Towards an Algebraic Morphosyntax

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There is a huge number of morphosyntactic scales:
- comparative suppletion (ABC, ABB, *ABA, *AAB)
- case hierarchy for pronoun suppletion
- omnivorous number (sg/pl + sg/pl = pl, *sg + sg = sg)
- resolved gender agreement

Different syntactic mechanisms seem to be involved
⇒ very different syntactic accounts for these phenomena

Research Program
If we abstract away from the syntactic machinery,
do we find commonalities among all these scales?
What is the PCC?

**Person Case Constraint (PCC)**

Whether the direct object (DO) and the indirect object (IO) of a clause can both be cliticized is contingent on the person specification of DO and IO.

(1) Roger *me/le leur a présenta\textsuperscript{é}.
Roger 1SG/3SG.ACC 3PL.DAT has shown
‘Roger has shown me/him to them.’

**Questions & Goals**

- What are the descriptive properties of PCCs?
  ⇒ algebraic unification in terms of presemilattices

- Can those properties be tied to independently motivated linguistic assumptions?  ⇒ connection to feature geometry
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- Can those properties be tied to independently motivated linguistic assumptions?
  ⇒ connection to feature geometry
### Outline

1. **Person Case Constraints: An Overview**
   - PCC Typology
   - Previous Proposals

2. **Characterizing the Class of PCCs**
   - The Generalized PCC
   - Algebraic Characterization via Person Locality

3. **Connection to Feature Complexity**
   - Reducing Person Locality to Feature Complexity
   - Reducing Feature Complexity to Feature Geometries
The PCC: A Closer Look

- attested in a variety of languages, including French, Spanish, Catalan, and Classical Arabic (Kayne 1975; Bonet 1991, 1994)
- specifics of PCC differ between languages, dialects, idiolects

### Four Attested PCC Variants

- **Strong PCC** (S-PCC; Bonet 1994)
  - DO must be 3.

- **Ultrastrong PCC** (U-PCC; Nevins 2007)
  - DO is less local than IO (where 3 < 2 < 1).

- **Weak PCC** (W-PCC; Bonet 1994)
  - 3IO combines only with 3DO.

- **Me-first PCC** (M-PCC; Nevins 2007)
  - If IO is 2 or 3, then DO is not 1.
## The Four PCC Variants (Walkow 2012)

<table>
<thead>
<tr>
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<th>3</th>
</tr>
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<tbody>
<tr>
<td>1</td>
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**S-PCC**

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**W-PCC**

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**U-PCC**

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**M-PCC**
The PCC in Minimalism

- Variety of proposals, work well empirically:
  - Anagnostopoulou (2005)
  - Nevins (2007)
  - Béjar and Rezac (2009)
  - Walkow (2012)

- **Shared Idea**: PCCs epiphenomenal, arise from more basic restrictions on the Agree operation

- **Conceptual Drawbacks**
  - non-standard Agree mechanisms
  - highly specific assumptions about feature system
  - technical, complex
  - hard to determine which assumptions are really needed
Example: Intuition Behind Nevins (2007)

- v needs to agree with a particular feature \( f \)
- a search domain is established, depending on the type of \( f \)
- ungrammatical if the domain contains DO but not IO
- v agrees with both DO and IO \( \Rightarrow \) IO and DO must have the same value for \( f \)
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Example: Assumptions of Nevins (2007)

- **Operations**
  - Agree steps happen concurrently
  - constraints on search domain
  - matching condition on IO and DO

- **Structure**
  - clitics are PF-realization of Agree
  - IO structurally higher than DO

- **Features**
  - features are binary valued
  - novel definition of contrastive features
  - feature values can be marked or unmarked
  - specific feature decomposition of person:

<table>
<thead>
<tr>
<th>Person</th>
<th>Feature Matrix</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>[+author, +participant]</td>
</tr>
<tr>
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Evaluation

- Previous accounts work on an empirical level.
- They are complex because they try to do two things at once:
  1. enforce the PCC with Minimalist machinery,
  2. capture the attested typology.
- But that’s more ambitious than necessary!

