Malagasy *maha* at the crossroads of voice, causation and modality*

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1 The puzzle

Since the pioneering work of Bhatt (1999), actuality entailments (AEs) have been associated with the perfective uses of modals (Hacquard, 2006, 2009; Homer, 2011). The examples from French below show that when the ability modal is in the imperfective, as in (1a), the successful completion of the action can be negated. If the modal appears in the perfective aspect, however, successful completion is entailed, thus the infelicity of (1b).

(1) a. Jean pouvait soulever un frigo, mais il ne l'a pas soulevé. ~~(French)~~
Jean could-IMPF lift a fridge, but he not it has lifted

b. Jean a pu soulever un frigo, # mais il ne l'a pas soulevé.
Jean has could (PFV) lift a fridge, but he not it has lifted
'Jean could lift a fridge, but he didn't lift it.'

More recently, however, Martin and Schäfer (2012) argue that non-agentive causative verbs in German and French also create AEs. In (2b), where the external argument of *enseigner* 'teach' is non-agentive, we see an infelicity similar to that in (1b).

(2) a. Pierre lui enseignera le russe, mais elle ne l'apprendra pas.
'Pierre will teach her Russian, but she won't learn it.'

b. Ce voyage lui enseignera le russe, # mais elle ne l'apprendra pas.
'This trip will teach her Russian, but she won't learn it.'

In the context of the literature on AEs, we consider the Malagasy voice prefix *maha-*. Malagasy does not have a rich aspectual system like French, so the contrast in (1) is hard to reproduce in this language. However, Malagasy has an elaborate voice system that it exploits to draw the kind of distinctions in (2). We argue that different voice markers reflect a grammaticalized distinction between agentive and non-agentive causers, which plays a role in the licensing of AEs.

Rajaona (1972) was the first to demonstrate that what we call AEs arise with verbs in Malagasy prefixed with *maha-* in the past tense (3a), not in the present (3b), or with verbs that carry certain other voice markers (3c).

(3) a. # Nahasambotra alika io zaza io nefa faingana loatra ilay alika ka tsy azony.
PST.AHA.catch dog DEM child DEM but fast too DEF dog C NEG do.3
'This child was able to catch a dog but it was too fast, so it didn't get caught by him.'

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b. Mahasambotra alika io zaza io nefa faingana loatra ity alika ity ka tsy
AHA.catch dog DEM child DEM but fast too DEM dog DEM C NEG
azony.
do.3
'This child is able to catch a dog but this dog is too fast so it isn't caught by him.'

c. Nisambotra alika io zaza io nefa faingana loatra ilay alika ka tsy azony.
PST.AT.catch dog DEM child DEM but fast too DEF dog C NEG do.3
'This child caught a dog but it was too fast, so it didn't get caught by him.'

Examples like (3a) pattern with French ability modals in the perfective (1b) and with non-agentive causative verbs (2b). At first sight, the contrast between (3a) and (3c) seems to reside purely in the distinction between what is called actor topic voice (AT) and *maha-*. But when we take a closer look, we observe that the inference arises when *maha-* verbs appear in the past tense (3a), but not in the present tense (3b). This provides a strong indication that *maha-* by itself is not sufficient to trigger an AE, but an interaction between *maha-* and tense is also at stake.

We cannot explain the problem away by arguing that the inference in (3a) is just an implicature. Homer (2011) claims that the AE in (1) qualifies as a bona fide entailment, because it satisfies the presupposition triggered by *too* in the consequent of a conditional, as illustrated in (4).

(4) Si Jean a pu soulever un frigo, Marie$_{[F]}$ aussi en a soulevé un.
if Jean has could(PFV) lift a fridge, Marie too of-it has lifted one.
'If Jean could lift a fridge, Marie could do so as well.'
Presupposition: someone other than Marie lifted a fridge.

Presupposition triggers like *too* are notorious for resisting accommodation, and scalar implicatures do not arise in downward entailing environments. So the felicity of (4) with focus on Marie supports the status of the AE as a (semantic) entailment over a (pragmatic) implicature.

We can apply the same test in Malagasy. The actuality of verbs with *maha-* can satisfy the presupposition triggered by *koa* 'too' in the continuation, as illustrated in (5).

(5) Raha nahabata vato mavestra Rabe dia nambata koa Rasoa$_{[F]}$.
if PST.AHA.lift rock heavy Rabe C PST.AT.lift too Rasoa
'If Rabe was able to lift a heavy rock then Rasoa lifted one too.'
Presupposition: someone other than Rasoa lifted a rock.

Thus the interpretation that Rabe was successful and did indeed lift a heavy rock is not an implicature, but is in fact entailed.

We set aside here any discussion of so-called non-culminating accomplishments (see Koenig and Muansuwan 2001; Bar-el, Davis, and Matthewson 2005). Although earlier analyses of *maha-* in the literature have pursued an aspectual explanation of the pattern in (3), we claim that *maha-* does not encode lexical aspect, and therefore does not encode culmination (we refer the reader to Paul, Ralalaoherivony, and de Swart 2015 for detailed arguments). Rather, we argue in this paper that the different voice markers in Malagasy reflect a grammaticalized distinction between agentive and non-agentive causers, which plays a role in the licensing of AEs. We begin in Section 2 with a brief overview of the literature on AEs and then provide an introduction to the Malagasy voice system in Section 3. In Section 4, we present our analysis, where we show that the combination of a non-agentive causer with a circumstantial modal base gives rise to AEs. Supporting data from Tagalog are discussed in Section 5 and Section 6 concludes.

