DOCTORAL DISSERTATION

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

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Chapter 1

Introduction

DISPLACEMENT 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 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*,[1] 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 &

[1] *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 prejacent 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/discretional" 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 *metricality*/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 methodologys. 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 commponent 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** ≈'it is necessary that' and $\Diamond$ or **M** ≈ 'it is possible that'.) A standard semantics for these operators is given in (1).

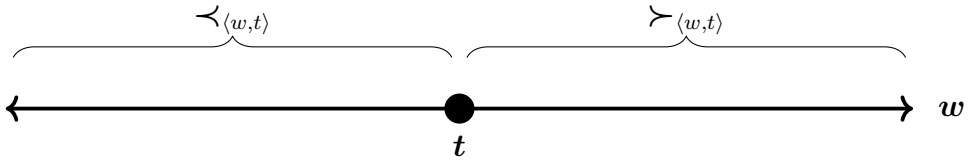
(1) A modal semantics for formulae containing the modal operators $\Box$ (necessity) and $\Diamond$ (possibility) given a model $\langle \langle \mathcal{W}, \mathcal{R} \rangle, [\![\bullet]\!] \rangle$ — that is, a modal frame and a valuation function $[\![\bullet]\!]$ (*e.g.*, Hughes & Cresswell 1996:39)

   a. $[\![\Box\varphi]\!]^w = 1 \leftrightarrow \forall w'[w\mathcal{R}w' \rightarrow [\![\varphi]\!]^{w'}]$
   Where φ is some well-formed formula, $\Box\varphi$ is true in some world w iff φ is true in **all** worlds w' accessible from w.

   b. $[\![\Diamond\varphi]\!]^w = 1 \leftrightarrow \exists w'[w\mathcal{R}w' \wedge [\![\varphi]\!]^{w'}]$
   Where φ is some well-formed formula, $\Diamond\varphi$ is true in some world w iff φ is true in **some** world w' accessible from w.

Building on these modal logic traditions, Prior (1957; 1958; 1967) analogised **P**ast and **F**uture 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).[2] 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 $t, t', t'' \ldots \in \mathcal{T}$.[3] The sets of times that are made available by each of these relations is schematised in Fig. 1.1.

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.



[2] 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.

[3] 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.*, $\forall t, t''\big[[t \prec t''] \rightarrow \exists t'[t' \neq t \neq t'' \wedge t \prec t' \prec t'']\big]$)

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) $[\![\mathbf{PAST}\varphi]\!]^{w,t} = 1 \leftrightarrow \exists\langle w,t'\rangle\left[\langle w,t'\rangle \prec \langle w,t\rangle \wedge [\![\varphi]\!]^{w,t'}\right]$
PASTφ 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 φ was true at t'.

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.*, 1967:121*ff*): namely an *Ockhamist* versus a *Peircian* conception of the truth of tensed propositions.[4]

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 repre-

[4]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 (1967:126*ff*) 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.)

sented as "branches."[5] (Potential) futures, then, are calculated from with respect to a given evaluation time. Broadly speaking, **Fut**φ, 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 φ is true (see Thomason 1970:267).[6] 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 $\langle w, t \rangle \in \mathcal{W} \times \mathcal{T}$ (the so-called "parallel worlds" model.)[7]

At any given index $i \in \mathcal{I}$, there is a single past and an infinity of branching 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 1.2 below.

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 possible course of events. 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 $\mathcal{W} \times \mathcal{T}$: $\big\langle \langle w, t \rangle, \langle w, t' \rangle, \langle w, t'' \rangle, \ldots, \langle w, t_n \rangle \big\rangle$.[8] 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 $\preccurlyeq$ and the complements of these two orders $\succ, \succcurlyeq$).

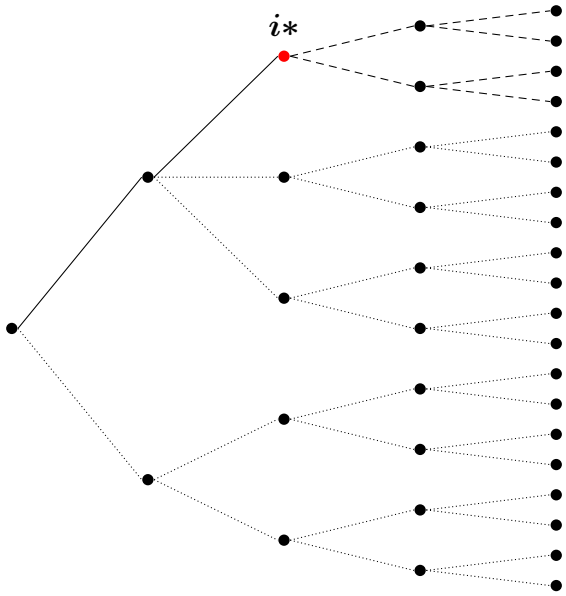
[5] "Branches" — the set of (maximal) chains within the (poset) $\mathfrak{T}$ — refers directly to this apparent "right-branching" property of time (sc. future contingents). Prior refers to "routes": this terminology apparently equivalent to the "histories" of other authors (Belnap et al. 2001; Dowty 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 (Zanardo 1996).

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

[7] For discussion of the related set of objects $\mathcal{W} \times \mathcal{T}$-frames — adopted in Condoravdi (2002); Kaufmann (2005); Kaufmann, Condoravdi & Harizanov (2006) a.o— and a comparison with branching times, see Rumberg 2016a; Thomason 1970, 1984.

[8] 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.) – this is also suggested in Dowty 1977 and Tedeschi 1981, which propose an interval semantic formalism for branching futures.

Figure 1.2. 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.)



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

Given that there are, in-principle, infinite possible futures for a given index, $\mathtt{B}_i$ will be taken to represent the set of all possible branches b that run through (that is, contain) a given index i $(b, b', b'', \ldots \ni i)$.

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).[9] 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,[10,11] Thomason & Gupta (1980) propose an additional "co-present" relation

[9]Similarly, Belnap et al. (2001:194*ff*) 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 2012:373*ff*).

[10]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.

[11]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

($\simeq \subseteq \mathcal{I}^2$) 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 (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:

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

a. i is **posterior** to j iff there is some copresent index of j (say, j') that is a successor to i $\quad i \succsim j \Leftrightarrow \exists j'[j' \simeq j \wedge i \succcurlyeq j']$)

b. i is **antiposterior** $\not\succsim$ 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).[12]

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 (5) which will permit for a formal definition of settledness as in (6).

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

a. $\forall t[\approx_t$ 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.

---

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 $d : \mathcal{I} \to \mathbb{N}$ that returns the how many "nodes" a given index is from $\mathfrak{T}$'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.* $\approx \underset{\text{def}}{=} \lambda i \lambda i'.d(i) = d(i')$.

[12] That is, for any index there is only one unique sub-branch representing its history/set of predecessors (Landman 1991:105). Where $a, b, b' \in \mathcal{I}$:

$$\forall a.b, b'[(b \prec a \wedge b' \prec a) \to (b \prec b' \vee b = b' \vee b \succ b')]$$

.

The relation is symmetric, transitive and reflexive (*i.e.*, an equivalence relation).

b. **monotonicity.**
$\forall w, w', t, t' \big[(w \approx_t w' \wedge t' \prec t) \rightarrow w \approx_{t'} w'\big]$
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 (5b) 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 $\preccurlyeq$ is monotonic (compare 5b′ below.)

(5) b′. **monotonicity of $\preccurlyeq$**
$\forall i, i', i'' \big[[i' \preccurlyeq i \wedge i'' \preccurlyeq i] \rightarrow [i' \preccurlyeq i'' \vee i'' \preccurlyeq i' \vee i = i'']\big]$

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, satisfied if the instantiation of a given predicate is identically determined at all historical alternatives to a given world-time pair $w*, t_0$ is adapted in (6) below.

(6) **Settledness for P in $w*$.**
$\forall w' : w* \approx_{t_0} w' :$
$AT\big([t_0, \_), w', P\big) \leftrightarrow AT\big([t_0, \_), w'', P\big)$
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.[13]

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 (8).[14]

[13]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 accomodate stative and temporal properties with minor adjustments (see *ibid.*). For the sake of perpescuity, I abstract away from (davidsonian) event variables in this section.

[14]As a property holding between sentences (rather than properties) and common grounds, Kaufmann 2005 similarly defines this condition as

(8) **The presumption of settledness for P.**
$\forall w' : w' \in cg, \forall w'' : w' \approx_{t_0} w'' :$
$AT\big([t_0, \_), w', P\big) \leftrightarrow AT\big([t_0, \_), w'', P\big)$ (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 to be equivalent to a context set — *sc.* the set of worlds that the speaker takes to be epistemically accessible for participants in the discourse context (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 (6′); again $i* \in \mathcal{I}$ represents the evaluation/reference index (analogous to $\langle w_0, t_0 \rangle$ above).

(6′) **Settledness for P** (branching times)
$\forall b \Big[b \in \mathtt{B}_{i*} \rightarrow \exists i' \Big[i' \in b \wedge \forall j \big[i' \simeq j \wedge [AT\big(i', P\big) \leftrightarrow AT\big(j, P\big)] \big] \Big] \Big]$
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 instantated at all or none of the indices that are copresent with i' (a branchmate of $i*$.))

As above, 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.

Von Prince's modal trichotomy As a consequence of this, Von Prince (2017, 2019) establishes a neat formal trichotomy between the ACTUAL, POTENTIAL and COUNTERFACTUAL domains by appealing to this framework (see also Rumberg 2016b:41). 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 (9).

(9) Given a contextually defined ACTUAL PRESENT $(i* = \langle w*, t* \rangle)$, $\mathcal{I}$ can be partitioned into three subdomains:

a. The ACTUAL (past/present) = $\{i \mid i \preccurlyeq i*\}$
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

φ is **presumed decided** by agent α at i iff $\underset{\sim\alpha}{\Box}(\varphi \rightarrow \underset{\approx}{\Box}\varphi)$ is true at i.

at t. These indices will be shown to be associated with the (notional semantic category of) REALIS.

b. 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 $i*$.

c. The COUNTERFACTUAL = $\{i \mid i$ **is unordered by** $\prec$ **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 1.2 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; 1981; 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 (10) below.

(10) Two readings of English modal auxiliary *must* from Kratzer (1977:338)

a. *All Māori children* ***must*** *learn the names of their ancestors*

b. *The ancestors of the Māori* ***must*** *have arrived from Tahiti*

In effect, the different readings ("flavours") of *must* in (10a-b) arise as a consequence of different **restrictions** that are made over the set of possible worlds. In effect, the deontic reading (10a) 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 (10b) 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 lingusitic 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* φ asserts that φ is true in all relevant worlds (universally quantifying over a subset of $\mathcal{W}$, returned by a **modal base** (*i.e.*, a conversationaal background) f) whereas one of the form *can* φ makes a weaker claim, namely that the truth of φ is *compatible* with those worlds. That is, *must* is a universal quantifier and *can* is an existential quantifier over possible worlds (11).

could be enriched to distinguish **modal bases** and **ordering** sources but unclear if this is nec. at this point?

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

a. $[\![\textit{must}]\!] = \lambda f \lambda p \lambda w. \forall w' [w' \in \cap f(w) \rightarrow w' \in p]$
must p is true given a modal base $f(w)$ if p follows from $f(w)$

b. $[\![\ \textit{can}\ ]\!] = \lambda f \lambda p \lambda w. \exists w' [w' \in \cap f(w) \wedge w' \in p]$
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 (12) (adapted from Kaufmann, Condoravdi & Harizanov 2006).

(12) *Randi must pay a fine for drink-driving*
$\not\Rightarrow$ 'In all those worlds where the rules are best followed, Randi must drink-drive.'

(12) 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 $\underset{o(w)}{\text{BEST}}$ 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 (13) adapted from von Fintel & Heim 2011:61.)[15]

[15]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).

(13) The best worlds in a modal base f according to an ordering $\underset{o(w)}{\prec}$

$\underset{o(w)}{\textsc{best}}\big((\cap f(w))\big) = \{w \in \cap f(w) \mid \neg\exists w'[w' \underset{o(w)}{\prec} w]\}$

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

$[\![\textit{must}]\!] = \lambda o \lambda f \lambda p \lambda w.\forall w'[w' \in \underset{o(w)}{\textsc{best}}(\cap f(w)) \rightarrow w' \in p]$

must p is true in w, given conversational backgrounds $\langle f, o\rangle$ if p is in 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 $\mathfrak{T}$ 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 $\textsc{deont}(i)$, 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 $\mathtt{B}_i$ — i.e. a subset of those branches that run through i.

