b:79-80) for a proof of this theorem.)

flow harder to follow. (There are a lot of them too, remove some)

something's up here  
 ght,  $r$  can't really be a  
 branchmate of  $i'$ , it's  
 just some salient  
 anterior index

Avoid these  
 subord  
 clauses, they make the  
 info. a bit  
 ( ) in  
 main  
 text

- (93) Assuming that the past morphology restricts instantiation of  $P$  (e.g., that property described in *bambai*'s preajacent) to  $\{i' \mid i' \prec i^*\}$ :  

$$\forall b \in \cap cg_{i^*} [i' \in b \wedge P(i')] \rightarrow \forall b' [b' \underset{i^*}{\approx} b \rightarrow [i' \in b' \wedge P(i')]]$$
  
 All branches  $b$  that are compatible with the common ground are such that if  $P$  at  $i'$  is true, then it is metaphysically necessary (i.e., holds at all historical alternatives to  $b$ .)

Conversely, in the absence of past morphology, no such restriction is made on the instantiation index of  $P$ : the modal base can therefore be *diverse*: the truth (or falsity) of  $P(i)$  is contingent/unsettled with respect to  $P(i)$  — that is, the common ground is compatible with branches at which  $P$  is settled differently (i.e., (93) is not valid if  $i' \not\prec i^*$ ).

This is implemented more precisely in the following sections.

## 4.4 Deriving the subsequential reading

What we've called the *subsequential* (TFA) use of *bambai* follows from general norms of assertion: given that the speaker is making a predication about a property that is presumed settled, her context set is understood as veridical and the assertion is taken to be factual — cf. Grice's (super)maxim of quality: "try to make your contribution one that is true" (1991:27).

As shown above, given the notion of historical necessity/the left-linearity of branching models of time, an evaluation index is associated with a unique past.

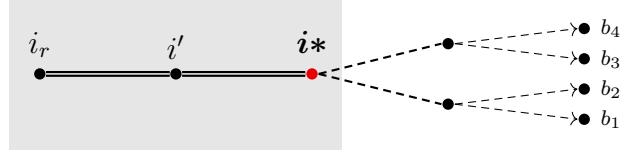
- (94) **A veridical conversational background:**  
***bambai*'s subsequential reading**

- a. *A metaphysical modal base  $m / \underset{\text{meta}}{\approx}$*   
 A metaphysical modal base  $\underset{\text{meta}}{\approx}$  is a function from indices to a set of propositions that are **consistent** with metaphysical assumptions about the state of the world at a given index  $i$ .  
 Consequently, the intersection of these propositions:  $\cap \underset{\text{meta}}{\approx}_i$  returns the set of **historical branching alternatives** to  $i$  — a set of branches that share  $i$ 's history and branch into its future (while according with metaphysical notions of possibility.s)
- b.  $o_{\text{empty}}(w) = \emptyset$   
 An empty ordering source  $o_{\text{empty}}$  contains no content (propositions) and hence induces no ordering over the modal base.
- c. Because the ordering source is empty, the function  $\mathbf{BEST}_{\emptyset}(\cap \underset{\text{meta}}{\approx}_i)$  simply returns  $\cap \underset{\text{meta}}{\approx}_i$ : the set of historic/branching alternatives to  $i$ .

By the (BT-adaptation of Thomason’s) definition in (87), historical alternatives have “identical pasts” to one another and to the evaluation index  $i_*$ . In the relevant sense, then, the quantification is trivial. With/respect to some  $i' : i' \prec i_*$ , all branches in the modal base are undivided-at- $i'$ . This is shown in the shaded portion of the BT diagram of  $\cap \approx_{i_*}$  in fig. 4.2.

**Figure 4.2.** A possible representation of  $\cap \approx_{i_*}$ : a “subtree” of  $\mathfrak{T}$ .

**shaded portion.** All metaphysically accessible branches are undivided at indices preceding  $i_*$ .



This is derived for (95) below (the sentence simplified from (21) above). The derivation is further explicated below.

