Ojibwe Agreement in Lexical$_{\text{Realizational}}$ Functional Grammar*

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1 Our project

- We are developing a theoretical framework that couples Lexical-Functional Grammar (LFG; Bresnan et al. 2016) with the realizational, morpheme-based approach to word-formation of Distributed Morphology (DM; Halle and Marantz 1993)
- The resulting framework, which we call Lexical-Realizational Functional Grammar (L_RFG), is particularly well-suited to model Canadian Indigenous languages, which are characterized by *polysynthesis* and *nonconfigurationality*
- In this talk we will summarize the framework, and demonstrate it with an analysis of Ojibwe inflection
- The talk will proceed as follows:
  - Section 2 outlines the L_RFG framework, comparing and contrasting it to standard LFG and providing details on the exponence function
  - Section 3 provides a brief introduction to Ojibwe, and a background on relevant aspects of the language's morphosyntax
  - Section 4 provides a demonstration of our analysis, including the structures of a representative example sentence, as well as presentation and discussion of the templates used and specifications of the Vocabulary Items needed for animate agreement in Ojibwe and for the examples in the handout
  - Section 5 indicates some directions for future research
  - The appendices provide structures for additional example sentences, demonstrating most of the Ojibwe agreement morphology under discussion (A) and a revised Correspondence Architecture (B)

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2 The framework

2.1 Comparison with standard LFG

- L_RFG is similar to standard LFG, with changes to the c-structure and its relationship with words/morphemes
- The terminal nodes of c-structures *are not words*, but instead are f-descriptions (sets of f-structure equations and constraints)
- The c-structure is mapped to a v(ocabulary)-structure, a linearized structure in which vocabulary items (VIs) *expone* (i.e., realize) the features in the terminal nodes, via a correspondence function, ν.
- Formally, v-structure is a list, each member of which a feature structure with four attributes: PHON(OLOGY), DEP(ENDENCE), CLISIS, and ALIGN(MENT)
  - The value of PHON(OLOGY) is the morphophonological realization of the VI, represented as a list of phonological elements (e.g., bundles of distinctive features, or whatever phonological rules take as inputs)
  - The value of DEP(ENDENCE) is itself a feature structure
    - It contains the features CLISIS and ALIGN.
    - The feature CLISIS has values EN or PRO and is used to encode whether a clitic is an enclitic or a proclitic.
    - The feature ALIGN has values R(IGHT) or L(EFT) and captures whether the item is realized on the right (suffixal) of the host VI or to its left (prefixal)[1]
    - The CLISIS and ALIGN features thus allow us to encode directionality of clisis and affixation independently[2]
    - A VI can thus be represented abstractly as follows:

      (1)
      $$\begin{bmatrix} \text{PHON} & \langle \ldots \rangle & \\ \text{DEP} & \begin{bmatrix} \text{CLISIS} & \text{EN/PRO} \\ \text{ALIGN} & \text{R/L} \end{bmatrix} \end{bmatrix}$$
- The order of c-structure terminal nodes is preserved in the v-structure, except for possible local flipping of affixes/clitics, governed by the CLISIS and ALIGN features.
  - We define the set of terminal nodes, T, where N is the set of c-structure nodes and $\mathcal{M}$ is the mother function on nodes:

    (2) $\{n_1 \in N \mid \neg\exists n_2 \in N.\mathcal{M}(n_2) = n_1\}$

[1] We simplify the content of ALIGN here, but we anticipate needing to add more structure to its value, in order to handle certain kinds of affixation, such as the English de-adjectival verbalizer *-en*, which requires monosyllabicity and final obstruence. In other words, a more articulated ALIGN will have to include a way to refer to phonological properties of the base, such that we might have to add some kind of BASE feature to the DEP structure.

[2] The canonical case will have enclitics aligning to the right and proclitics aligning to the left (i.e., canonically, proclitics are prefixal and enclitics are suffixal), such that there is no mismatch in linear order between c-structure and v-structure. However, specifying the CLISIS and ALIGN features separately allows for mismatches between the direction of clisis and affixation. Thus, an expression may be a suffixal proclitic, being phonologically dependent on an element to its right (in the c-structure) but appearing as a suffix on its host, such as the Latin conjunction *que*; or it may be a prefixal enclitic, appearing as a prefix on a host to its left, such as Romance object clitics.

Note that in this paper there are no cases of flipping, so the order of terminal nodes in c-structure is strictly the same as the order of their ν-correspondents in v-structure, so we can make the simplifying assumption that:

(3) $\forall n_1, n_2 \in T. n_1 < n_2 \leftrightarrow \nu(n_1) < \nu(n_2)$

- Vocabulary structure is a morphophonological structure that maps to phonological form.
  - In other words, v-structure precedes the phonological string in the Correspondence Architecture (see, e.g., Asudeh 2012, 53), resulting in the revised architecture in Appendix B.
  - We capture this by introducing a new phonological correspondence function, o, which maps from vocabulary items to phonological outputs; in other words, the output of o is the output of phonology, a set of strings that are based on the PHON and DEP features of VIs.
  - In other words, the morphology is responsible for the input to phonology, but phonology does whatever phonology does to create the output, which is not part of morphology per se.
  - Given the set of VIs, V, and a set of phonological strings, P:

    (4) $o : V \rightarrow P$

- The relationship between terminal nodes and VIs is many-to-one, using the mechanism of *Spanning* (Haugen and Siddiqi 2016; Merchant 2015; Ramchand 2008; Svenonius 2016); i.e. one VI may realize features of multiple terminal nodes
- The result is similar to the Lexical Sharing model of Wescoat (2002, 2005), but maintains the complex internal structures of words as part of syntax
- In this paper, only the strings themselves are relevant, so we make some simplifying assumptions:
  1. We represent the output of the exponence function, ν, simply as a string, not a full VI structure
  2. We show alignment informally using the standard notational convention of adding a dash to the left or right of the string
  3. We do not show the o-mapping, but instead let the phonological forms stand in for the VI strings (i.e., we conflate the two for simplicity/presentational purposes)

2.2 The exponence function ν

- The exponence function ν maps from a pair of arguments to a VI, the exponence of the arguments.
  - The first argument is a list of pre-terminal categories, typically of length 1, which are taken in the linear order they appear in the tree.
  - The second argument is itself a function, Φ, which maps an f-description to the set of f-structures that satisfy the description; i.e. $\Phi(d \in D) = \{f \in F \mid f \models d\}$, where D is the set of valid f-descriptions and F is the set of f-structures.[3]

[3]We thank Ron Kaplan (p.c.) for discussion of this point. Any remaining errors are our own.

– In sum, ν maps **from** a pair whose first argument is a list of c-structure pre-terminal categories and whose second argument is a set of f-structures **to** a structured expression as described above.

- **Conditions on exponence:**
  - Let V be the range of the exponence function ν, the set of VIs (structured expressions); then the following condition on exponence holds.[4]

    (5) Given $\alpha \in A$ and $\beta \in B$, where $A, B \subseteq V$, and a function $[\![\ ]\!]_p$ that returns the conventionalized presuppositions of a given expression,
    If $\bigcup_{a \in A} [\![a]\!]_p = \bigcup_{b \in B} [\![b]\!]_p$
    Then **MostInformative**(α, β)

    - The conventionalized presuppositions of an expression are the set of presuppositions lexically triggered by the expression (Keenan 1971; Beaver 2001; Beaver and Geurts 2014). Presuppositions are propositions. Propositions are sets of possible worlds. Therefore, $[\![\ ]\!]_p$ returns a set of sets of possible worlds.
    - The antecedent of the conditional in (5) therefore collects the conventionalized presuppositions of its arguments in two sets and tests whether the sets are equal.
    - **MostInformative**(α, β) returns whichever of α,β has the most specific f-structure in the set of f-structures returned by Φ applied to the unions of α/β's collected f-descriptions. Formally:

      $$\textbf{MostInformative}(\alpha, \beta) = \begin{cases} \alpha \textbf{ if } \exists f \forall g . f \in \pi_2(\nu^{-1}(\alpha)) \wedge g \in \pi_2(\nu^{-1}(\beta)) \wedge g \sqsubset f \\ \beta \textbf{ if } \exists f \forall g . f \in \pi_2(\nu^{-1}(\beta)) \wedge g \in \pi_2(\nu^{-1}(\alpha)) \wedge g \sqsubset f \\ \bot \textbf{ otherwise} \end{cases}$$

    - Thus, the condition in (5) amounts to a combination of the elsewhere condition/subset principle and an economy constraint that enforces spanning when possible

3 Ojibwe: Background

3.1 Why look at Ojibwe?

- Ojibwe exhibits many of the features that we hope to be able to model:
  - Nonconfigurationality – word order is very free (i.e., determined by discourse and pragmatic, rather than syntactic, factors)[5]
  - Polysynthesis – complex verb morphology with extensive head-marking
  - A direct-inverse-based agreement system cross-referencing all core arguments
  - Various morphological processes, including verbal reflexives, noun incorporation, applicatives, various kinds of (anti)passives, and more

[4] One difference between our proposal and the lexical sharing of Wescoat (2002, 2005, 2007) is the notion, which we'll call *Pac-Man Spanning*, that VIs can span any number of adjacent preterminal nodes, so long as the presuppositions of the exponed expressions are held constant.

[5] When we say that Ojibwe is "nonconfigurational", we do not intend to claim that word order is completely free. We are using the term in the LFG sense (Bresnan et al. 2016), meaning that word order and phrase structure are not used to distinguish grammatical functions like subject and object. Instead, word order is determined by a combination of factors, including obviation and information structure; see Dahlstrom (2017) for extensive discussion and references.

