Direct-Inverse Agreement Systems: Plains Cree

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Our goal

- Our goal is to explain agreement in a language with direct-inverse agreement morphology.
- We have chosen Plains Cree (Algonquian) as the object of analysis.
- This choice is motivated because of its morphological complexity and because there is evidence that direct-inverse morphology does not imply a change in the mapping of GFs to thematic roles.

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Claims

- Plains Cree provides further evidence for the need of AGR as the feature bundle that represents agreement features in a clause, as in Alsina and Vigo (2014).
- We assume a major division in agreement systems between GF-governed and person-governed: they only differ in the ranking of agreement constraints.
- Inflectional morphology is the realization of syntactic features rather than the source of syntactic features.

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Roadmap

1. Introduction

2. Description and analysis of Plains Cree
   - Syntactic aspects of agreement
   - Morphological aspects of agreement
   - Agreement in local scenarios
   - Non-local scenarios

3. Conclusions

The issue of GF-argument mapping

- An existing analysis of direct-inverse agreement systems (Arnold, 1997) claims that the direct-inverse morphology correlates with a difference in the mapping between arguments and GFs. Under this analysis:
  - In the direct form, the subject is mapped to the agent and the object to the patient.
  - In the inverse form, the subject is mapped to the patient and the object to the agent.
- Following Dahlstrom (1986), Plains Cree does not fit into this analysis. She provides evidence for the claim that there is no difference in the GF-argument mapping between direct and inverse forms.

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Dahlstrom's (1986) arguments: subjecthood

- In the copying-to-object construction the main verb is inflected for an object which agrees in features with the subject of the embedded verb. This is true for both direct and inverse forms of the embedded verb.

  (1) nikiske:yima:w John e:kiwa:pamisk
  know.DIR.1→3 *John see*.PERF.INV.3→2
  'I know John saw you'

- *John* is both the object of the main clause and the controller of the subject of the embedded clause.
- Therefore, the inverse morphology in the embedded clause does not entail a realignment of the argument-to-GF mapping.

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Dahlstrom's (1986) arguments: objecthood

- The same construction shows that the subject of the embedded clause is controlled by the object of the main clause (a null pronoun) inspite of the inverse morphology:

(2) namoya kiske:yimik o:hta:wiya e:sipwe:hte:t
not *know*.INV.OBV→3 *his.father*.OBV *leave*.3
'His father.OBV did not know that he.PROX had gone off'

Dahlstrom's (1986) arguments: object-oriented floating quantifiers

- Plains Cree shows some floating quantifiers that are exclusively oriented to the object of the clause.

(3) pe:yak pikoh nipahikwak e:wakonik o:ki
one *only* *kill*.INV.OBV→3 *those* *these*
'They.OBV killed only one of them.PROX'

- The floating quantifier cannot be interpreted as oriented to the subject.
- Therefore the inverse morphology does not signal that the patient argument is the subject.

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Basic Plains Cree minimal pair

- We restrict ourselves to Transitive Animate (TA) verbs in Plains Cree. Intransitive and Transitive Inanimate verbs are subject to other rules that are not discussed here.
- Person-Number affixes are neutral wrt GF.
- Direct morphology signals that SUBJ ranks higher than or equal to OBJ in the Person-Animacy Hierarchy (2 ≫ 1 ≫ 3.PROX ≫ 3.OBV).
- Inverse morphology signals the opposite: SUBJ ranks lower than OBJ in the Person-Animacy Hierarchy.

(4) a. ni- wa:pam -a: -na:n
1 *see* DIR 1.PL.EXCL
'We.EXCL see him'

b. ni- wa:pam -iko -na:n
1 *see* INV 1.PL.EXCL
'He sees us.EXCL' Dahlstrom (1986, pp. 40-41)

(5) a. ki- se:kih -a: -w
2 *frighten* DIR 3
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A new theory of agreement

- The agreement features of the clause are represented as the feature bundle AGR.
- AGR is spelled out as the agreement morphology on the verb of the clause.
- As a rule, the AGR features have to match those of one of the syntactic arguments of the clause. This is captured by the high-ranking OT constraint AGR-SHARE:

(6) AGR-SHARE:

$$\begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{GF} & \begin{bmatrix} \text{AGR} & \boxed{1} \end{bmatrix} \end{bmatrix}$$

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- We refer to the agreeing GF by GF_{AGR}.