Proposals for Branching-theoretic lexical entries for the English modal auxiliaries in (11) are modified accordingly below.[16]

(11′) Proposed modification to semantics for modal auxiliaries (11) for $\mathfrak{T}$-frames.

a. $[\![\textit{must}]\!] = \lambda f \lambda p \lambda i.\forall b \ni i[b \in \cap f(i) \rightarrow \exists i' : i' \in b \wedge p(i')]$

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. $[\![\textit{can}]\!] = \lambda f \lambda p \lambda i.\exists b \ni i[b \in \cap f(i) \wedge \exists i' : i' \in b \wedge p(i')]$

can p is true if, there is some branch running through i, which is selected by the modal base $f(i)$ and along that branch there is an index i' such that p holds at i'.

[16] 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.

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 Sḵát̓imcets (Salish: British Columbia), deontic and epistemic modal clitics are separately lexified whereas quantificational force is contextually determined (*viz. ka* 'IRR', *k̓a* '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 (15).

(15) Semantics for *k̓a* 'EPIST' (Sḵát̓imcets epistemic variable-force modal, from Rullmann et al. 2008:340)
$[\![k\text{ʔ}a]\!]^{x,w}$ presupposes an epistemic modal base m &
$[\![k\text{ʔ}a]\!]^{c,w} = \lambda f_c \lambda p : \forall w'[w' \in f_c(m(w)) \rightarrow p(w')]$

Building on other insight on usage of possibility modals (notably Klinedinst 2007), for Rullmann et al. (2008) the "appearance" of force variability in Sḵát̓imcets 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 Fintel & 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, additionial 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 Anderson 2008, 2016).

In the semantic domain, for Kiparsky, "[grammaticalisation] reveals the langauge 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 α comes to denote β, then γ *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.[17] 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 timedepth 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 tthe 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.* **??**).

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

[17] See also James Leow's recent (2020) dissertation where he reports change in the modal necessity domain of Cuban Spanish.

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].

field methods

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 prejacent predicate.

Consider the contributions of *bambai* in the Australian Kriol sentence pair in (16):

(16) **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 (16a) roughly translates to 'soon, in a minute', this reading is infelicitous in (16b), 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.

(17) *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 (≈ 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 1986:262*ff* a.o.). The cognates across these contact languages have preserved the function of *by-and-by* as encoding some relationship of temporal subsequentiality between multiple eventualities.[1,2] Clark takes this shared feature (along with other cognates) to be a retention, evincing a shared history between these varieties (see also fn 3 below.)

As shown in 16, Australian Kriol (hereafter Kriol *simpliciter*) has retained this function: below, in (18), *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'.

[1] *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.

[2] 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 oof 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.

(18) *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.' [AJ 23022017]

In addition to the familiar 'subsequential' use provided in (18), *bambai* appears to have an additional, ostensibly distinct function as shown in (19) below.[3]

(19) **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 (19), 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 (18). 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 APPREHENSIONAL 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).

[3]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 (19). 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.

(19′) Apprehensional-like cognate in Pitkern-Norfolk (Clark 1979:15)

kʌm dʌʊn ***bɛmbɛə*** *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 Apprehensionality cross-linguistically

While descriptive literatures have described the appearance of morphology that encodes "apprehensional" 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,[4] Lichtenberk (1995), Angelo & Schultze-Berndt (2016, 2018) and Vuillermet (2018) represent the few attempts to describe these markers as a grammatical category).[5]

2.2.1 Apprehensionality as a semantic domain

In the first piece of published work dedicated to the properties of apprehensional marking ("apprehensional-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 'APPREHENSIONAL' properties. Shown here in (20), Lichtenberk distinguishes: (a) **apprehensive-epistemic** function, a **fear** function (b) and (c-d) **precautioning** functions.

[4] TIMITIVE and particularly EVITATIVE a.o are also cited in these descriptive literatures.

[5] An edited collection on *Apprehensional 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.

(20) **Apprehensional marking in To'abaita**

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*** $\textit{FEAR}(\blacklozenge p)$

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" function)** $\neg p \rightarrow \blacklozenge q$

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" function)** $\neg p \rightarrow \blacklozenge(\mathfrak{r}(q))$

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)

(20a) 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 (20b). 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*. In the *avertive* function p *ada* q— translated as 'p otherwise/or else q' — a conditional-like reading obtains: if p doesn't obtain, then q may $(\neg p \rightarrow \blacklozenge q)$. In "in-case" uses, while q is interpreted as a justification for the utterance of p, there is no reasonably inferrable causal relation between the two clauses. For AnderBois & Dąbkowski (2020), "in-case" uses involve some distinct "contextually inferrable" proposition r from which q follows $(\mathfrak{r}(q))$. Effectively, if p doesn't obtain, then some r (a consequence of q) may. In (20d), the failure to take umbrel-

las ($\neg p$) 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 prejacent 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 (21a-b), compare To'abaita (20c-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 (22).

(21) Adjunct uses of apprehensional *=sa'ne* in A'ingae
(AnderBois & Dąbkowski 2020)

a. AVERTIVE use

*sema-'je=ngi dû'shû=ndekhû khiphue'sû=**sa'ne***
work-IPFV=1 child=PL starve=**APPR**

'I'm working lest my children starve.' (381)

b. IN-CASE use

*tsa'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)

(22) AnderBois & Dąbkowski's (2020:382) semantics for A'inge apprehensional adjunct uses of *=sa'ne* (on its avertive/*lest*-like reading)
$[\![$*=sa'ne*$]\!] = \lambda q.\lambda p.\lambda w : \exists i[\text{RESP}(i,p)].p(w) \wedge \forall w' \in \text{GOAL}_{i,p}(w) : \neg q(w')$
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, "inferrable" 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 $x \in \mathfrak{D}_e$ (instead of $q \in \mathfrak{D}_{\langle s,t \rangle}$), now asserting that • x "is involved in" $r(w')$ and that • $\neg r(w')$. [6]

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. [7]

[6] AnderBois & Dąbkowski (2020:15) retain a lexical entry for *=sa'ne*$_{\text{TIMITIVE}}$ 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 PRED' (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.

[7] Beyond the adjunct uses (21) 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 (21′). It is not immediately clear what alterations to the semantics in (22) 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 somwhat different path.

Finally, on the basis of a comparison with the neighboring Lau language ([llu] Solomonic: Malaita) and other SE Solomonic 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 a fullly-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 (evincing 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.[8] 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 (23) below are all adapted from Austin (1981), labelled for the apprehensional uses described in the previous section.

(23) 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$_{SS}$

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

(21′) 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.'

[8] 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)

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 (23) 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).[9] 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 oo=f apprehensionality.[10]

As we will see in the following sections, apprehensional uses of preposed *bambai* 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-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 biclausal 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 (24).

[9] Austin claims that these clauses are invariably 'structually dependent' (230) on a 'main clause' (*viz.* the antecendent.) We will see in what follows a series of arguments (to some degree foreshadowed by Lichtenberk (1995: 307)) to eschew such a description.

[10] 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.

(24) **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-ḏaŋgu-yuŋ *ŋaṛa-waṭi-ji,* *a-waṭu-ḏu* *aguṛa-**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* *waṛŋ'waṛŋˀ-yiˀ*
high 3ns-put **APPR**-eat.PRES crow-ERG

'They put it up high lest the crows eat it.' (Merlan 1983:102)

d. **Rembarrnga**

*ŋaran-**məʔ**-ɲamʔ* *ŋa-na* *laŋə* *ṛalk*
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-ḷa *ṇariya-yur,* ***wuniŋgi*** *ŋula* *n̲iŋgu-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 *∅-ṇama* ***baḷaga*** *ña-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 (24), there is a diversity of formal strategies deployed (or combined) in these languages to realise apprehensional meaning: suffixation inside the verbal paradigm (24a-b), prefixation to the verb stem (24b-d) and a separate apprehensional particle (24e-g).[11] While detailed work on the expression of apprehensionality in these languages (including the syntactic status of apprehensional clauses) is not currently available,[12] a number of generalisations can be made on the basis of the data in (24). 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/$\blacklozenge p$) type use. It is unclear at this stage whether/for which languages the apprehensional-marked clauses invite an analysis as syntactically subordinate, althouogh in all cases, the prejacent 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 evidence 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 3).

[11] 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).

[12] 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.

[13] 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 interpretable as subsets of this category.

Table 2.1. Etyma and polysemy for apprehensional modals

Language	Adverbial	Gloss[13]	Author (grammar)
Std Dutch [nld]	*straks*	soon	Boogaart (2009, 2020)
Std German [deu]	*nachher*	shortly, afterwards	A&SB (2018)
Marra [mec]	*wuniŋgi*	further	Heath (1981)
Mangarayi [mpc]	*baḷaga*	right now/today	Merlan (1989)
Kriol [rop]	*bambai*	soon, later, then	

Compare these uses of Mangarrayi *baḷaḷaga~baḷaga* in (25) to (24g) above. In (25a), Merlan (1989:138) notes that the temporal frame uses of *baḷaḷaga*—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, *baḷaga* 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.[14]

(25) **Mangarayi**

a. *ḏayi ŋa-yirri-wa-ya-b gurrji,* ***baḷaḷaga*** *ga-ŋa-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 ŋanʔ-ma* ***baḷaga*** *yag*
quickly ask-IMP **before** go

'Ask him quick before he goes.'
(Merlan 1989:147, cited also in A&SB: 284)

c. *a-ŋaḷa-yag* ***baḷaga*** *miḷiḷitma*
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)

[14]Note that *baḷaga* is glossed by Merlan as 'before' in the imperative sentences (25b-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'.)

e. *ŋiñjag* *ŋaḷa-bu-n* *guṛuugguṛug-bayi,* ***wuṛay*** *ḍoʔ*
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.[15] Note additionally the apparently apprehensional use of *wuṛay* 'later' in a prohibitive context in (25e). 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 patter in attested in Marra (26):

(26) **Marra *wuniŋgi*** (Heath 1981:360, interlinearised)

a. Subsequential use

wayburi *jaj-gu-yi* ***wuniŋgi****:* *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 24f above)

ŋa-naŋgu-wa, ***wuniŋgi*** *ṛag-ṇiŋg-anjiyi*
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 (26b). 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, incuding Kriol *bambay* (*sic*; 187, 308).

[15] 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.'

2.3 The distribution of *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.

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).

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 $t_e \in [t_1, t_2]$.

Discussed in §**??**, 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 prejacent 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 (27).

(27) 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$_h$ had a son$_i$. Later, he$_i$ got a wife and had a son$_j$. This woman$_k$ had a daughter$_\ell$. Then, when the girl$_\ell$ had grown up, her husband got her$_\ell$ pregnant, she$_\ell$ had a daughter$_m$. Then, when the boy$_j$ was grown and the girl$_m$ was grown, he$_j$ got her$_m$.'

Note that, according to Parkhouse, (27) 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 (27), 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. 18), the SUBSEQ-denoting function of *bambai* shown here has been retained in Kriol. This reading is shown again in the two sentences in (28). The schema in (28c) provides an informal representation of this context-dependent, "subsequential" temporal contribution.

(28) 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 ——— $\boldsymbol{t_e}$ ····· 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 (28a) 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 prejacent 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 $t_e \in \{t'_e : t_r \prec t'_e \prec t^+\}$.[16] 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

[16] 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 prejacent 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."

Here 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 prejacents ("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.

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.[17]

Indicative 'nonimplicationals.' Apprehensional *bambai* occurs in situations where the speaker identifies some undesirable eventuality as a potential outcome of the discourse situation. Angelo & Schultze-Berndt (2016:272*ff*) 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 29a-b), or merely as predictions of a negative outcome for the subject (*e.g.*, 29c).

The sentence data in (29) 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 as-

[17] 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).

sumptions, 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 1979, 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.*, $\neg p(w) \rightarrow \blacklozenge q(w)$.

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

Ey! ***bambai***$_1$ *yundubala breikim thet motika, livim.* ***bambai***$_2$ *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]

b. *yu stap ritjimbat 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.' [AJ 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 æroplane

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

In (29a), there are two tokens of apprehensional *bambai*. The second *(bambai*$_2$*)* 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*$_1$, the first token in (29a), appears to have a similar function, although has no overt sentential antecedent.[18] In this case, the Speaker

[18]In reconstructing this sentence context, a consultant unprompted introduced an explicit ante-

is issuing a general warning/admonition about the children's behaviour at speech time. In uttering the *bambai*$_1$ clause, she asserts that, should they fail to heed this warning, an event of their breaking the car is a possible outcome. (29b) shows a similar use.