3.2 Ojibwe primer: Prominence, animacy and obviation

- Ojibwe grammar has many features that are mostly shared with the other Algonquian languages, but fairly uncommon outside the family:
  - Typical **polysynthetic** morphysyntactic features, including nonconfigurationality, extensive head-marking, and various kinds of incorporation
  - Agreement morphology determined by a **prominence hierarchy**, which involves:
    - A system of grammatical gender based on **animacy**
    - A system of **obviation** distinguishing clause-mate third-person animate arguments
  - A **direct-inverse** system that indicates the relationship between thematic roles and the person hierarchy
  - Two separate inflectional paradigms: **independent order**, found in most matrix clauses, and **conjunct order**, found in subordinate clauses and certain matrix clause contexts
  - Separate (derivational) verb classes based on (i) transitivity and (ii) the animacy of the object (if transitive) or subject (if intransitive)
- Some of these properties warrant some further discussion
- **Animacy:**
  - Ojibwe grammatical gender is based on animacy (**animate** vs. **inanimate**)
  - All nouns referring to notionally/semantically animate entities are grammatically animate; however, notionally inanimate nouns may be of either gender
  - Animacy (of the subject or object) determines the verb final suffix (i.e., verb class, v) that is used, among other things
- **Obviation:**
  - Obviation distinguishes third-person animate clausemates: in any clause, one third-person animate argument is **proximate**, and the rest are **obviative**
  - The choice of which argument is proximate is mainly based on (poorly-understood) pragmatic/discourse factors
  - Obviation is marked on nouns and is distinguished in verb agreement
  - Obviative nouns are unspecified for number (except in isolated inflectional contexts), and can be interpreted as singular or plural
- **The prominence/person hierarchy:**
  - The distribution of agreement affixes, and the choice of direct or inverse morphology, is based on arguments' relative positions in a **prominence/person hierarchy**
  - This ranks arguments in terms of person, obviation and animacy
  - The hierarchy is as follows (Valentine 2001, 268; abbreviations largely follow common Algonquianist practice):[6]

[6]The "unspecified actor" form occurs in verb forms with a passive-like meaning, where the agent argument is existentially bound and otherwise absent. The morphology treats this form as a part of the prominence hierarchy ranked between 1 and 3. However, this form introduces further complications into the paradigm which we will mostly set aside in this presentation.

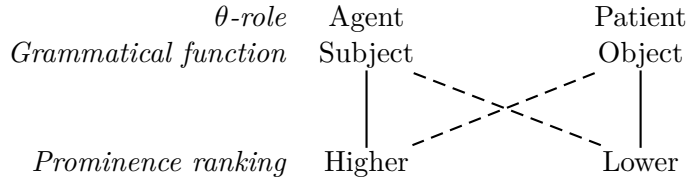
(6) *Prominence Hierarchy*

2	2nd person
1	1st person
X	Unspecified actor
3	3rd person animate proximate
3′	3rd person animate obviative
0	3rd person inanimate

- It should be noted that, while the ranking of 2 above 1 determines the insertion of the person prefix (at least on the view of Rhodes 1994; Rhodes and Valentine 2015, adopted here; see discussion below), there are other areas of the grammar where 1 appears to be ranked above 2, for instance when determining the insertion of certain agreement morphemes, and others where they appear to be equally ranked (see Sections 4.2 and 4.3 and Appendix A)

- **Direct/inverse marking:**
  - In transitive clauses, the relationship between the two arguments' relative ranking in the prominence hierarchy and their thematic roles is tracked by the **direct/inverse** morpheme, known as a Theme Sign (analyzed as Voice; e.g., Oxford 2014, 2019):
    - When the agent is the higher-ranked argument and the patient is lower, the verb is marked as **direct**[7]
    - When the patient is the higher-ranked argument and the agent is lower, the verb is marked as **inverse**
  - The theoretical status of inversion in Ojibwe is still under debate. One question involves the relationship between inversion and the grammatical functions of subject and object
  - For some, the agent is always the subject and the patient is always the object (e.g., Valentine 2001; Dahlstrom 2014; Oxford 2019)
    - **Direct:** subject is higher-ranked, object is lower-ranked
    - **Inverse:** subject is lower-ranked, object is higher-ranked
    - Thus, in the diagram below, the solid lines represent the correspondences in a direct form, and the dashed lines the correspondences in inverse

(7) **GFs-as-θ-roles analysis**

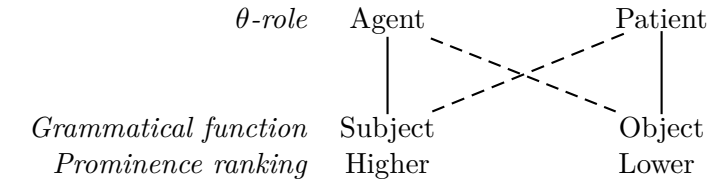


  - For others, the higher-ranked argument is always the subject and the lower-ranked argument is always the object (e.g., Rhodes 1994, 2010)
    - **Direct:** subject is agent, object is patient
    - **Inverse:** subject is patient, object is agent

[7] Following common practice, we are using the term "agent" to refer to agent-like roles, including causes and many experiencers – i.e., the agent proto-role in the sense of Dowty (1991). Similarly, the term "patient" is used for the proto-role that includes patients, recipients, themes, and so on.

- Thus, in the diagram below, the solid lines represent the correspondences in a direct form, and the dashed lines the correspondences in inverse

(8) **GFs-as-prominence analysis**



– We adopt the **GFs-as-prominence analysis**, where the grammatical functions are defined in terms of the prominence hierarchy[8]

- This allows us to treat direct/inverse marking as determining the mapping between f-structural objects (grammatical functions) and s-structural objects (thematic argument roles)
- It also means that the subject and object have consistent (word-internal) c-structural positions, as with the clausal structure in configurational languages; the alternative would be to have specific positions for the higher and lower arguments, which is more difficult to model
- See Section 4.3 for a formalization of this analysis

3.3 Data under consideration

- The data and analysis in this talk is meant to be widely applicable across the different varieties that linguists consider to be part of the Ojibwe language, including both Nishnaabemwin and Anishinaabemowin dialects (such as Algonquin)
- The data are taken mainly from paradigms in Valentine's (2001) grammar of Nishnaabemwin, as well as those in Oxford's (2019) study of Algonquin.
  - We include vowels that are omitted in the syncopated (Nishnaabemwin) dialects, and word final /n/, which is often dropped; we are essentially presenting the underlying forms of the morphemes and inflected verbs, though their pronunciation varies widely from one variety to the next.
  - Where Valentine's (2001) grammar presents inflected forms that differ between dialects, we consider those that are consistent with the data in Oxford (2019). For instance, for verbs with 1pl agents and 2sg/pl patients, we present the forms with the /-imin/ morpheme found in Algonquin (Oxford 2019) and Walpole Island (Valentine 2001), rather than the more innovative impersonal forms found in other Nishnaabemwin dialects.
- While we intend to eventually provide an account for the entire Ojibwe agreement system in DLFG terms, the goals for this talk are more modest
- Here we restrict our analysis to instances where all arguments are animate, and the verb appears in a matrix clause context; i.e., *(in)transitive animate verbs* in the *independent order*

[8] While it has been claimed that there is syntactic evidence for the GFs-as-θ-roles analysis (e.g., Dahlstrom 2014; Alsina and Vigo 2017; Oxford 2019), the evidence largely relies on judgements that vary between Algonquian languages, and even between dialects or individual speakers of Ojibwe, as pointed out by Rhodes (1994, 443). It is possible that languages differ as to which is the proper analysis, as is claimed by McGinnis (1999); Alsina and Vigo (2017).

- We provide f-descriptions for the set of inflectional morphemes that appear with these verbs, and illustrate by providing c-, f-, and v-structures for some representative examples

