First-come, First-serve
Marker-sensitive Blocking and Ordering in Potawatomi

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3rd Vienna Workshop on Affix Order

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We present an account for some interesting properties of the verbal agreement system in the Algonquian language Potawatomi:

- the order of affixes follows a hierarchy of morpho-syntactic features
- a marker-sensitive blocking of expected markers

We will discuss and compare different possible approaches and will conclude that a solution to the interesting marker-sensitive blocking is naturally provided in a realizational DM account that introduces the new concept of **Collateral Feature Discharge**.
1. Introduction

2. Affix Order
   - Affix Order in OT: Alignment
   - Affix Order in DM: Hierarchy-governed insertion

3. Blocking of subsequent markers
   - Blocking in DM
   - Blocking in OT

4. Summary
Potawatomi language

- Potawatomi, Central Algonquian, North America
- rich morphology (especially verbal morphology)
- direct/inverse system
- agreement with subject and object

- Hockett 1939, Hockett 1948
Potawatomi Affix Order

(1) Extract of the transitive animate paradigm

<table>
<thead>
<tr>
<th></th>
<th>2s</th>
<th>2p</th>
<th>3s</th>
<th>3p</th>
</tr>
</thead>
<tbody>
<tr>
<td>2s</td>
<td></td>
<td></td>
<td>Σ-a</td>
<td>Σ-a-k</td>
</tr>
<tr>
<td>2p</td>
<td></td>
<td></td>
<td>Σ-a-wa</td>
<td>Σ-a-wa-k</td>
</tr>
<tr>
<td>3s</td>
<td>Σ-uko</td>
<td>Σ-uko-wa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3p</td>
<td>Σ-uko-k</td>
<td>Σ-uko-wa-k</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

case ≫ 1 ≫ 2 ≫ 3

(2) Marker specifications

−uko Nom, 3  −a Acc, 3
−wa 2p  −k 3p
Available Types of Theories

Theories

- hierarchical
  - non-cyclic
    - OT
  - cyclic
    - DM

Trommer 2001
Violable alignment constraints (McCarthy & Prince 1993) demand the order of morphemes:

\[ \Sigma \leftrightarrow [\text{Agr}] \]

Assign a violation mark for every morpheme between the right edge of the stem and a morpheme realizing [Agr].
Order of Affixes in Potawatomi (OT)

The order of morphemes following the prominence hierarchy

\[ \text{case} \gg 1 \gg 2 \gg 3 \]

is derived from the constraint hierarchy:

\[ (4) \quad \Sigma \leftrightarrow [C] \gg \Sigma \leftrightarrow [+1] \gg \Sigma \leftrightarrow [+2] \gg \Sigma \leftrightarrow [+3] \]
### Order of Affixes in Potawatomi (OT)

<table>
<thead>
<tr>
<th></th>
<th>( [A,-1,-2,+3,+pl] )</th>
<th>( [P,-1,+2,-3,+pl] )</th>
<th>( \Sigma \leftrightarrow [C] )</th>
<th>( \Sigma \leftrightarrow [+2] )</th>
<th>( \Sigma \leftrightarrow [+3] )</th>
</tr>
</thead>
<tbody>
<tr>
<td>a.</td>
<td>–wa ([+2,+pl])</td>
<td>–uko ([A,-1,-2])</td>
<td>–k ([+3,+pl])</td>
<td>(*)!)</td>
<td>(**)</td>
</tr>
<tr>
<td>b.</td>
<td>–uko ([A,-1,-2])</td>
<td>–wa ([+2,+pl])</td>
<td>–k ([+3,+pl])</td>
<td>(*)</td>
<td>(**)</td>
</tr>
<tr>
<td>c.</td>
<td>–uko ([A,-1,-2])</td>
<td>–k ([+3,+pl])</td>
<td>–wa ([+2,+pl])</td>
<td>(**!)</td>
<td>(*))</td>
</tr>
</tbody>
</table>
Discussion: OT derives affix order

- the OT account allows to implement a prominence hierarchy: the constraint ranking directly reflects it
- not every affix is assigned to a certain position: the order is derived with reference to the morpho-syntactic features a marker realizes
Theories

- hierarchical
  - non-cyclic
    - OT
    - Trommer 2001
  - cyclic
    - DM

Affix Order in DM: Hierarchy-governed insertion
Distributed Morphology – A realizational theory I