2 Theoretical background

2.1 Early observations on actuality entailments

As mentioned above, Bhatt (1999) noted the appearance of actuality entailments in French, Hindi, and Greek with perfective uses of modals.

(6) a. Jean pouvait soulever un frigo, mais il ne l'a pas soulevé. (French)
Jean could-IMPF lift a fridge, but he not it has lifted

b. Jean a pu soulever un frigo, # mais il ne l'a pas soulevé.
Jean has could (PFV) lift a fridge, but he not it has lifted
'Jean could lift a fridge, but he didn't lift it.'

In her survey of AEs, Hacquard (2014) concludes that they arise with specific types of modals (ability), in a specific aspect (perfective). Lexical category also plays a role: modal verbs but not nouns like *ability* give rise to AEs. As we discuss in the following sections, the first two parts of Hacquard's claim have been called into question.

2.2 The role of perfective and prospective aspect

Despite Hacquard's assertions, recent work casts doubt on the role of perfective aspect in licensing AEs. In particular, Mari and Martin (2007) and Homer (~~2010,~~ 2011) show that perfective aspect is not a sufficient condition for AEs to arise with modals. Adding certain adverbial modifiers, as in (7), removes the AE.

(7) À plusieurs reprises, Olga a pu soulever le frigo, mais ne l'a pas fait.
on several occasions Olga has could (PFV) lift the fridge, but not it has lifted
'On several occasions, Olga could lift the fridge, but didn't do it.'

Matthewson (2012), on the other hand, takes the opposite approach. She argues that it is not perfective aspect that licenses AEs, but prospective aspect that blocks it. Prospective aspect locates the event in some future time interval with respect to the temporal perspective, and is responsible for the future orientation often associated with root modals (Condoravdi, 2001). Further evidence comes from the Gitksan modal *da'a~~k~~khlxw*, which obligatorily co-occurs with the prospective marker *dim* (Matthewson, 2012). Crucially, such utterances lack actuality entailments, as illustrated in (8).

(8) **da'a~~k~~khlxw**-'y **dim** hahla'alsd-'y k'yoots, ii ap nee=dii wil='y
CIRC.POSS-1SG.II **PROSP** work.1SG.II yesterday and EMPH NEG=CONTR be-1SG.II
'I was able to work yesterday, but I didn't.'

All in all, we see good reasons to loosen up the relation between perfectivity and AEs, and consider the possibility of future orientation playing a role in blocking AEs.

2.3 Sublexical modality

Along similar lines, Martin and Schäfer (2012) question the restriction of AEs to modal verbs, and open up the debate to sublexical modality. They observe that 'defeasible causative' verbs (Oehrle, 1976) display AEs when the subject is an inanimate non-agentive causer, as shown in the French example (9b), while no AE arises with an animate agent, as seen in (9a).

(9) a. Pierre lui enseignera le russe, mais elle ne l'apprendra pas.
'Pierre will teach her Russian, but she won't learn it.'

b. Ce voyage lui enseignera le russe, # mais elle ne l'apprendra pas.
'This trip will teach her Russian, but she won't learn it.'

Earlier analyses of Malagasy have identified two readings of *maha-*, and one of them is labeled the 'causative' interpretation (see Section 4 below), so it is worth diving a bit deeper into Martin and Schäfer's analysis to see how we can exploit their insights for Malagasy.

To account for the pattern in (9), and its counterparts in German, Martin and Schäfer (2012) assign defeasible causative verbs a bi-eventive structure, where modality is present at the sublexical level (Koenig and Davis, 2001). To illustrate their analysis, let us consider the lexical semantics of a verb like teach, as shown below.

(10) $[_{\text{VP}}$ *teach* y]:
λy.λe[**teach**(e) $\wedge$ **theme**(y) $\wedge$ $\Box_{\rho}\exists$e'[**cause**(e,e') $\wedge$ **learn**(e') $\wedge$ **theme**(y,e')]]

In words: the verb *teach* introduces a bi-eventive structure whereby the event *e* of teaching causes an event *e'* of learning. The theme of *e* is linked to the thematic argument of *e'*. The causal relation is under the scope of a necessity modal operator $\Box$ with a modal base ρ, so what is taught is necessarily learned.

The value of ρ is underspecified in the lexicon, and Martin and Schäfer (2012) relate differences in implicative readings to different modal bases associated with the modal operator. The modal base is determined by the external argument: when the external argument is an agent, the modal base is energetic but when the external argument is a non-agentive causer, there is a circumstantial modal base.

(11) a. $\forall$e$\forall$y$\forall$x[[**teach**(ρ,e,y) $\wedge$ **agent**(e,x)] $\rightarrow$ ρ is energetic]
b. $\forall$e$\forall$y$\forall$x[[**teach**(ρ,e,y) $\wedge$ **causer**(e,x)] $\rightarrow$ ρ is circumstantial]

A circumstantial modal base concerns what is possible or necessary given a particular set of circumstances, and is found in different instances of root modality (von Fintel, 2006). Energetic modality is concerned with acts that include an inherent goal or situations that include an inherent result. Performance of the act entails the fulfillment of their goal or result in all situations that are accessible in the modal base (Koenig and Davis, 2001). For an actuality entailment to go through, it is then crucial whether the real world is included in the modal base or not. For instance, both *give* and *offer* encode that the agent performed the act that causes transfer of possession, that is, s/he did more than just 'try' to do something. But performance of the act does not guarantee that possession is successfully transferred: acceptance by the beneficiary only goes through within the modal base. The circumstantial modal base associated with *give* ensures that there is transfer of possession, because the actual world of evaluation is always accessible. However, the selected worlds in an energetic modal base are worlds in which the actions or situations denoted by the verb achieve the goals that motivate those actions, or the inherent consequences that result from the occurrence of the situation. Since the world of evaluation is not necessarily included in the energetic modal base associated with *offer*, the result does not have to be reached in the actual world.