4 Analysis: Ojibwe inflection

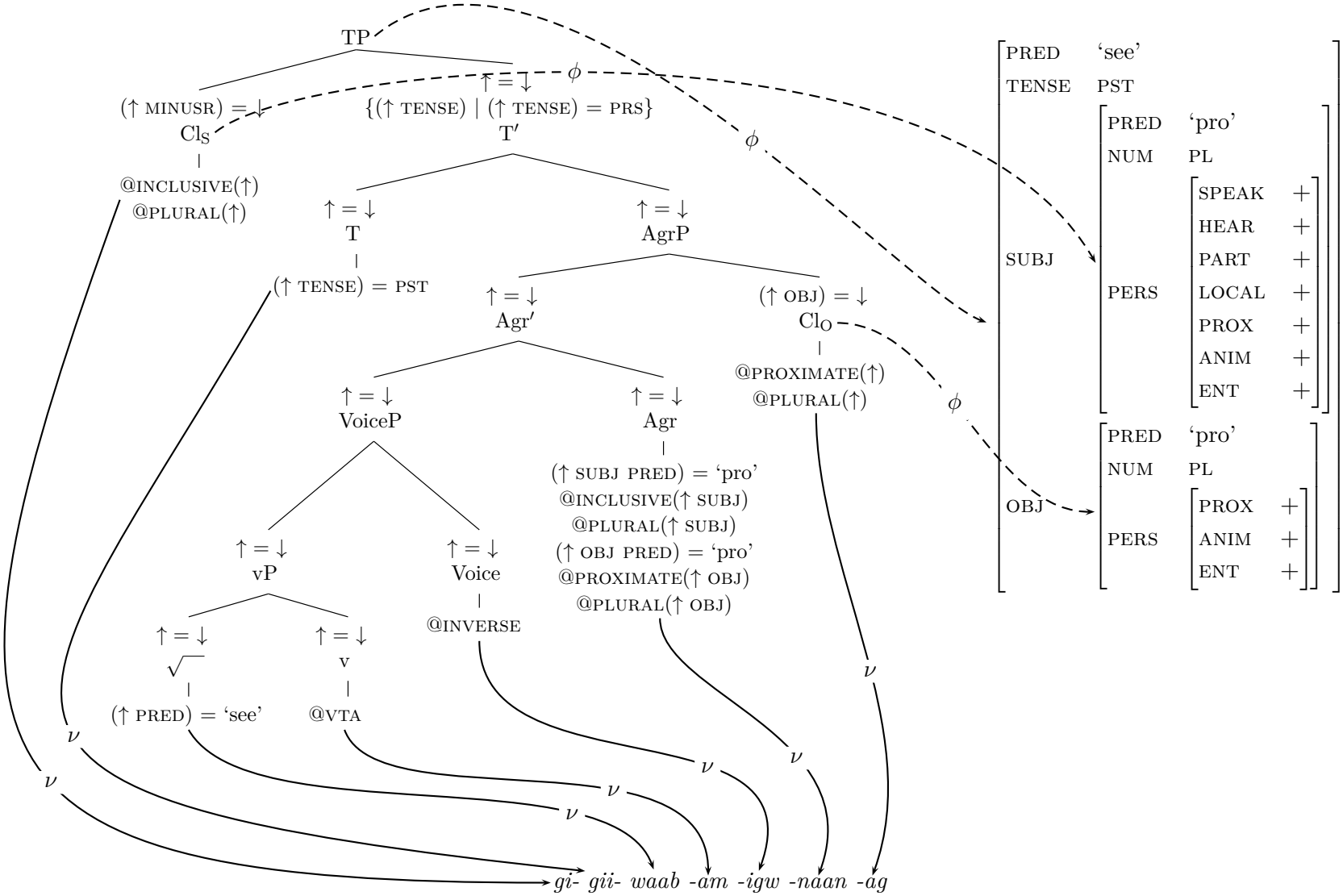
4.1 Example structure

- The following are the c-, f-, and v-structures for a representative example, which was constructed based on the paradigms in Valentine (2001) (more can be found in Appendix A)
- Note that, while we have included templates in the c-structure of the tree, as usual in LFG they are to be interpreted as the full bundle of features abbreviated by the template
- Thus, the c-structure in (11) gives the expanded form of (10)
- Thus, while the description for the Cl_s node in (10) is written in the c-structure as (9a), it should be read as in (9b):

(9) a. @PLURAL(↑)
@INCLUSIVE(↑)

b. (↑ NUM) = PL
(↑ PERS SPEAK) = +
(↑ PERS HEAR) = +
(↑ PERS PART) = +
(↑ PERS LOCAL) = +
(↑ PERS PROX) = +
(↑ PERS ANIM) = +
(↑ PERS ENT) = +

(10) gi- gii- waab -am -igw -naan -ag
2 PST see VTA INV 1PL 3PL
'They saw us(incl).'



(11) gi- gii- waab -am -igw -naan -ag
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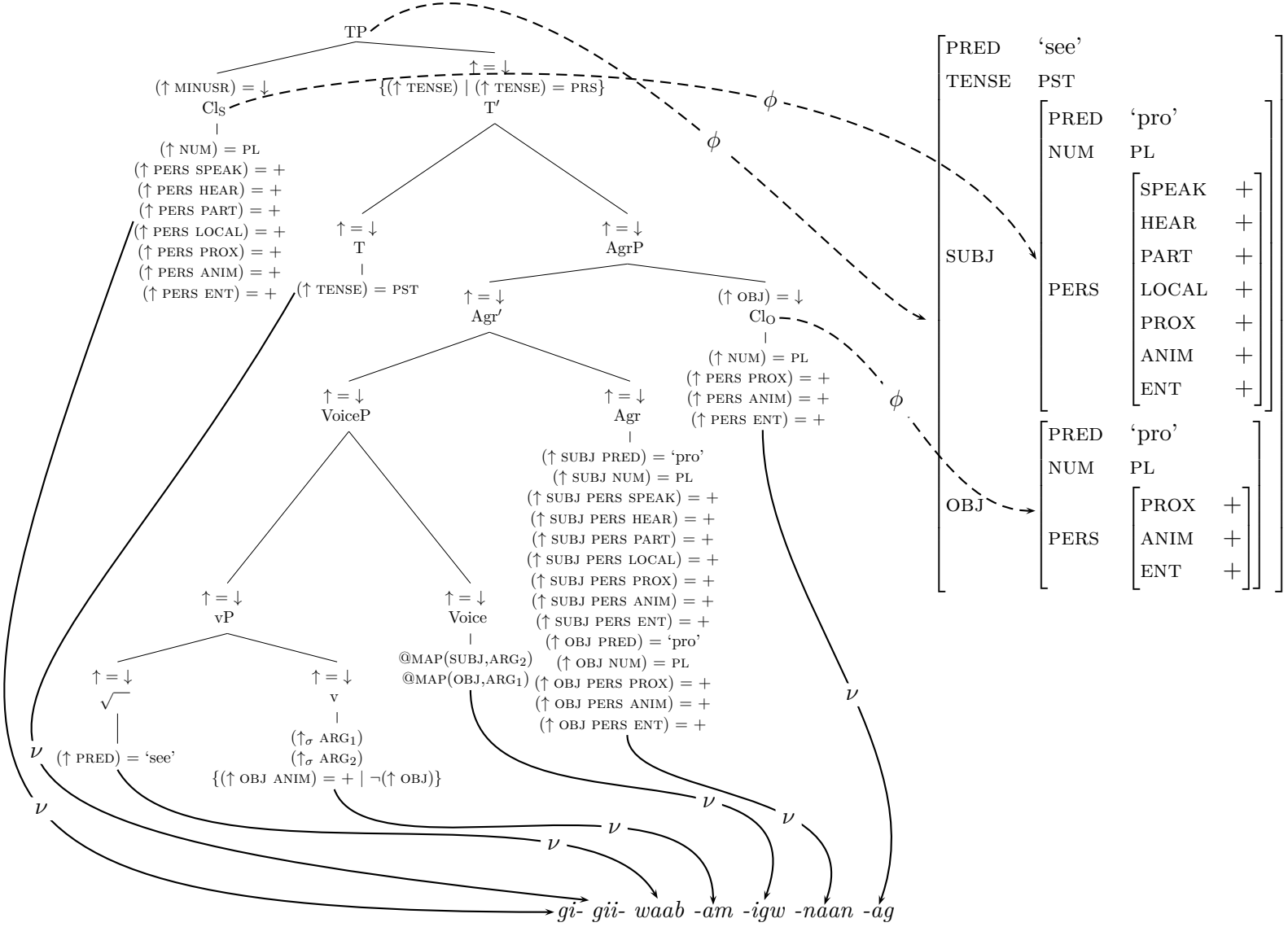
'They saw us(incl).'



4.2 Templates used

- We make use of the LFG mechanism of *templates* (Dalrymple et al. 2004; Asudeh et al. 2013) to encode bundles of grammatical descriptions that get expressed in the language
- The templates involved in our analysis can be divided into two groups: those encoding agreement features (person/gender and number), discussed in Section 4.2.1, and those encoding verb class and lexical mapping (associated with v and Voice), which determine argument structure, discussed in Section 4.2.2

4.2.1 Agreement templates

- Following Bejar and Rezac (2009); Oxford (2014), among others, we assume that the person and animacy features are decomposed into a number of privative features
- Instead of the feature geometries used by the above authors, in our system the implicational relationships between the features are encoded in a set of templates, providing a way to represent the prominence hierarchy (6) without stipulating independent structures beyond those already provided by the LFG framework
- These templates, and others that we use for person and number features, are shown in (12):[9]

[9]The symbol '@' signifies calling or invoking a template; e.g., the template ANIMATE(f) calls the template ENTITY(f), and therefore all the features included within that template (i.e., (f PERS ENTITY) = +).

(12) *Person and number templates*

Template	*Description*	*Explanation*
INCLUSIVE(f)	(f PERS SPEAK) = + (f PERS HEAR) = + @PARTICIPANT(f)	1st person inclusive
SPEAKER(f)	(f PERS SPEAK) = + @PARTICIPANT(f)	1st person
HEARER(f)	(f PERS HEAR) = + @PARTICIPANT(f)	2nd person
PARTICIPANT(f)	(f PERS PART) = + @LOCAL(f)	1 and/or 2
LOCAL(f)	(f PERS LOCAL) = + @PROXIMATE(f)	Unspecified actor and above
PROXIMATE(f)	(f PERS PROX) = + @ANIMATE(f)	3 and above
ANIMATE(f)	(f PERS ANIM) = + @ENTITY(f)	3′ and above
ENTITY(f)	(f PERS ENTITY) = +	All persons (0 and above)
IMPERSONAL(f)	¬(f PERS PART) @LOCAL(f)	Unspecified actor only
NONLOCAL(f)	¬(f PERS LOCAL) @PROXIMATE(f)	3 only
OBVIATIVE(f)	¬(f PERS PROX) (f OBV) = + @ANIMATE(f)	3′ only
INANIMATE(f)	¬(f PERS ANIM) @ENTITY(f)	0 only
PLURAL(f)	(f NUM) = PL	
SINGULAR(f)	(f NUM) = SG	

- Note that, as mentioned above, the ranking of 2 > 1 shown in (6) does not apply to all lexical items; thus, the templates in (12) allow either 1 or 2 to be at the top of the hierarchy, depending on whether @SPEAKER or @HEARER is used
- The first set of templates encodes the hierarchy; the second singles out particular points on the hierarchy

4.2.2 Argument structure templates

- We also use the following templates for verb classes and direct-inverse marking (note that we are leaving out the two verb classes that involve inanimate arguments):[10]

[10]Here and elsewhere we are using the traditional Algonquianist abbreviations for the verb classes: VTA = transitive animate, VTI = transitive inanimate, VAI = intransitive animate, VII = intransitive inanimate.