- Halle & Marantz 1993
- post-syntactic insertion
- functional morphemes contain fully specified bundles of morpho-syntactic features
- vocabulary items pair phonological and (underspecified) morpho-syntactic features
- VIs are inserted to **realize** the morphosyntactic features the syntax provides
- VIs can be **underspecified** and are inserted if their features are a proper **subset** of the morphosyntactic feature context (Halle 1997)
(5) *Subset Principle*  
A vocabulary item $V$ is inserted into a functional morpheme $M$ iff a. and b. hold:  

a. The morpho-syntactic features of $V$ are a subset of the morpho-syntactic features of $M$.  
b. $V$ is the most specific vocabulary item that satisfies a.
Distributed Morphology – Feature Discharge

- Noyer 1997
- After insertion, the features that are realized by the marker are discharged and unavailable for further insertion.

\[ Fission \text{ as Feature Discharge} \]

Noyer (1992)

If insertion of a vocabulary item $V$ with the morpho-syntactic features $\beta$ takes place into a fissioned morpheme $M$ with the morpho-syntactic features $\alpha$, then $\alpha$ is split up into $\beta$ and $\alpha - \beta$, such that (i) and (ii) hold:

(i) $\alpha - \beta$ is available for further vocabulary insertion.
(ii) $\beta$ is not available for further insertion.
Specificity

- if more than one VI matches a context, the more specific marker is chosen
- hierarchy-effects result if specificity refers not only to the number of features a marker realizes, but to the quality of the features.

(7) \textit{Specificity} \hspace{1cm} \text{Müller (2005)}

A vocabulary item $V_i$ is more specific than a vocabulary item $V_j$ iff there is a class of features $F$ such that a. and b. hold.

a. $V_i$ bears more features belonging to $F$ than $V_j$ does.

b. There is no higher-ranked class of features $F'$ such that $V_i$ and $V_j$ have a different number of features in $F'$. 
Example: Potawatomi

<table>
<thead>
<tr>
<th>case</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>context:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>possible VIs:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>the most specific one:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

\[
\begin{bmatrix}
\mathcal{A},-1,-2,+3,\text{+pl} \\
P,-1,+2,-3,\text{+pl}
\end{bmatrix}
\]

\[-wa \leftrightarrow [+2, \text{+pl}]\]

\[-uko \leftrightarrow [A,-1,-2]\]

\[-k \leftrightarrow [+3, \text{+pl}]\]

\[-uko \leftrightarrow [A,-1,-2]\]
Example: Potawatomi

...the insertion continues...

\[
\begin{bmatrix}
A, & -1, & -2, & +3, & +pl \\
P, & -1, & +2, & -3, & +pl
\end{bmatrix}
\]

\(-wa \leftrightarrow [+2, +pl]\)  \(-uko/\)

\[
\begin{bmatrix}
A, & -1, & -2, & +3, & +pl \\
P, & -1, & +2, & -3, & +pl
\end{bmatrix}
\]

\(-k \leftrightarrow [+3, +pl]\)  \(-uko-wa/\)

\[
\begin{bmatrix}
A, & -1, & -2, & +3, & +pl \\
P, & -1, & +2, & -3, & +pl
\end{bmatrix}
\]

\(-uko-wa-k/\)
OT vs. DM draw?

- up to now both approaches seem to work equally good since they derive the affix order with help of a hierarchy

- but there are more data which have to be taken into account
Blocking of markers

- There are contexts where certain suffixes do not occur although they would be expected.
- We see only theme marking and a 1p suffix.

<table>
<thead>
<tr>
<th>A\P</th>
<th>1pe</th>
<th>2p</th>
<th>3p</th>
<th>obv</th>
<th>-anim</th>
</tr>
</thead>
<tbody>
<tr>
<td>1p</td>
<td></td>
<td>-en-men*–m</td>
<td>-a-men*–k</td>
<td>-a-men*–n</td>
<td>-a-men*–n</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[+2,+pl]</td>
<td>[+3,+pl]</td>
<td>[+obv]</td>
<td>[–anim]</td>
</tr>
<tr>
<td>2p</td>
<td>-y-men*–m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>[+2,+pl]</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Σ–case–1p
Theories