The Secret Power of Merge (Graf 2011; Kobele 2011)

Every syntactic constraint that can be computed with a finite amount of working memory can be enforced purely via Merge.

- The PCCs can be enforced by Merge, we do not need to extend our framework at all.
- The big issue is Point 2: There are $2^6 = 64$ logically possible PCC variants. Why do we find only 4 PCCs?
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The Generalized PCC

The U-PCC was defined in terms of person locality. This system can be extended to all four PCC-types.

Generalized PCC (G-PCC)

IO is not less local than DO (IO $\not< DO$), where

- **S-PCC**: $1 > 2$  $1 > 3$  $2 > 1$  $2 > 3$
- **U-PCC**: $1 > 2$  $1 > 3$  $2 > 3$
- **W-PCC**: $1 > 3$  $2 > 3$
- **M-PCC**: $1 > 2$  $1 > 3$
Person Locality Hierarchies

S-PCC  U-PCC  W-PCC  M-PCC
Example 1: S-PCC

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Example 2: W-PCC

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The G-PCC gives a unified description of the four PCCs, but we could have drawn any kind of graph. What makes the previous four structures so special?

First, they are all *presemilattices* (Plummer and Pollard 2012).

**Definition (Presemilattices for Linguists)**

A structure $S$ is a *presemilattice* iff for all nodes $u$ and $v$ of $S$, there is some node $t$ such that

- $t$ “reflexively dominates” $u$ and $v$, or
- $u$ and $v$ “reflexively dominate” $t$. 
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Two More Restrictions

The number of presemilattices with three nodes is still more than 4. We have to stipulate two more properties:

**Top and Bottom**

**Top**  For all $x$, $1 < x$ implies $x < 1$.
‘Every person feature is at most as local as 1.’

**Bottom**  There is no $x \neq 3$ such that $x < 3$.
‘No person feature is less local than 3.’

**Unifying the PCCs**

The class of attested PCCs is given by
- the G-PCC IO $\not\preceq$ DO such that
- $<$ defines a presemilattice $\mathcal{P}$ over $\{1, 2, 3\}$, and
- $\mathcal{P}$ respects both Top and Bottom.
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Top and Bottom are stipulations, but express a common intuition: 1 is “maximally complex”, 3 “minimally complex”.

### Example 1: Person Specifications in Nevins (2007)

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<tbody>
<tr>
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Syntactic proposals use feature geometry to derive PCC typology. Can we do the same? Yes, and No.

**Algebraic Feature Complexity [Idea Sketch]**

- **PCC locality is partially determined by feature complexity:**
  - Person features are ordered by their internal complexity $\Rightarrow$ algebraic structure $\mathcal{C}$
  - PCC locality rankings are exactly those structures that can be obtained from $\mathcal{C}$ by a map $f$ such that:
    - $f$ preserves certain properties of $\mathcal{F}$

The above is feasible, but more stipulative than one would expect.
Schema of Reduction to Feature Complexity

1. S-PCC
2. U-PCC
3. W-PCC
4. M-PCC
Schema of Reduction to Feature Complexity

S-PCC  U-PCC  W-PCC  M-PCC

\( f_1 \)  \( f_2 \)  \( f_3 \)  \( f_4 \)
What does $C$ Look Like?