Under this analysis, the difference in modal base drives the presence or absence of the AE. With an energetic modal base, the configuration in (11a) triggers a result implicature under which the learning is achieved when the teacher successfully reaches her goals. This implicature is cancelled when the actual world is not included in the energetic modal base. With a circumstantial modal base, the world of evaluation cannot be filtered out, and it is thus necessarily quantified over by the necessity operator. This gives rise to the result implication in (11b).

The claim that the circumstantial modal base gives rise to AEs connects to earlier observations in the literature that root modals trigger AEs, but epistemic modals do not (Hacquard, 2006,

2014), so Martin and Schäfer's approach is broadening the debate on AEs, but it not necessarily incompatible with it. There is also a connection with aspect, as shown by Piñón (2014), who points out that defeasible causative verbs with agents behave like activities or accomplishments, while the same verbs with non-agentive causers are states (or achievements if interpreted inchoatively). As mentioned above, we argued in earlier work (Paul, Ralalaoherivony, and de Swart, 2015) that *maha*-verbs are not achievements, and so we will not pursue this possible aspectual reinterpretation of Martin and Schäfer's account for Malagasy.

2.4 Intermediate conclusion

In sum, the early literature focused on perfective aspect and modal verbs licensing AEs, but more recent proposals have pointed to the relevance of future orientation, with prospective aspect blocking AEs, and have broadened the empirical domain to verbs exemplifying sublexical modality, where we find similar contrasts to those pointed out between root ability readings and circumstantial modals. It is in this context that we consider Malagasy, where AEs emerge in the absence of a rich aspectual system, and with *maha*-, which is not a modal verb. We therefore now turn to some key background on Malagasy.

3 Background on the Malagasy voice system

Malagasy is an Austronesian language spoken in Madagascar; the unmarked word order is VOS. We follow most syntactic work on Malagasy and assume that there is a major constituent made up of the verb and its internal arguments; the clause-final subject appears to the right of this constituent. Pearson (2005) refers to the former as PredP, while Keenan (2008) calls it P1. Pearson takes the external DP to be in an A' position, where it binds a variable in the PredP. Keenan does not rely on movement or empty operators, but takes P1 to denote a property that applies to the sister DP. We do not commit ourselves to a particular syntax of Malagasy voice, but focus on its compositional semantics, so we remain close to Keenan for that reason. However, we will use the term PredP from Pearson as a simpler descriptive term. As illustrated in (12), Malagasy has a rich system of verbal voice morphology that (simplifying somewhat) indicates the semantic role of the subject (sometimes called the topic or trigger).

(12) a. Actor Topic (AT) – Subject is agent

[$_{\text{PredP}}$ Nanapaka ity hazo ity tamin' ny antsy] i Sahondra.
PST.AT.cut this tree this PST.P DET knife DET Sahondra

'Sahondra cut this tree with the knife.'

b. Theme Topic (TT) – Subject is theme

[$_{\text{PredP}}$ Notapahin' i Sahondra tamin' ny antsy] ity hazo ity.
PST.TT.cut DET Sahondra PST.P DET knife this tree this

'Sahondra cut this tree with the knife.'

c. Circumstantial Topic (CT) – Subject has some other role

[$_{\text{PredP}}$ Nanapahan' i Sahondra ity hazo ity] ny antsy.
PST.CT.cut DET Sahondra this tree this DET knife

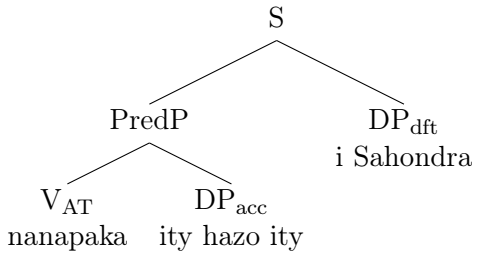
'Sahondra cut this tree with the knife.'

Voice morphology and case marking strongly interact in Keenan's approach.[1] The sister to PredP is always in the default case. Moreover, Keenan posits an important distinction between verb forms that have genitive case and verbs that do not. When the DP associated with the Agent role appears with default case, we find the AT voice morphology, and all other arguments (if any) are marked with accusative case or by prepositions; no DP bears genitive case (the verb is [-gen]). When the DP associated with the Agent role does not appear as the sister to PredP, it bears genitive case (the verb is [+gen]). Different voice morphemes can appear on the verb, depending on which argument bears default case and is the sister to PredP. With TT it is the DP that is interpreted as the theme, with CT it is a DP that bears some oblique role (goal, benefactive, instrument, location, cause, etc.). Case and voice morphology drive the syntax-semantics interface. We illustrate Keenan's approach below.