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Two types of agreement systems

- Languages split in two major types depending on how GF_{AGR} is selected.
- GF-governed agreement systems: the subject is preferentially chosen for agreement. AGRSUBJ is high-ranking:

(7) AGRSUBJ: $\begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{AGR} & \boxed{1} \end{bmatrix} \end{bmatrix}$

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Deriving the typology

- In an OT approach, both types of languages are derived from a different ranking of these two constraints.
  - GF-governed: AGRSUBJ ≫ AGRPERS
  - Person-governed: AGRPERS ≫ AGRSUBJ
- We will see later that AGRPERS is actually part of a cluster of constraints that refer to person/empathy features.
- Plains Cree is a person-governed language.

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f-structures of direct agreement

- For this sentence, there are two candidate f-structures:

(9) ki- se:kih -a: -w
2 *frighten* DIR 3
'You.SG frighten him'

$$\begin{bmatrix} \text{PRED} & \text{`}\textit{frighten}\ \langle\ \text{Ext}_1\ \text{Int}_2\ \rangle\text{'} \\ \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \boxed{1}\begin{bmatrix} \text{PERS} & 2 \\ \text{NUM} & \text{SG} \end{bmatrix} \end{bmatrix}_1 \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \begin{bmatrix} \text{PERS} & 3 \\ \text{NUM} & \text{SG} \end{bmatrix} \end{bmatrix}_2 \end{bmatrix}$$

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Optimization: direct agreement

- Pretty straighforward optimization: the f-structure in which GF_{AGR} = SUBJ is chosen because the subject ranks higher than the object in the Person-Animacy Hierarchy.

	AGRPERS	AGRSUBJ
☞ GF_{AGR} = SUBJ		
GF_{AGR} = OBJ	*!	*

- (We are leaving AGR-SHARE out of the Tableaux in this presentation because it is irrelevant for our discussion; it is always satisfied by the candidates under consideration.)

f-structures of inverse agreement

- For this sentence, there are two candidate f-structures as well:

(10) ki- se:kih -ikw -w
2 *frighten* INV 3.SG.ANIM
'He frightens you.SG'

$$\begin{bmatrix} \text{PRED} & \text{`}\textit{frighten}\ \langle\ \text{Ext}_1\ \text{Int}_2\ \rangle\text{'} \\ \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \begin{bmatrix} \text{PERS} & 3 \\ \text{NUM} & \text{SG} \end{bmatrix} \end{bmatrix}_1 \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \boxed{1}\begin{bmatrix} \text{PERS} & 2 \\ \text{NUM} & \text{SG} \end{bmatrix} \end{bmatrix}_2 \end{bmatrix}$$

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Optimization: inverse agreement

- Pretty straighforward optimization as well: the f-structure in which GF_{AGR} = OBJ is chosen because the object ranks higher than the subject in the Person-Animacy Hierarchy.

	AGRPERS	AGRSUBJ
☞ GF_{AGR} = OBJ		*
GF_{AGR} = SUBJ	*!	

The morphology-syntax interface problem

- The OT-LFG analysis presented allows us to choose between the two f-structure candidates.
- In Plains Cree Person-Number affixes are neutral wrt GF: they provide features that can be either of the SUBJ or the OBJ.
- The distribution of these affixes responds to ordered lists, such that an element higher in the list blocks the appearance of any that is lower.
- This happens despite possible feature-compatibility.

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Plains Cree affix ranking

Person-Number prefixes	Person-Number suffixes
k(i)- '2nd sg./pl., 1st pl. incl.'	*-na:n* '1st pl. excl.'
n(i)- '1st sg, 1st pl. excl.'	*-naw* '1st pl. incl.'
o(t)- / ∅- '3rd'	*-wa:w* '3rd pl.'
	-w '3rd sg.'
	-n '1st sg./2nd sg./pl.'

Figure: Table based on Zúñiga (2008)

(11) ni- se:kih -a: -na:n
1 *frighten* DIR 1.PL.EXCL
'We.EXCL frighten him'

(12) ki- se:kih -i -na:n
2 *frighten* LDIR 1.PL.EXCL
'You frighten us.EXCL'

Beware the ranking of affixes!

- The following is ungrammatical, despite its perfectly well-formed optimal f-structure! (GF_{AGR} = OBJ is discarded due to AGRPERS).