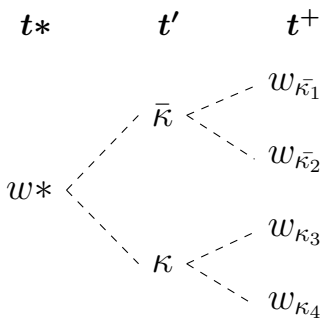
(29c) provides an example of an apprehensional/LEST-type reading occurring in a narrative context (that is a representational/predictive-type illocutionary act). Here, the Speaker identifies a possible unfortunate future situation in which she has no food with which to take her medicine. Here, in uttering the *bambai* clause, she asserts that such an eventuality is a possible outcome should she fail to go to the shop to purchase food: $\neg(\textit{go.shop}) \rightarrow \blacklozenge(\textit{foodless})$. This reading is robustly attested in contexts where the antecendent is modified by some irrealis operator. For example, in (30) – repeated here from (19) above – *bambai* makes a similarly modal claim: if κ is a set of worlds in which I drink coffee at t' (and $\overline{\kappa}$ is its complement), then an utterance of (30) asserts that $\exists w \in \overline{\kappa}$: I sleep by t^+ in w.

(30) 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 $\{w' \mid w' \in \overline{\kappa}\}$. In those worlds where he fails to drink coffee, there exist possible futures ($w_{\overline{\kappa}_1} \vee w_{\overline{\kappa}_2}$) 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 rep-

cent: *gita burru det mutika, bambai yu breigim im* 'get off the car! Otherwise you might break it!' [GT 20170316]

resented antecedent (that is, the preceding clause.) Demonstrated in (31), 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 ¬*(watch.movie)* $\rightarrow$ ♦*(sleep)*.

(31) **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.[19] The occurrence of apprehensionals in these contexts is little-reported cross-linguistically (described as "rare" in Angelo & Schultze-Berndt 2018 for German *nachher*.)

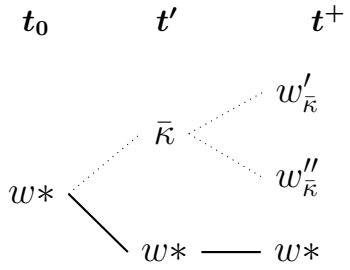
In (32), the Speaker identifies that in some alternative world (say w') in which he behaved differently to the way in which he did in the evaluation world ($w' \not\approx_{t*} w*$)[20] — namely one in which the event described in the antecedent failed to obtain — there is a (significant) possibility that he would have slept at work. Consequently, and comparably to the example (31) above, *bambai* modalises its prejacent: it asserts that $\exists w'[w' \notin \kappa \wedge$ I sleep by t^+ in $w']$.

(32) 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'
[AJ 23022017]

[19] See von Fintel 2012 for a general overview of counterfactual conditionals.
[20] A definition and further discussion the $\approx$-relation ("historical alternative to") is given in (5). A formal account is further developed below.

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' — $\{w' \mid w' \in \overline{\kappa}\}$. The Speaker asserts that there are some possible near futures to $\langle t', w_{\overline{\kappa}}\rangle$ 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 "infixed" 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 discussed 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).[21] 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.)[22] Consider first an elaboration of (30), provided as (33) below. Here there is no explicit linguistic antecedent for *bambai*, whereas its prejacent encodes an unfortunate future possibility.

(33) **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*?'

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 (34) below, **B** deploys *bambai* to the same effect in two single-clause utterances; each encoding an unfortunate future possibility — namely an unsuccessful trip (♦*no.meat*) in the event that the two *gajin*s permit their young relative to join in.

(34) **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'

[21] The first token of *bambai* in (29a) also represents an apprehensive use like this.
[22] See, *e.g.*, Blühdorn 2008; Cristofaro 2005 for overviews of subordination.

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, (35) below provides a clear example of Lichtenberk's (1995) "epistemic downtoning" function for apprehensionals. Here, *bambai* clearly behaves as an epistemic possibility modal ($\textit{bambai}\ q = \underset{\text{EPIST}}{\blacklozenge}\ q$). 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.)

(35) **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 prejacent 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 (36), *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 prejacent (*viz.* one of the

Philistines committing adultery with Rebekah) is taken to describe a counterfactual event in view of Isaac's deception.

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

Wotfo yu nomo bin jinggabat 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 (37) give examples of an indicative and subjunctive *if*-conditional, where *bambai* modifies the consequent clause (the "apodosis.")

(37) a. *if ai dringgi kofi* ***bambai*** *mi* #*(nomo) gurrumuk*
if 1s drink coffee ***bambai*** 1s #(NEG) sleep

'If I drink coffee then I might not sleep' [AJ 23022017]

b. *if ai=ni=min-a dringgi det kofi* ***bambai*** *ai(#=ni)=bin-a*
if 1S=NEG=PST-IRR drink the coffee ***bambai*** 1S(#=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 (37a,b) and their *if*-less counterparts in (30a and 32a) respectively (*pp.* 37-38), 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 (37) diverge sharply from this interpretation. That is, each of the *if* p*, bambai* q sentences in (37) 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 Fintel 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 (38).

(38) **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.[23]

[23]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	*garra*	*ai**rra** dringgi kofi **bambai** mi gurrumuk* 'I'll have a coffee or I might fall asleep'
NEG IRREALIS	*kaan*	*ai **kaan** dringgi kofi **bambai** mi nomo silip* 'I won't have a coffee or I mightn't sleep'
C'FACTUAL	*bina* PST:IRR	*aibin dringgi kofi nairram **bambai** ai**bina** gurrumuk* 'I had a coffee last night or I might've passed out'
IMPERATIVE	∅	*yumo jidan wanpleis **bambai** mela nogud*[24] 'Youse sit still or we might get cross'
PROHIBITIVE	∅ [*nomo*] IMPR	***nomo** krosim det riba, **bambai** yu flodawei* 'Don't cross the river or you could be swept away!'
GENERIC	∅	*im gud ba stap wen yu confyus, **bambai** yu ardim yu hed* 'It's best to stop when you're confused; you could get a headache'
NEG GENERIC	∅ [*nomo*] GEN	*ai **nomo** dringgi kofi enimo, **bambai** mi fil nogud* 'I don't drink coffee anymore or I'd feel unwell'
CONDITIONAL	*if*	***if** ai dringgi kofi, **bambai** ai kaan silip* 'If I have coffee, then I mightn't sleep'

[24]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 (39):

(39) **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!'

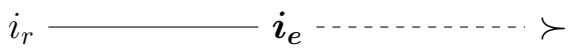
b. APPREHENSIONAL reading of *bambai*

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

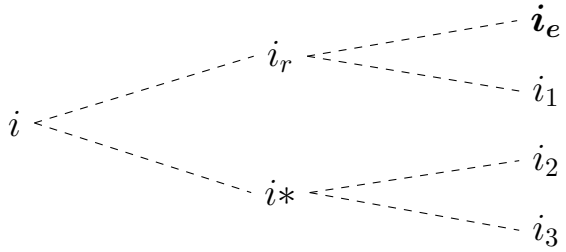
'No, that's okay! (If I did,) I mightn't (be able to) finish my work!'
[GT 20170316]

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 (39a-b) are provided below.

(39) 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 (39b), 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 (40).

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

$$\lambda Q[\textsc{Operator}\ \mathcal{R}\ Q]$$

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 16 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 (41):

(41) MODAL SUBORDINATION is a phenomenon wherein the interpretation of a clause α is taken to involve a modal operator whose force is relativized to some set β of contextually given propositions. (Roberts 1989:718)

In *bambai*'s 'AVERTIVE'-type uses (*sc.* those of the form p *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 *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 (41) the notion of MODAL SUBORDINATION captures the idea that a modal operator scoping over a clause has visibility

of elements of the foregoing discourse.[1] Roberts's schematisation of this type of relation is reproduced in (42) and a classic operationalisation is given in (43).

(42) The general logical form of a modal subordination relation — given two (syntactically independent) clauses K_1, K_2 — where the prejacent to a modal operator (MOD_2) is "modally subordinate" to the content in the scope of OP_1, another (intensional) operator (Roberts 2020).

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

1. Y is a presupposition trigger and only the content X (under the scope of OP_1) would satisfy this presupposition.
2. MOD_2 is a modal operator scoping over Y.
3. The constituent in K_2, headed by MOD_2, has an interpretation wherein part of its restriction consists of X.

(43) 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!*

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

This schema is straightforwardly reflected in Gretel's two sentence utterance in (43) below where, crucially:

- the domain of 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—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 (43), 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

[1] Much of the content of this subsection draws on the presentation of a similar analysis for *otherwise* in Phillips & Kotek, 2018), available at `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).[2] Because it models the accretion of information over the course of a discourse, DISCOURSE REPRESENTATIONS — effectively "pictures of the world [≈ 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 (44), 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 44 introduces a discourse referent and condition set, represented as (a), expanded in the second (b).[3]

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

a.

x
duck(x) *entered-room(x)*

b.

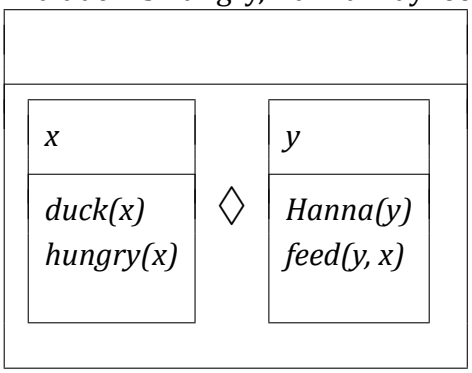
x y
duck(x) *entered-room(x)* *x=y* *quacked(y)*

[2]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.

[3]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 $P(x_{i_1}...x_{i_n})$ (where P is an n-place predicate). In a given model $\mathcal{M}$, if a world/variable-assignment pair $\langle w, f\rangle$ **satisfies** $(\underset{\mathcal{M}}{\Vdash})$ all of the conditions in K, then that pair **verifies** $(\underset{\mathcal{M}}{\models})K$. Additionally, DRSs are recursively closed under the operations $\neg, \bigvee, \Rightarrow, \Box, \Diamond$. 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.[4] (45) 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:

(45) 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.

(46) 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. $K_\ell \,\Box\, K_i \longrightarrow K_\ell \leqslant K_i$ where '$\leqslant$' reads "is accessible from."

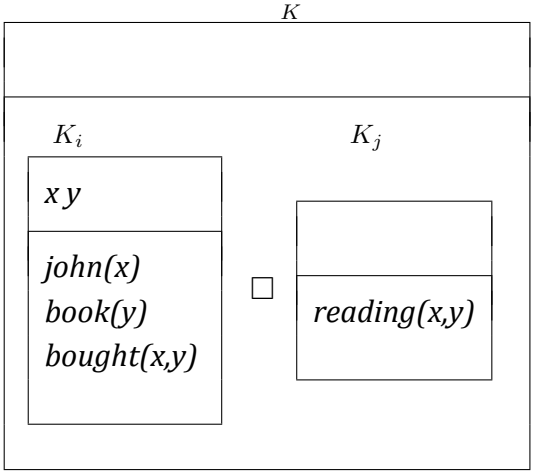
In (45), the consequent box of the conditional makes reference to a variable introduced in the antecedent. Furthermore, the entire conditional statement is embedded inside a larger discourse, so that we are not committed to the existence of any dog in the context: the *feeding*-worlds are a subset of *hungry-dog*-worlds.

Based on the assumptions introduced in (46), a given DRS K that is interpreted in the scope of a modal operator can be *modally subordinate* to those DRSs whose

[4] 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 (47) 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 (46), 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.

(47) *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 (47), 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. $K_i \leqslant K_j$). Moreover, both K_i and K_j are subordinate to the matrix DRS K (i.e. $K \leqslant K_i \leqslant K_j$); 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, (48) enumerates some key properties of these uses.

(48) **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 nonfactal proposition derived from *K_1*: that is, the **negation** of a "basic proposition"

(which may be in the scope of another other modal operator.)[5]

c The speaker asserts K_1.

For clarity, the three sentences in (49) 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 (42), the modal subordination schema from Roberts (2020).

(49) 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'
≈ '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'
≈ 'If I don't have coffee, I might fall asleep' [GT 28052016]
≉ 'If I need not have a coffee, I might fall asleep'

c. *kaan* φ 'won't/can't/mustn't φ' has the logical form $\Box\left[\neg[\varphi]\right]$. The negation of the proposition in the scope of □ 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]
≈ 'If you don't not go to the shop, you might spend all your money.'
≉ 'If i'ts not the case that you mustn't go to the shop...'

As the infelicitous paraphrases in (49b-c) make clear, K_1 *bambai* K_2 doesn't have a straightforward conditional semantics. It is **not** the negation of K_1, but rather ma-

[5]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 φ.

terial under the scope of some modal operator within K_1 (*viz.* OP_1) 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_2*"* 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 $\boldsymbol{K_1}$. A new operator over DRSs $\ominus$ (and hence the complex condition $K_i \ominus K_j$) will represent the (truth-conditional) contribution of *bambai*:

(50) *Proposal: A dynamic semantics for* bambai
$K_i \ominus K_j \Longleftrightarrow (K_i) \wedge (\neg K_{i_{\text{sub}}} \Diamond K_j)$
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.[6]

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 (1981:§2.7) regarding different "flavors" of modality.

