The Price of Freedom: Why Adjuncts are Islands

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The Talk in a Nutshell

(1)  
a. Which book did John complain that he lost?
b. * Which book did John complain because he lost?
c. * Which book did John complain after losing?

Take-Home Message

Why do adjuncts constitute islands?  
Because they are not as tightly integrated as arguments.
Outline

1. A Theory-Neutral Definition of Adjuncts
   - Defining Adjuncts
   - Characterizing Adjunct Languages

2. Empirical Implications
   - Deriving the AIC
   - Parasitic Gaps

3. The Big Picture: Structure & Information Flow
   - Constraints through Operations
   - Adjuncts: The Price of Freedom

4. Conclusion
Adjuncts ...  
- have no special operational status (CG; Cinque 1999),
- are pair-merged (Chomsky 1995),
- are late-merged (Stepanov 2001),
- are inserted but not merged immediately (Hunter 2012),
- involve asymmetric feature checking (Frey and Gärtner 2002),

Problem
Can we abstract away from these details? Properties that hold of every conceivable implementation?
Two Surface Properties of Adjuncts

- Optionality
  Adjuncts can be omitted.

(2) (Obviously) I will (easily) ace this ((very) challenging) exam (because I (really) am that smart).

- Independence
  Independently well-formed adjuncts can be combined.

(3) a. Obviously I will ace this exam.
   b. I will easily ace this exam.
   c. Obviously I will easily ace this exam.

Definition (Adjuncts)
Phrase marker $a$ is an Adjunct iff it is optional and independent.
Two Surface Properties of Adjuncts

- **Optionality**
  Adjuncts can be omitted.

  (2) *(Obviously)* I will *(easily)* ace this *((very) challenging)* exam *(because I (really) am that smart)*.

- **Independence**
  Independently well-formed adjuncts can be combined.

  (3) a. *(Obviously)* I will ace this exam.
   
   b. I will *easily* ace this exam.
   
   c. *(Obviously)* I will *easily* ace this exam.

**Definition (Adjuncts)**

Phrase marker \( a \) is an **Adjunct** iff it is optional and independent.
Adjunct Extension

What do these properties tell us about grammars with Adjuncts? What is the general shape of the generated language?

**Definition (Adjunct Extensions)**

Let $s$ and $t$ be (multi-dominance) trees. Then $t$ is an **Adjunct extension** of $s$ for grammar $G$ ($s <_G t$) iff $t$ is the result of inserting one or more Adjuncts of $G$ in $s$.

**Example**

- *Obviously* I will ace this exam $<_G$
  
  *Obviously* I will easily ace this exam

- I will ace this exam $<_G$
  
  *Obviously* I will easily ace this exam

- *Obviously* I will ace this exam $\not<_G$
  
  I will easily ace this exam

- I will ace this exam $\not<_G$
  
  *Easily* I will easily ace this test

- Exam will this I ace $<_G$
  
  *Easily* exam will this I ace
Defining Adjuncts

Empirical Implications

Big Picture

Conclusion

Adjunct Extension

What do these properties tell us about grammars with Adjuncts? What is the general shape of the generated language?

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Let $s$ and $t$ be (multi-dominance) trees. Then $t$ is an **Adjunct extension** of $s$ for grammar $G$ ($s <_G t$) iff $t$ is the result of inserting one or more Adjuncts of $G$ in $s$.

Example

- **Obviously** I will ace this exam $<_G$
  - Obviously I will easily ace this exam
- I will ace this exam $<_G$
- **Obviously** I will ace this exam $<_G$
- I will ace this exam $<_G$
- **Obviously** I will easily ace this exam
- I will easily ace this exam
- Exam will this I ace $<_G$ easily exam will this I ace
Defining Adjuncts

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What do these properties tell us about grammars with Adjuncts? What is the general shape of the generated language?

Definition (Adjunct Extensions)

Let \( s \) and \( t \) be (multi-dominance) trees. Then \( t \) is an **Adjunct extension** of \( s \) for grammar \( G \) (\( s <_G t \)) iff \( t \) is the result of inserting one or more Adjuncts of \( G \) in \( s \).

Example

- **Obviously** I will ace this exam \(<_G\)
  
  **Obviously** I will *easily* ace this exam

- I will ace this exam \(<_G\)
  
  **Obviously** I will *easily* ace this exam

- **Obviously** I will ace this exam \(\nRightarrow_{_G}\)
  
  **Obviously** I will *easily* ace this exam

- I will ace this exam \(\nRightarrow_{_G}\)
  
  **easily** ace this test

- exam will this I ace \(<_G\)
  
  easily exam will this I ace
Adjunct Extension

What do these properties tell us about grammars with Adjuncts? What is the general shape of the generated language?

