Adjuncts, Conjuncts, Ojuncts: Deriving Strong Island Constraints

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Take-Home Message

The Strong Island Puzzle

Adjuncts and conjuncts are hard to extract from — why?

(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**?

(2) * Which book does John like Ke$ha and **the author of**?

Mathematical Solution

- Island effects are an inevitable consequence of optionality.
- Non-islands lack optionality wrt syntax or semantics.

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Outline

Adjuncts

- extraction usually blocked

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

- gaps licensed

(4) Which book did John burn *t* **after reading** *e*?

- usually optional

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

Coordination

- extraction usually blocked

(6) a. Ed brewed beer and Greg drank it.
b. * Which beer did **Ed brew** t **and Greg drink it**?
c. * Which wine did **Ed brew beer and Greg drink** t?

- across-the-board extraction possible

(7) a. Which wine did **Ed brew** t **and Greg drink** t?

- mostly optional (modulo morphological/semantic agreement)

(8) a. Ed brewed beer and Greg drank it.
b. Ed brewed beer.

(9) a. Ed and Greg are brewing beer.
b. * Ed are brewing beer.

(10) a. Ed and Greg met.
b. * Ed met.

The Big Picture

As a rule of thumb, adjuncts and coordinations

1. block extraction,
2. allow for gaps,
3. are optional.

The Big Question

Could (1) and (2) be related to optionality?

Outline

Adjuncts in the Literature

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?

Ojuncts

The notion of an **ojunct** provides an abstract characterization of optional phrase markers.

Ojunct (Intuitive Definition)

A phrase marker is an **ojunct** iff it is implemented by some operation that captures optionality.

Under pretty much any account of displacement, **ojuncts are necessarily islands**:

Theorem (Islandhood)

No ojunct can be extracted from if the extraction step is necessary in order to satisfy a dependency at the target site.

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Ojunct Extension

Due to optinality, grammars with ojuncts generate languages with a special **algebraic shape**.

Definition (Ojunct Extensions)

Let s and t be trees.
Then t is an **ojunct extension** of s for grammar G (s $<_G$ t) iff t is the result of inserting one or more ojuncts 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
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Characterizing Ojunct Languages

Theorem (Optionality Closure)

If **t** *is an ojunct 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 Ojunct Languages

Theorem (Optionality Closure)

If **t** *is an ojunct 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

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If **t** *is an ojunct 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

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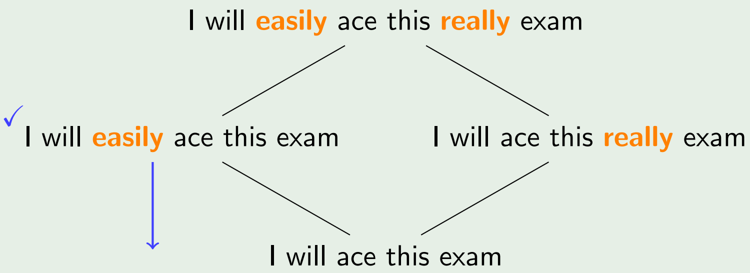

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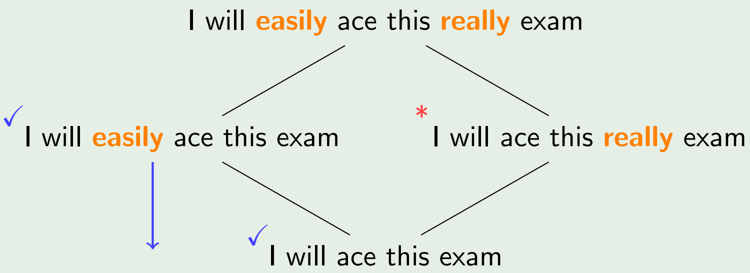

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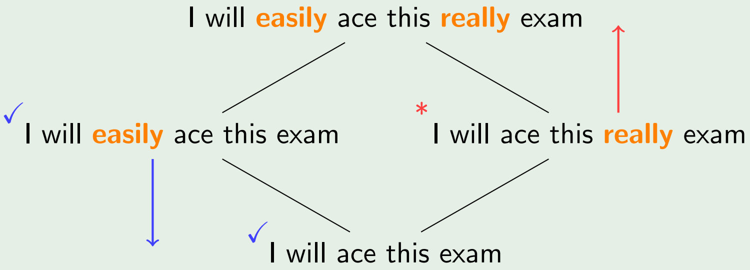