A complex condition of the form $K_i \underset{m,o}{\Diamond} K_j$ 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 $K_i \underset{m,o}{\Diamond} K_j$ can be instructively rewritten as in (51):[7,8]

(51) *Satisfaction conditions for Roberts' possibility operator* $\Diamond$ *as an existential quantifier, given a world* w*:*
$K_i \underset{m,o}{\Diamond} K_j \iff \exists w' \big[w' \in \underset{o(w)}{\text{BEST}} \big(\bigcap [m(w) \cup \{w'' \vDash K_i\}] \big) \wedge w' \vDash K_j \big]$

[6] 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 $K_{i_{\text{sub}}}$.

[7] See Chapter 1 for a definition of BEST and a brief overview of ordering semantics.

[8] Roberts (1989) in fact equivalently defines the satisfaction conditions for 'possibility (in view of)' $K_i \underset{m,o}{\Diamond} K_j$ as the dual of 'necessity (in view of)' $\neg(K_i \underset{m,o}{\Box} \neg K_j)$. 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.

In words: The condition $K_i \underset{m,o}{\Diamond} K_j$ 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.

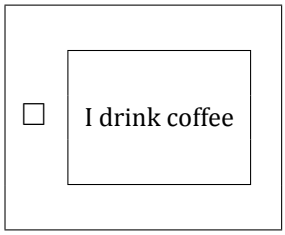
3.1.1.3 Modal subordination in action

Described above, the second (*bambai*) clause of (49b) is interpreted as *modally subordinate* to antecedent material. Following the discussion of the previous subsection, its discourse representation structure can be diagrammed as in (52). In (a), K_1 is asserted. In (b), the content in the scope of OP_1 (*viz.* $K_{1_{\text{sub}}}$) is accommodated; its negation restricts the domain of the possibility modal encoded in *bambai*.

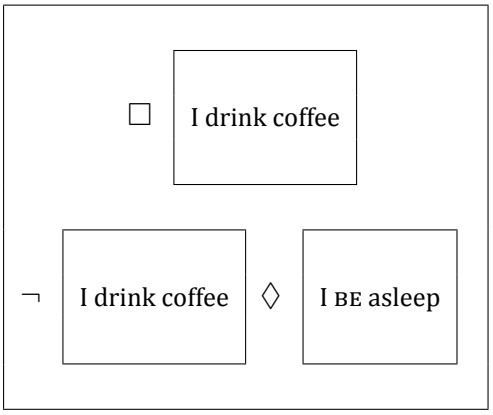
(52) Discourse representation structure for (49b)
[$_{K_1}$*airra dringgi kofi*] *bambai mi gurrumuk*

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

K_1. DRS first clause



K_2. DRS full sentence



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*.

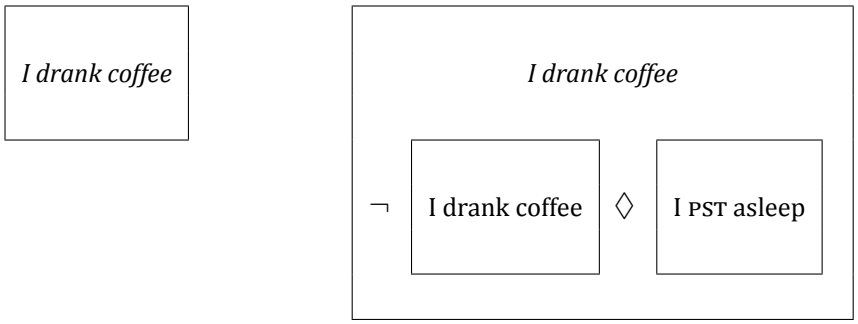
The second clause of (49a) is interpreted as a counterfactual (while it has past temporal reference, *bina* explicitly marks its nonfactual status.) Consequently, *bambai* needs a nonfactual antecedent and the negation of the foregoing proposition is accommodated to restrict its domain. Reminiscent of standard treaments 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 1981; Lewis 1973). This is represented in (53) below: the first clause (coffee-drinking) is asserted as actual, the second a nonrealised possible outcome had the coffee-drinking not obtained.

(53) Discourse representation structure for (49a)
[$_{K_1}$ *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 (54); accommodation of the entire conditional as an antecedent appears to be infelicitous (*cf.* Kruijff-Korbayová & Webber 2001; Phillips & Kotek; Webber et al. 2003).[9] A DRS for (54a) is additionally provided in (55).

(54) *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.'

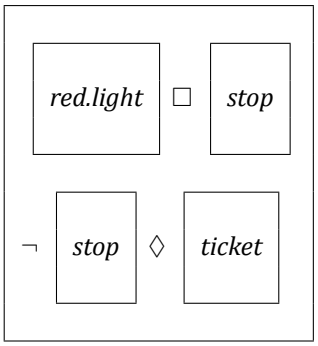
b. *If det lait im redwan, stap; if najing, kipgon.*
if the light 3s red stop if no CONT

'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*.

[9]These judgments have only been tested on a single speaker and bear confirmation of a negative judgment/further investigation. Of course the felicity of (54b) would also be predicted to be independently degraded without establishing negative speaker attitude vis-à-vis the prejacent.

(55) DRS for (54a)



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

summary.
K_i = *red light* □ *stop*
$K_{i_{sub}}$ = *stop*
K_j = *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.*, $[_{S_2}$ $\text{MOD}_2 \ldots \text{Y} \ldots]$), an antecedent (X) that determines the modal domain must be found among accessible discourse referents (*i.e.*, $[_{S_1}$ $\text{OP}_1 \ldots \text{X} \ldots]$).

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).[10] 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.

3.1.2 Information structure

Again following the analysis of *otherwise* in Phillips & Kotek and modulo the constraints in precautioning uses described above, "accommodation of the missing antecedent" to *bambai* operates on a pragmaic basis with reference to prior discourse and the content of the prejacent.'[11,12]

By deploying the information structure 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 in a given discourse context $\mathcal{D}$.

[10] Additionally, a proposal for unifying *bambai*'s range of apprehensional uses with its subsequential use is detailed in Ch. 4.

[11] 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).

[12] 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.* (our translations: 256, 258).

(56) *Two useful definitions:*

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 1979 *et seq.*, also introduced in § 1.2.1).

b. 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.*, a set of "open" questions in the discourse at a given time.)

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 p *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.

(57) *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 (58):

(58) [*airra dringgi kofi*]$_{m_i}$, **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.*, $\underset{\textit{tel(w)}}{\text{BEST}}\big(\cap \underset{\text{CIRC}}{m(w)}\big)$

$$\forall w'\big[w' \in \underset{\textit{tel(w)}}{\text{BEST}}\big(\cap \underset{\text{CIRC}}{m(w)}\big) \rightarrow \text{HAVE.COFFEE}(w')\big]$$

m_j Per (57), *bambai*, encodes an instruction to consider the COMPLEMENT of some set of worlds made contextually salient. This can be thought of as signalling the addition of a question to the QuD stack of the form:[13]

$$\lambda p.\ \text{what could (unfortunately) happen next in } w \in \overline{\boldsymbol{p}}?$$

[13] As in the previous chapter, I use the overline notation denotes 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 addressee doesn't have a coffee in that world?

m_k The second clause – *bambai*'s **prejacent** is interpreted as proffering a (partial) answer to the current QUD *viz.* that the speaker asserting he may pass out as his desk in the set of worlds made available to *bambai* — here, the complement of the set of worlds that best adhere to some set of goals/nutritional standards in w.

$$\forall w''\left[w''\in \underset{o(w)}{\textbf{BEST}}\Big(\cap \underset{\text{CIRC}}{m(w)} \cup \overline{\textbf{EAT}(w'')}\Big)\Box\neg\textbf{GROW}(w'')\right]$$

3.2 Apprehensional readings emerge in subsequential TFAs

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 apparent 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 German *nachher* and Dutch *straks* in addition to Kriol *bambai* (see also Kuteva et al. 2019:427-8). Parallels between *bambai* and *straks*, for example, are shown in the contrast between a subsequential and apprehensional reading in (59) below.

(59) The *straksconstructie* in Dutch (see also Boogaart 2020)

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 3.50, 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 be closed!' [Mireille L'Amie, *p.c.* 20200130]

***bambai* and conditional modality** Numerous 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: *John comes, I leave* (where my departure is interpreted as a consequence of his arrival.) In these cases, although the second clause is interpreted as being "semantically subordinate" to the first, this relation is not made explicit in the syntax (see Ch. 3 and also Roberts 1989, 1990, 2020 for discussion and an implementation of her notion of "modal subordination.")

Relatedly, consider the parallels between interrogative and conditional clauses.[14] The functional motivation for these appears to be that conditional apodoses (consequent clauses) can be understood as answering a "question" posed by the antecedent/protasis. This is clearly demonstrated for Danish by Harder (1995:101-2), replicated in (60) below.

(60) a. **A two-participant discourse**

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.'

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."

Consider the discourses in (61-63) below.

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

A. *gita la jeya!*
get off LOC there!

B. *ba wani?*
why?

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

'Get off of there [...why?...] In a minute, you'll break the car!'
[GT 16032017]

[14] See Phillips & Kotek (forthcoming: §4.3) for an operationalisation of this observation in information structural terms.

(62) **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?...] In a minute, you'll be swept away!'
[GT 16032017]

(63) **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.PST:IRR bite.TR 1s

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

In all of the short discourses above, the translation provided elucidates the capacity of the temporal properties of *bambai qua* sequential TFA to implicate additional nontemporal properties of the relation between the clauses it links. In each of the examples, **A**'s response identifies an eventuality that might obtain in the near future (of the speech-time for (61-62) and of the slithering/frightening-time for (63).

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 (61), 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 (Geis & Zwicky 1971:see).

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

(64) 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 [64a] When one clause refers to a non- past event or to a state, the reading is typically causal, as in [64c] and [64d], but the causal reading is not required, as [64b] indicates. The contrastive readings in [64b] signal polysemy, i.e. conventionalized meanings, not just conversational. (1991:195)

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" (viz. e_1 causes e_2).

3.3 *bambai* and apprehensional expressive content

Crucially, apprehensionals additionally conventionally implicate information about the Speaker's attitude vis-à-vis their prejacent. Angelo & Schultze-Berndt (2016) propose that:

> 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)

Synchronically, the apprehensional reading frequently occurs embedded under a predicate of fearing or with a directive/prohibitive antecedent all of the examples (61-63) also show examples of this. Relatedly, Boogaart (2020:192*ff*) 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. The selection of a subsequential TFA instead of a different epistemic adverbial in some unsettled context invites the inference that the Speaker is negatively disposed to the event described in the prejacent.

Marshalling cross-linguistic evidence of this path of change,[15] 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.' What's more, tracking the facts for *bambai* presented above, these TFAs appear to have encroached into the semantic domain of epistemic adverbials, where they are reported to encode negative speaker affect with respect to their prejacents (relative to the other members of these semantic domains.)[16,17]

Additionally, *nachher* appears to have acquired a similar semantics to *bambai*,[18] shown by its felicity in the discourse in (65) below, where, tracking ⟨*marri, bambai*⟩, *nachher* appears to have encroached into the semantic domain of *vielleicht* 'perhaps.' In these contexts, *nachher* asserts negative speaker attitude with respect to its prejacent in terms relative to neutral *vielleicht* (Hanna Weckler, p.c.).

(65) **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$_2$ *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!'

B$_2$ *nein, das ist nicht möglich*
no, that is not possible

B$'_2$ # *nein, das wäre gut!*
no, that would.be good

[15]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).

[16]Thanks to Hanna Weckler and Mireille L'Amie for discussion of German and Dutch intuitions respectively.

[17]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]*

(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]

[18]Although see Angelo & Schultze-Berndt (2018:30) for a discussion of distributional differences between these two items.

$\mathbf{B}_2''$ *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 susbsequentiality, has developed the characteristics of an apprehensional epistemic, a likely consequence of frequent embedding in the discourse contexts discussed above. Following the literature on expressive content and use-conditional semantics (e.g Gutzmann 2015; Kaplan 1999; Potts 2007), it is fruitful to model the 'negative speaker attitude' component of the meaning of apprehensionals as a conventional implicature, inhabiting a second semantic "dimension"—connected to but distinct from the truth conditions set out above. The infelicity of (65$\mathbf{B}_2$)'s utterance shows that negation cannot target this component of Speaker meaning, an argument for its treatment as a non-truth-conditional, not-at-issue component of the semantics: the domain of CONVENTIONAL IMPLICATURE. The proposals of Gutzmann (2015); McCready (2010); Potts (2007) (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. Borrowing rhe informal "fraction notation" deployed by these authors, we can tease apart the asserted and implicated components of the *bambai* clause in (63) – this is given in (66).