Definition (Adjunct Extensions)

Let $s$ and $t$ be (multi-dominance) trees. Then $t$ is an **Adjunct extension** of $s$ for grammar $G$ ($s \prec_G t$) iff $t$ is the result of inserting one or more Adjuncts of $G$ in $s$.

Example

- **Obviously** I will ace this exam $\prec_G$

  **Obviously** I will easily ace this exam

- I will ace this exam $\prec_G$ **Obviously** I will easily ace this exam

- **Obviously** I will ace this exam $\not\prec_G$ I will easily ace this exam

- I will ace this exam $\not\prec_G$ I will **easily** ace this exam

- **easily** exam will this I ace $\prec_G$ **easily** exam will this I ace
Adjunct Extension

What do these properties tell us about grammars with Adjuncts? What is the general shape of the generated language?

**Definition (Adjunct Extensions)**

Let $s$ and $t$ be (multi-dominance) trees. Then $t$ is an **Adjunct extension** of $s$ for grammar $G$ ($s \prec_G t$) iff $t$ is the result of inserting one or more Adjuncts of $G$ in $s$.

**Example**

- *Obviously* I will ace this exam $\prec_G$
  
  - I will easily ace this exam
- I will ace this exam $\prec_G$ *Obviously* I will easily ace this exam
- *Obviously* I will ace this exam $\not\prec_G$ I will easily ace this exam
- I will ace this exam $\not\prec_G$ I will easily ace this test
- exam will this I ace $\prec_G$ easily exam will this I ace
Defining Adjuncts

Empirical Implications

Big Picture

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Adjunct Extension

What do these properties tell us about grammars with Adjuncts? What is the general shape of the generated language?

Definition (Adjunct Extensions)

Let $s$ and $t$ be (multi-dominance) trees. Then $t$ is an Adjunct extension of $s$ for grammar $G$ ($s <_G t$) iff $t$ is the result of inserting one or more Adjuncts of $G$ in $s$.

Example

- **Obviously** I will ace this exam $<_G$
  
  Obviously I will easily ace this exam

- I will ace this exam $<_G$ **Obviously** I will easily ace this exam

- **Obviously** I will ace this exam $\not<_G$ I will easily ace this exam

- I will ace this exam $\not<_G$ I will **easily** ace this exam

- I will ace this exam $\not<_G$ I will easily ace this test

- exam will this I ace $<_G$ **easily** exam will this I ace
Adjunct Extension

What do these properties tell us about grammars with Adjuncts? What is the general shape of the generated language?

Definition (Adjunct Extensions)

Let $s$ and $t$ be (multi-dominance) trees. Then $t$ is an **Adjunct extension** of $s$ for grammar $G$ ($s <_G t$) iff $t$ is the result of inserting one or more Adjuncts of $G$ in $s$.

Example

- **Obviously** I will ace this exam $<_G$
  
  Obviously I will easily ace this exam

- I will ace this exam $<_G$
  
  Obviously I will easily ace this exam

- **Obviously** I will ace this exam $\not<_G$
  
  I will easily ace this exam

- I will ace this exam $\not<_G$
  
  I will easily ace this test

- Exam will this I ace $<_G$
  
  Easily exam will this I ace
Theorem (Optionality Closure)

If \( t \) is an Adjunct extension of \( s \) for \( G \) and \( G \) generates \( t \), then \( G \) generates \( s \).

Example

I will \textcolor{orange}{easily} ace this \textcolor{blue}{really} exam

I will easily ace this exam \quad I will ace this really exam

I will ace this exam
Characterizing Adjunct Languages

Theorem (Optionality Closure)

*If* \( t \) *is an Adjunct extension of* \( s \) *for* \( G \) *and* \( G \) *generates* \( t \), *then* \( G \) *generates* \( s \).*

Example

I will *easily* ace this *really* exam

I will *easily* ace this exam  
I will ace this *really* exam

I will ace this exam
Theorem (Optionality Closure)

If \( t \) is an Adjunct extension of \( s \) for \( G \) and \( G \) generates \( t \), then \( G \) generates \( s \).

Example

I will \textit{easily} ace this \textit{really} exam

✓ I will \textit{easily} ace this exam  
I will ace this \textit{really} exam

I will ace this exam
Theorem (Optionality Closure)

If $t$ is an Adjunct extension of $s$ for $G$ and $G$ generates $t$, then $G$ generates $s$.