(13) *Templates for verb classes and Voice*

Template	*Description*	*Explanation*
VTA	$(\uparrow_\sigma \text{ ARG}_1)$	Two semantic arguments
	$(\uparrow_\sigma \text{ ARG}_2)$	
	$\{(\uparrow \text{ OBJ ANIM}) = + \mid \neg(\uparrow \text{ OBJ})\}$	Object animate if present
VAI	$(\uparrow_\sigma \text{ ARG}_1)$	One semantic argument
	$(\uparrow \text{ SUBJ ANIM}) = +$	Subject animate
DIRECT	$@\text{MAP}(\text{SUBJ},\text{ARG}_1)$	Subject $\mapsto$ agent
	$@\text{MAP}(\text{OBJ},\text{ARG}_2)$	Object $\mapsto$ patient
INVERSE	$@\text{MAP}(\text{SUBJ},\text{ARG}_2)$	Subject $\mapsto$ patient
	$@\text{MAP}(\text{OBJ},\text{ARG}_1)$	Object $\mapsto$ agent
REFLEXIVE	$@\text{NOMAP}(\text{ARG}_2)$	No object is present
	$\Re(\text{ARG}_2 \text{ INDEX}) = (\text{ARG}_1 \text{ INDEX})$	Reflexive antecedence relation

- We are assuming a mapping theory similar to that of Findlay (2016), in which arguments are represented in the s-structure (as underspecified, ordered argument roles) and associated by mapping rules with grammatical functions in the f-structure
  - However, this system requires modifications to account for the behaviour of argument roles with respect to grammatical functions in Ojibwe
  - In the theory of Findlay (2016), as in the more traditional Lexical Mapping Theory assumed in LFG (Bresnan and Kanerva 1989), the agent-like argument ARG_1 is associated with the grammatical functions of subject and oblique, in order to account for the behaviour of agents in the long passive found in English and many other languages
  - However, in Ojibwe and other Algonquian languages, the agent, if realized at all, can only be associated with the subject and object functions, never as an oblique; in other words, Ojibwe has no equivalent of the long passive[11]
  - The Algonquian mapping theory must also be able to account for the behaviour of a OBJ_θ role found in ditransitive and "secondary object transitive" (Rhodes and Valentine 2015) or, as they are more traditionally known, VAIO/AI+O (e.g., Valentine 2001), predicates; these predicates are outside the scope of this presentation, but see Rhodes (1990) and Rhodes and Valentine (2015) for discussion of this grammatical function and its properties
  - A detailed account of the mapping theory, and the definitions of some of the templates used in (13), must be left for future research
- @VTA states that there are two core arguments (which, all else being equal, map to subject and object), and that the object (if present) is animate, although further valency-changing operations such as the reflexive can remove the object argument
- @VAI is similar, but intransitive

[11] While Ojibwe has some detransitivizing constructions (which are not discussed here for reasons of space) that are similar to the short passive, in which the patient argument (ARG_2) is realized as a subject and the ARG_1 role is not syntactically realized, the closest analogue to the long passive in Ojibwe is the inverse voice. See Oxford (2018) for discussion of the Algonquian inverse as a "transitivized passive", and for comparison to a "transitivized antipassive" found in the voice system of many Austronesian languages.

- @DIRECT maps the subject function to ARG_1 in s-structure, which is the agent-like argument, and the object to ARG_2, the patient; vice versa for @INVERSE[12]
- @REFLEXIVE ensures that no grammatical function maps to ARG_2 (Ojibwe reflexives are morphosyntactically intransitive), and that the referential index of ARG_2 has an antecedence relationship with that of ARG_1 (see Dalrymple et al. 2018 on reflexive binding in LFG)

4.3 Prominence constraint on f-structures

- Recall from Section 3.2 that we follow Rhodes (1994) and Rhodes and Valentine (2015), among others, in assuming the GFs-as-prominence analysis illustrated in (8): in most cases, the argument that is higher-ranked in the prominence hierarchy (6) will be realized as the subject and the lower-ranked argument as object, regardless of their thematic roles
- Using the templates in Section 4.2.2, the Voice heads determine the mapping from grammatical functions (in f-structure) to argument roles (in s-structure)
- However, we depart from Rhodes (1994) and Rhodes and Valentine (2015) in assuming that the two local theme signs *-i* and *-in* are *both direct* – in other words, there is no inverse form when both subject and object are participants; see Oxford (2019, 959–961) for extensive discussion and references
- This state of affairs can be ensured using the following constraint, which we assume to be associated with the Agr head:

(14) *In independent order*
$[(\uparrow \text{SUBJ}) \;\&\; (\uparrow \text{OBJ})] \Rightarrow$
$\{[(\uparrow \text{SUBJ PERS PART}) = + \;\&\; (\uparrow \text{OBJ PERS PART}) = +] \mid [(\uparrow \text{OBJ PERS}) \sqsubset (\uparrow \text{SUBJ PERS})]\}$

  - This can be read as: In a transitive predicate, *either* the subject and object are both participants (1st and 2nd person), *or* the subject must outrank the object in the prominence hierarchy (i.e., the object's person features properly subsume those of the subject)

- This has a number of effects:
  - It rules out any f-structure in which the object outranks the subject, except when both arguments are participants (as desired)
  - It rules out any form in which both arguments are 3rd person and either (i) both are proximate, (ii) both are obviative, or (iii) both are inanimate, all of which are illicit in Ojibwe (Valentine 2001)
- However, in the conjunct order, found (roughly) in clauses other than declarative matrix clauses (e.g., in embedded clauses, matrix questions, and certain other configurations), the distribution of direct and inverse forms is somewhat different, with inverse forms found only when *both arguments* are 3rd person
- For this context, the constraint is somewhat different, as specified in (15):

[12] Note that this again somewhat departs from Findlay (2016)'s analysis, in which ARG_1 and ARG_2 are not necessarily associated with specific thematic roles; again, we leave the formal details to further work.

(15) *In conjunct order*
[(↑ SUBJ) & (↑ OBJ)] ⇒
{[(↑ {SUBJ|OBJ} PERS PART) = + | [(↑ OBJ PERS) ⊏ (↑ SUBJ PERS)]}

- This can be read as: In a transitive predicate, *either* one core argument (subject or object) is a participant, *or* the subject must outrank the object in the prominence hierarchy (i.e., the object's person features properly subsume those of the subject)
- We assume that this version of the constraint is associated with a separate form of the Agr head, found in conjunct order forms; this conjunct Agr head is also realized by a completely different set of VIs, which are not discussed in this talk. This Agr head, and the VIs that realize it, are distinguished by those found in the independent order by the following constraint:[13]

(16) @CONJUNCT-FORM(f) := ((GF f) MOOD) ≠ DECLARATIVE

4.4 Vocabulary Items

- First we list all of the Ojibwe subject and object agreement inflection that is involved with animate arguments (again, we set aside inanimate agreement here)
- Next we list the other morphemes that are used in the examples in Section 4.1 and the Appendix, including VIs for verb roots, v and tense
- The order of morphemes in an Ojibwe transitive independent-order verb is as follows (the material enclosed in brackets comprises the verb stem, the rest is inflection):

(17) Clitic$_{subj}$ – Tense – [Root – v] – Voice – Agr – Clitic$_{obj}$

- We treat the VIs as a mapping from a double, consisting of a list of syntactic categories and a bundle of grammatical descriptions, to a phonemic form (rendered here in standard orthography)

4.4.1 Agreement inflection

There are four categories of morpheme that are involved in inflection: the subject proclitic and object enclitic, an agreement morpheme that usually agrees with the subject (but occasionally with the object), and a Voice morpheme that encodes direct and inverse marking, reflexivity, and certain other features.

- **Cl$_S$** (subject proclitics):
  - This category indexes person features of one grammatical function, usually the subject; the only time it indexes the object is when the object is 2nd person, in which case the *gi-* proclitic is inserted
  - We capture this in the c-structure rule for the daughters of TP, annotating the Cl$_S$ node as (↑ MINUSR) = ↓ , rather than (↑ SUBJ) = ↓ ; the MINUSR is a template standing in for a disjunction of SUBJ and OBJ (Findlay 2016)

[13] The conjunct order is also distinguished from the independent order in other ways, mainly by the lack of Cl$_S$ and Cl$_O$; again, further discussion of the conjunct order is outside the scope of the present talk.