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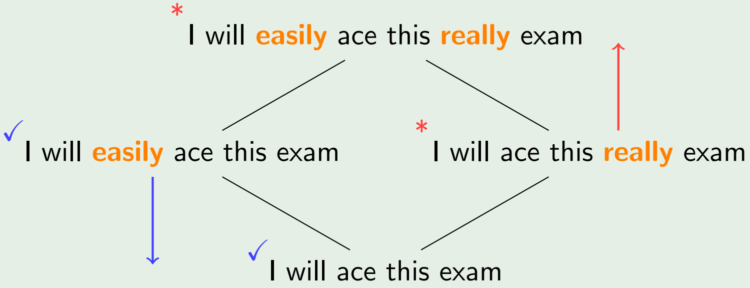


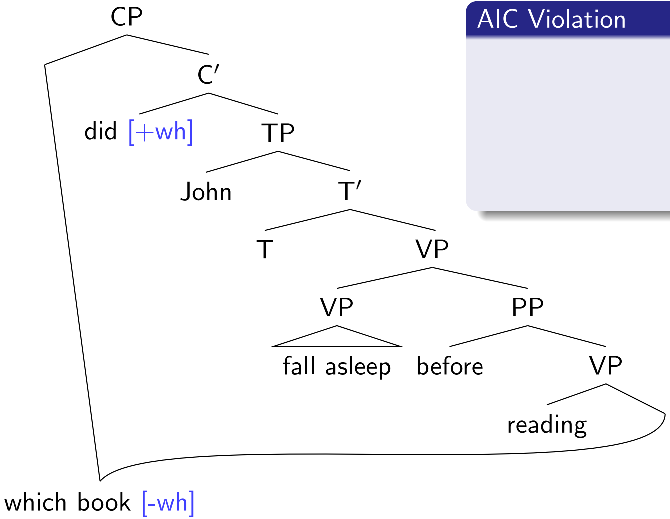
Interim Summary

- We abstract away from technical details of the grammar.
- **Major Requirement**
  implementation of adjuncts and conjuncts must capture their optionality $\Rightarrow$ abstract notion of ojuncts
- Grammars with ojuncts show special inference patterns:
  - $\Downarrow$ grammaticality is downward entailing with respect to $<_G$,
  - $\Uparrow$ ungrammaticality is upward entailing with respect to $<_G$.

Outline

Deriving the Adjunct Island Constraint

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



AIC Violation

Deriving the Adjunct Island Constraint

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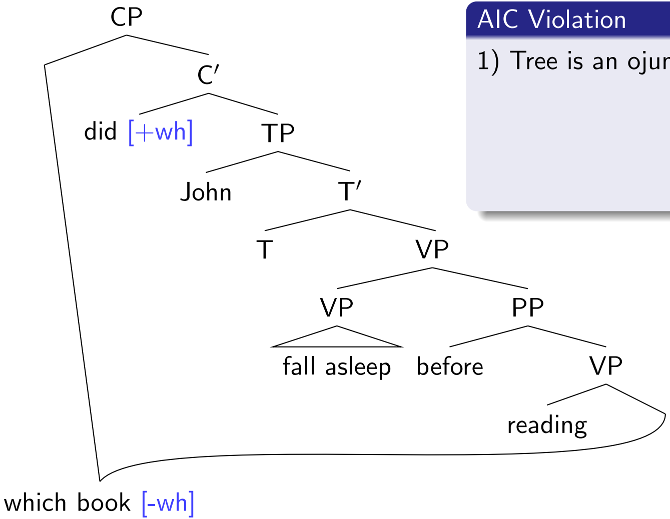

AIC Violation

1) Tree is an ojunct extension

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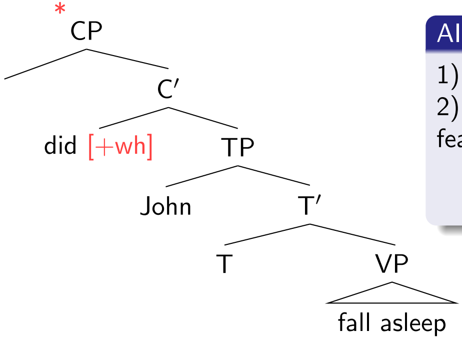