Example

I will easily ace this really exam

✓ I will easily ace this exam

I will ace this really exam

I will ace this exam
Theorem (Optionality Closure)

*If* \( t \) *is an Adjunct extension of* \( s \) *for* \( G \) *and* \( G \) *generates* \( t \), *then* \( G \) *generates* \( s \).*

Example

I will *easily* ace this *really* exam

✓ I will *easily* ace this exam  I will ace this *really* exam

✓ I will ace this exam
Theorem (Optionality Closure)

*If* $t$ *is an Adjunct extension of* $s$ *for* $G$ *and* $G$ *generates* $t$, *then* $G$ *generates* $s$.

Example

I will *easily* ace this *really* exam

- I will *easily* ace this exam
- I will ace this *really* exam
Theorem (Optionality Closure)

If $t$ is an Adjunct extension of $s$ for $G$ and $G$ generates $t$, then $G$ generates $s$.

Example

I will **easily** ace this **really** exam

✓ I will **easily** ace this exam

 ✓ I will ace this exam

 ✓ I will ace this exam

* I will ace this **really** exam
Theorem (Optionality Closure)

If \( t \) is an Adjunct extension of \( s \) for \( G \) and \( G \) generates \( t \), then \( G \) generates \( s \).

Example

* I will easily ace this really exam

✓ I will easily ace this exam  

✓ I will ace this really exam  

✓ I will ace this exam
Characterizing Adjunct Languages

**Theorem (Independence Closure)**

For \( s \) and \( t \) adjunct extensions of some tree, \( G \) generates the “fusion” of \( s \) and \( t \) (\( s \lor t \)) if it generates both \( s \) and \( t \).

**Example**

I *really* will *easily* ace this exam *now*

I will *easily* ace this exam  
I *really* will ace this exam *now*

I will ace this exam
Characterizing Adjunct Languages

Theorem (Independence Closure)

For s and t adjunct extensions of some tree, G generates the “fusion” of s and t (s ∨ t) if it generates both s and t.

Example

I really will easily ace this exam now

✓ I will easily ace this exam
✓ I really will ace this exam now
✓ I will ace this exam
Characterizing Adjunct Languages

Theorem (Independence Closure)

For $s$ and $t$ adjunct extensions of some tree, $G$ generates the “fusion” of $s$ and $t$ ($s \lor t$) if it generates both $s$ and $t$.

Example

I really will easily ace this exam now

✓ I will easily ace this exam ✓ I really will ace this exam now
✓ I will ace this exam
Characterizing Adjunct Languages

Theorem (Independence Closure)

For $s$ and $t$ adjunct extensions of some tree, $G$ generates the “fusion” of $s$ and $t$ ($s \vee t$) if it generates both $s$ and $t$.

Example

✓ I really will easily ace this exam now

✓ I will easily ace this exam

✓ I really will ace this exam now

✓ I will ace this exam
Any implementation of Adjunction that captures Optionality and Independence yields a grammar formalism where

- \( \downarrow \) grammaticality is downward entailing with respect to \(<_G\),
- \( \uparrow \) ungrammaticality is upward entailing with respect to \(<_G\),
- \( \lor \) grammaticality is preserved under “fusion”. 
Deriving the AIC

The AIC follows from **optionality closure and feature checking**.

\[
\begin{array}{c}
\text{CP} \\
\downarrow \\
\text{C'} \\
\downarrow \\
\text{TP} \\
\downarrow \\
\text{John} \\
\downarrow \\
\text{V'} \\
\downarrow \\
\text{VP} \\
\downarrow \\
\text{VP} \\
\downarrow \\
\text{fall asleep} \\
\downarrow \\
\text{before} \\
\downarrow \\
\text{VP} \\
\downarrow \\
\text{reading}
\end{array}
\]

\text{did [+]wh} \\
\text{which book [-]wh}
The AIC follows from **optionality closure and feature checking**.

**AIC Violation**

1) Tree is an Adjunct extension
The AIC follows from **optionality closure and feature checking**.

AIC Violation

1) Tree is an Adjunct extension
2) Tree without Adjunct violates feature calculus
The AIC follows from **optionality closure and feature checking**.

AIC Violation
1) Tree is an Adjunct extension
2) Tree without Adjunct violates feature calculus
3) Ungrammaticality is upward entailing
PGs piggyback on a mandatory feature checker.
Why Parasitic Gaps are Different

PGs piggyback on a mandatory feature checker.

AIC Exemption
1) Tree is an Adjunct extension
Why Parasitic Gaps are Different

PGs piggyback on a mandatory feature checker.