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Realizational morphology

- A morpheme-based approach does not satisfactorily explain why in (11) *-w* '3rd sg.' **cannot** appear.
  - If it appeared, it would generate the correct two f-structure candidates as well (and the OT component would choose the f-structure in which GF_{AGR} = SUBJ).
- A morpheme-based approach would have to complicate the lexical entries of the affixes enormously.
  - *-w* is not *just* '3 sg', but it requires that no GF be 1st inclusive, 1st exclusive, or 2nd person plural.
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- A morpheme-based approach does not satisfactorily explain why in (11) *-w* '3rd sg.' **cannot** appear.
  - If it appeared, it would generate the correct two f-structure candidates as well (and the OT component would choose the f-structure in which $\text{GF}_{\text{AGR}} = \text{SUBJ}$).
- A morpheme-based approach would have to complicate the lexical entries of the affixes enormously.
  - *-w* is not *just* '3 sg', but it requires that no GF be 1st inclusive, 1st exclusive, or 2nd person plural.
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The relation between f-structure and morphology

- Morphological rules map the f-structure of the sentence to morphologically complex words.
- Contrary to standard LFG, we assume that inflectional elements do not have lexical entries akin to those of lexemes. This means that these elements do not carry f-structure information.
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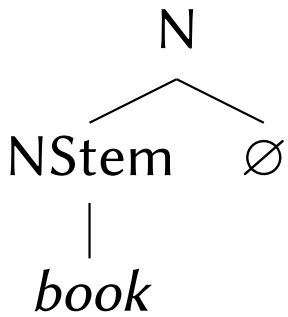
English plurals in standard LFG morphology

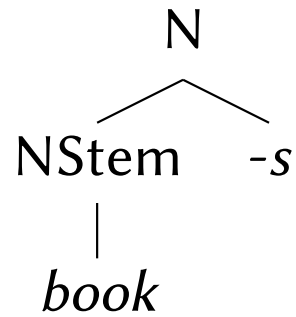
- Standard LFG requires the following lexical entries for successfully generating both *book* and *books*:

(14) a. NStem *book*: (↑ PRED) = '*book*'

b. Suf -*s*: (↑ NUM) = PL

c. Suf -∅: (↑ NUM) = SG





English plurals in our proposal

- We propose rules that check the features in f-structures and map them to morphological forms.

(15) a. $\left[\textsc{pred} \quad \text{`}book\text{'}\right] \rightarrow [_N \text{ book }]$

b. For a nominal f-structure:

$$\left[\textsc{agr} \quad \left[\textsc{num} \quad \textsc{pl}\right]\right] \rightarrow [_N \text{ X }]s$$

- No need for a default or zero-morpheme rule to predict the singular: if NUM is singular, no rule is applied and therefore, the result is *book*.

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Person features in Plains Cree

- In order to capture the fact that 1st plural inclusive behaves exactly as a 2nd person, we represent PERS in Plains Cree as a set of two features PERS1 (for the speaker) and PERS2 (for the addressee).

(16) 1st excl.: $\begin{bmatrix} \text{PERS1} & + \\ \text{PERS2} & - \end{bmatrix}$

(17) 1st incl.: $\begin{bmatrix} \text{PERS1} & + \\ \text{PERS2} & + \end{bmatrix}$

(18) 2nd: $\begin{bmatrix} \text{PERS1} & - \\ \text{PERS2} & + \end{bmatrix}$

(19) 3rd: $\begin{bmatrix} \text{PERS1} & - \\ \text{PERS2} & - \end{bmatrix}$

- Number is represented as usual, by means of NUM.

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(19) 3rd: $\begin{bmatrix} \text{PERS1} & - \\ \text{PERS2} & - \end{bmatrix}$

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Redefining AgrPers

- The new representation of person features requires redefining AgrPers as follows:

(20) AgrPers: $\left[\textsc{agr} \quad \left[\textsc{pers1} \quad +\right] \vee \left[\textsc{pers2} \quad +\right]\right]$

Person prefix rules

- The rules in each block are applied in order, such that rule *n* is only applied if $n - 1$ cannot be applied.
- Prefix rules form an independent block.