(95) **Deriving the subsequential reading**

*main dedi bin go la det shop, bambai im=in gugum dina*  
 my father PST go LOC the shop **bambai** 3S=PST cook dinner

‘My dad went to the shop, **then** he made lunch’ [A] 23022017]

a. **Taking *bin* ‘PAST’ to restrict  $i$  to before speech time  $i_*$**

$$\llbracket bin \rrbracket^c = \lambda P \lambda i. i \prec i_* \wedge P(i)$$

*bin* realises ‘PST’ — a past tense operator which restricts the instantiation time to some index  $i$  that precedes the speech index  $i_*$ .

b. **Meaning of the first clause**

$$\llbracket bin \rrbracket^c(\llbracket main dedi go la det shop \rrbracket^c) = \lambda P \lambda i. i \prec i_* \wedge P(i) (\lambda i'. GO.SHOPPING(i'))$$

$$\llbracket main dedi bin go la det shop \rrbracket^c = \lambda i. i \prec i_* \wedge GO.SHOPPING(i)$$

$i$  is then existentially bound (Dowty 1979; Ogihara 1996; Stump 1985). The first clause, then, asserts that the event of Dad’s trip to the shop occurs at some index that precedes the utterance index — I’ll call this index  $j$ .

$$\llbracket main dedi bin go la det shop \rrbracket^c = \exists j [j \prec i_* \wedge GO.SHOPPING(j)]$$

c. **Meaning of *bambai* & assignment of  $i_r$**

$$\llbracket bambai \rrbracket = \lambda P. \exists b [b \in \text{BEST}_{o(w)}(\cap m(i_*)) \wedge \exists i'_b [i'_b \succ i_r \wedge P(i'_b) \wedge \mu(i_r, i'_b) \leq s_c]]$$

$j$  is assigned to  $i_r$ , per standard assumptions about temporal anaphora (e.g., Hinrichs 1986; Partee 1984, these insights have been implemented



in DRT frameworks § 3.1, see chapter 5 of Kamp & Reyle 1993.)

$$\llbracket bambai \rrbracket^c = \lambda P. \exists b [b \in \text{BEST}_{o(w)}(\cap m(i*)) \wedge \exists i'_b [i' \succ j \wedge P(i') \wedge \mu(j, i') \leq s_c]]$$

d. **Meaning of the second clause (*bambai*'s prejacent)**

$$\llbracket imin gugum dina \rrbracket^c = \lambda i. i' \prec i* \wedge \text{MAKE.LUNCH}(i')$$

e. **Substitution of prejacent (d)**

$$\begin{aligned} \llbracket bambai (d) \rrbracket^c &= \exists b [b \in \text{BEST}_{\emptyset}(\cap \approx_{i*}) \wedge \exists i'_b [i' \succ j \wedge \lambda i'. i' \prec i* \wedge \text{MAKE.LUNCH}(i') \wedge \mu(j, i') \leq s_c]] \\ &= \exists b [b \in \text{BEST}_{\emptyset}(\cap \approx_{i*}) \wedge \exists i'_b [i' \succ i_r \wedge \text{SUBSEQ}(\lambda i'. i' \prec i* \wedge \text{MAKE.LUNCH}(i'), j)]] \end{aligned}$$

the binding is not  
working here, moving  
on. i probably need to  
substitute something in,  
maybe bambai should  
still be a relation bw  
indices and  
propositions instead of  
temp abstracts.

In (b-c)], the mechanism responsible for establishing the interclausal anaphoric relation between *im* and *main dedi* is similar to that which equates of  $i_r$  with the index at which Dad's SHOPPING trip was instantiated: viz.  $j$ . As described in § 3.1, in the Kampian/DRT terms (e.g., Kamp & Reyle 1993:Ch. 5) – also adopted in, e.g. Partee 1984 – this relies on the notion of an expanding universe of discourse: modelled as sets of assignments.

Shown in (e), MAKE.LUNCH is instantiated prior to the utterance index  $i*$ ; the modal component of *bambai* involves quantification over a totally realistic conversational background. That is, given that the prejacent is predicated of a preceding index  $i' \prec i*$ , all branches in the metaphysical modal base are undivided at  $\{i \mid i \prec i*\}$  (fig. 4.2). Because the SUBSEQ predication involves branchmates of  $i*$ , it is interpreted as factual.

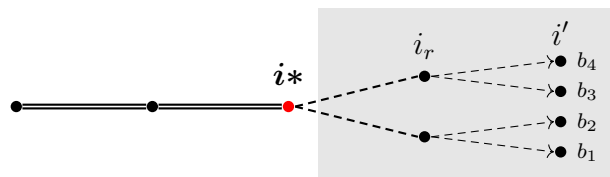
as  
5  
3  
2  
1

## 4.5 Deriving the apprehensional reading

In unsettled contexts, *bambai*'s metaphysical modal base gives rise to a nonfactual/nonveridical conversational background. In view of pragmatic principles (the “omniscience restriction”), the metaphysical alternatives are sorted by a “stereotypical ordering source” (e.g., Kratzer 2012:37ff i.a..)