An eventive verb root like *tapaka* ('cut') denotes a two place-relation between a 'cutter' and a 'cuttee'. When the verb is marked with AT, it first combines with its theme argument (marked with accusative case) to create PredP, and then the agent argument (marked with default case), which appears as the sister to PredP. We provide a simplified syntactic representation in (13b) below.

(13) a. Nanapaka ity hazo ity i Sahondra.
PST.AT.cut this tree this DET Sahondra
'Sahondra cut this tree.'

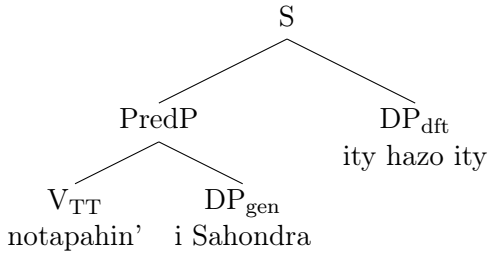
b.



When the verb is marked with TT, it first combines with its agent argument (marked with genitive case), then with other internal argument DPs and adjuncts (if any), and finally the theme argument (marked with default case), which appears as the sister to PredP.

(14) a. Notapahin' i Sahondra ity hazo ity.
PST.TT.cut DET Sahondra this tree this
'This tree was cut by Sahondra.'

b.



The structural differences are reflected in the compositional semantics. The semantics of an AT marked transitive verb V relating an agent to a theme treats the agent as the highest argument, whereas the same verb marked with TT treats the theme as the highest argument. More precisely:

(15) $[\![AT(V)]\!](y)(x) = \text{True iff}$
$\langle x,y\rangle \in \mathbf{V} \wedge \text{Theme}(y, \mathbf{V}) \wedge \text{Agent}(x, \mathbf{V})$ where $\mathbf{V}=[\![V]\!]$

[1]For Pearson (2005), voice is A-bar agreement with the case of the moved DP.

(16) $[\![TT(V)]\!](x)(y) = \text{True iff}$
$<x,y> \in \mathbf{V} \wedge \text{Agent}(x, \mathbf{V}) \wedge \text{Theme}(y, \mathbf{V})$ where $\mathbf{V}=[\![V]\!]$

The AT and TT marked verbs combine with their arguments in different orders, and the semantics in (15) and (16) analyzes them as denoting inverse relations. This is of course reminiscent of active and passive voice in languages like English. However, the Malagasy voice system is much more engrained in the grammar, because it also plays a role in other syntactic phenomena such as relative clause formation and binding, as shown by Keenan (1976). Also, the Malagasy voice system is much richer, and we refer to Keenan (2008), who shows how the CT voice marker alternates with PPs that specify thematic roles such as Goal, Instrument, Location, and Time.

We follow Keenan's morphology-syntax-semantics interface for Malagasy voice. But Keenan is not concerned with the lexical semantics of the verb, and he doesn't provide an analysis of *maha-*. In order to extend this system to *maha*-verbs, we need the bi-eventive structure defined by Davis and Koenig and used by Martin and Schäfer. We go one step further than Martin and Schäfer in that we introduce designated variables e for events and s for states. This is necessary to account for the combination of *maha-* with eventive and stative roots in Section 4.3.

Verbs in Malagasy are built from roots by adding voice morphology and therefore the core of any verb is the root. We propose the bi-eventive structure in (17) as the lexical semantics of the eventive root *tapaka-* ('cut'):[2]

(17) $[_V \text{ cut}]$: $\lambda x \lambda y \lambda e\ [\text{Cut}(e) \wedge \text{Cutter}(x,e) \wedge \text{Cuttee}(y,e) \wedge \Box_\rho \exists s\ [\text{Be-cut}(s) \wedge \text{Cause}(e,s) \wedge \text{Theme}(y,s)]$

In words: eventive roots like *tapaka-* ('cut') introduce an event and a resulting state. The lexical semantics of the root provides the descriptive content of the event (in this case we are dealing with a cutting event) as well as that of the consequent state that is caused by the event (in this case the state of the theme of the cutting event being cut). The argument y involved in the cutting event is identified as the theme of the result state.

What we see when we combine the lexical semantics of the eventive root in (17) with the semantics of the voice markers in (15) and (16) is that AT and TT help us to identify the cutter as the agent and the cuttee as the theme of the event e of cutting. We obtain the following semantics for the PredPs in (18a) and (18b):

(18) a. $[_{\text{PredP}}$ AT.cut the tree with a knife$]$:
$\lambda e \lambda x \exists z \iota y\ [\text{Cut}(e) \wedge \text{Agent}(x,e) \wedge \text{Tree}(y) \wedge \text{Theme}(y,e) \wedge \text{Knife}(z) \wedge \text{Instrument}(z,e) \wedge \Box_\rho \exists s\ [\text{Be-cut}(s) \wedge \text{Cause}(e,s) \wedge \text{Theme}(y,s)]]$

b. $[_{\text{PredP}}$ TT.cut Sahondra with a knife$]$:
$\lambda e \lambda y \exists z\ [\text{Cut}(e) \wedge x{=}\text{Sahondra} \wedge \text{Agent}(x,e) \wedge \text{Theme}(y,e) \wedge \text{Knife}(z) \wedge \text{Instrument}(z,e)] \wedge \Box_\rho \exists s\ [\text{Be-cut}(s) \wedge \text{Cause}(e,s) \wedge \text{Theme}(y,s)]]$