(18) $\langle\, [\mathrm{Cl_S}], \quad \Phi\left\{\ @\textsc{hearer}(\uparrow)\ \right\}\,\rangle \quad \xrightarrow{\nu} \quad gi\text{-}$

$\langle\, [\mathrm{Cl_S}], \quad \Phi\left\{\ @\textsc{participant}(\uparrow)\ \right\}\,\rangle \quad \xrightarrow{\nu} \quad ni\text{-}$

$\langle\, [\mathrm{Cl_S}], \quad \Phi\left\{\begin{array}{l} @\textsc{proximate}(\uparrow) \\ ((\textsc{subj}\ \uparrow)\ \textsc{obj}) \end{array}\right\}\,\rangle \quad \xrightarrow{\nu} \quad o\text{-}$

- These are considered to be subject clitics, appearing in Spec-TP, although they are unspecified for number
- As is often the case with clitics, these may appear with or without overt arguments, and so the PRED are optional (Bresnan et al. 2016); the same holds for the object clitics in (19)
- The 3rd-person clitic *o-* is unlike the others in that it only appears with transitive verbs; this is indicated by the inside-out constraint ((SUBJ ↑) OBJ), which requires that the f-structure containing the subject clitic includes an OBJ feature

- **$\mathbf{Cl_O}$** (object enclitics)[14]
  - This node is present only when the object is 3rd-person plural or obviative

(19) $\langle\, [\mathrm{Cl_O}], \quad \Phi\left\{\begin{array}{l} @\textsc{nonlocal}(\uparrow) \\ @\textsc{plural}(\uparrow) \end{array}\right\}\,\rangle \quad \xrightarrow{\nu} \quad \textit{-ag}$

$\langle\, [\mathrm{Cl_O}], \quad \Phi\left\{\ @\textsc{obviative}(\uparrow)\ \right\}\,\rangle \quad \xrightarrow{\nu} \quad \textit{-an}$

  - Note that the vowels in these are subject to a fair bit of allophonic variation

- **Agr**
  - The Agr node in the c-structure contains the features of the subject and the object (if present). This includes the appropriate person and number features, and specifying the value of their PRED features as 'pro' (we assume the Pronominal Argument Hypothesis (Jelinek 1984) for Ojibwe, which in LFG amounts to the assumption that agreement morphology contains PRED features)[15]

[14] For motivation for the analysis of these morphemes as enclitics in Algonquian, see Oxford (2014, 203–210).

[15] LeSourd (2006) argues that the Pronominal Argument Hypothesis is untenable for the Algonquian language Maliseet-Passamaquoddy, for various reasons, a stance that has been adopted by many Algonquianist syntacticians (e.g., Oxford 2014). However, LeSourd (2006, 511) notes in conclusion that "[w]e can maintain the PAH in light of the these facts by amending the hypothesis so as to take the ensemble of inflectional information abstractly associated with a verb, rather than any actual morphological material, to constitute its syntactic arguments (in some sense)"; in effect, this is what is assumed here, an analysis that is unproblematic in the present framework.

(20)
$$\langle\ [\text{Agr}],\quad \Phi\left\{\begin{array}{l}(\uparrow \textsc{minusr}) = \%\textsc{gf}\\ @\textsc{speaker}(\%\textsc{gf})\\ @\textsc{plural}(\%\textsc{gf})\\ \{(\uparrow \textsc{obj pers local}) \mid \neg(\uparrow \textsc{obj})\}\end{array}\right\}\ \rangle \quad \xrightarrow{\nu} \quad \textit{-imin}$$

$$\langle\ [\text{Agr}],\quad \Phi\left\{\begin{array}{l}(\uparrow \textsc{minusr}) = \%\textsc{gf}\\ @\textsc{participant}(\%\textsc{gf})\\ @\textsc{plural}(\%\textsc{gf})\\ \{(\uparrow \textsc{obj pers local}) \mid \neg(\uparrow \textsc{obj})\}\end{array}\right\}\ \rangle \quad \xrightarrow{\nu} \quad \textit{-im}$$

$$\langle\ [\text{Agr}],\quad \Phi\left\{\begin{array}{l}@\textsc{speaker}(\uparrow \textsc{subj})\\ @\textsc{plural}(\uparrow \textsc{subj})\end{array}\right\}\ \rangle \quad \xrightarrow{\nu} \quad \textit{-naan}$$

$$\langle\ [\text{Agr}],\quad \Phi\left\{\begin{array}{l}@\textsc{proximate}(\uparrow \textsc{subj})\\ @\textsc{plural}(\uparrow \textsc{subj})\end{array}\right\}\ \rangle \quad \xrightarrow{\nu} \quad \textit{-waa}$$

$$\langle\ [\text{Agr}],\quad \Phi\left\{\begin{array}{l}@\textsc{proximate}(\uparrow \textsc{subj})\\ @\textsc{plural}(\uparrow \textsc{subj})\\ \neg(\uparrow \textsc{obj})\end{array}\right\}\ \rangle \quad \xrightarrow{\nu} \quad \textit{-wag}$$

$$\langle\ [\text{Agr}],\quad \Phi\left\{\begin{array}{l}@\textsc{obviative}(\uparrow \textsc{subj})\\ \neg(\uparrow \textsc{obj})\end{array}\right\}\ \rangle \quad \xrightarrow{\nu} \quad \textit{-wan}$$

  - The notation %GF appearing with *-imin* and *-im* indicates a "local name", which is a variable ranging over grammatical functions; the equation (↑ MINUSR) = %GF restricts this to the grammatical functions in the set specified as MINUSR, namely subjects and objects (see Findlay 2016 on MINUSR). This means that *-imin* appears if *either the subject or object* is 1st-person plural, and *-im* if either is 2nd-person plural; since @SPEAKER is more highly-specified than @PARTICIPANT, this means that if both 1st- and 2nd-person plural arguments are present, *-imin* will be realized in Agr
  - The VIs *-imin* and *-im* are specified as appearing either in local contexts (both arguments have (↑ PERS LOCAL) = +) or intransitives; likewise, *-wag* and *-wan* are specified as appearing only in intransitives
  - In transitive, non-local contexts (one or both arguments are not (↑ PERS LOCAL) = +), the morphemes *-naan* and *-waa* appear

- **Voice** (Theme signs and reflexive)
  - The Voice head contains the features in the @DIRECT and @INVERSE features, specifying the mapping of subject and object to argument positions

(21)
$$\langle\ [\text{Voice}],\quad \Phi\left\{\begin{array}{l}@\textsc{direct}\\ @\textsc{addressee}(\uparrow \textsc{obj})\end{array}\right\}\rangle \xrightarrow{\nu} \textit{-in}$$

$$\langle\ [\text{Voice}],\quad \Phi\left\{\begin{array}{l}@\textsc{direct}\\ @\textsc{participant}(\uparrow \textsc{obj})\end{array}\right\}\rangle \xrightarrow{\nu} \textit{-i}$$

$$\langle\ [\text{Voice}],\quad \Phi\left\{\begin{array}{l}@\textsc{direct}\\ @\textsc{animate}(\uparrow \textsc{obj})\end{array}\right\}\rangle \xrightarrow{\nu} \textit{-aa}$$

$$\langle\ [\text{Voice}],\quad \Phi\left\{\begin{array}{l}@\textsc{inverse}\\ @\textsc{animate}(\uparrow \textsc{obj})\end{array}\right\}\rangle \xrightarrow{\nu} \textit{-igw}$$

$$\langle\ [\text{Voice}],\quad \Phi\left\{\ @\textsc{reflexive}\ \right\}\rangle \xrightarrow{\nu} \textit{-idizo}$$

- Each of the direct theme signs also encodes object agreement (e.g., Oxford 2019); recall that the inverse voice is not used when both arguments are participants[16]

  There are two each of the direct and inverse theme signs (with animate arguments): one that appears when both arguments are participants (i.e., @PARTICIPANT(↑ OBJ)), and one when the object is not a participant (i.e., @ANIMATE(↑ OBJ))
- There are further theme signs for inanimate arguments and unspecified actors, which we are disregarding here
- In ordinary intransitive contexts (i.e., in the absence of reflexives and other valency-reducing Voice morphemes), the Voice head is absent

4.4.2 Other VIs used

- In addition to the agreement morphemes listed above, the following morphemes appear in the examples in Section 4.1 and the Appendix:

(22)
$$\langle\ [\text{T}],\quad \Phi\left\{\ (\uparrow \textsc{tense}) = \textsc{pst}\ \right\}\rangle \xrightarrow{\nu} \textit{gii-}$$

$$\langle\ [\sqrt{\ }],\quad \Phi\left\{\ (\uparrow \textsc{pred}) = \text{`see'}\ \right\}\rangle \xrightarrow{\nu} \textit{waab}$$

$$\langle\ [\sqrt{\ }],\quad \Phi\left\{\ (\uparrow \textsc{pred}) = \text{`arrive'}\ \right\}\rangle \xrightarrow{\nu} \textit{dago}$$

$$\langle\ [\text{v}],\quad \Phi\left\{\ @\textsc{vta}\ \right\}\rangle \xrightarrow{\nu} \textit{-am}$$

$$\langle\ [\text{v}],\quad \Phi\left\{\ @\textsc{vai}\ \right\}\rangle \xrightarrow{\nu} \textit{-shin}$$

$$\langle\ [\sqrt{\ }, \text{v}],\quad \Phi\left\{\begin{array}{l}(\uparrow \textsc{pred}) = \text{`eat'}\\ @\textsc{vai}\end{array}\right\}\rangle \xrightarrow{\nu} \textit{wiisini}$$

[16] As mentioned in Section 4.3, the distribution of inverse voice differs in the conjunct order; however, the specifications of the theme signs are consistent.