**Figure 4.3.** A possible representation of  $\cap \approx_{i*}$ : a “subtree” of  $\mathfrak{T}$ .

**shaded portion.** Multiple accessible branches (metaphysically “possible futures”) succeeding  $i*$ .



(96) **conversational background: *bambai*'s modal-apprehensional reading**

- a. (As above) a metaphysical modal base  $\approx$  is a function that retrieves the of metaphysically possible branches from a given index.
- b.  $\mathfrak{s}(i) = \{p \mid p \text{ will hold in the 'normal' course of events at } i\}$ .  
A stereotypical ordering source is a set of propositions that are “normally true” in  $w$ /can be taken to hold in the “normal course of events” in  $w$  (Kratzer 1981b:295, see Yalcin 2010 for discussion.)
- c. A set of propositions  $\mathfrak{s}(w)$  then induces an ordering  $\leq_{\mathfrak{s}(w)}$  on the modal base:

$$\begin{aligned} \forall b', b'' \in \cap \approx_i: b' \leq_{\mathfrak{s}(i)} b'' &\longleftrightarrow \\ &\{p' \mid p' \in \mathfrak{s}(i) \wedge i'[i' \in b' \wedge p'(i')]\} \\ &\quad \sqcup \\ &\{p'' \mid p'' \in \mathfrak{s}(i) \wedge i''[i'' \in b'' \wedge p''(i'')]\} \end{aligned}$$

That is,  $b'$  is more normal (stereotypical) than  $b''$  iff  $\mathfrak{s}(w)$  – the propositions “normally true given  $i$ ” that are true of indices along  $b'$  are a superset of those true of indices along  $b''$ .

- d.  $\text{BEST}_{\mathfrak{s}(i)}(\cap \approx_i)$  then returns just that subset of metaphysical alternative branches that are closest to what is judged to be a “normally-unfolding course of events” at  $i$ .

Armed with these assumptions, we can now derive the proper semantics for a “pre-cautioning” use of *bambai*, as in (22), repeated here as (97).

(97) **Deriving the apprehensional reading**

*ai=rra dringgi kofi bambai mi gurrumuk (la desk iya gin)*  
1s-IRR drink coffee *bambai* 1s fall.asleep LOC desk here EMPH

‘I’d better have a coffee otherwise I might pass out (right here on the desk)’  
[GT 28052016]

a. **(*ga*)rra as a necessity modal**

Let’s take *garra* to instantiate the abstract (untensed) modal particle WOLL.<sup>76</sup>

$$\llbracket \text{garra} \rrbracket = \lambda P \lambda i \forall b [b \in \text{BEST}_{o(i)}(\cap m(i)) \rightarrow \exists i'[i' \succ i \wedge P(i')]]$$

?

<sup>76</sup>Semantics for WOLL adapted from Condoravdi (2002:71)). A satisfactory analysis of the semantics of *garra* (glossed here as ‘IRR’) is beyond the scope of this work. It is treated by Schultze-Berndt et al. (2019) as polysemous between a future and “obligation” marker, although I have also elicited tentative evidence of epistemic necessity readings. Abstracting away from these questions of modal flavour, it is treated here as a necessity modal and glossed as IRR.

*garra* takes a predicate  $P$  and an evaluation index  $i$  and asserts that  $P$  holds at some successor of  $i$  in all of the best-according-to- $o$  worlds in the modal base.

1

- b. **Meaning of the first clause** Without explicit tense marking, the (evaluation) index variable for  $i$  is identified as the utterance index (this is represented as a covert NPST morpheme below, the alternative to *bin* in 95a)

$$\begin{aligned} \llbracket garra \rrbracket^c(\llbracket ai dringgi kofi \rrbracket^c) &= \lambda P \lambda i. \forall b' [b' \in \text{BEST}_{o(i)}(\cap m(i)) \\ &\quad \rightarrow \exists i' [i' \in b' \wedge i' \succ i \wedge P(i')]] \quad (\lambda i'. \text{I.DRINK.COFFEE}(i')) \\ \text{NPST}(\llbracket airra dringgi kofi \rrbracket^c) &= \lambda P \lambda i. i = i* \wedge P(i) \\ &\quad (\lambda i. \forall b' [\text{BEST}_{o(i)}(\cap m(i)) \rightarrow \exists i' [i' \in b' \wedge i' \succ i \wedge \text{DRINK.COFFEE}(i')]]) \\ \llbracket airra dringgi kofi \rrbracket^c &= \forall b' [\text{BEST}_{tel(i*)}^{\text{CIRC}}(\cap m(i*)) \rightarrow \exists i' [i' \in b' \wedge i' \succ i* \wedge \text{DRINK.COFFEE}(i')]] \end{aligned}$$

*airra dringgi kofi* is true in a context  $c$  iff all branches in the modal base that conform best with some ordering source (in  $c$ , likely a teleological background, consisting of the speaker's goals) contain some index in the future of utterance time at which the speaker drinks coffee.