(21) BLOCK P

i. $\left[\text{AGR} \quad \left[\text{PERS2} \quad +\right]\right] \rightarrow ki[_V \text{ X }]$

ii. $\left[\text{AGR} \quad \left[\text{PERS1} \quad +\right]\right] \rightarrow ni[_V \text{ X }]$

iii. $\left[\text{TENSE} \quad \text{PAST}\right] \rightarrow o(t)[_V \text{ X }]$

- 1st person inclusive behaves as a 2nd person in Plains Cree.
- Rule (21iii) applies in all cases where the two previous rules are not applied, namely for 3rd person in the past tense.
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Direction suffix rules

- The application of (22i), (22ii) vs. (22iii),(22iv) is governed by the elsewhere condition (more specific principles are applied before more general principles).

(22) BLOCK DRCTN

i. $\text{GF}_{\text{AGR}} = \text{SUBJ}, \left[\text{OBJ} \left[\text{AGR} \begin{bmatrix}\text{PERS1} & + \\ \text{PERS2} & -\end{bmatrix}\right]\right] \rightarrow [_V\ \text{X}]i$

ii. $\text{GF}_{\text{AGR}} = \text{OBJ}, \left[\text{SUBJ} \left[\text{AGR} \begin{bmatrix}\text{PERS1} & + \\ \text{PERS2} & -\end{bmatrix}\right]\right] \rightarrow [_V\ \text{X}]iti$

iii. $\text{GF}_{\text{AGR}} = \text{SUBJ} \rightarrow [_V\ \text{X}]a{:}/e{:}$

iv. $\text{GF}_{\text{AGR}} = \text{OBJ} \rightarrow [_V\ \text{X}]ikw/iko$

Local and non-local direction suffixes

- (22i) and (22ii) are the so-called *local direction suffixes* (glossed as LDIR).
- (22iii) and (22iv) are the so-called *non-local direction suffixes* (glossed as DIR).
- In this theory, direct morphology: the affixes that spell out GF_{AGR} = SUBJ.
- Conversely, inverse morphology: the affixes that spell out GF_{AGR} = OBJ.

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Person-Number suffix rules

- With DGF = {SUBJ, OBJ}

(23) BLOCK PN

i. $\left[\text{DGF}\ \left[\text{AGR}\ \begin{bmatrix}\text{PERS1} & +\\ \text{PERS2} & -\\ \text{NUM} & \text{PL}\end{bmatrix}\right]\right] \rightarrow [_V\ \text{X}\ ]na{:}n$

ii. $\left[\text{DGF}\ \left[\text{AGR}\ \begin{bmatrix}\text{PERS1} & +\\ \text{PERS2} & +\\ \text{NUM} & \text{PL}\end{bmatrix}\right]\right] \rightarrow [_V\ \text{X}\ ]naw$

iii. $\left[\text{DGF}\ \left[\text{AGR}\ \begin{bmatrix}\text{PERS2} & +\\ \text{NUM} & \text{PL}\end{bmatrix}\right]\right] \rightarrow [_V\ \text{X}\ ]wa{:}w$

iv. $\left[\text{DGF}\ \left[\text{AGR}\ \begin{bmatrix}\text{PERS1} & -\\ \text{PERS2} & -\end{bmatrix}\right]\right] \rightarrow [_V\ \text{X}\ ]w$

v. Else $\rightarrow [_V\ \text{X}\ ]n$

- The elsewhere condition implies that the suffix *-n* is used when both subject and object are 1st and 2nd person singular.

Relative order of affixes

- The application of the blocks of rules follows this structured order:

(24) P—*Stem*—DRCTN—PN

(25) ki- se:kih -i -na:n
P:2 *Stem:frighten* DRCTN:LDIR PN:1.PL.EXCL
'You frighten us.EXCL'

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Reminder of what we are doing

- Let's remind ourselves why we need this morphological theory and its relation to HAA in Plains Cree.

(26) ni- se:kih -a: -na:n
1 *frighten* DIR 1.PL.EXCL
'We.EXCL frighten him'

(27) * ni- se:kih -a: -w
1 *frighten* DIR 3.SG
'*We.EXCL frighten him'

- In a morpheme-based approach to morphology, both (26) and (27) are possible (both have the same f-structure!).
- In our approach, (27) is correctly discarded because its morphology is not licensed by its f-structure.