Following Keenan (2008), we assume that the PP in (12a) and (12b) specifies the thematic role of the knife as an Instrument. Application of the AT and TT marked PredP to the DP in default case, and the interpretation of past tense leads to the semantics of the clauses in (19a) and (19b):

(19) a. $[_S\ [_{\text{PredP}}$ AT.cut the tree with a knife$]\ [_{\text{DP}}\ \text{Sahondra}_{\text{dft}}]]$:
$\exists e \exists z \iota y\ [\text{Cut}(e) \wedge x = \text{Sahondra} \wedge \text{Agent}(x,e) \wedge \text{Tree}(y) \wedge \text{Theme}(y,e) \wedge \text{Knife}(z) \wedge \text{Instrument}(z,e) \wedge e \subseteq r \wedge r < \text{now} \wedge \Box_\rho \exists s\ [\text{Be-cut}(s) \wedge \text{Cause}(e,s) \wedge \text{Theme}(y,s)]]$

[2]To simplify our representations, we label *tapaka* with 'V', but most roots are either adjectives or nouns; a small handful are verbs.

b. [$_{S}$ [$_{PredP}$ TT.cut Sahondra with a knife] [$_{DP}$ the tree$_{dft}$]]:
$\exists e \exists z \iota y$ [Cut(e) $\wedge$ x = Sahondra $\wedge$ Agent(x,e) $\wedge$ Tree(y) $\wedge$ Theme(y,e) $\wedge$ Knife(z) $\wedge$ Instrument(z,e) $\wedge$ e $\subseteq$ r $\wedge$ r $<$ now $\wedge$ $\Box_{\rho}\exists$s [Be-cut(s) $\wedge$ Cause(e,s) $\wedge$ Theme(y,s)]]

The past tense introduces a reference point *r* preceding the speech time *now*. In the absence of aspectual marking, we take the past tense to be aspectually transparent, and it simply passes on the eventive/stative nature of the root to the semantics. Because *tapaka-* ('cut') is an eventive root, we take it to denote an event. In line with standard views on lexical and grammatical aspect, we take events to be included in *r* (e $\subseteq$ r). In the end, the examples in (12) are not crucially different in their final representation: all sentences denote a past event of cutting that involves an Agent, a Theme and an oblique argument, and a causal relation between the cutting of the tree and the tree being cut. But the situational core is built up differently.

In (19a) and (19b), the event *e* of cutting is anchored to the time axis by means of tense. But whether the resulting state *s* of the tree being cut is true in the world of evaluation depends on the modal base ρ associated with necessity operator $\Box$. With Martin and Schäfer, we assume that the modal base associated with eventive roots remains underspecified in the lexicon. In German and French, the external argument is responsible for the specification of ρ (cf. (11) above). We claim that in Malagasy, the voice marker assumes this responsibility. We take the agentive causer (*Sahondra* in (12)) in AT, TT and CT voice to associate an energetic modal base with the eventive root. The result of the tree being cut is thus necessarily reached upon completion of the event, but the set of worlds in which the result comes true is restricted to the set of worlds in which the agent reaches her goals. In an energetic modal base, the real world may or may not be included in the set of worlds quantified over. We thus account for the fact that, although there is no lack of culmination associated with the examples in (12), there are no actuality entailments with AT, TT and CT. In the next section, we show how a difference in modal base triggered by *maha-* constitutes one of the ingredients of the AE in Malagasy.

4 *Maha-* introduces a non-agentive causer

4.1 The challenges raised by *maha-*

Recall that our goal is to account for AEs with *maha-* verbs in the past tense (20a), and rule out AEs with *maha-* in the present tense (20b), or past tense with other voices (20c)-(20d).

(20) a. # Nahasambotra alika io zaza io nefa faingana loatra ilay alika ka tsy azony.
PST.AHA.catch dog DEM child DEM but fast too DEF dog C NEG do.3
'This child was able to catch a dog but it was too fast, so it didn't get caught by him.'

b. Mahasambotra alika io zaza io nefa faingana loatra ity alika ity ka tsy azony.
AHA.catch dog DEM child DEM but fast too DEM dog DEM C NEG do.3
'This child is able to catch a dog but this dog is too fast so it isn't caught by him.'

c. Nisambotra alika io zaza io nefa faingana loatra ilay alika ka tsy azony.
PST.AT.catch dog DEM child DEM but fast too DEF dog C NEG do.3
'This child caught a dog but it was too fast, so it didn't get caught by him.'

d. Nosamborin' io zaza io ilay alika nefa faingana loatra ilay alika ka tsy
PST.TT.catch DEM child DEM DEF dog but fast too DEF dog C NEG
azony.
do.3
'This child caught the dog but it was too fast, so it didn't get caught by him.'

So far, we have dealt with the AT and TT verbs in (20c) and (20d). In Section 3, we argued that they do not trigger AEs, because an energetic modal base is involved. The aim of this section is to explain why AEs arise with *maha-* verbs in the past tense (20a), but not the present tense (20b). In order to do so, we must proceed in two steps, because it has been noted in the literature on Malagasy that *maha-* verbs appear to allow two distinct interpretations, abilitive and causative, as in the examples below (adapted from Phillips (1996, 2000)).

(21) a. Mahaongotra fantsika amin' ny tanana Rabe.
AHA.pull-out nail with DET hand Rabe
'Rabe can pull out nails with his hands.'

b. Mahafinaritra an' i Soa Rabe.
AHA.happy ACC DET Soa Rabe
'Rabe makes Soa happy.'