- c. **Meaning of *bambai* & substitution of (97b- $i'$  ( $= i_\kappa$ )) for  $i_r$**

$$\begin{aligned} \llbracket bambai \rrbracket &= \lambda P. \exists b [b \in \text{BEST}_{o(w)}(\cap m(i*)) \wedge \exists i' [i' \succ i_r \wedge P(i') \wedge \mu(i_r, i') \leq s_c]] \\ \llbracket bambai \rrbracket^c &= \lambda P. \exists b [b \in \text{BEST}_{o(w)}(\cap m(i*)) \wedge \exists i' [i' \succ i_\kappa \wedge P(i') \wedge \mu(i_\kappa, i') \leq s_c]] \end{aligned}$$

As in (95c), the “reference time”  $i_r$  is assigned to the existentially-bound index  $i'$  from (b) — here notated as  $i_\kappa$  (coffee-drinking time).

- d. **Meaning of the second clause**

$$\llbracket mi gurrumuk \rrbracket^c = \lambda i. \text{PASS.OUT}(i)$$

Temporal abstract *mi gurrumuk* denotes a set of indices at which the speaker passes out.

- e. **(d) saturates *bambai*'s  $P$  argument; temporal abstract is existentially bound**

$$\begin{aligned} \llbracket bambai \rrbracket^c(d^c) &= \lambda P. \exists b [b \in \text{BEST}_{o(w)}(\cap m(i*)) \\ &\quad \wedge \exists i' [i' \succ i_\kappa \wedge P(i') \wedge \mu(i_\kappa, i') \leq s_c]] \quad (\lambda i. \text{PASS.OUT}(i)) \\ \llbracket bambai (d) \rrbracket^c &= \exists b [b \in \text{BEST}_{s(w)}(\cap \approx_{i*}^+) \wedge \exists i' [i' \succ i_\kappa \wedge \text{PASS.OUT}(i') \wedge \mu(i_\kappa, i') \leq s_c]] \\ &= \exists b [b \in \text{BEST}_{s(w)}(\cap \approx_{i*}^+) \wedge \exists i' [i' \succ i_\kappa \wedge \text{SUBSEQ}(\text{PASS.OUT}(i'), i_\kappa)]] \end{aligned}$$

The SUBSEQ component of *bambai*'s meaning asserts that • the speaker's

maybe an issue here:  $i'$  isn't a successor of the coffee index, rather a posterior non-successor...

what to put in an index  
and what to  
lambda-bind and what  
if any diff preds this  
makes. what's clear is  
that  $t \neq t_r$

PASSING OUT obtains at some index ( $i'$ ) preceded by a contextually-retrieved reference time  $i_\kappa$  DRINK.COFFEE and • the temporal distance between those two times is below some contextual standard (“soonness”).

In the context of (97),  $i_* \prec i_\kappa \prec i'$ . Given that  $i_\kappa$  (and therefore  $i'$ ) is in the **future of speech time**, the modal base  $\approx_{i_*}$  is **diverse with respect to the SUBSEQ property** — that is:  $\text{SUBSEQ}([\lambda i'. \text{PASS.OUT}(i')], t_\kappa)$  is **not presumed settled at  $i_*$**  (compare fig. 4.3.)