AIC Exemption
1) Tree is an Adjunct extension
2) Tree without Adjunct satisfies feature calculus
Why Parasitic Gaps are Different

PGs piggyback on a **mandatory feature checker**.

AIC Exemption

1) Tree is an Adjunct extension
2) Tree without Adjunct satisfies feature calculus
3) Grammaticality isn’t upward entailing ⇒ nothing follows

Which book [-wh]

Did [+wh]

Did before sell reading

VP

PP

CP

C′

TP

John

T′

VP

VP

which book [-wh]
Why Parasitic Gaps are Idempotent

Multiple PGs may piggyback on a single mover.

(4) Which movie did John *whilst mocking* throw in the trash *after watching*?

Follows from *independence closure*

(5) a. Which movie did John *whilst mocking* throw in the trash?

b. Which movie did John throw in the trash *after watching*?
Constraints through Operations

Constraints and operations are **closely connected**.

**Theorem (Graf 2011; Kobele 2011)**

*A constraint can be expressed via Merge iff it can be computed using only a finitely bounded amount of working memory.*

- **Intuition**: Use feature calculus to emulate how information flows through the tree during computation
- Doable for almost all constraints from the syntactic literature
- Relies on symmetry of c-selection
  (category features & selection features)

**head-argument relation ≡ information pipeline**
Constraints and operations are closely connected.

**Theorem (Graf 2011; Kobele 2011)**

A constraint can be expressed via Merge iff it can be computed using only a finitely bounded amount of working memory.

- **Intuition**: Use feature calculus to emulate how information flows through the tree during computation
- Doable for almost all constraints from the syntactic literature
- Relies on symmetry of c-selection
  (category features & selection features)

head-argument relation $\equiv$ information pipeline
### Example: Keeping Track of Movers

```
CP
  C
   [+wh]
  C'
   TP
      T'
         T
         VP
             V'
               V
               DP
                   which man [−wh]
```

<table>
<thead>
<tr>
<th>Category</th>
<th>Selects</th>
<th>Selected by</th>
</tr>
</thead>
<tbody>
<tr>
<td>D</td>
<td>N</td>
<td>V</td>
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<tr>
<td>V</td>
<td>D</td>
<td>T</td>
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<tr>
<td>T</td>
<td>V</td>
<td>C</td>
</tr>
<tr>
<td>C</td>
<td>T</td>
<td>V,N</td>
</tr>
</tbody>
</table>
Example: Keeping Track of Movers

Category | Selects | Selected by
----------|---------|--------------
D         | N       | V            
V         | D       | T            
T         | V       | C            
C         | T       | V,N          
D–wh      | N       |              

which man [–wh]
Example: Keeping Track of Movers

```
\[
\begin{array}{c}
\text{CP} \\
\downarrow \\
C' \\
\downarrow \\
C \quad TP \quad [+\text{wh}] \\
\downarrow \\
T' \\
\downarrow \\
T \quad VP_{-\text{wh}} \\
\downarrow \\
V'_{-\text{wh}} \\
\downarrow \\
V_{-\text{wh}} \quad DP_{-\text{wh}} \\
\downarrow \\
\text{which man } [-\text{wh}] \\
\end{array}
\]
```

**Table:**

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<tr>
<td>C</td>
<td>T</td>
<td>V,N</td>
</tr>
<tr>
<td>D_{-\text{wh}}</td>
<td>N</td>
<td>V_{-\text{wh}}</td>
</tr>
<tr>
<td>V_{-\text{wh}}</td>
<td>D_{-\text{wh}}</td>
<td></td>
</tr>
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Example: Keeping Track of Movers

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<td>V, N</td>
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<td>D_{wh}</td>
<td>N</td>
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<td>D_{wh}</td>
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<td>V_{wh}</td>
<td></td>
</tr>
</tbody>
</table>
```

Example: Keeping Track of Movers

```
CP
 |
C
[+wh]
 |
C'