- hierarchical
  - non-cyclic
    - OT
    - Trommer 2001
  - cyclic
    - DM
Hierarchy-governed insertion in DM: The misprediction

head:

\[
\begin{bmatrix}
A, +1, -2, -3, +pl \\
P, -1, -2, +3, +pl
\end{bmatrix}
\]

insertion of:

\[
\begin{bmatrix}
A, +1, -2, -3, +pl \\
P, -1, -2, +3, +pl
\end{bmatrix}
\]

\[\neg\text{men} \leftrightarrow [+1, +pl]\]

\[\neg k \leftrightarrow [+3, +pl]\]

\[\neg a\neg\text{men}\]
A possible solution: Impoverishment Rules

- in DM, the VIs are inserted to realize the morpho-syntactic features the syntax provides
- prior to insertion, these features can be manipulated: features can be deleted in the presence of other features
Impoverishment Rules in Potawatomi

(8)  
\[
\begin{align*}
\text{a. } +\text{pl} & \Rightarrow \emptyset / \{ A,+1,+\text{pl} \} \\
\text{b. } +\text{obv} & \Rightarrow \emptyset / \{ A,+1,+\text{pl} \} \\
\text{c. } -\text{anim} & \Rightarrow \emptyset / \{ A,+1,+\text{pl} \} \\
\text{d. } +\text{pl} & \Rightarrow \emptyset / \{ P,+1,+\text{pl} \}
\end{align*}
\]

\[
\begin{array}{cccccc}
 & 1p & 2p & 3p & \text{obv} & -\text{anim} \\
\hline
1p & -\text{men}^{*}\text{–m} & -\text{men}^{*}\text{–k} & -\text{men}^{*}\text{–n} & -\text{men}^{*}\text{–n} \\
 & [+2,+\text{pl}] & [+3,+\text{pl}] & [+\text{obv}] & [-\text{anim}] \\
2p & -\text{men}^{*}\text{–m} & & & & \\
 & [+2,+\text{pl}] & & & & \\
3p & & & -\text{nan–k} & & \\
\end{array}
\]
The effect of impoverishment in Potawatomi

head after impoverishment:

\[
\begin{align*}
A, +1, -2, -3, +pl \\
P, -1, -2, +3
\end{align*}
\]

\[
\begin{align*}
A, +1, -2, -3, +pl \\
P, -1, -2, +3
\end{align*}
\]

insertion of:

\[
\begin{align*}
-men & \leftrightarrow [+1, +pl] \\
* -k & \leftrightarrow [+3, +pl]
\end{align*}
\]

\[ -a-men \]
Theories

- hierarchical
  - non-cyclic
    - OT
      - Trommer 2001
  - cyclic
    - DM
Blocking in Optimality Theory (Trommer 2001)

The constraint (9) demanding that every feature in the input must be realized with some morpheme in the output is outranked by a constraint (10) demanding that a certain feature must be impoverished (=not realized) in a certain context.

(9) Parse [FS]
Assign a violation mark for each feature structure $FS'$ in the input that is subsumed by $FS$ and not realized by a feature structure in the output that parses $FS$ in $FS'$.

(10) Impoverishment $[FS_{\text{Target}}][FS_{\text{Trigger}}]$:
Assign a violation mark if there is a VI in the output that parses $FS_{\text{Target}}$ in an input $FS$ subsumed by $FS_{\text{Trigger}}$. 
## Blocking in Potawatomi (OT)

<table>
<thead>
<tr>
<th></th>
<th>1p</th>
<th>2p</th>
<th>3p</th>
<th>obv</th>
<th>–anim</th>
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<tr>
<td>1p</td>
<td>–en–men*–m</td>
<td>–a–men*–k</td>
<td>–a–men*–n</td>
<td></td>
<td>–a–men*–n</td>
</tr>
<tr>
<td>2p</td>
<td>–y–men*–m</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(11) Impoverishment $[+3]^{[A,+1,+pl]}$  

$I[3^{A1p}]$
### Blocking in Potawatomi (OT)