AIC Violation

1) Tree is an ojunct extension
2) Tree without ojunct violates feature calculus

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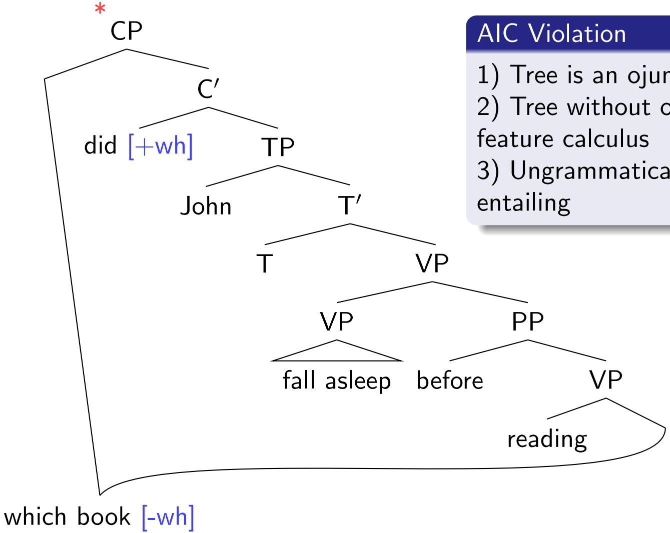
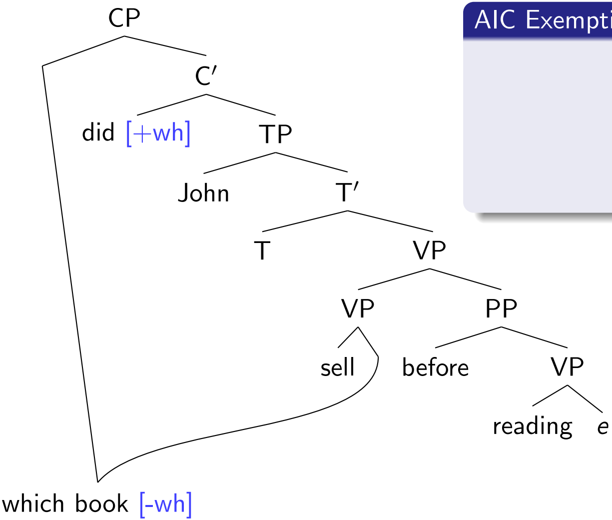


AIC Violation

1) Tree is an ojunct extension
2) Tree without ojunct violates feature calculus
3) Ungrammaticality is upward entailing

Why Parasitic Gaps are Different

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



AIC Exemption

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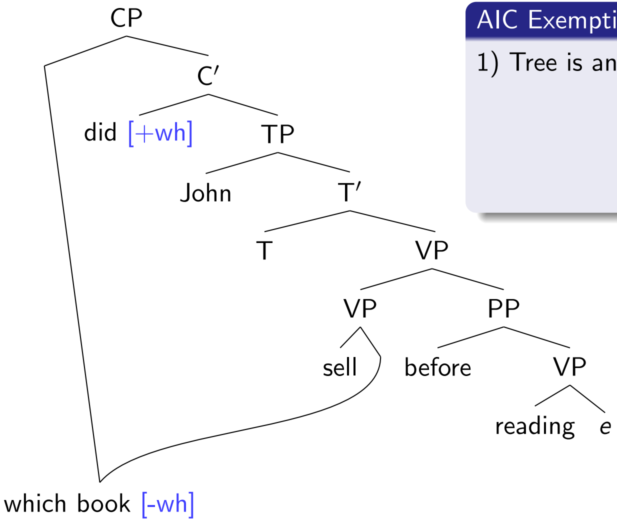