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

If this mode of thinking about the speaker attitude implications of *bambai* q is on the right track, then, in addition to signalling possibility, *bambai* can be thought of as a context. In uttering *bambai* q at t in w, the Speaker has created a context just like $\langle t, w\rangle$, but one in which 'it registers that [they regard q] negatively somehow' (Potts 2007:175). 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.

Apprehensionality: competition with *marri* As with the other uses discussed in this subsection, then, *bambai* functions as a possibility adverbial whose domain can be restricted by the presence of an *if*-clause. As a possibility adverbial, *bambai* has entered into the semantic domain of other Kriol lexical items including *marri* 'maybe'. Crucially though, the examples in (67-68) below serve to evince the perseverance of apprehensional expressive content in these syntactic frames. In (67a), 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.[19]

[19] 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.'

(67) **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' $\not\rightsquigarrow$ I'm likely to cancel my holiday
[AJ 04082017]

Here, the contrast between (a) and (b) is attributable to the expressive content of *bambai* (e.g. Kaplan 1999). 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 (68) below, where the selection of *marri* instead of *bambai* gives rise to a conventional implicature that the Speaker's utterance of (68) ought not be interpreted as the expression of a desire to prevent her daughter's participation in the football game.

(68) **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' $\not\rightsquigarrow$ [so she shouldn't play]
[AJ 04082017]

Based on this evidence, we may conclude that the ostensible encroachment of *bambai* into the domain of epistemic adverbials has given rise to a privative dyad (*i.e.* 'Horn scale', see Horn 1984: 33-8) of the type $\langle$*marri, bambai*$\rangle$ — that is, an utterance of *marri p* conventionally implicates that the Speaker was not in a position to utter *bambai p*. That is, the meaning of the 'weaker' expression comes (via hearer-based/$\mathcal{Q}$-implicature) to represent the relative complement of the stronger in a given semantic domain: here that the neutral epistemic adverbial comes to conventionally implicate *non-apprehensional* readings/modalities:

$$[\![marri]\!] \approx \Diamond \setminus [\![bambai]\!]$$

In §**??**, we saw how (along with the illocutionary "downtowning" analysed immediately above), the expressive content of *bambai* appears to be a result of fre-

quent occurrence of *bambai* (and similar subsequential TFAs) in contexts of "preacautioning" and fearing. In these cases, *bambai* behaves as a discourse anaphor: a connective whose truth-conditional contribution is asserting that the eventuality described in its prejacent obtains subsequently to a contextually salient time made available in the discourse context.

In that section I additionally provided data from other languages where a subsequential TFA appears to have undergone similar functional change, developing apprehensional expressive content. German *nachher* is one such item. In (65), we saw how the expressive content of *nachher* appears to be not-at-issue: Pott's "nondisplaceability" criterion for identifying use-conditional semantic 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." The previous section discussed the truth-conditional contribution of *bambai*, providing the lexical entry in (75) above. Following the proposal in Kaplan (1999)whee a "use-conditonal proposition" is understood to denote a set of contexts, Gutzmann (2015, following a suggestion in Portner 2007) appeals to a model with parallel types, interpretation functions 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.

The use-conditional contribution of *bambai* (as suggested in §**??**) can then be informally stated as (69).[20]

(69) $[\![\textit{bambai}\ p]\!]^u = \{c : c_s \text{ is negatively disposed to } p \text{ in } c_W\}$
bambai p is expressively correct in a context where the speaker c_s is negatively disposed to p in $w*$

In this case, *bambai* p can be taken to conventionally implicate a proposition of the form given in (69), in addition to the asserted/truth conditional content presented in the above subsections.

[20]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))

Chapter 4

A semantics for *bambai*

This section seeks to provide a semantics for Kriol *bambai* that unifies the available SUBSEQUENTIAL and APPREHENENSIONAL readings discussed above and explains how a given reading is privileged in particular linguistic contexts. In order to do this, we assume a Kratzerian treatment of modal operators (1977; 1981 *et seq.*)

4.1 Subsequentiality

§2.3.1 showed how Kriol has retained the temporal frame uses of *bambai* derived from 'by-and-by.' For Dowty (1979, 1982), time adverbials are taken to denote sets of sets of temporal intervals. A frame adverbial[1] then, takes a predicate and says that its instantiation is contained in a given temporal interval. Following assumptions made by Kamp (1971:238ff) and Johnson (1977:115), Dowty (1979:29ff) 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 prejacents with respect to some contextually-provided reference time. (70) represents a proposal to capture this relation.

(70) **SUBSEQUENTIAL INSTANTIATION** (intensionalised)
SUBSEQ$(P, t_r, w) \underset{\text{def}}{=} \exists t' : t_r \prec t' \wedge P(t')(w) \wedge \mu(t_r, t') \leq s_c$
A subsequentiality relation SUBSEQ holds between a predicate P, reference time t_r and reference world w iff the P holds in w at some time t' that follows t_r.
Additionally, it constrains the temporal distance $\mu(t_r, t')$ between reference

[1]The term "temporal frame adverbial" due to Bennett & Partee 2004, and equivalent to "locating adverbial" for Kamp & Reyle 1993:613)

and event time to some value below a contextually-provided standard of 'soon-ness' s_c.

maybe the t' variable should be not existentially bound?

The relation between a contextually-provided standard and measure function $\mu(t_1, t_2)$ analysis[2] builds in a truth-condition that captures variable intuitions about the falsity of a statement such as *Eve fell pregnant then shortly afterwards gave birth to a son* in some situation where the birth of Cain succeeds the pregnancy described in the antecedent clause by some contextually inappropriate length of time (*e.g.* ninety years.) An additional advantage is that, in appealing to a pragmatically retrieved standard, we allow for faultless disagreement between interlocutors, in case speaker and addressee retrieve divergent standards of soonness from the discourse context (as in (71) below).

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

Glurmo. Soon enough.

Fry. That's not soon enough.

('Fry and the Slurm Factory', *Futurama*)

In (71), 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 (72) below.

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

$[\![\textit{bambai}]\!]^c \underset{\text{def}}{=} \lambda P.\textsc{subseq}(P, t_r, w)$

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 §2.3.2 above, the concept of **settledness** was introduced, as deployed by Condoravdi (2002) and otherwise well established in the literature. Thomason traces the notion of historical necessity to Aristotle and Jonathan Edwards (1984:138)

[2]Given that $\mathcal{T}$ is isomorphic with $\mathbb{R}$, formally $\boldsymbol{\mu} : \wp(\mathcal{T}) \rightarrow \mathbb{R}$ represents a Lebesgue measure function that maps any interval $[t_1, t_2]$ to its length $t_2 - t_1$.

(see also Kamp 1979). The notion is deployed to similar effect in Giannakidou & Mari (2018) in their modal account of the future tense. The primary intuition is that some property (be it of times or eventualities) P is settled just in case it is a fact in the evaluation world that the truth of P resolves at a given time.

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 (73) and, on the basis of this, a formal definition of settledness is given as (74).

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

a. $\forall t[\simeq_t$ is an equivalence relation]
All world-pairs in $\simeq_t$ (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.** $\forall w, w', t, t' \big[(w \simeq_t w' \wedge t' \prec t) \rightarrow w \simeq_{t'} w'\big]$
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)

(74) **Settledness for P.**
$\forall w' : w' \in cg, \forall w'' : w' \simeq_{t_0} w'' :$
$AT\big([t_0, \_), w', P\big) \leftrightarrow AT\big([t_0, \_), w'', P\big)$ (Condoravdi 2002:82)

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.[3]

Here, I defend a claim that the modalised meaning component of apprehensional readings of *bambai* arise in part (*i.e.*, Lichtenberk's *epistemic downtoning* — the 'epistemic' component of APPR markers) due to the conventionalisation of an R-based implicature that the Speaker is making a modalised claim when they make any predication that is epistemically unsettled. Given 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 (particularly an premonitory one, cf. § **??**) about some unsettled eventuality on its possible truth in

[3]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 accomodate stative and temporal properties with minor adjustments (see *ibid.*). For the sake of perpescuity, I abstract away from (davidsonian) event variables in this section.

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 subsequentiality 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; 1981; 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 (75) proposes a unified, modalised semantics for *bambai*.

(75) $[\![\textit{bambai}]\!]^c = \lambda m \lambda o \lambda P. \exists w' \big[w' \in \textbf{best}_{o(w)}(m, t*, w*) \wedge \textsc{subseq}(P, t_r, w') \big]$
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 (70) above) holds between that world w', the prejacent P, and a reference time provided by the utterance context t_r.

With the entry in (75), 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 or (presently) unverifiable — state-of-affairs. Spelled out below, the availability of multiple readings to *bambai*-sentences is modelled as compatibility with a range of conversational backgrounds (*cf.* Kratzer 2012:55*ff*).

4.2.1 Deriving the subsequential reading

The so-called subsequential TFA use of *bambai* follows from general norms of assertion: given that the speaker is predicating about a settled property, her context set is understood as veridical and the assertion is taken to be factual (*cf.* the (super)maxim of quality: "try to make your contribution one that is true" (Grice 1991:27)).

In these cases the intensional contribution of *bambai* can be captured by claiming that it quantifies (trivially) over a *metaphysical* modal base and an empty ordering source (see Kratzer 2012).)[4]

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

[4] In her treatment of Marathi present tense marking, Deo (2017) makes similar appeal to veridical vs. nonveridical conversational backgrounds to capture ostensible polysemy associated with these (present-tense) forms.

a. $\bigcap m_{\text{meta}}(w)(t) = \{w' \mid w' \simeq_t w\}$
A metaphysical modal base m_{meta} retrieves the set of propositions that are **consistent** with a world w at a given time t.
Consequently, the intersection of these propositions returns the set of **historical alternatives** to w at the given evaluation time t.

b. $o_{\text{empty}}(w) = \varnothing$
An empty ordering source o_{empty} contains no content (propositions) and hence induces no ordering over the modal base.

c. Because the ordering source is empty, the function $\textbf{\textit{best}}_{\varnothing}(m_{\text{meta}}, t, w)$ simply returns $\cap\underset{\text{meta}}{m(w)}$: a set of worlds which are historical alternatives to w at t.

Given that, by the definition in (73), historical alternatives have "identical pasts" to one another, in factual, past-tensed contexts, the metaphysical modal base over which *bambai* quantifies (trivially) are identical to the evaluation world. This is derived for (77) below (the sentence simplified from (18) above)

(77) **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' [AJ 23022017]

a. **Taking *bin* 'PAST' to restrict t to before speech time $t*$**
$[\![\textit{bin}]\!]^c = \text{PST} = \lambda t : t \prec t*.t$
bin is an partial identity function from times to times, defined only if a given (reference) time precedes speech time

b. **Meaning of the first clause**

$$[\![\textit{main dedi go la det shop}]\!](\text{PST}) = \lambda t \lambda w.\text{GO.SHOPPING}(t)(w)$$
$$= \lambda w : t \prec t* .\text{GO.SHOPPING}(t)(w)$$

Defined only if $t' \prec t*$, the first clause asserts that the event of Dad's trip to the shop occurs at a contextually-retrieved time t'.

c. **Meaning of the second clause (*bambai*'s prejacent)**
$[\![\textit{im gugum dina}]\!]^c(\text{PST}) =: t'' \prec t*.\text{MAKE.LUNCH}(t'')(w)$

d. **Meaning of *bambai* & substitution of meaning of (c) for λP**

$$[\![\textit{bambai}]\!]^c = \lambda m \lambda o \lambda P.\exists w' \big[w' \in \textbf{best}_{o(w)}(m, t, w) \wedge \text{SUBSEQINST}(P, t_r, w')\big]$$
$$[\![\textit{bambai imin gugum dina}]\!]^c = \lambda m \lambda o : t'' \prec t*.\exists w' \big[w' \in \textbf{best}_{o}(m, t_r, w*)$$
$$\wedge \text{SUBSEQINST}\Big(\big(\text{MAKE.LUNCH}(t'')(w)\big), t_r, w\Big)\big]$$

e. **substitution of conversational backgrounds m, o**

$$[\![\textit{bambai imin gugum dina}]\!]^c =: t'' \prec t* .\exists w' \big[w' \in \textbf{best}_{\varnothing}(m_{\text{meta}}, t_r, w*) \\ \wedge \textsc{subseqInst}\Big(\big(\textsc{make.lunch}(t'')(w)\big), t_r, w\Big)\big]$$

Given that MAKE.LUNCH is instantiated prior to speech time $t*$, the modal component of *bambai* involves quantifying over a veridical conversational background, *sc.* $\{w' \mid w' \simeq_{t*} w*\}$ (*per* general pragmatic principles/assertoric norms, *e.g.*, Grice's quality maxim.)
MAKE.LUNCH is in the SUBSEQ relation with t_r in w' in a historical alternative$_{t*}$ to $w*$.