As argued by Phillips (1996, 2000), eventive roots such as *sambotra* 'catch' in (20a) and (20b), and *ongotra* 'action of pulling out' in (21a) give rise to abilitive readings, but when *maha-* combines with a stative root such as *finaritra* 'happy' in (21b) the interpretation is causative. We work out the semantics of *maha-* with eventive roots in Section 4.2, and extend the analysis to stative roots in Section 4.3.

What the two readings have in common is that Rabe is not treated like an agent, the way we have seen this for AT, TT and CT voice markers, so we treat the abilitive and causative interpretations in (21) as the outcome of a singular underlying semantics of *maha-*. Independent evidence in favor of the non-agentive interpretation of the argument external to the PredP in examples like (21a) and (21b) comes from the incompatibility of *maha-* with agent-oriented adverbs (Phillips, 1996, 2000; Travis, 2010). We illustrate in the contrast between (22a) where the main verb *nameno* 'fill' is AT and (22b) with *mahafeno*.

(22) a. Nanao fanahy iniana nameno tavoahangy Rakoto.
PST.AT.do spirit TT.do-on-purpose PST.AT.fill bottle Rakoto
'Rakoto deliberately filled bottles.'

b. # Nanao fanahy iniana nahafeno tavoahangy Rakoto.
PST.AT.do spirit PST.TT.do-on-purpose PST.AHA.fill bottle Rakoto
'Rakoto was deliberately able to fill bottles.'

Verbs with AT morphology, such as *nameno* 'fill' are compatible with adverbials such as *nanao fanahy iniana* 'deliberately', while *maha-* verbs, such as *nahafeno* 'fill' are not. With these observations in place, we turn now to our analysis.

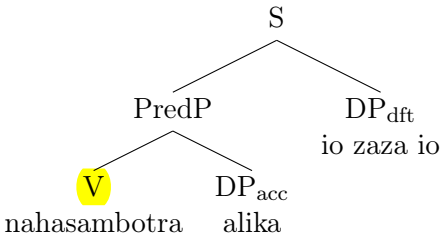
4.2 The syntax-semantics interface *maha-* with eventive roots

We take our starting point in the lexicon-syntax-semantics interface developed in Section 3, and begin with the lexical semantics of the root *sambotra* 'catch'. The bi-eventive structure we propose in (23) mirrors the lexical semantics of *tapaka* ('cut') in (17).

(23) $[_V$ catch]: $\lambda x \lambda y \lambda e$ [Catch(e) $\wedge$ Catcher(x,e) $\wedge$ Catchee(y,e) $\wedge$ $\Box_\rho \exists$s [Be-caught(s) $\wedge$ Cause(e,s) $\wedge$ Theme(y,s)]

Verbs with *maha-* head a PredP that contains all the internal arguments of the root, just like other voice markers do. This leads to the syntactic structure (24) for the first clause of (20a) (we refer the reader to Travis 2016, for a more detailed syntactic analysis).

(24)



In line with the observations made with respect to (2) and (22), we take the core contribution of *maha-* to be the identification of the "catcher" as a non-agentive causer. (25) is the adapted version of Keenan's (2008) analysis of voice to *maha-*.

(25) $[\![$*maha*-(V)$]\!]$(y)(x) = True iff
<x,y> $\in$ **V** $\wedge$ Theme(y, **V**) $\wedge$ Causer(x, **V**) where **V** = $[\![$V$]\!]$

Verbs with *maha-* head a PredP that contains all the internal arguments of the root. The application of (25) to the syntactic structure in (24) results in the semantics in (26).

(26) $[_{PredP}$ *maha*-catch the dog$_{acc}$]:
$\lambda x \iota y \lambda e$ [Catch(e) $\wedge$ Catcher(x,e) $\wedge$ Causer(x) $\wedge$ Dog(y) $\wedge$ Catchee(y,e) $\wedge$ Theme(y,e) $\wedge$ $\Box_\rho \exists$s [Be-caught(s) $\wedge$ Cause(e,s) $\wedge$ Theme(y,s)]]

In line with Martin and Schäfer (2012), we take the non-agentive causative nature of *maha-* to support the selection of a circumstantial modal base as the value of ρ. This explains the potential of AE with this voice marker. We are careful to specify this as a potential, because root modals also come with a circumstantial modal base, and we know from the analyses discussed in Section 2 above that they give rise in particular temporal/aspectual configurations, but not in others. We see this in Malagasy as well, with the contrast between past tense (20a) and present tense (20b). So we need to zoom into the next step of the derivation, namely the combination with the subject, and with tense.

Combining the PredP in (26) with its DP sister, and interpretation of past tense results in the semantics for the clause in (27):

(27) $[_S$ $[_{PredP}$ *maha*-catch the dog$_{acc}$] $[_{DP}$ this child$_{dft}$]]:
$\exists e \iota x \iota y$ [Catch(e) $\wedge$ Catcher(x,e) $\wedge$ Child(x) $\wedge$ Causer(x,e) $\wedge$ Dog(y) $\wedge$ Catchee(y,e) $\wedge$ Theme(y,e) $\wedge$ e $\subseteq$ r $\wedge$ r $<$ now $\wedge$ $\Box_\rho \exists$s [Be-caught(s) $\wedge$ Cause(e,s) $\wedge$ Theme(y,s)]]

In languages with a perfective/imperfective contrast in the past tense (Hindi, French), the perfective past is required to obtain an AE (but see Section 5 for a discussion of Tagalog). Malagasy is not a grammatical aspect language, but of course it does establish a distinction between stative and eventive roots, so we have lexical aspect (sometimes called Aktionsart or situational class). The fact that we are dealing with an eventive root implies that we have a configuration in which *e* is included in the reference time (see Section 3). Past tense is aspectually neutral, and just contributes the location of *r* before now. We take the e $\subseteq$ r configuration to be responsible for lack of a future temporal orientation: the orientation time *r* is stated to precede the *now* (r $<$ now), and if *e* is included in *r*, the whole event not only precedes the *now*, but doesn't look forward beyond *r*.