- For most verbs in Ojibwe, the verb root and the v morpheme indicating the verb class are separate morphemes, as with *waab* and *-am*
- However, the verb meaning 'eat' has suppletive forms for the three compatible verb classes (i.e., depending on transitivity and animacy of the object): *amw* 'eat.VTA', *miij* 'eat.VTI', *wiisini* 'eat.VAI'
- This is analyzed as the verb exponing a span including both $\sqrt{}$ and v
- We see the intransitive form *wiisini* in (28) below

5 Future research

The following are phenomena that we will need to explain in the present framework, but haven't yet:

- Morphosyntactic effects attributed to Head Movement
- *Do*-support and affix hopping (multiple exponence)
- Clitics vs. affixes; positioning of "special clitics"
- Directionality of words vs. phrases
- Productivity and blocking
- "Derivational" meaning (beyond changes in category)
- Contents and distribution of feature bundles
- Idioms

In doing so, we will examine (at least) the following languages:

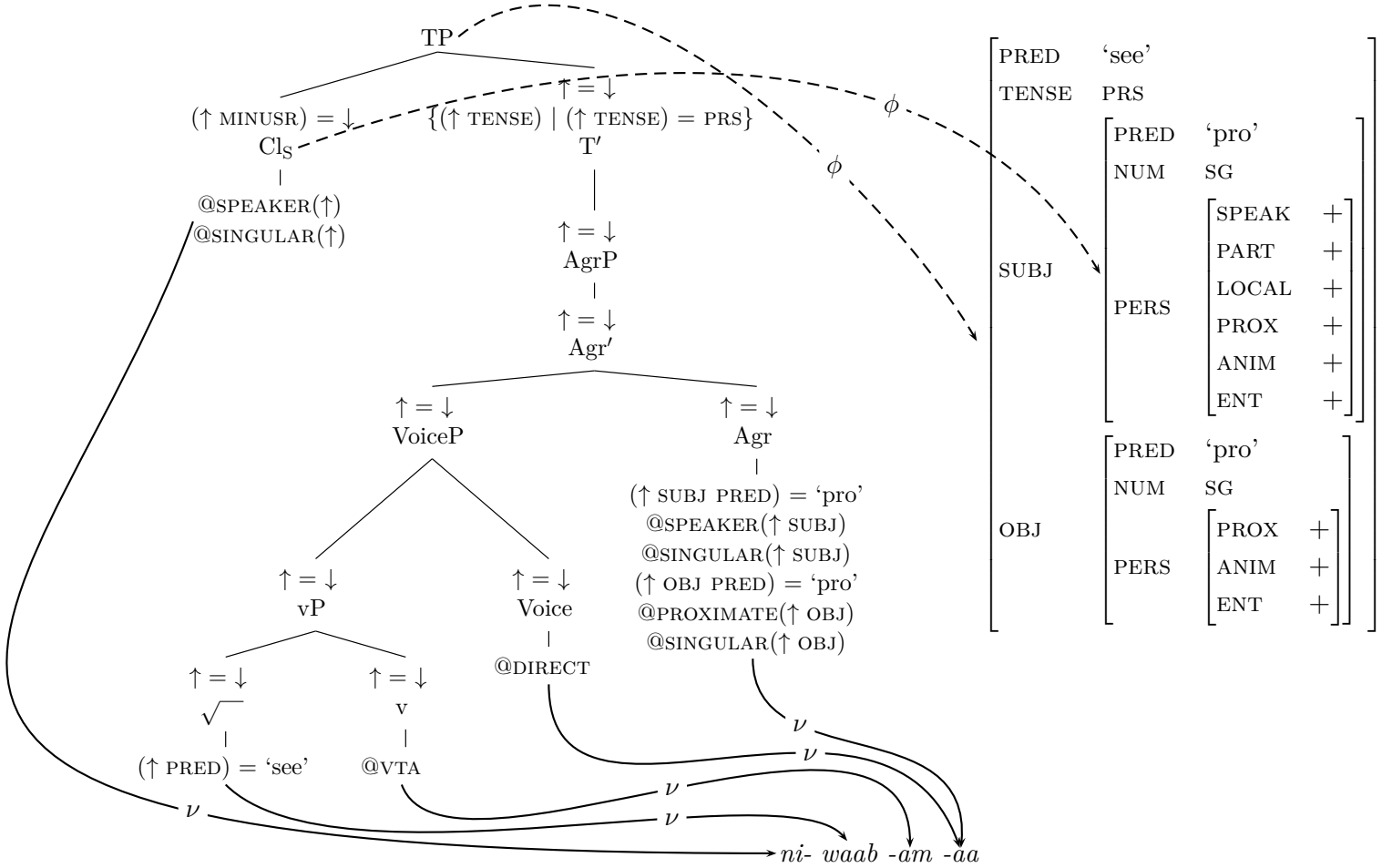
- English and French – verb raising, auxiliaries, clitics
- Mixé – another direct/inverse system

Appendices

A More examples

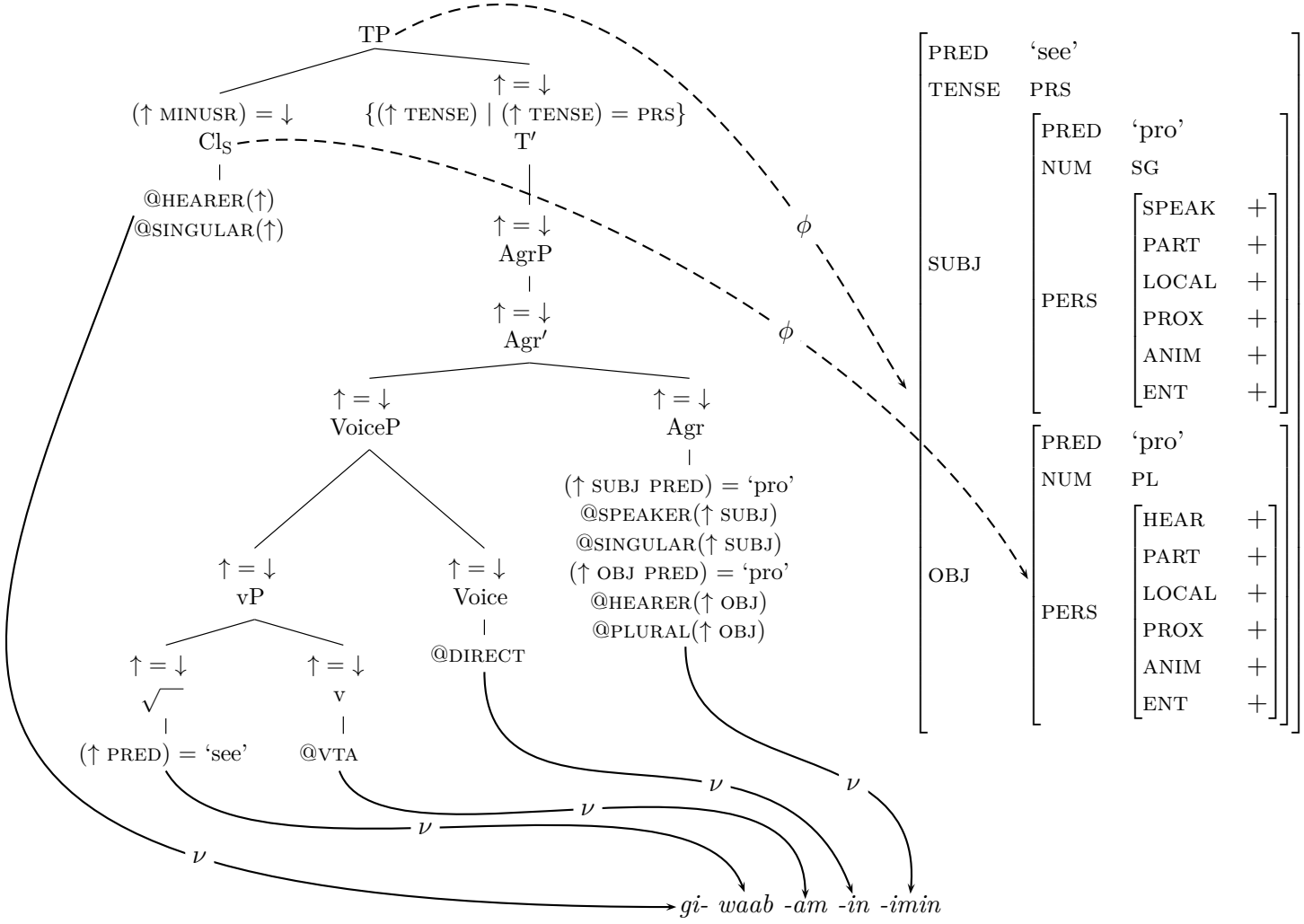
- Here we show more representative examples, demonstrating most of the templates and VIs introduced in Section 4

(23) ni- waab -am -aa
1 see VTA DIR
'I see him/her.'[17]