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

f. **Spelling out the SUBSEQUENTIAL INSTANTIATION relation (cf. 70)**

$$[\![\textit{bambai imin gugum dina}]\!]^c =: t'' \prec t_r .\exists w' \big[w' \in \textbf{best}_{\varnothing}(m_{\text{meta}}, t*, w*) \\ \wedge \exists t''[t_r \prec t'' \wedge \textsc{make.lunch}(t'')(w') \wedge \mu(t_r, t'') \leq s_c]\big]$$

The SUBSEQ component of *bambai*'s meaning further restricts the instantiation time (t'') of MAKE.LUNCH: it asserts • that a contextually-retrieved reference time t_r precedes t'' and • that the temporal distance between those two times is below some contextual standard ("soonness").

Note that, in (77f), it is exactly the same mechanism responsible for establishing the interclausal anaphoric relation between *im* and *main dedi* is responsible for the the equation of t_r with SHOPPING-time $(\lambda t.\textsc{go shopping}(t))$. In Kampian (discourse representation theoretic) terms (1993:Ch. 5) (also adopted in, *e.g.* Partee 1984) a new time referent has been introduced into the discourse by the first clause, which is accessible from the second, where it is equated with the reference time t_r.

4.2.2 Deriving the apprehensional reading

In unsettled contexts, *bambai* selects for a nonfactual/nonveridical modal base (whether epistemic or metaphysical) and a stereotypical ordering source. These backgrounds are formalised in (78), adapting liberally from (Kratzer 2012:37-40 i.a.)

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

a. $\bigcap_{\text{meta}} m(w)(t) = \{w' \mid w' \simeq_t w\}$
(As above) a metaphysical modal base m_{meta} is a function that retrieves the set of historical alternatives to w at t.

b. $o_{\text{s'typ}}(w) = \{p \mid p$ will hold in the 'normal' course of events in $w\}$.
A sterotypical ordering source is a set of propositions that can be taken to hold in the "normal course of events" (Kratzer 1981:295).

c. $o_{s'typ}(w)$ then induces an ordering $\leqslant_{o_S(w)}$ on the modal base:
$\forall w', w'' \in \bigcap f_{\text{epist}}(w)(t) : w' \leqslant_{\boldsymbol{g(w)}} w'' \leftrightarrow \{p : p \in g(w) \wedge'' \in p\} \subseteq \{p : p \in g(w) \wedge w' \in p\}$
For any worlds w' and w'', w' is 'at least as close to an ideal' than w'' with respect to $_{s'\text{typ}}(w)$ (*i.e.* it is at least as close 'normal course of events') if all the propositions of $o(w)$ true in w'' are also true in w'.

d. ***Best***$(m_{\text{meta}}, o_{s'\text{typ}}, t, w)$ then returns just that subset of historical alternatives to $w*$ that are closest to what might be judged as a "normally-unfolding course of events" in $w*$.

've written to cleo and ave a number of things o work out/add on the choice of epistemic modal base, especially given the apparent problems this will pose for counterfactuals. This draws largely from Giannakidou & Mari (2018), while trying to harmonise this with observations made at the end of Condoravdi (2002) (21feb email exch.)

We can now derive the proper semantics for a "precautioning" use of *bambai*, as in (19), repeated here as (79).

(79) **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**
(adapted from the semantics forr WOLL cited in Condoravdi 2002:71)[5]
Given a modal base m, ordering source o and an evaluation time & world $t*, w*$:

$$[\![\textit{garra}]\!] = \lambda P \forall w' \big[w' \in \textsc{best}_o(m, w*, t*) \rightarrow \textsc{at}\big((t*, \infty], w', P\big)\big]$$

garra takes a predicate P and says that P holds in the future of t of all best-according-to-*o* worlds in the modal base.

b. **Meaning of the first clause**
$[\![\textit{airra dringgi kofi}]\!] = \forall w' \big[w' \in \textsc{best}_o(m, w*, t*) \rightarrow \textsc{at}\big((t*, \infty], w', \textsc{drink.coffee}\big)\big]$

c. **meaning of the second clause**
$[\![\textit{mi gurrumuk}]\!]^c = \lambda t \lambda w.\textsc{pass.out}(t)(w)$

it kosher just to say hat these variables get xistentially closed at the nd of the derivation hat is what the SSQ ondition is meant to ssert. Or would it be etter to not lambda-bind hose variables)

d. **Meaning of *bambai* & substitution of meaning of (c) for λP**

$$\begin{aligned}[\![\textit{bambai}]\!]^c =& \lambda m \lambda o \lambda P. \exists w' \big[w' \in \textbf{best}_{o(w)}(m, t, w) \\ & \wedge \textsc{subseqInst}(P, t_r, w')\big] \\ [\![\textit{bambai mi gurrumuk}]\!]^c =& \lambda m \lambda o. \exists w' [w' \in \textbf{best}_o(m, t, w) \\ & \wedge \textsc{subseq}(\textsc{pass.out}, t_r, w')]\end{aligned}$$

[5] 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 sas IRR.

e. **substitution of conversational backgrounds m, o**

$$[\![\textit{bambai mi gurrumuk}]\!]^c = \exists w' \big[w' \in \textbf{best}_{\mathcal{S}}(m_{\text{meta}}, t*, w*) \\ \wedge \textsc{subseqInst}\big(\textsc{pass.out}, t_r, w\big)\big]$$

In this instance, where the reference time retrieved from context is in the **future of speech time** (i.e. some time in an interval following speech time — $t_r \in (t*, \infty]$), the modal base m is **diverse with respect to the SUBSEQ property** — that is, the property $\textsc{subseq}\big([\lambda t' \lambda w.\textsc{pass.out}(t')(w)], t_r, w\big)$ is **not settled in $w*$**.

f. **Spelling out the SUBSEQUENTIAL INSTANTIATION relation (cf. 70)**

$$[\![\textit{bambai mi gurrumuk}]\!]^c = \exists w' \big[w' \in \textbf{best}_{\mathcal{S}}(m_{\text{meta}}, t*, w*) \\ \wedge \exists t' [\textsc{pass.out}(t')(w') \wedge \mu(t_r, t') \leq s_c]\big]$$

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

The SUBSEQ component of *bambai*'s meaning asserts the instantiation of PASS.OUT at some time (t'). t' is preceded by a contextually-retrieved reference time t_r: • t_r is identified as some time in the interval $[t*, \infty)$ (i.e. the instantiation time of DRINK.COFFEE) and • the temporal distance between those two times is below some contextual standard ("soonness").

The crucial difference then, that distinguishes the pure (actualised) subsequential reading from the apprehensional one is that the property described by the prejacent is **settled by $t*$ in $w*$** — that is, in all historical alternatives to the evaluation world, the event described by MAKE.LUNCH in (77) holds. Conversely, the context **fails to satisfy** settledness for PASS.OUT in (79). As claimed in (e), it satisfies the *diversity condition* (Condoravdi 2002:83):

(80) **Diversity condition w/r/t prejacent in (79)**
$\exists w', w'' \in \cup \simeq_{t*} w* : \textsc{at}\big((t*, \infty], w', \textsc{pass.out}\big) \wedge \neg\textsc{at}\big((t*, \infty], w'', \textsc{pass.out}\big)$
There are metaphysical alternatives to $w*$ at $t*$ where the event described by the prejacent to *bambai* in (79) holds and others where it doesn't hold.

4.2.2.1 the omniscience restriction.

Crucially, in the apprehensional cases presented above, those where predications about unsettled states of affairs timeline has been triggered (perhaps by one of the operators presented in Table 2.2 (*p.*44 above)), modalisation with respect to a non-settled property cannot reasonably select for the set of conversational backgrounds presented in (78). 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.)[6]

This condition allows us to unify the modalised and non-modalised readings of *bambai*: iff utterance context satisfies the diversity condition, the modal reading "emerges."

4.3 Conclusion

This paper has 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 mechansims 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.

It has attempted to elucidate the mechanisms through which frame adverbs that originally encode a relation of temporal sequency come to encode causality, possility 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.

[6]Compare this also to the epistemic constraint discussed in Kaufmann (2002).

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 prejacent (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 N∃C can be conceived of as a 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 ±IRREALIS mood distinction drawn on WD verbal predicates is neutralised in negative predications. 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.

Bibliography

AnderBois, Scott & Maksymilian Dąbkowski. 2020. A'ingae ʔsa'ne APPR and the semantic typology of apprehensional adjuncts. In *Proceedings of salt 30*, 371–91. Linguistic Society of America.

Anderson, Stephen R. 2008. The Logical Structure of Linguistic Theory. *Language* 84(4). 795–814. doi:10.1353/lan.0.0075.

Anderson, Stephen R. 2016. Synchronic versus diachronic explanation and the nature of the language faculty. *Annual Review of Linguistics* 2. 11–31.

Angelo, Denise & Eva Schultze-Berndt. 2016. Beware bambai – soon it may turn apprehensive. In Felicity Meakins & Carmel O'Shannessy (eds.), *Loss and renewal: Australian languages since contact*, 255–296. Berlin: Mouton de Gruyter.

Angelo, Denise & Eva Schultze-Berndt. 2018. Syntactically independent but pragmatically dependent: precautioning temporal markers. In *Syntax of the world's languages*, Paris. `https://pdfs.semanticscholar.org/cd1e/93b90b1bd5e3f82ac1d146d73af348fa3ed1.pdf`.

Austin, Peter K. 1981. *A Grammar of Diyari, South Australia*. London: SOAS.

Bednall, James. 2019. *Temporal, aspectual and modal expression in Anindilyakwa, the language of the Groote Eylandt archipelago, Australia*: ANU/Paris VII Phd thesis. doi:10.25911/5e3a935248011.

Belnap, Nuel, Michael Perloff & Ming Xu. 2001. *Facing the Future* February. Oxford.

Bennett, Michael & Barbara Hall Partee. 2004. Towards the Logic of Tense and Aspect in English. In *Compositionality in formal semantics: Selected papers by barbara h. partee*, chap. 4, 59–109. Blackwell.

Bermúdez-Otero, Ricardo. 2015. *Amphichronic explanation and the life cycle of phonological processes*. doi:10.1093/oxfordhb/9780199232819.013.014. `http://ling.auf.net/lingbuzz/001679/current.pdf`.

Binnick, Robert I. 1991. *Time and the verb : a guide to tense and aspect*. Oxford University Press.

Blake, Barry. 1993. Verb affixes from case markers : some Australian examples. *La Trobe working papers in linguistics* 6. 33–58. internal-pdf://228.60.152.45/Blake93.pdf.

Blühdorn, Hardarik. 2008. Subordination and coordination in syntax, semantics, and discourse: Evidence from the study of connectives. In Cathrine Fabricius-Hansen & Wiebke Ramm (eds.), *'subordination' versus 'coordination' in sentence and text*, 59–85. Amsterdam: John Benjamins.

Boogaart, Ronny. 2009. Een retorische straks-constructie. In Ronny Boogart, Joisen Lalleman, Marijke Mooijart & Marijke van der Wal (eds.), *Woorden wisselen. voor ariane van santen bij haar afscheid van de leise universiteit*, vol. 20, Leiden: SNL-reeks.

Boogaart, Ronny. 2020. *Expressives in Argumentation: The Case of Apprehensive Straks ('Shortly') in Dutch*. Springer International Publishing. doi:10.1007/978-3-030-28367-4_12.

Bouckaert, Remco R, Claire Bowern & Quentin D Atkinson. 2018. The origin and expansion of Pama–Nyungan languages across Australia. *Nature Ecology & Evolution* doi:10.1038/s41559-018-0489-3. https://doi.org/10.1038/s41559-018-0489-3.

Bowler, Margit. 2014. Conjunction and disjunction in a language without 'and'. *Semantics and Linguistic Theory* 24. 137–155. http://journals.linguisticsociety.org/proceedings/index.php/SALT/article/view/24.137.

Browne, Mitchell, Thomas Ennever & David Osgarby. ???? Apprehension as a grammatical category in Ngumpin-Yapa languages. In Marine Vuillermet, Eva Schultze-Berndt & Martina Faller (eds.), *Apprehensional constructions*, Berlin: Language Sciences Press.

Burgess, John P. 1978. The unreal future. *Theoria* 44(3). 157–179. doi:10.1111/j.1755-2567.1978.tb00175.x.

Carlson, Lauri. 1983. *Dialogue Games: An approach to discourse analysis*, vol. 53 9. Dordrecht: D Reidel. doi:10.1017/CBO9781107415324.004.