On this analysis, then, the crucial property that distinguishes the pure (actualised) subsequential reading from the apprehensional one is that the property described by the prejacent is presumed **settled at  $i_*$**  (or alternatively, by  $t_*$  in  $w_*$ .) In all historical alternatives to the evaluation world, the event described by MAKE.LUNCH in  $c_{(95)}$  holds at  $i'$ . Conversely, in (97), the context ( $c_{(97)}$ ) **fails to satisfy** settledness for PASS.OUT because the relation between modal base and predicate here satisfies the *diversity condition* — that is, there are metaphysical alternatives branching from  $i_*$  which both verify and falsify PASS.OUT( $i'$ ) (cf. Condoravdi 2002:83):

(98) **Diversity of the common ground at  $i_*$  w/r/t prejacent in (97)**

$$\begin{aligned} \exists b \in \cap cg \wedge \exists b', b'' [b, b'' \in \text{BEST}(\cap \approx_{b i_*}^+) \\ \wedge \text{SUBSEQ}(\text{PASS.OUT}(b' i'), b' i_\kappa) \wedge \neg \text{SUBSEQ}(\text{PASS.OUT}(b'' i''), b'' i_\kappa)] \end{aligned}$$

re the types here ok/is  
that a licit intersection?

There are metaphysical alternatives branching from  $i$  where the event described by the prejacent to *bambai* in (97) holds and others where it doesn't hold.

Finally, following the discussion and interpretation conventions discussed in § 3.1, the accommodation of an antecedent (the “apprehension-causing situation”) is intersected with the modal base — that is, it is from that subset of metaphysical branching futures to  $i_*$  in which the speaker doesn't have coffee that  $\text{BEST}_{\mathfrak{s}(i_*)}$  selects a domain to be quantified over.

(97) f. **Modal subordination**

$$\begin{aligned} \llbracket \text{bambai mi gurrumuk} \rrbracket^c = \exists b [b \in \text{BEST}(\cap (\approx_{i_*} \cup \llbracket \text{ai dringgi kofi} \rrbracket(i_\kappa))) \\ \wedge \exists i' [i' \succ i_\kappa \wedge \text{SUBSEQ}(\text{PASS.OUT}(i'), i_\kappa)] \end{aligned}$$

The modal base is intersected with a (negated) proposition derived from the discourse context. *bambai* signals that *mi gurrumuk* is **modally subordinate** to the proposition *ai dringgi kofi* ‘I drink coffee (at  $i_\kappa$ )’.

The meaning of the sentence (97), then, is the conjunction of (97b) and (97f). The “dynamic” interpretive conventions (*i.e.*, the update of  $c$ ) are clearly vital in terms of retrieving the relevant parameters of interpretation and the subordinative relation between the propositions in a precautioning-apprehensional ( $p$  bambai  $q$ ) usage of *bambai*.

Subjunctive/counterfactual uses (*e.g.*, ex. (36) or table 4.1) are assumed to be derivable in much the same way as above. That is, the modal reading emerges as a consequence of a (conventional) implicature that the relation between the common ground and the SUBSEQ relation meets the diversity condition/is presumed **unsettled**. A complete derivation is not provided, although truth conditions can be composed for (36 repeated here as 99) following standard treatments of counterfactuals (effectively as propositions ordered by their similarity to  $i^*$ —*i.e.*, a *totally realistic ordering source* — *cf.* Kratzer 1981a, 2012; Lewis 1973 a.o.)

(99) *ai=bin dringgi kofi nairram bambai ai bina silip~silip-bat*  
 1s=PST drink coffee night **bambai** 1s PST:IRR sleep~DUR-IPFV

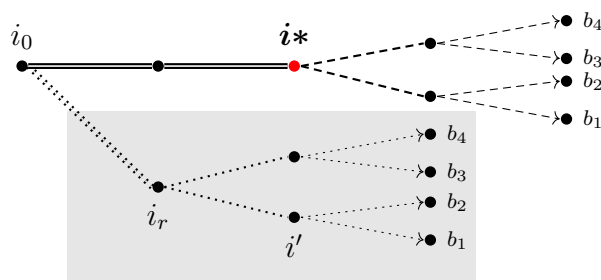
‘I had coffee last night **otherwise** I might have slept [at work.]’

[A] 23022017]

**Figure 4.4.** A possible representation of  $\cap \approx_{i_0}$ : a “subtree” of  $\mathfrak{T}$ .

**shaded portion.**  $\text{BEST}_{\{p|i^* \in p\}}()$

Multiple accessible branches (possible developing counterfactuals) succeeding  $i_0$  (the greatest lower  $\prec$ -bound of  $i^*$  and  $i'$ .)



## 4.6 Conclusion

These three chapters have proposed a formal account for the emergence of apprehensional epistemic markers from temporal frame adverbs, based on the central descriptive observation of Angelo & Schultze-Berndt (2016). It shows the potential of formal semantic machinery for better understanding the conceptual mechanisms that underpin meaning change (in the spirit of much the emergent tradition appraised in Deo 2015) as applied to the modal domain. Further work may additionally extend the formal treatment of the expressive component of apprehensional (and other apparently use-conditional) items.