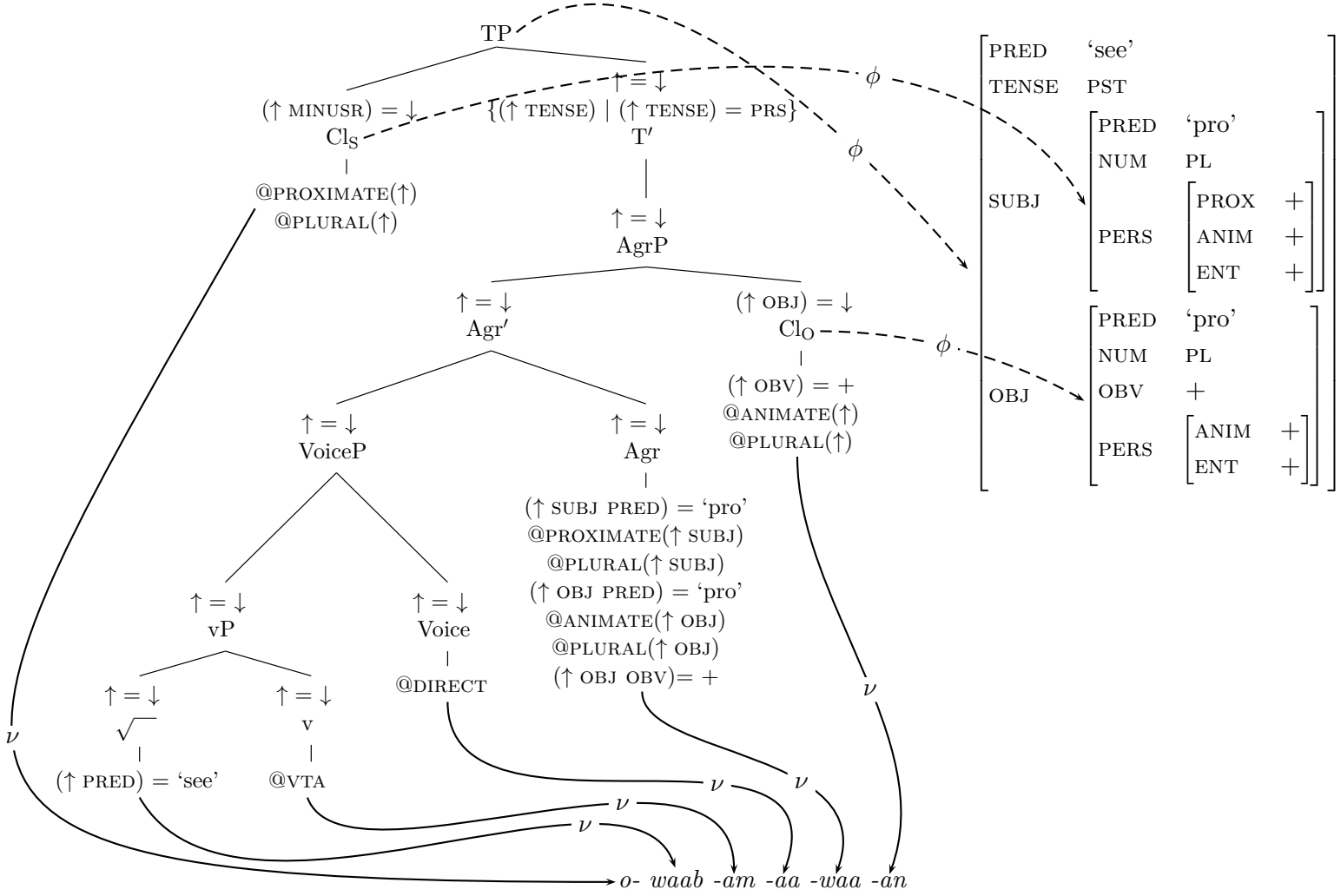
[17]This example includes the phenomenon referred to as Pac-Man Spanning (see footnote 4), in which a VI (here, *-aa*) spans an adjacent preterminal node (here, Agr) for which no other VI is available. As shown in (20), there are no VIs specified for the category Agr that are compatible with singular number – all of the Agr VIs are specified as (↑ NUM) = PL. This means that, while the VI *-aa* is specified only for the category Voice and not for Agr, there is no v-structure that is more informative than one in which it also realizes the adjacent Agr head. In this way, (pre)terminal nodes that are necessary in the c-structure but for which there is no VI available can still serve as an input to the exponence function without the need for (stipulated) empty categories.

(24) gi- waab -am -in -imin
2 see VTA INV 1PL
'We(excl) see you.'[18]



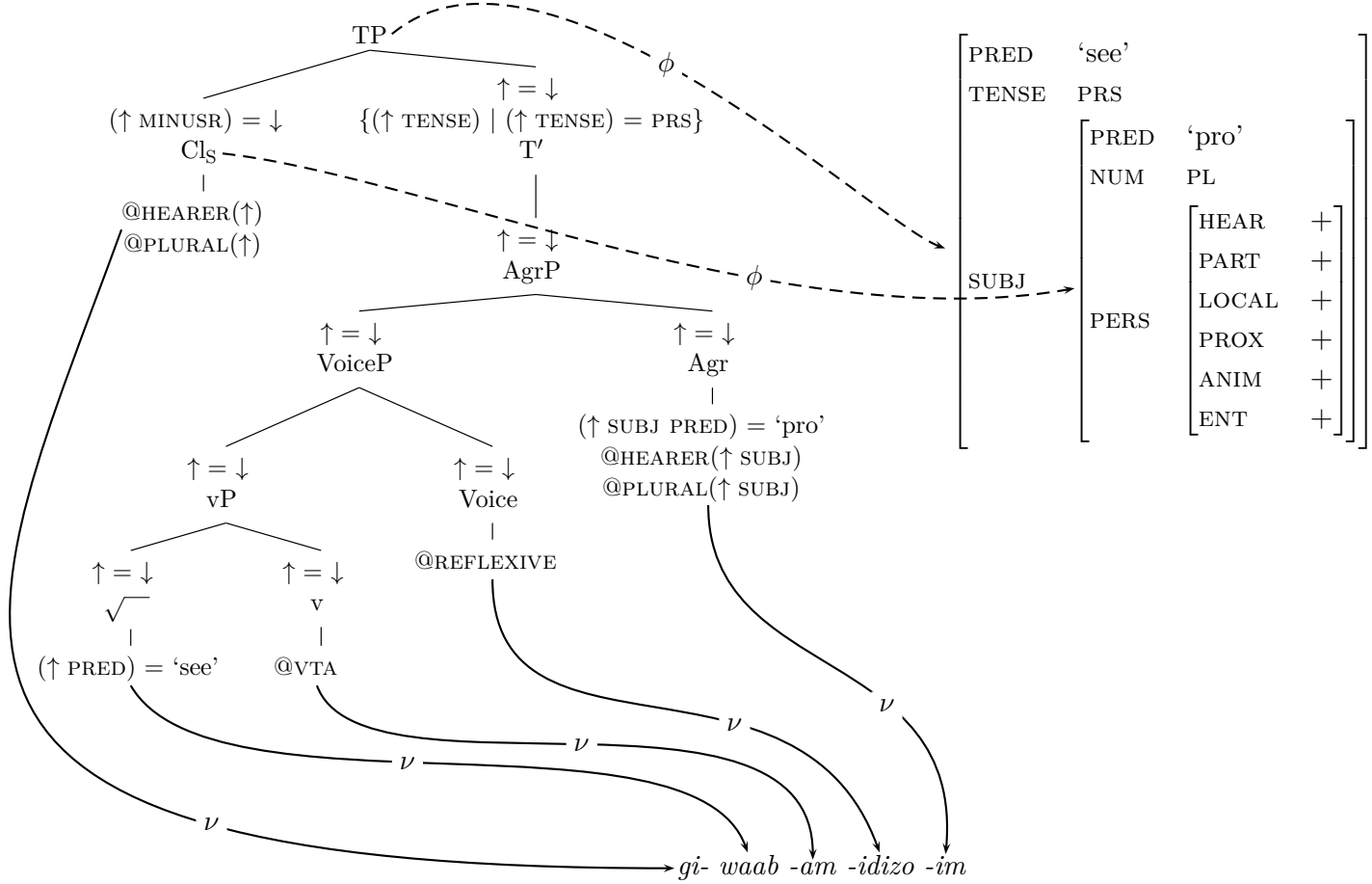
[18] In this sentence, the 2nd person argument's number is ambiguous; we take this to mean that the number is fully specified in the c- and f-structures, but the singular and plural forms map to identical v-structures. Here we provide the structures for the singular reading.

(25) o- waab -am -aa -waa -an
3 see VTA DIR 3PL OBV
'They see him/her/them(obv).'[19]