The combination of a circumstantial modal base, the aspectual information e $\subseteq$ r, and past time reference r $<$ now is sufficient to trigger the actuality entailment in (20a): we are dealing with a completed event e in the past, no prospective aspect, and the circumstantial modal base implies that the causal result of e is true in the real world.

Martin and Schäfer link the distinction between agentive and non-agentive causers to animacy. Indeed, the agent of (2a) is animate, and the non-agentive cause in (2b) is inanimate. The animacy distinction is not strict in German and French, but it is a strong tendency. The felicity of animate/human DPs external to the *maha-* marked PredP in (20a) and (20b) shows that animacy does not play a role in Malagasy, and the distinction between agentive/non-agentive causers is purely driven by the voice system. The fact that *maha-* imposes a non-agentive role on the highest argument of an eventive root seems to be responsible for the abilitive reading of the external argument in configurations like (21a).

We can use the insights about combination of tense and modality to explain why no AE arises with the present tense in (20b). Unlike the past tense, the present tense is not aspectually neutral. Comrie (1976) drew the typological generalization that (simple) present tenses are never perfective, but always imperfective. We try to avoid the perfective/imperfective terminology here, because Malagasy does not have formal grammatical aspect markers. Rather, we build on Matthewson's (2012) distinction between prospective and non-prospective aspect. More specifically, we take aspectually unmarked (simple) present tenses to have a future orientation by default. As pointed out by Matthewson, a prospective temporal orientation blocks the AE, while lack of a prospective orientation brings out the AE. The future orientation of the simple present then explains why no AE arises in (20b).

Summing up, we propose an analysis of Malagasy in which the contrast between (20a) and (20c)-(20d) is derived as a consequence of the difference in sublexical modality. While *maha-* comes with a circumstantial modal base, the AT and TT voice markers trigger an energetic modal base, which does not necessarily include the real world. Energetic modality is prospective, but circumstantial modality is not (Martin and Schäfer, 2012). Thus no AEs are predicted to arise with AT and TT. The future orientation of the simple present blocks the AE in (20b), but the simple past is aspectually neutral, so with eventive roots, there is no future orientation, and thus nothing blocks the AE in (20a). We conclude that AEs in Malagasy arise out of the combination of sublexical modality (energetic vs. circumstantial modal base), lexical aspect (events are included in their reference time) and tense (past tense, unlike present tense, is aspectually neutral).

4.3 Stative roots

In the preceding section, we considered an eventive root, *sambotra* 'catch'. Many roots in Malagasy, however, are stative and describe a result state, e.g. *finaritra* 'happy'; **happy**(e'). It is not plausible to attribute a bi-eventive structure to such roots. Without the bi-eventive structure, however, *maha-* cannot apply to such a root, because there is no agentive causer that it can reinterpret as non-agentive. We suggest that these cases involve coercion: the stative root is reinterpreted in terms of a bi-eventive structure in which the state described by the root constitutes the descriptive content of the state s, the result of an underspecified causing event e. Note that we have also enriched the argument structure, so after coercion we are dealing with a transitive root.

(28) $[_{V}\ C_{se}(\text{happy})]$:
$\lambda x \lambda y \lambda e\ [\text{Theme}(y,e) \wedge \Box_{\rho} \exists s\ [\text{Happy}(s) \wedge \text{Cause}(e,s) \wedge \text{Theme}(y,s)]]$

After coercion, *maha-* can apply to the root, identifying the x variable as the causer:

(29) $[_{\text{PredP}}$ *maha*-C_{se}(Soa_{acc} happy)]:
$\lambda x \lambda e$ [Causer(x,e) $\wedge$ y=Soa $\wedge$ Theme(y,e) $\wedge \Box_{\rho} \exists s$ [Happy(s) $\wedge$ Cause(e,s) $\wedge$ Theme(y,s)]]

Adding Rabe as the sister of the PredP spells out who is the non-agentive causer:

(30) $[_{\text{TP}}$ $[_{\text{PredP}}$ *maha*-C_{se}(Soa_{acc} happy)] $[_{\text{DP}}$ Rabe_{dft}]]:
λe [x=Rabe $\wedge$ Causer(x,e) $\wedge$ y=Soa $\wedge$ Theme(y,e) $\wedge \Box_{\rho} \exists s$ [Happy(s) $\wedge$ Cause(e,s) $\wedge$ Theme(y,s)]]

Here the external argument (*Rabe*) is interpreted as causing the result state (*Soa being happy*). The basic interpretation of *maha-* as imposing a non-agentive role on the external argument strongly brings out the causative reading with stative roots. With this interpretation in mind, we look at the range of readings of *maha-* in the following section.