Verstr06 for a ref on  
 why only in mdoal  
 contexts att. UCs  
 “emerge”

It has attempted to elucidate the mechanisms through which frame adverbs that originally encode a relation of temporal sequency come to encode causality, possibility and speaker apprehension by way of the generalisation and conventionalisation of implicatures. The existence of this 'pathway' of grammaticalisation provides further evidence of the conceptual unity of these linguistic categories and sheds light on the encoding of (and relationship between) tense and modality in human language. Of particular note is the salient role played by 'settledness' (*cf.* Condoravdi 2002 a.o.) in adjudicating the available readings of relative tense operators (here exemplified in subsequential' TFAs.)

Additionally, an apparent cross-linguistic relationship between subsequentiality and the semanticisation of apprehensional use-conditions may have implications for our understanding of the development of linguistic markers which express speaker attitudes.

An open issue that demands further consideration is that of better understanding the relation between the proposition on which the *bambai* clause is anaphoric and which is interpreted as the restrictor of the modal base in apprehensional contexts and the antecedent clause to which it is syntactically linked. A satisfying answer to this question likely lies at the semantics-pragmatics interface. A successful analysis may have ranging implications for understanding the interplay of factors that contribute to the proper interpretation of discourse anaphors.

## **Part II**

# **Semantics of the Negative Existential Cycle**

## **Part III**

# **Reality status & the Yolŋu verbal paradigm**



# General conclusion

The four essays that constitute this dissertation have sought to provide new data, analysis and insights of how the conceptual domains of modality, temporality and negation interact. In particular, each represents an investigation of some dimension of irreality.

Part I showed how an Australian Kriol future-oriented temporal frame expression has developed APPREHENSIONAL meaning. From advancing the temporal reference of its prejacents (SUBSEQUENTIALITY-marking), *bambai* has come to encode possibility and negative speaker affect. Further, it is a discourse anaphor that appears to, by default, restrict its modal base to (a subset of) the negation of some foregoing proposition.

Relatedly, chapter ?? develops a “dynamic” account for the interpretation of *otherwise* on the basis of contemporary theories of **modal subordination** (Roberts 1989, 1995, 2020) and **information structure** (e.g. Roberts 2012). Building on existing treatments of *discourse anaphora* (Kruijff-Korbayová & Webber (2001); Webber et al. (2001)), we propose to treat a sentence of the form *p otherwise q* as asserting both *p* and *if not p*,  $\Box q$ . The second conjunct has the form of a conditional — i.e. *q* is *modally subordinate* to the negation of some proposition related to *p*, calculated from discourse context. Chapter ??, then, constituted an exploration of a lexical item that encodes negative conditionality and requires a pragmatic/discourse structure-sensitive modal restriction (one of several available readings to *bambai*.)

Part II proposed a formal semantic treatment of the Negative Existential Cycle — a grammaticalisation cycle described in the typological literature where nominal negators develop into sentential negators. I showed that the generalisation of PRIVATIVE case morphology in a number of Australian languages instantiates this cycle. By analysing PRIV as a (negative) generalised quantifier, the NEC can be conceived of as stemming from the generalisation in the quantificational domain of this operator. A consequence of this unified treatment of PRIV and NEG is a modal semantics for sentential negation.

Finally, Part III comprised an account of verbal mood semantics in the Western Dhuwal(a) language, including a type of “asymmetric negation” where the  $\pm$ IRREALIS mood distinction drawn on WD verbal predicates is neutralised in negative predication. By assuming the “branching time” framework familiar from work on intensional logic and appealing to other notions from the formal literature, a compo-

sitional account that unifies the disparate distribution of each of WD's four inflectional categories is proposed. As in Part II, an apparent quantificational semantics for negation makes a number of felicitous predictions.

In this dissertation, I hope to have made a contribution to the following related enterprises:

- 1 The pay-off of deploying tools from the formal semantics and symbolic traditions in developing a systematic and precise understanding the meaning contributions of cross-linguistic phenomena as well as "grammaticalisation" trajectories and synchronic variation.

Particularly crucial from the perspective of the empirical phenomena treated here is the insight that temporal and modal logics are intimately related, a fact that predicts visible interactions between linguistic tense and modal operators.

- 2 The importance and utility of rigorous investigation of understudied (and particularly threatened) language varieties and typological phenomena in developing a nuanced and complete theory of natural language semantics.

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