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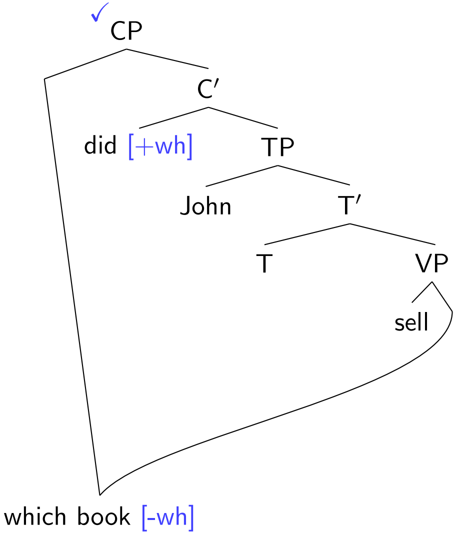

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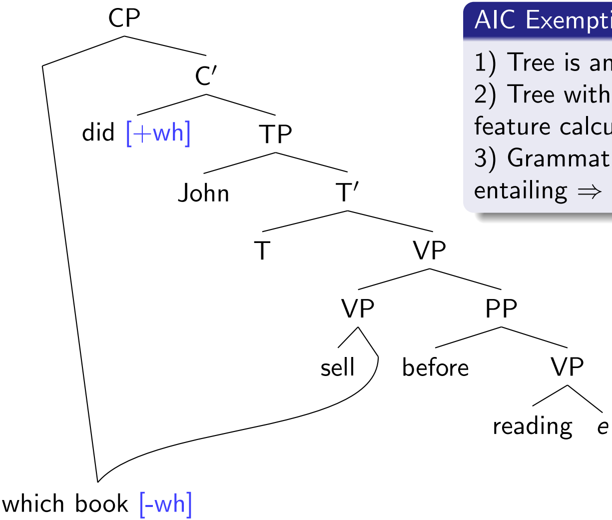
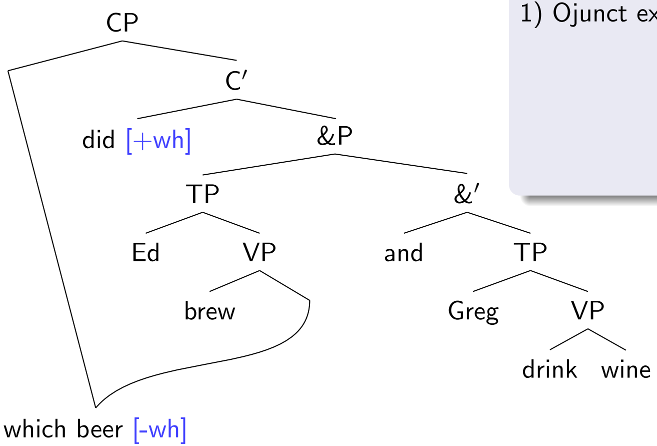


AIC Exemption

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

Deriving the Coordinate Structure Constraint



CSC Violation

1) Ojunct extension of two trees

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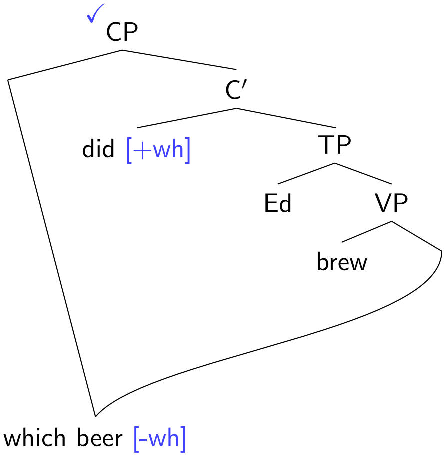

CSC Violation

1) Ojunct extension of two trees
2) Fine without second conjunct

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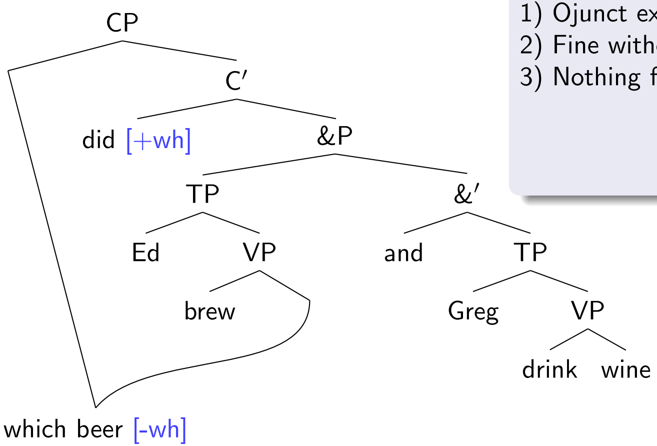