- $C$ must assign different complexity to 1 and 2:

```
  1 * 2
   \  /  \
  2  1
   \  /  \
  3  3
```

- $C$ must assign different complexity to 2 and 3:

```
  1 * 1
   \  /  \
  2  3
   \  /  \
  3  2
```

```
  2 *
   \  \
  1  3
   \  \
  3  2
```
The previous observations entail that $C$ must be

1

2

3

This is identical to Zwicky’s person hierarchy!
(Zwicky 1977)
From $\mathcal{C}$ to Person Locality

- The 4 PCCs are generated from $\mathcal{C}$ by those maps that
  - preserve connectedness ($\approx$ Presemilattice)
  - preserve maximality ($\approx$ Top)
  - preserve lack of daughter nodes ($\approx$ Bottom)

- But where does $\mathcal{C}$ come from?
  Can we obtain $\mathcal{C}$ from some feature geometry $\mathcal{G}$?
Obtaining $\mathcal{C}$ from Feature Geometries

- **S-PCC**: 1 → 2 → 3
- **U-PCC**: 1 → 2 → 3
- **W-PCC**: 1 → 2 → 3
- **M-PCC**: 1 → 2 → 3
Obtaining $C$ from Feature Geometries

S-PCC  U-PCC  W-PCC  M-PCC

$f_1$  $f_2$  $f_3$  $f_4$
Obtaining $C$ from Feature Geometries

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$g$
Using Nevin’s Geometry

$C$ is easily obtained from the feature specification in Nevins (2007) if person complexity is determined by the number of features.


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This counting measure also works for unnatural specifications:

Example: Specification with Distinguished Feature for 3

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- Without restrictions on what counts as a complexity measure, any feature geometry can be the basis for $C$.
- But some feature geometries are compatible with more complexity measures than others.


1 and 2 are structurally equivalent: same number of features, same structural representation $\Rightarrow$ features must be weighted

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referring

participant

author    address
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participant

author

addresse
Technical Summary

- **Natural algebraic characterization** of the attested PCCs:
  - a ban against specific person locality configurations (G-PCC),
  - locality structures must be presemilattices,
  - locality structures respect both Top and Bottom.

- Going **one level deeper**:
  - person complexity must be $1 > 2 > 3$,
  - person complexity restricts shape of locality structures (stipulative right now, but algebraically fairly natural).

- Going **even deeper**:
  - person complexity determined by feature geometry
  - no obvious natural link at this point, but some geometries derive person complexity more easily
At this point there’s **too many algebraic solutions**. 

We need to look at morphosyntax beyond person:

1. number  
2. gender  
3. animacy  
4. case  
5. comparatives  

All phenomena should follow from a given feature geometry once all parameters have been fixed:

- mapping from feature geometry to complexity structures  
- mappings from complexity structures to locality structures


Why IO $\not<\not>$ DO?

Reminder: Unifying the PCCs

The class of attested PCCs is given by

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Maybe our problem with reducing the PCCs to feature geometries is due to our peculiar choice of G-PCC?

Spoiler

It is not.
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Typology with Other Constraints

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<th>P3</th>
<th>P4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>IO ≮ DO</strong></td>
<td>S</td>
<td>U</td>
<td>W</td>
<td>M</td>
</tr>
<tr>
<td><strong>DO ≮ IO</strong></td>
<td>W</td>
<td>U</td>
<td>S</td>
<td>M2</td>
</tr>
</tbody>
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Me-second PCC (**M2-PCC**): If there is a DO, IO must be 1. [unattested]

- Under IO ≮ DO, M2-PCC is given by

- Weakening Bottom to allow for this structure also brings in
Typology with Other Constraints

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**Me-second PCC (M2-PCC):** If there is a DO, IO must be 1. [unattested]

- Under IO $\not<$ DO, M2-PCC is given by

![Diagram](image)

- Weakening Bottom to allow for this structure also brings in
### Typology with Additional Structures

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<th>P6</th>
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<td>M2</td>
<td>M</td>
<td>N</td>
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**Indiscriminate PCC (I-PCC):** No IO-DO clitic combinations. [Cairene Arabic (Shlonsky 1997:207, Walkow p.c.)]  

**Null PCC (N-PCC):** Any clitic combination.
### Typology with Additional Structures

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The Full Extended Typology

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Implications

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- However, the complexity ranking C stays the same ⇒ problem of linking C to feature geometry unchanged
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