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Formal illustration: agreement

- The f-structure candidates are these two.
- The candidate on the right loses because it violates AGRPERS.

$$\begin{bmatrix} \text{PRED} & \text{`}\textit{frighten}\ \langle\ \text{Ext}_1\ \text{Int}_2\ \rangle\text{'} \\ \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \boxed{1}\begin{bmatrix} \text{PERS1} & + \\ \text{PERS2} & - \\ \text{NUM} & \text{PL} \end{bmatrix} \end{bmatrix}_1 \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \begin{bmatrix} \text{PERS1} & - \\ \text{PERS2} & - \\ \text{NUM} & \text{SG} \end{bmatrix} \end{bmatrix}_2 \end{bmatrix}$$

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Formal illustration: Person prefix

$$\begin{bmatrix} \textsc{pred} & \text{`}\textit{frighten}\ \langle\ \text{Ext}_1\ \text{Int}_2\ \rangle\text{'} \\ \textsc{agr} & \boxed{1} \\ \textsc{subj} & \begin{bmatrix} \textsc{pred} & \text{`}\textsc{pro}\text{'} \\ \textsc{agr} & \boxed{1}\begin{bmatrix} \textsc{pers}1 & + \\ \textsc{pers}2 & - \\ \textsc{num} & \textsc{pl} \end{bmatrix} \end{bmatrix}_1 \\ \textsc{obj} & \begin{bmatrix} \textsc{pred} & \text{`}\textsc{pro}\text{'} \\ \textsc{agr} & \begin{bmatrix} \textsc{pers}1 & - \\ \textsc{pers}2 & - \\ \textsc{num} & \textsc{sg} \end{bmatrix} \end{bmatrix}_2 \end{bmatrix}$$

- $\begin{bmatrix} \textsc{agr} & \begin{bmatrix} \textsc{pers}2 & + \end{bmatrix} \end{bmatrix} \rightarrow \textit{ki}[_V\ \text{X}\ ]$
- $\begin{bmatrix} \textsc{agr} & \begin{bmatrix} \textsc{pers}1 & + \end{bmatrix} \end{bmatrix} \rightarrow \textit{ni}[_V\ \text{X}\ ]$
- **Result:** The prefix is *ni-*

Formal illustration: Person prefix

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- $\begin{bmatrix} \textsc{agr} & \begin{bmatrix} \textsc{pers}2 & + \end{bmatrix} \end{bmatrix} \rightarrow \textit{ki}[_V\ \text{X}\ ]$ **FALSE**
- $\begin{bmatrix} \textsc{agr} & \begin{bmatrix} \textsc{pers}1 & + \end{bmatrix} \end{bmatrix} \rightarrow \textit{ni}[_V\ \text{X}\ ]$
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- $\begin{bmatrix} \textsc{agr} & \begin{bmatrix} \textsc{pers}1 & + \end{bmatrix} \end{bmatrix} \rightarrow \textit{ni}[_V\ \text{X}\ ]$ **OK**
- **Result:** The prefix is *ni-*

Formal illustration: Person prefix

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Formal illustration: Direction suffix

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- $\text{GF}_{\text{AGR}} = \text{SUBJ}, \begin{bmatrix} \text{OBJ} & \begin{bmatrix} \text{AGR} & \begin{bmatrix} \text{PERS1} & + \\ \text{PERS2} & - \end{bmatrix} \end{bmatrix} \end{bmatrix} \rightarrow [_V\ \text{X}]i$
- $\text{GF}_{\text{AGR}} = \text{OBJ}, \begin{bmatrix} \text{SUBJ} & \begin{bmatrix} \text{AGR} & \begin{bmatrix} \text{PERS1} & + \\ \text{PERS2} & - \end{bmatrix} \end{bmatrix} \end{bmatrix} \rightarrow [_V\ \text{X}]iti$
- $\text{GF}_{\text{AGR}} = \text{SUBJ} \rightarrow [_V\ \text{X}]a{:}/e{:}$
- **Result:** Suffix is *-a:/e:*

Formal illustration: Direction suffix

$$\begin{bmatrix} \text{PRED} & \text{`}\textit{frighten}\ \langle\ \text{Ext}_1\ \text{Int}_2\ \rangle\text{'} \\ \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \boxed{1}\begin{bmatrix} \text{PERS1} & + \\ \text{PERS2} & - \\ \text{NUM} & \text{PL} \end{bmatrix} \end{bmatrix}_1 \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \begin{bmatrix} \text{PERS1} & - \\ \text{PERS2} & - \\ \text{NUM} & \text{SG} \end{bmatrix} \end{bmatrix}_2 \end{bmatrix}$$