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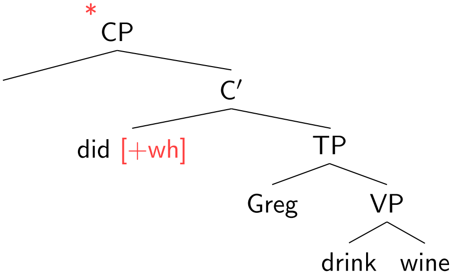

CSC Violation

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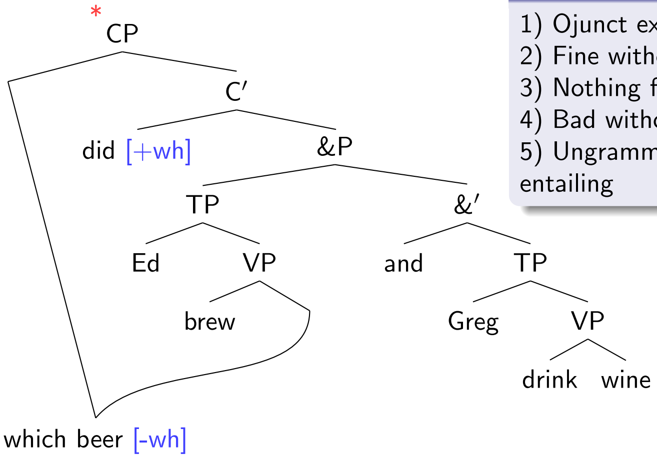

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5) Ungrammaticality is upward entailing

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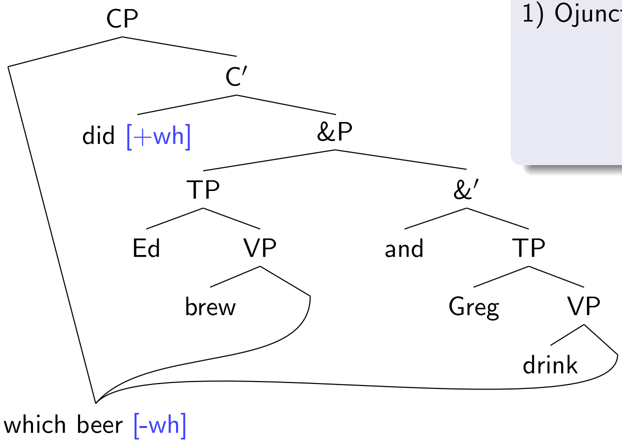

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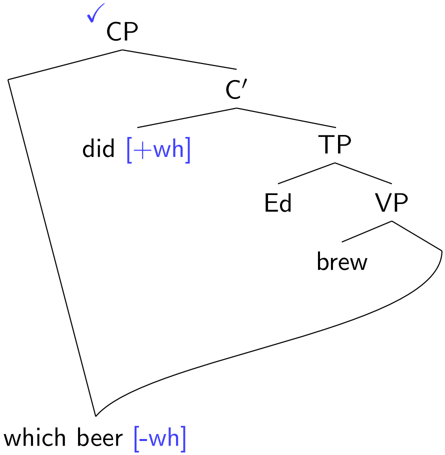

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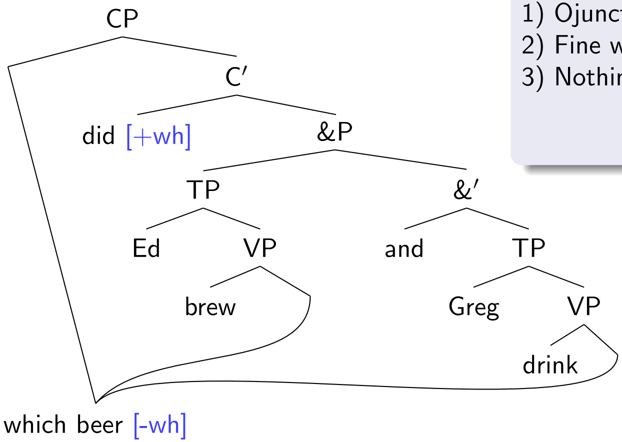