Caudal, Patrick, Alan Dench & Laurent Roussarie. 2012. A Semantic Type-driven Account of Verb-formation Patterns in Panyjima. *Australian Journal of Linguistics* 32(1). 115–155.

Clark, Ross. 1979. In search of Beach-la-mar: towards a history of Pacific Pidgin English. *Te Reo* 22. 3–64.

Condoravdi, Cleo. 2002. Temporal Interpretation of Modals: Modals for the Present and for the Past. In Luis Casillas, Brady Clark & Stefan Kaufmann (eds.), *The construction of meaning*, Stanford: CSLI publications.

Condoravdi, Cleo. 2003. Moods and Modalities for Will and Would. In *Amsterdam colloquium 2003*, 1–16.

Copeland, B Jack. 2002. The genesis of possible worlds semantics. *Journal of Philosophical Logic* 31(2). 99–137. doi:10.1023/A:1015273407895.

Copeland, B Jack. 2020. Arthur Prior. doi:10.5860/choice.41sup-0181. `https://plato.stanford.edu/archives/spr2020/entries/prior/`.

Corblin, Francis. 2002. *Répresentation du discours et sémantique formelle: Introduction et applications au français*. Paris: Presses Universitatires de France.

Cristofaro, Sonia. 2005. *Subordination*. Oxford University Press. doi:10.1093/acprof:oso/9780199282005.001.0001.

Croft, William. 1991. The Evolution of Negation. *Journal of Linguistics* 27. 1–27. `http://www.jstor.org/stable/4176090`.

Culicover, Peter W & Ray Jackendoff. 1997. Semantic Subordination despite Syntactic Coordination. *Linguistic Inquiry* 28(2). 195–217.

Dąbkowski, Maksymilian & Scott AnderBois. ???? The apprehensional domain in A'ingae (Cofán). In Marine Vuillermet, Eva Schultze-Berndt & Martina Faller (eds.), *Apprehensional constructions*, Berlin: Language Sciences Press.

Deo, Ashwini. 2015. Diachronic Semantics. *Annual Review of Linguistics* 1. 179–197.

Deo, Ashwini. 2017. Marathi tense marking: a window into the lexical encoding of tense meanings.

Dickson, Greg. 2015. *Marra and Kriol: the loss and maintenance of knowledge across an language shift boundary*. Canberra: dissertation. `internal-pdf://209.155.80.11/Marra{_}and{_}Kriol{_}the{_}loss{_}and{_}maintenance.pdf`.

Dixon, Robert M W. 2002. *Australian languages: their nature and development*. New York: Cambridge University Press.

Dowty, David Roach. 1977. Toward a semantic analysis of verb aspect and the English 'imperfective' progressive. *Linguistics & Philosophy* 1(1). 45–77.

Dowty, David Roach. 1979. *Word Meaning and Montague Grammar*. Dordrecht: Kluwer.

Dowty, David Roach. 1982. Tenses, time adverbs, and compositional semantic theory. *Linguistics and Philosophy* 5(1). 23–55. doi:10.1007/BF00390692.

Eckardt, Regine. 2011. Semantic Reanalysis and Language Change. *Language and Linguistics Compass* 5. 33–46.

von Fintel, Kai. 1994. *Restrictions on quantifier domains*. Amherst: University of Massachusetts dissertation. internal-pdf://228.60.152.37/fintel-1994-thesis.pdf.

von Fintel, Kai. 2001. Counterfactuals in a dynamic context. In *Ken hale: a life in language*, chap. 3, 123–52. Cambridge, MA: MIT.

von Fintel, Kai. 2012. Subjunctive conditionals. In Gillian Russell & Delia Graff Fara (eds.), *The routledge companion to philosophy of language*, 466–477. NY: Routledge. internal-pdf://121.226.169.206/fintel-2012-subjunctives.pdf.

von Fintel, Kai & Irene Roswitha Heim. 2011. *Intensional Semantics*.

von Fintel, Kai & Sabine Iatridou. 2008. How to say ought in foreign: The composition of weak necessity modals. In Jacqueline Guéron & Jacqueline Lecarme (eds.), *Time and modality* Studies in Natural Language and Linguistic Theory, 115–141. New York: Springer.

Geis, Michael L & Arnold M Zwicky. 1971. On invited inferences. *Linguistic Inquiry* 2(4). 561–6. http://www.jstor.org/stable/4178090.

Geurts, Bart, David Beaver & Emar Maier. 2016. Discourse Representation Theory. internal-pdf://121.226.169.204/discourse-representation-theory{_}a4.pdfhttps://plato.stanford.edu/archives/spr2016/entries/discourse-representation-theory.

Giannakidou, Anastasia & Alda Mari. 2018. A unified analysis of the future as epistemic modality: The view from Greek and Italian. *Natural Language and Linguistic Theory* 36(1). 85–129. doi:10.1007/s11049-017-9366-z.

Grice, H Paul. 1991. *Studies in the Way of Words*. Cambridge, MA; London: Harvard University Press.

Gutzmann, Daniel. 2015. *Use-Conditional Meaning: Studies in Multidimensional Meaning*. Oxford: Oxford University Press.

Hacquard, Valentine. 2006. *Aspects of Modality*. Cambridge, MA: Massachusetts Institute of Technology Phd dissertation.

Harder, Peter. 1995. Subordinators in a semantic clause structure. In Betty Devriendt, Louis Goossens & Johan van der Auwera (eds.), *Complex structures : A functionalist perspective*, 93–118. Berlin ; New York: De Gruyter. doi:10.1515/9783110815894.93.

Harris, John. 1986. Northern Territory Pidgins and the Origin of Kriol.

Heath, Jeffrey. 1978. *Ngandi grammar, texts and dictionary*. Canberra: Australian Institute of Aboriginal Studies.

Heath, Jeffrey. 1980a. *Basic Materials in Warndarang: grammar, texts and dictionary*. Canberra: Pacific Linguistics. `internal-pdf://121.226.169.193/heath{_}warndarang1980{_}o.pdf`.

Heath, Jeffrey. 1980b. *Nunggubuyu Myths and Ethnographic Texts*. Canberra: Australian Institute for Aboriginal Studies. doi:10.2307/415482.

Heath, Jeffrey. 1981. *Basic Materials in Mara: grammar, texts and dictionary*. Canberra: Pacific Linguistics.

Heim, Irene Roswitha. 1982. *The semantics of definite and indefinite noun phrases*. Amherst: University of Massachusetts, Amherst dissertation.

Hengeveld, Kees & Rafael Fischer. 2018. A'ingae (Cofán/Kofán) Operators. *Open Linguistics* 4(1). 328–355. doi:10.1515/opli-2018-0018. `http://www.degruyter.com/view/j/opli.2018.4.issue-1/opli-2018-0018/opli-2018-0018.xml`.

Horn, Laurence Robert. 1984. Towards a new taxonomy for pragmatic inference: Q-based and R-based implicature. In Deborah Schriffen (ed.), *Meaning, form and use in context: Linguistic applications*, Washington, D.C.: Georgetown University Press. `internal-pdf://57.13.130.89/Horn1984{_}Q{_}R{_}OCR.pdf`.

Hughes, G E & Max J Cresswell. 1996. *A New Introduction to Modal Logic*. Longon: Routledge. doi:10.4324/9780203290644.

Janssen, Theo M V. 2016. Montague Semantics.

Johnson, Marion Rose. 1977. *A semantic analysis of Kikuyu Tense and Aspect*: The Ohio State University Phd dissertation.

Kamp, Hans. 1971. Formal Properties of 'Now'. *Theoria* 37(3). 227–73. doi:10.1163/9789004252882_004.

Kamp, Hans. 1979. Events, Instants and Temporal Reference. In Rainer Bäuerle, Urs Egli & Arnim von Stechow (eds.), *Semantics from different points of view*, 376–. Berlin: Springer. doi:10.1163/9789004252882_005.

Kamp, Hans. 1981. A theory of truth and semantic representation. In Jeroen Groenendijk, Theo M V Janssen & Martin J B Stokhof (eds.), *Formal methods in the study of language, part i*, 277–322. Amsterdam: Mathematsiche Centrum.

Kamp, Hans. 1988. Discourse representation theory: What it is and where it ought to go. In A Bläser (ed.), *Natural language and the computer*, 84–111. Berlin: Springer. doi:10.1007/3-540-50011-1_34.

Kamp, Hans & Uwe Reyle. 1993. *From Discourse to Logic: Introduction to modeltheoretic Semantics of natural language, formal logic and Discourse Representation Theory*. Dordrecht: Springer. doi:10.2307/415752.

Kapitonov, Vanya. 2018. Degrees and scales of Kunbarlang. In *Semantics of triplea 5*, Tübingen: University of Tübingen.

Kaplan, David. 1999. The meaning of ouch and oops: Explorations in the theory of meaning as use.

Kaufmann, Stefan. 2002. The Presumption of Settledness. *Chicago Linguistic Society* 38(2). 313–328.

Kaufmann, Stefan. 2005. Conditional truth and future reference. *Journal of Semantics* 22(3). 231–280. doi:10.1093/jos/ffh025.

Kaufmann, Stefan, Cleo Condoravdi & Valentina Harizanov. 2006. Formal approaches to modality. In William Frawley (ed.), *The expression of modality*, 71–106. De Gruyter. doi:10.1039/DT9770001453.

Kiparsky, Paul. 2006. The Amphichronic Program v s. Evolutionary Phonology. *Theoretical Linguistics* 32. 217–236.

Kiparsky, Paul. 2015. New perspectives in historical linguistics. In Claire L Bowern & Bethwyn Evans (eds.), *The routledge handbook of historical linguistics*, 64–103. Routledge. doi:10.4324/9781315794013.ch2. `http://web.stanford.edu/{~}kiparsky/`.

Klinedinst, Nathan. 2007. Plurals, possibilities, and conjunctive disjunction. *UCL Working Papers in Linguistics 19* 261–284.

Klinedinst, Nathan & Daniel Rothschild. 2012. Connectives without truth tables. *Natural Language Semantics* 20(2). 137–175. doi:10.1007/s11050-011-9079-5.

Kratzer, Angelika. 1977. What 'must' and 'can' must and can mean. *Linguistics and Philosophy* 1. 337–355.

Kratzer, Angelika. 1979. Conditional necessity and possibility. In R Bäuerle, U Egli & Arnim von Stechow (eds.), *Semantics from different points of view*, 117–47. Berlin, Heidelberg: Springer. doi:10.2307/j.ctt2851gx.

Kratzer, Angelika. 1981. The Notional Category of Modality. In Hans-Jürgen Eikmeyer & Hannes Rieser (eds.), *Words, worlds, and contexts: New approaches in word semantics*, 38–74. Berlin; NY: Walter de Gruyter.

Kratzer, Angelika. 1991. Modality. In Arnim von Stechow & Dieter Wunderlich (eds.), *Semantics: An international handbook of contemporary research*, 639–650. Berlin: de Gruyer.

Kratzer, Angelika. 2012. *Modals and Conditionals*. Oxford: OUP.

Kripke, Saul A. 1963. Semantical Analysis of Modal Logic I: Normal modal propositional calculi. *Zeitschrift für mathematische Logik und Grundlagen der Mathematik* 9. 67–96.

Kruijff-Korbayová, Ivana & Bonnie Lynn Webber. 2001. Information structure and the Interpretation of "otherwise". In Ivana Kruijff-Korbayová & Mark Steedman (eds.), *European summer school for language, logic and computation workshop on information structure, discourse structure and discourse semantics*, 67–83. University of Helsinki.

Kuteva, Tania, Bernd Heine, Bo Hong, Haiping Long, Heiko Narrog & Seongha Rhee. 2019. *World Lexicon of Grammaticalization*. Cambridge: Cambridge University Press 2nd edn. doi:10.1017/s0272263104253062.

Laca, Brenda. 2012. On modal tenses and tensed modals. In Chiyo Nashida & Cinzia Russi (eds.), *Building a bridge between linguistic communities of the old and the new world: Current research in tense, aspect, mood and modality*, 163–98. Amsterdam: Rodopi.

Landman, Fred. 1991. *Structures for Semantics* Studies in Linguistics and Philosophy. Dordrecht: Springer Netherlands. doi:10.1007/978-94-011-3212-1. `http://link.springer.com/10.1007/978-94-011-3212-1`.

Leow, James A. 2020. *An amphichronic analysis of modals of necessity in Cuban Spanish*: The Ohio State University Phd dissertation.

Lewis, David. 1973. *Counterfactuals*. Malden, MA: Blackwell.

Lewis, David. 1975. Adverbs of Quantification. In Edward L Keenan (ed.), *Formal semantics of natural language.*, 178–88. Cambrdige University Press.

Lewis, David. 1986. *On the Plurality of Worlds*. Oxford: Blackwell.