- $\text{GF}_{\text{AGR}} = \text{SUBJ}, \begin{bmatrix} \text{OBJ} & \begin{bmatrix} \text{AGR} & \begin{bmatrix} \text{PERS1} & + \\ \text{PERS2} & - \end{bmatrix} \end{bmatrix} \end{bmatrix}$

  $\rightarrow [_V\ \text{X}]i$ **FALSE**

- $\text{GF}_{\text{AGR}} = \text{OBJ}, \begin{bmatrix} \text{SUBJ} & \begin{bmatrix} \text{AGR} & \begin{bmatrix} \text{PERS1} & + \\ \text{PERS2} & - \end{bmatrix} \end{bmatrix} \end{bmatrix}$

  $\rightarrow [_V\ \text{X}]iti$

- $\text{GF}_{\text{AGR}} = \text{SUBJ} \rightarrow [_V\ \text{X}]a{:}/e{:}$

- **Result:** Suffix is *-a:/e:*

Formal illustration: Direction suffix

$$\begin{bmatrix} \text{PRED} & \text{`}\textit{frighten}\ \langle\ \text{Ext}_1\ \text{Int}_2\ \rangle\text{'} \\ \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \boxed{1}\begin{bmatrix} \text{PERS1} & + \\ \text{PERS2} & - \\ \text{NUM} & \text{PL} \end{bmatrix} \end{bmatrix}_1 \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \begin{bmatrix} \text{PERS1} & - \\ \text{PERS2} & - \\ \text{NUM} & \text{SG} \end{bmatrix} \end{bmatrix}_2 \end{bmatrix}$$

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Formal illustration: Direction suffix

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  $\rightarrow [_V\ \text{X}]iti$ **FALSE**

- $\text{GF}_{\text{AGR}} = \text{SUBJ} \rightarrow [_V\ \text{X}]a{:}/e{:}$ **OK**
- **Result:** Suffix is *-a:/e:*

Formal illustration: Person-Number suffix

$$\begin{bmatrix} \text{PRED} & \text{`}\textit{frighten}\ \langle\ \text{Ext}_1\ \text{Int}_2\ \rangle\text{'} \\ \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \boxed{1}\begin{bmatrix} \text{PERS}1 & + \\ \text{PERS}2 & - \\ \text{NUM} & \text{PL} \end{bmatrix} \end{bmatrix}_1 \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \begin{bmatrix} \text{PERS}1 & - \\ \text{PERS}2 & - \\ \text{NUM} & \text{SG} \end{bmatrix} \end{bmatrix}_2 \end{bmatrix}$$

- $\begin{bmatrix} \text{DGF} & \begin{bmatrix} \text{AGR} & \begin{bmatrix} \text{PERS}1 & + \\ \text{PERS}2 & - \\ \text{NUM} & \text{PL} \end{bmatrix} \end{bmatrix} \end{bmatrix}$
  $\rightarrow [_V\ \text{X}\ ]\textit{na:n}$
- **Result:** Suffix is *-na:n*

Formal illustration: Person-Number suffix

$$\begin{bmatrix} \text{PRED} & \text{`}\textit{frighten}\ \langle\ \text{Ext}_1\ \text{Int}_2\ \rangle\text{'} \\ \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \boxed{1}\begin{bmatrix} \text{PERS} & 1 & + \\ \text{PERS} & 2 & - \\ \text{NUM} & & \text{PL} \end{bmatrix} \end{bmatrix}_1 \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \begin{bmatrix} \text{PERS} & 1 & - \\ \text{PERS} & 2 & - \\ \text{NUM} & & \text{SG} \end{bmatrix} \end{bmatrix}_2 \end{bmatrix}$$

- $\begin{bmatrix} \text{DGF} & \begin{bmatrix} \text{AGR} & \begin{bmatrix} \text{PERS} & 1 & + \\ \text{PERS} & 2 & - \\ \text{NUM} & & \text{PL} \end{bmatrix} \end{bmatrix} \end{bmatrix}$
  $\rightarrow [_V\ \text{X}\ ]$*na:n* **OK**
- **Result:** Suffix is -*na:n*