C
 TP_{wh}
 |
 T'_{wh}
 |
 T_{wh}
 |
 VP_{wh}
 |
 V'_{wh}
 |
 V_{wh}
 |
 DP_{wh}
 |
 which man [−wh]
```
Example: Keeping Track of Movers

Defining Adjuncts

Empirical Implications

Big Picture

Conclusion

Category | Selects | Selected by
---|---|---
D | N | V
V | D | T
T | V | C
C | T | V,N

which man [−wh]
Example: Keeping Track of Movers

\[
\begin{align*}
\text{CP}_{-\text{wh}} & \checkmark \\
\mid & \\
\text{C'}_{-\text{wh}} & \checkmark \\
\mid & \\
\text{CP}_{-\text{wh}} & \checkmark \\
\mid & \\
\text{TP}_{-\text{wh}} & \\
\mid & \\
[+\text{wh}] & \\
\mid & \\
\text{T'}_{-\text{wh}} & \\
\mid & \\
\text{T}_{-\text{wh}} & \\
\mid & \\
\text{VP}_{-\text{wh}} & \\
\mid & \\
\text{V'}_{-\text{wh}} & \\
\mid & \\
\text{V}_{-\text{wh}} & \\
\mid & \\
\text{DP}_{-\text{wh}} & \checkmark \\
\mid & \\
\text{which man } [\text{--wh}] & \\
\end{align*}
\]

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<td>T</td>
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</tr>
<tr>
<td>C_{-\text{wh}}</td>
<td>T_{-\text{wh}}</td>
<td>V_{-\text{wh}},N_{-\text{wh}}</td>
</tr>
</tbody>
</table>
Adjuncts: The Price of Freedom

- Adjuncts very free due to Optionality and Independence
- Freedom reflected in feature calculus, limits information flow
  ⇒ feature calculus cannot emulate all constraints correctly

**Semi-Permeability**

- Information flow into Adjuncts reliable
  ⇒ Adjuncts can put restrictions on shape of tree
  (cf. parasitic gaps)
- Information flow out of Adjuncts unreliable
  ⇒ Adjuncts cannot be depended on

Adjunct ≡ black hole
Example: Adjunction a la Frey and Gärtner (2002)

Adjunction as Asymmetric Selection

Adjuncts select XP they adjoin to, but are not themselves selected.

Category | Selects | Selected by
--- | --- | ---
Adjunct | V | —
V | D | T

Example: after punching which man [−wh]
Example: Adjunction a la Frey and Gärtner (2002)

Adjunction as Asymmetric Selection

Adjuncts select XP they adjoin to, but are not themselves selected.

```
VP
   |
   VP
   |  Adjunct-\text{wh}
V   DP  
       
after punching which man [−wh]
```

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Example: Adjunction a la Frey and Gärtner (2002)

Adjunction as Asymmetric Selection

Adjuncts select XP they adjoin to, but are not themselves selected.

```
Category        Selects    Selected by
------------------------
Adjunct           V         —
                   D         T
Adjunct−wh        V−wh      —
                   D         T−wh
```

Example: Adjunction a la Frey and Gärtner (2002)

Adjunction as Asymmetric Selection

Adjuncts select XP they adjoin to, but are not themselves selected.

```
               VP_{wh}
              /       \
VP_{wh}       Adjunct_{wh}
            /     \
V_{wh}     after punching which man [−wh]
  DP
```

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<tr>
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<td>V_{wh}</td>
<td>—</td>
</tr>
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</tr>
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</table>

Example sentence: after punching which man [−wh]
Summary

- Adjuncts characterized by Optionality and Independence
- enforces certain grammatical inferences
  - ↓ grammaticality is preserved under Adjunct removal
  - ↑ ungrammaticality is preserved under Adjunct insertion
  - V grammaticality is preserved under Adjunct combination

⇒ AIC falls out naturally, yet allow for parasitic gaps

- Information flow metaphor: Adjuncts ⇔ black holes
Not all adjuncts are Adjuncts
Some adjuncts can be extracted from (Truswell 2007):

(6) Which car did John drive Mary crazy trying to fix?

Truswell’s event-based generalization ≈

some adjuncts more tightly integrated semantically

<table>
<thead>
<tr>
<th>syn-adjunct</th>
<th>sem-argument</th>
<th>Truswell adjuncts</th>
<th>arguments</th>
</tr>
</thead>
</table>

Extension to Other Cases
DP-conjuncts are also optional and independent
⇒ CSC ≡ AIC & ATB extraction ≡ PGs

Caveat: agreement, binding, NPI-licensing
Work in Progress

- **Not all adjuncts are Adjuncts**
  Some adjuncts can be extracted from (Truswell 2007):

  \[(6) \text{ Which car did John drive Mary crazy trying to fix?} \]

  Truswell’s event-based generalization ≈
  some adjuncts more tightly integrated semantically

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- **Extension to Other Cases**
  DP-conjuncts are also optional and independent
  ⇒ **CSC ≡ AIC & ATB extraction ≡ PGs**

  Caveat: agreement, binding, NPI-licensing
Work in Progress

● **Not all adjuncts are Adjuncts**
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