Lichtenberk, František. 1995. Apprehensional Epistemics. In Joan Bybee & Susan Fleischman (eds.), *Modality in grammar and discourse*, Amsterdam: John Benjamins.

Markoska-Cubrinovska, Aneta. 2016. Possible worlds in "The Craft of Formal Logic". *Synthese* 193(11). 3459–3471. doi:10.1007/s11229-015-0912-0.

Matthewson, Lisa. 2010. Cross-linguistic variation in modality systems: The role of mood. *Semantics & Pragmatics* 3. 1–74.

McCready, Eric. 2010. Varieties of conventional implicature. *Semantics and Pragmatics* 3(8). 1–57. doi:10.3765/sp.3.8. http://dx.doi.org/10.3765/sp.3.8.

McKay, Graham Richard. 2011. *Rembarrnga, a language of central Arnhem Land*. Munich: LINCOM.

Menzel, Christopher. 2017. Possible worlds. https://plato.stanford.edu/archives/win2017/entries/possible-worlds/.

Merlan, Francesca C. 1983. *Ngalakan grammar, texts and vocubulary* 89. Canberra: Pacific Linguistics.

Merlan, Francesca C. 1989. *Mangarayi*. London: Routledge.

Miestamo, Matti. 2005. *Standard Negation: The Negation of declarative verbal main clauses in a typological perspective*. Berlin; New York: Mouton de Gruyter.

Montague, Richard. 1970. Universal Grammar. *Theoria* 36(3). 373–398. doi:10.1111/j.1755-2567.1970.tb00434.x. http://languagelog.ldc.upenn.edu/nll/?p=2507.

Nishimura, Hirokazu. 1979. Is the semantics of branching structures adequate for chronological modal logics? *Journal of Philosophical Logic* 8(3). 469–475.

Nuyts, Jan. 2005. The modal confusion: on terminology and the concepts behind it. In Alex Klinge & Henrik Høeg Müller (eds.), *Modality: Studies in form and function*, chap. 1, 5–. London: Equinox.

Ockham, William. 1945. *The Tractatus de prædestinatione et de præscientia Dei et defuturis contingentibus*, vol. 11 3. St Bonaventure, NY: Franciscan Institute publications with a stu edn. doi:10.2307/2266752. https://hdl.handle.net/2027/uc1.31822012083044.

Øhrstrøm, Peter & Per F V Hasle. 1995. *Temporal Logic: From Ancient Ideas to Artificial Intelligence*. Dordrecht: Kluwer.

Øhrstrøm, Peter & Per F V Hasle. 2020. Future Contingents.

Parkhouse, Thomas Anstey. 1895. Native tribes of Port Darwin and its neighbourhood. In *Australasian association for the advancement of science, brisbane*, s.l.: s.n. http://nla.gov.au/nla.obj-33683714.

Partee, Barbara Hall. 1984. Nominal and temporal anaphora. *Linguistics & Philosophy* 7. 243–281.

Peirce, Charles Sanders. ???? *The Collected Papers of Charles Sanders Peirce*. Cambridge, MA: Belknap Press electronic edn.

Perry, John. 2012. *Reference and Reflexivity*. Stanford, CA: CSLI 2nd edn.

Peterson, Tyler. 2008. The ordering source and graded modality in Gitksan epistemic modals. `http://www.public.asu.edu/{~}trpete13/papers/Peterson(SuB).pdf`.

Peterson, Tyler. 2010. *Epistemic Modality and Evidentiality in Gitksan at the Semantics-Pragmatics Interface*: University of British Columbia Phd thesis.

Phillips, Josh. 2021. Negation. In Claire Bowern (ed.), *The oxford handbook of australian languages*, chap. 34. Oxford: Oxford University Press.

Phillips, Josh & Hadas Kotek. ???? Discourse anaphoric otherwise: Information structure & modal subordination. `https://ling.auf.net/lingbuzz/004800`.

Phillips, Josh & Hadas Kotek. 2018. Updates & discourse anaphora: a dynamic approach to otherwise. In Maggie Baird & Jonathan Pesetsky (eds.), *Nels 49: Proceedings of the forty-ninth annual meeting of the north east linguistic society*, vol. 3, 19–38. Ithaca, NY: GLSA UMass.

Ploug, Thomas & Peter Øhrstrøm. 2012. Branching time, indeterminism and tense logic: Unveiling the Prior-Kripke letters. *Synthese* 188(3). 367–379. doi:10.1007/s11229-011-9944-2.

Portner, Paul. 2007. Imperatives and modals. *Natural Language Semantics* 15(4). 351–383. doi:10.1007/s11050-007-9022-y.

Portner, Paul. 2009. *Modality*. Oxford: Oxford University Press.

Potts, Christopher. 2007. The expressive dimension. *Theoretical Linguistics* 33. 165. doi:10.1515/TL.2007.011. `www.degruyter.com/view/j/thli.2007.33.issue-2/tl.2007.011/tl.2007.011.xml`.

von Prince, Kilu. 2017. Paradigm-induced implicatures of TAM markers: The case of the Daakaka distal. In Robert Truswell, Chris Cummins, Caroline Heycock, Brian Rabern & Hannah Rohde (eds.), *Proceedings of sinn und bedeutung 21*, 969–984.

von Prince, Kilu. 2019. Counterfactuality and past. *Linguistics and Philosophy* 42(6). 577–615. doi:10.1007/s10988-019-09259-6.

Prior, Arthur Norman. 1957. Time and Modality.

Prior, Arthur Norman. 1958. The syntax of time distinctions. *Franciscan Studies* 18(2). 105–20. doi:10.1353/frc.1958.0008.

Prior, Arthur Norman. 1967. *Past, Present, and Future*, vol. 6: Scienti. Oxford: Oxford University Press.

Reichenbach, Hans. 1947. The Tenses of Verbs. In *The elements of symbolic logic*, chap. 51, 287–98. New York: Macmillan.

Ritz, Marie-Ève, Alan Dench & Patrick Caudal. 2012. Now or Then? The Clitic -rru in Panyjima: Temporal Properties in Discourse. *Australian Journal of Linguistics* 32(1). 41–72.

Roberts, Craige. 1989. Modal Subordination and Pronominal Anaphora in Discourse. *Linguistics & Philosophy* 12. 683–721.

Roberts, Craige. 1990. *Modal subordination, Anaphora, and Distributivity*. New York: Garland Press.

Roberts, Craige. 1995. Domain restriction in Dynamic Semantics. In Emmon Bach, Eloise Jelinek, Angelika Kratzer & Barbara Hall Partee (eds.), *Quantification in natural languages*, vol. II, Kluwer: Dordrecht.

Roberts, Craige. 1996. Anaphora in intensional contexts. In Shalom Lappin (ed.), *The handbook of contemporary semantic theory*, Blackwell.

Roberts, Craige. 2012. Information structure in discourse: Towards an Integrated Formal Theory of Pragmatics. *Semantics & Pragmatics* 5.

Roberts, Craige. 2020. Modal subordination. In Daniel Gutzmann, Lisa Matthewson, Cecile Meier, Hotze Rullmann & Thomas E Zimmerman (eds.), *The wiley blackwell companion to semantics*, Wiley. doi:10.1002/9781118788516.sem102. `http://ling.osu.edu/{~}croberts/roberts.modalsubordination.SemCom.2019.final.pdf`.

Romaine, Suzanne. 1995. The grammaticalization of irrealis in Tok Pisin. In Joan Bybee & Susan Fleischman (eds.), *Modality in grammar and discourse*, 389–428. Amsterdam: John Benjamins.

Rullmann, Hotze & Lisa Matthewson. 2018. Towards A Theory of Modal-Temporal Interaction. *Language* .

Rullmann, Hotze, Lisa Matthewson & Henry Davis. 2008. Modals as distributive indefinites. *Natural Language Semantics* 16(4). 317–357. doi:10.1007/s11050-008-9036-0.

Rumberg, Antje. 2016a. Transition Semantics for Branching Time. *Journal of Logic, Language and Information* 25(1). 77–108.

Rumberg, Antje. 2016b. *Transitions toward a Semantics for Real Possibility*: Universiteit Utrecht Phd dissertation.

Schmerling, Susan F. 1975. Asymmetric conjunction and the rules of conversation. In Peter Cole & Jerry L Morgan (eds.), *Speech acts*, New York: Academic Press.

Schultze-Berndt, Eva, Maïa Ponsonnet & Denise Angelo. 2019. The semantics of modal markers in North Australian Kriol.

Schwager, Magdalena. 2006. Conditionalized Imperatives. *Semantics and Linguistic Theory* 16. 241–58. doi:10.3765/salt.v16i0.2937.

Stalnaker, Robert C. 1968. A Theory of Conditionals. *Ifs* 41–55. doi:10.1007/978-94-009-9117-0_2.

Stalnaker, Robert C. 1979. Assertion. In Peter Cole (ed.), *Syntax and semantics*, vol. 9, New York: Academic Press.

Stalnaker, Robert C & Richmond H Thomason. 1970. A semantic analysis of conditional logic. *Theoria* 36(1). 23–42. doi:10.1111/j.1755-2567.1970.tb00408.x.

Stirling, Lesley & Alan Dench. 2012. Tense, aspect, modality and evidentiality in Australian Languages: Foreword. *Australian Journal of Linguistics* 32(1). 1–6. doi:10.1080/07268602.2012.662888.

Stukker, Ninke & Ted Sanders. 2012. Subjectivity and prototype structure in causal connectives: A cross-linguistic perspective. *Journal of Pragmatics* 44. 169–190.

Tedeschi, Philip J. 1981. Some evidence for a branching-futures model. In *Syntax and semantics 14: Tense and aspect*, 239–70. Academic Press.

The Bible Society in Australia. 2007. *Holi Baibul: the Bible in the Kriol of North Australia*. Minto, NSW: Bible Society in Australia Inc. `http://aboriginalbibles.org.au/Kriol/Conc/root.htm`.

Thomason, Richmond H. 1970. Indeterminist time and truth-value gaps. *Theoria* 36(3). 264–281. doi:10.1111/j.1755-2567.1970.tb00427.x.

Thomason, Richmond H. 1984. Combinations of Tense and Modality. In D Gabbay & Guenthner F (eds.), *Handbook of philosophical logic, vol. ii: Extensions of classical logic*, 135–165. Dordrecht: Reidel. doi:https://doi.org/10.1007/978-94-009-6259-0.

Thomason, Richmond H & Anil Gupta. 1980. A Theory of Conditionals in the Context of Branching Time. In W L Harper, Robert C Stalnaker & G Pearce (eds.), *Ifs*, 299–322. Dordrecht: Springer. doi:10.1007/978-94-009-9117-0_15.

Traugott, Elizabeth Closs & Ekkehard König. 1991. The semantics-pragmatics of grammaticalization revisited. In Elizabeth Closs Traugott & Bernd Heine (eds.), *Approaches to grammaticalization*, vol. 1 189–211. Amsterdam: John Benjamins.

Troy, Jakelin. 1994. *Melaleuka: A history and description of New South Wales Pidgin*: Australian National University dissertation.

Veselinova, Ljuba N. 2016. The negative existential cycle viewed through the lens of comparative data. In Elly van Gelderen (ed.), *Cyclical change continued* Linguisk Aktuell, 139–87. John Benjamins.

Vuillermet, Marine. 2018. Grammatical fear morphemes in Ese Ejja. *Studies in Language* 42(1). 256–293. doi:10.1075/sl.00010.vui.

Webber, Bonnie Lynn. 1988. Tense as discourse anaphor. *Computational Linguistics* 14(2). 61–73.

Webber, Bonnie Lynn, Aravind K Joshi, Matthew Stone & Alistair Knott. 2003. Anaphora and discourse structure. *Computational Linguistics* 29(4). 545–587. doi:10.1162/089120103322753347.

Webber, Bonnie Lynn, Matthew Stone, Aravind K Joshi & Alistair Knott. 2001. Anaphora and Discourse Semantics. Tech. rep. University of Pennsylvania. `http://repository.upenn.edu/ircs{_}reports/30`.

Werner, Tom. 2006. Future and non-future modal sentences. *Natural Language Semantics* 14(3). 235–255. doi:10.1007/s11050-006-9001-8.

Winans, Lauren Danae. 2016. *Inferences of will*: UCLA Phd dissertation. `https://escholarship.org/uc/item/0cz3t955{%}0Ahttps://escholarship.org/uc/item/6cm9v671`.

Zanardo, Alberto. 1996. Branching-time logic with quantification over branches: The point of view of modal logic. *The Journal of Symbolic Logic* 61(1). 1–39.

Zester, Laura. 2010. *The semantics of avoidance and its morphosyntactic expression: Australian languages vs. English*: Heinrich-Heine-Universität Düsseldorf Ma thesis.