Formal illustration: Person-Number suffix

$$\begin{bmatrix} \text{PRED} & \text{`}\textit{frighten}\ \langle\ \text{Ext}_1\ \text{Int}_2\ \rangle\text{'} \\ \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \boxed{1}\begin{bmatrix} \text{PERS}1 & + \\ \text{PERS}2 & - \\ \text{NUM} & \text{PL} \end{bmatrix} \end{bmatrix}_1 \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{AGR} & \begin{bmatrix} \text{PERS}1 & - \\ \text{PERS}2 & - \\ \text{NUM} & \text{SG} \end{bmatrix} \end{bmatrix}_2 \end{bmatrix}$$

- $\begin{bmatrix} \text{DGF} & \begin{bmatrix} \text{AGR} & \begin{bmatrix} \text{PERS}1 & + \\ \text{PERS}2 & - \\ \text{NUM} & \text{PL} \end{bmatrix} \end{bmatrix} \end{bmatrix}$
  $\rightarrow [_V\ \text{X}\ ]$*na:n* **OK**
- **Result:** Suffix is -*na:n*

Formal illustration: Final result

$$\begin{bmatrix} \textsc{pred} & \text{`}\textit{frighten}\ \langle\ \text{Ext}_1\ \text{Int}_2\ \rangle\text{'} \\ \textsc{agr} & \boxed{1} \\ \textsc{subj} & \begin{bmatrix} \textsc{pred} & \text{`}\textsc{pro}\text{'} \\ \textsc{agr} & \boxed{1}\begin{bmatrix} \textsc{pers}1 & + \\ \textsc{pers}2 & - \\ \textsc{num} & \textsc{pl} \end{bmatrix} \end{bmatrix}_1 \\ \textsc{obj} & \begin{bmatrix} \textsc{pred} & \text{`}\textsc{pro}\text{'} \\ \textsc{agr} & \begin{bmatrix} \textsc{pers}1 & - \\ \textsc{pers}2 & - \\ \textsc{num} & \textsc{sg} \end{bmatrix} \end{bmatrix}_2 \end{bmatrix}$$

- **Final Result:**

(28) ni- se:kih -a: -na:n
1 *frighten* DIR 1.PL.EXCL
'We.EXCL frighten him'

The interaction between 1st and 2nd person (local scenarios)

- Up to this point, we have assumed that 1st and 2nd person have equal rank for purposes of agreement (remember AGRPERS).
- There is a lot of cross-linguistic variation wrt which of the two SAP arguments triggers verbal agreement in local (SAP-exclusive) contexts.
- In some languages the SUBJ is invariably chosen (Chirag Dargwa: Belyaev, 2013).
- In other languages, the first person is always chosen as the agreement trigger (Nocte: Thompson, 1994; Japhug Rgyalrong: Jacques, 2010; Wobzi Lavrung: Lai, 2015).
- In yet other languages: the second person is always chosen as the agreement trigger (mainly Algonquian languages, Khaling Kiranti: Jacques and Antonov, 2014; Zúñiga, 2006).
- Plains Cree belongs to the latter group.

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2nd person over 1st person in Plains Cree

- Consider this case (Dahlstrom, 1986) and its two (abridged) candidates:

(29) ki- se:kih -iti -n
2 *frighten* LINV 1/2
'I frighten you.SG'

$$\begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{AGR} & \boxed{1}\begin{bmatrix} \text{PERS} & 1 \\ + \end{bmatrix} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{AGR} & \begin{bmatrix} \text{PERS} & 2 \\ + \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

$$\begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{AGR} & \begin{bmatrix} \text{PERS} & 1 \\ + \end{bmatrix} \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{AGR} & \boxed{1}\begin{bmatrix} \text{PERS} & 2 \\ + \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The failed optimization

- Our hypothesis so far incorrectly predicts (29) to be ungrammatical: it predicts subject agreement, and therefore *-iti* should not be possible (it requires $\text{GF}_{\text{AGR}} = \text{OBJ}$).

	AgrPers	AgrSubj
☞ $\text{GF}_{\text{AGR}} = \text{SUBJ}$		
$\text{GF}_{\text{AGR}} = \text{OBJ}$		*!

Figure: Incorrect optimization

The need for AgrPers2

- In order to capture the fact that 2nd person ranks higher than 1st person, we need AgrPers2 as defined below:

(30) AgrPers2: $\left[\text{agr} \quad \left[\text{pers2} \quad +\right]\right]$

(31) AgrPers, AgrPers2 $\gg$ AgrSubj

- The relative ranking of AgrPers and AgrPers2 is underspecified.
- This ranking of constraints correctly selects the 2nd person for agreement in local contexts.