4.4 The range of interpretations *maha-* can have

In the literature on *maha-* there is a long-standing debate about whether or not this voice marker is ambiguous between an abilitive and a causative interpretation (Rajaona, 1972; Dez, 1980; Phillips, 1996, 2000). We repeat the relevant examples in (31), where (31a) illustrates the abilitive reading and (31b) illustrates the causative reading.

(31) a. Mahaongotra fantsika amin' ny tanana Rabe.
AHA.pull-out nail with DET hand Rabe
'Rabe can pull out nails with his hands.'

b. Mahafinaritra an' i Soa Rabe.
AHA.happy ACC DET Soa Rabe
'Rabe makes Soa happy.'

The analysis in this paper accounts for the two readings. The abilitive reading emerges in configurations where the combination of the eventive root with any of the AT, TT and CT voice markers would lead to an agentive interpretation of the highest argument, in line with the expected thematic grid of the root, yet *maha-* imposes a non-agentive interpretation. With stative roots such as *finaritra* 'happy' in (31b), coercion results in an interpretation where the external argument causes the result state, hence the saliency of the causative reading. The unified semantics we propose in (25) above covers both, so we agree with Dez (1980) and Phillips (1996, 2000) that there is one *maha-*.

In fact, there are other non-agentive readings possible with *maha-*: certain utterances have an 'accidentally' reading, as shown in (32).

(32) a. Nahasotro poizina izy
PST.AHA.drink poison 3
'He drank poison.'

b. Nahatelina moka aho
PST.AHA.swallow mosquito 1SG
'I swallowed a mosquito.'

c. Nahapetraka teo ambony tsilo i Soa
PST.AHA.sit PST.LOC on thorn DET Soa
'Soa sat on a thorn.'

What unifies the interpretations associated with *maha-* is non-agentivity. Independent evidence for the absence of agentivity comes from the incompatibility of *maha-* with agent-oriented adverbs,

as mentioned above. We leave a complete discussion of these readings for future research, but we note that a similar range of interpretations arise with the St'át'imcets circumstantial modal (Davis, Matthewson, and Rullmann, 2009).

5 Tagalog

Before concluding, we provide independent support for our analysis from a related language, Tagalog. As described by Dell (1983/1984) and Kroeger (1993), Tagalog has an "ability involuntary action" (AIA) voice (Schachter and Otanes, 1972, 330-333) that is associated with AEs. In (33) below, the successful completion of the action is asserted – just as we have seen with *maha-* in Malagasy.

(33) Nakunan ni Ben ng litrato si Luisa
AIA-PF-take GEN Ben GEN picture NOM Luisa
'Ben managed to take a picture of Luisa.'
'Ben involuntarily took a picture of Luisa.'

Moreover, as discussed in detail by Dell, the end result comes about because of circumstances often beyond the agent's control, as indicated by the translations. On the other hand, non-AIA voices (Dell calls these "neutral") implicate the successful completion of the action, but do not entail it – like AT, TT and CT voices in Malagasy. The neutral voice is illustrated in the first clause of (34).

(34) Itinulak ni Ben ang bato pero hindi niya naitulak dahil napakabigat niyon
N-PF-push GEN Ben NOM rock but NEG 3GEN AIA.PF-push because very-heavy GEN-that
'Ben pushed the rock, but he could not make it move, because it was so heavy.'
(lit.) 'Ben pushed the rock, but he couldn't push it because it was so heavy.'

Unlike Malagasy, however, Tagalog has a rich system of aspect: imperfective, perfective and contemplated. When imperfective aspect combines with AIA forms, an AE is still present. When prospective aspect combines with AIA, however, the AE disappears (Dell, 1983/1984).

(35) a. Nagpunta sana si Ben kahapon, kung
come would NOM Ben yesterday if
'Ben would have come yesterday, if...'

b. makakapunta siya
AIA-CTP-come NOM-he
'... he had been able to.'

c. # nakakapunta siya
AIA-IMPF-come NOM-he

The first clause in (35a) implies that Ben did not come. The continuation in (35c) with AIA and imperfective aspect asserts that he did come, giving rise to infelicity. With contemplated aspect, as in (35b), there is no such assertion and the result is felicitous.

We suggest that in Tagalog neutral voice is like AT, TT and CT and involves an energetic modal base. The AIA morphology introduces a circumstantial modal base, parallel to *maha-*. Following the description in Schachter and Otanes 1972, perfective and imperfective aspects in Tagalog indicate that the event has begun. Contemplated aspect, however, indicates that the event has not begun. We therefore propose that contemplated aspect has a prospective temporal orientation (Matthewson,

2012), blocking the AE in examples such as (35b), much like present tense in Malagasy. Thus Tagalog provides further support for dissociating AEs from perfective aspect, as AEs in this language arise with both perfective and imperfective aspect.

6 Conclusion

In this paper, we have provided arguments from Malagasy confirming that actuality entailments are not limited to modal verbs and to perfective aspect. We drew on work by Martin and Schäfer (2012) to argue that while modality plays a role, it can be sublexical. Moreover, the role of aspect depends on contrasts in a language. What appears to be crucial for AEs is the notion of a non-agentive causer that triggers a circumstantial modal base. This connection between the agentivity of the external argument and an energetic modal base is the subject of much discussion in the recent literature, and there are relevant connections to explore with aspect, in particular non-culminating events (e.g. Demirdache and Martin 2015). We hope to explore this connection in more detail in future research.

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