<table>
<thead>
<tr>
<th></th>
<th>[A, +1, –2, –3, +pl]</th>
<th>[P, –1, –2, +3, +pl]</th>
<th>I[3A1p]</th>
<th>Ps-[+1]</th>
<th>Ps-[+2]</th>
<th>Ps-[+3]</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>–a–men–k</td>
<td>![image]</td>
<td>![image]</td>
<td>![image]</td>
<td>![image]</td>
<td>![image]</td>
</tr>
<tr>
<td></td>
<td>[P, –1, –2]</td>
<td>[+1, +pl]</td>
<td>[+3, +pl]</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b</td>
<td>–a–men</td>
<td>![image]</td>
<td>![image]</td>
<td>![image]</td>
<td>![image]</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[P, –1, –2]</td>
<td>[+1, +pl]</td>
<td></td>
<td></td>
<td></td>
<td>![image]</td>
</tr>
<tr>
<td>c</td>
<td>–a–k</td>
<td>![image]</td>
<td>![image]</td>
<td>![image]</td>
<td></td>
<td>![image]</td>
</tr>
<tr>
<td></td>
<td>[P, –1, –2]</td>
<td>[+3, +pl]</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
to account for the blocking in Potawatomi, at least 4 different impoverishment constraints are necessary

(12)  
*Impoverishment constraints in Potawatomi*

a. Impoverishment [+2][+1,+pl]

b. Impoverishment [+3][A,+1,+pl]

c. Impoverishment [+obv][A,+1,+pl]

d. Impoverishment [–anim][A,+1,+pl]
in addition, the concept of impoverishment constraints is a quite stipulated mechanism and can in principle be stated for any feature in any context
Impoverishment Rules: Discussion

Impoverishment is a quite powerful and stipulated mechanism and should be avoided.

We rather argue that morphological deletion generally follows from marker insertion. The markers themselves are responsible for the blocking of other markers:

1. markers that do not trigger blocking
2. markers that do trigger blocking
An Alternative: Collateral Feature Discharge

- markers that trigger blocking
- they discharge more than the features which are necessary for their insertion
  - VI with the property of **Collateral Feature Discharge** (CFD)
### Potawatomi revisited

**Table:**

<table>
<thead>
<tr>
<th>A \ P</th>
<th>1pe</th>
<th>1pi</th>
<th>2p</th>
<th>3p</th>
<th>obv</th>
<th>–anim p</th>
</tr>
</thead>
<tbody>
<tr>
<td>1p</td>
<td></td>
<td></td>
<td>–men</td>
<td>–men</td>
<td>–men</td>
<td>–men</td>
</tr>
<tr>
<td>2p</td>
<td>–men</td>
<td></td>
<td>–wa–k</td>
<td>–wa–n₁</td>
<td>–wa–n₂</td>
<td></td>
</tr>
</tbody>
</table>

- two markers for [+1,+pl]: –*nan* and –*men*
- blocking effect is marker specific
- happens only after –*men*
/-men/ has the CFD-property

head: 

\[
\begin{bmatrix}
A, +1, -2, -3, +pl \\
P, -1, -2, +3, +pl
\end{bmatrix}
\]

insertion of: 

\[
-\text{men}_{\text{cfd}} \leftrightarrow [+1, +pl]
\]

\[
\begin{bmatrix}
A, +1, -2, -3, +pl \\
P, -1, -2, +3, +pl
\end{bmatrix}
\]

\[-a-\text{men}\]
the CFD approach allows to treat the blocking as a marker specific property

the cyclic insertion allows to capture the fact that the blocking does only affect subsequent markers
Discussion of CFDs

vs. Impoverishment rules (DM)

- impoverishment rules can not handle this marker sensitivity: they are not bound to the presence of a certain marker but manipulate the context before insertion

vs. Impoverishment constraints (OT)

- although impoverishment constraints only refer to features that are already realized by a marker, the marker sensitivity cannot be handled: it is irrelevant which marker is inserted

- the fact that only subsequent markers are blocked can only be captured with the questionable reintroduction of serialism into an originally parallel model (McCarthy 2000, Wolf 2008)
Summary

- the order of affixes and the marker sensitivity in Potawatomi followed from:
  1. Specificity in concepts of feature hierarchies
  2. Feature Discharge
  3. Collateral Feature Discharge as special property of certain markers

- it easily implements the prominence hierarchy: affix order does not follow an arbitrary stipulation as in e.g. templatic approaches (Stump 2001)

- this approach works for the most other Algonquian languages in the same way
Migwe’c!
Thank you!


References II


References III