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- The relative ranking of AgrPers and AgrPers2 is underspecified.
- This ranking of constraints correctly selects the 2nd person for agreement in local contexts.

The correct optimization

- With AgrPers2 we correctly predict object agreement in this case, and therefore *-iti* is licensed (GF_{AGR} = OBJ and the subject is 1st person).

(32) ki- se:kih -iti -n
2 *frighten* LINV 1/2
'I frighten you.SG'

	AgrPers	AgrPers2	AgrSubj
☞ GF_{AGR} = OBJ			*
GF_{AGR} = SUBJ		*!	

Proximate & Obviative

- 3rd person in Algonquian languages is further divided between proximate and obviative forms.
- In non-local scenarios (i.e. both DGFs are 3rd person) one of the arguments may be singled out as the proximate argument, and it corresponds to the protagonist of the discourse.
- 3rd persons that are not the proximate are obviative.
- 3rd proximate ranks higher for agreement than 3rd obviative.
- In the context of non-local scenarios:
  - If the obviative is the OBJ, the verb takes the direct form.
  - If the proximate is the OBJ, the verb takes the inverse form.

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  - If the proximate is the OBJ, the verb takes the inverse form.

The data

- Data taken from Zúñiga (2008):

(33) se:kih -e: -w
3.*frighten* DIR 3
'He.PROX frightens him.OBV'

(34) se:kih -ikw -w
3.*frighten* INV 3
'He.OBV frightens him.PROX'

- A new constraint is required to cover these cases: AGRPROX.

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(33) se:kih -e: -w
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3.*frighten* INV 3
'He.OBV frightens him.PROX'

- A new constraint is required to cover these cases: AGRPROX.

Defining AGRPROX

- We define AGRPROX as below:

(35) AGRPROX: $\begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{GF} & \begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{PROX} & + \end{bmatrix} \end{bmatrix}$

- The PROX feature is only available for 3rd persons.
- The ranking of constraints is as follows: AGRPERS, AGRPERS2, AGRPROX $\gg$ AGRSUBJ.
- AGRPROX is only relevant in non-local scenarios.
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(35) AgrProx: $\begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{GF} & \begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{PROX} & + \end{bmatrix} \end{bmatrix}$

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Candidates for the non-local direct form

- The abridged f-structures of the candidates for (36) are shown below:

(36) se:kih -e: -w
3.*frighten* DIR 3
'He.PROX frightens him.OBV'

$$\begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{PROX} & + \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{PROX} & - \end{bmatrix} \end{bmatrix}$$

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Optimization for the non-local direct form

	AGRPERS	AGRPERS2	AGRPROX	AGRSUBJ
☞ GF_{AGR} = SUBJ	*	*		
GF_{AGR} = OBJ	*	*	*!	*

Figure: Optimization for (36)

Candidates for the non-local inverse form

- The abridged f-structures of the candidates for (37) are shown below:

(37) se:kih -ikw -w
3.*frighten* INV 3
'He.OBV frightens him.PROX'

$$\begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{PROX} & - \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{PROX} & + \end{bmatrix} \end{bmatrix}$$

$$\begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{SUBJ} & \begin{bmatrix} \text{AGR} & \boxed{1} \\ \text{PROX} & - \end{bmatrix} \\ \text{OBJ} & \begin{bmatrix} \text{PROX} & + \end{bmatrix} \end{bmatrix}$$

Optimization for the non-local inverse form

	AGRPERS	AGRPERS2	AGRPROX	AGRSUBJ
☞ GF_{AGR} = OBJ	*	*		*
GF_{AGR} = SUBJ	*	*	*!	

Figure: Optimization for (37)

Conclusions regarding syntax

- Languages can be grouped into two basic types wrt agreement: GF-governed agreement systems and person-governed agreement systems.
- We capture these two types by positing:
  a. An AGR feature bundle of the clause.
  b. OT constraints: AGR-SHARE (high-ranking), AGRSUBJ, and AGRPERS.
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Conclusions regarding morphology

- Inflectional morphology is the realization of syntactic information present in the f-structure.
  - Morphological rules place word forms in correspondence with f-structures.
- Direct-inverse morphology:
  - Typically found in person-governed agreement systems
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