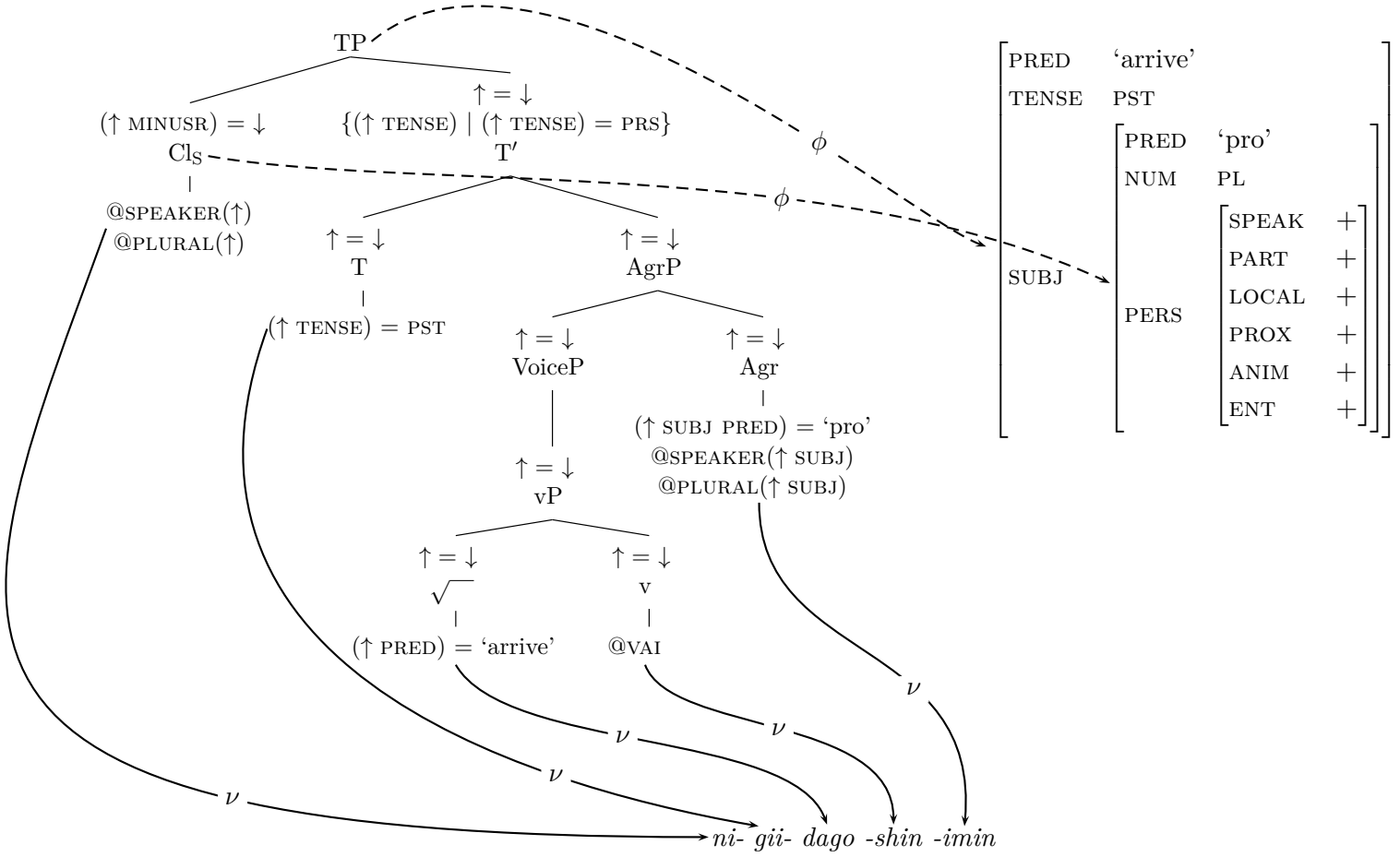
[19]For obviative arguments the number is ambiguous between singular and plural (except in certain contexts), but we assume it is specified in the c- and f-structures. Here we specify it as plural.

(26) gi- waab -am -idizo -im
2 see VTA REFL 2PL
'You(pl) see yourselves.'[20]

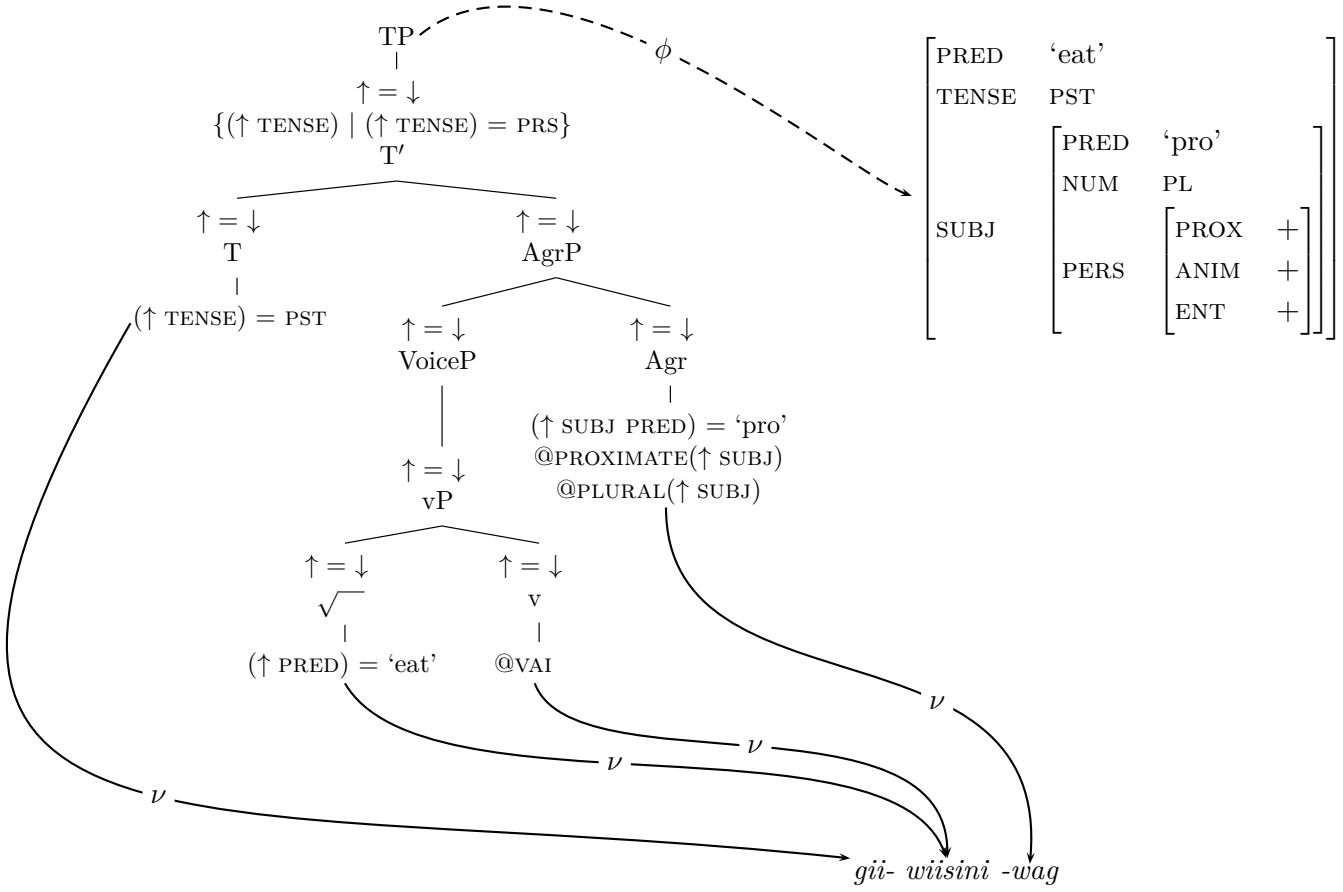


[20] As mentioned above, the @REFLEXIVE template ensures that the form is morphosyntactically intransitive (i.e., no OBJ in f-structure), and that the patient is interpreted as co-indexed with the agent. However, the latter property is modelled in the s-structure, which is not shown here.

(27) ni- gii- dago -shin -imin
1 PST see VAI 1PL
'We(excl) arrived.'



(28) gii- wiisini -wag
PST see.VAI 3PL
'They ate.'



B Revised Correspondence Architecture

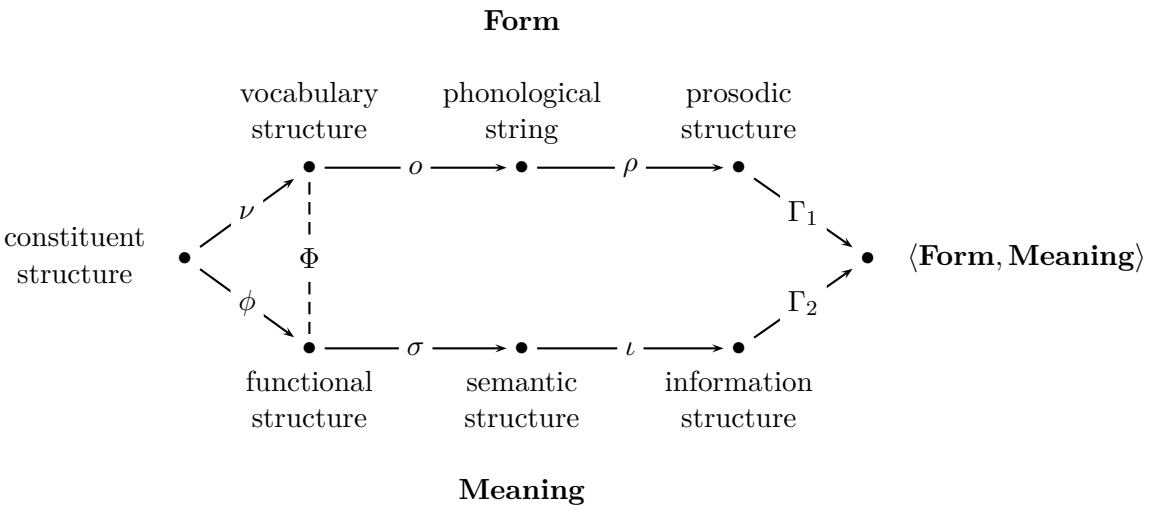


Figure 1: Correspondence Architecture

Notes:

- We assume that the morphological structure of Butt et al. (1996) is no longer necessary, given vocabulary structure, and that the Φ function would allow us to address the concerns of Frank and Zaenen (2002) regarding Butt et al. (1996); although the Φ function is not a correspondence function, but captures a relationship between vocabulary structure and functional structure. Details remain to be worked out.
- We have eliminated the independent level of argument structure based on the proposal that argument structure information is best captured at semantic structure (Asudeh and Giorgolo 2012).
- The output of the grammar, $\langle \Gamma_1, \Gamma_2 \rangle$, consists of a form–meaning pair, where the form incorporates prosody (still fed by constituent structure) and the meaning incorporates information structure (still fed by semantic structure).

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