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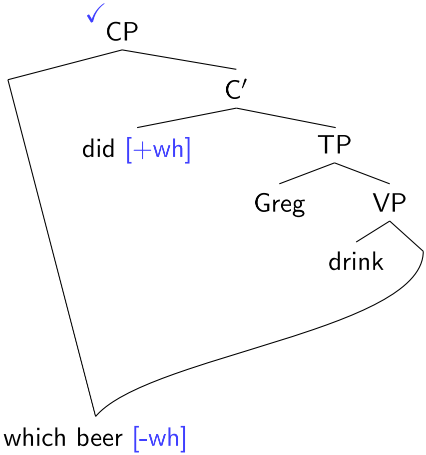

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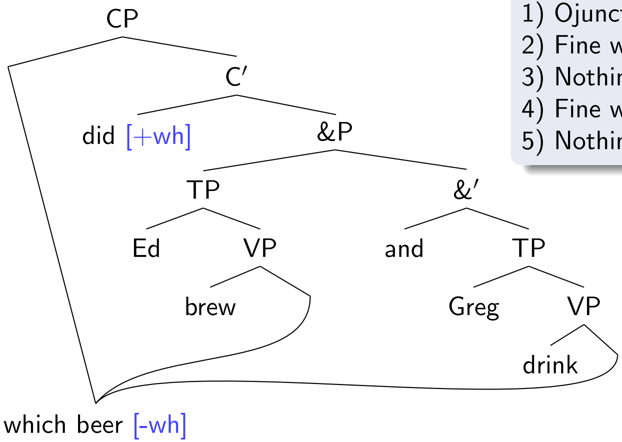

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Interim Summary

- Ojuncts are incompatible with instances of extraction that depend on the presence of the ojunct.
  - AIC violations
  - CSC violations
- All other kinds of extraction should be subject to cross-linguistic variation.
  - ATB (mover originates outside ojunct)
  - parasitic gaps (ojunct imposes constraints on tree, but not the other way round)

Outline

The Account So Far

- **Mathematical Fact**
  With dependencies at target site, all ojuncts are islands while still allowing for parasitic gaps and ATB extraction.
- **Empirical Assumptions**
  - Displacement always involves such target site requirements.
  - Adjuncts and coordinations are ojuncts.

Is this true?

The Issue

- Some phrases look like ojuncts yet are not islands.
- Two possible solutions
  - no movement/mandatory feature checking (stipulative)
  - optionality does not hold

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Subject *by*-Phrases and Instrumentals

In passives, *by*-phrases are optional but do not block extraction. The same holds for instrumentals.

(11)
a. Mary was assaulted **(by John) (with a hammer)**.
b. Which man was Mary assaulted **by** t?
c. What kind of weapon was Mary assaulted **with** t?

However, these phrases are **semantic arguments of the verb**.

Truswell Sentences

Truswell adjuncts also allow for extraction. (Truswell 2007)

(12) Which car did John drive Mary crazy **trying to fix** t?

Truswell's Generalization

Adjunct denotes an event e' that is related via R to the event e of the matrix clause

⇒ does not have standard (Neo-Davidsonian) denotation
⇒ adjunct behaves more like a **semantic argument**

Coordination without Parallelism

Extraction from a conjunct is fine if the coordination has serial or subordinate semantics.
(Culicover and Jackendoff 1997; Kehler 2002)

(13) a. How many beers can you **drink** *t* and still stay sober?
b. This is the guy **that you sleep with** *t* and end up with an STD.

Once again one cannot use the standard semantics for adjuncts/conjuncts.

The Big Picture

- **more fine-grained classification** than just argument vs adjunct
  (cf. Dowty 2003; Needham and Toivonen 2011)

	sem-argument	sem-adjunct
syn-adjunct	Truswell adjuncts	ojuncts
syn-argument	arguments	case-marked adjuncts (?)

- whatever mechanism gives rise to the optionality of ojuncts also limits their semantic denotation
- non-adjunct semantics implies usage of a different mechanism that does not give rise to optionality

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Neo-Davidsonian Adjunct Semantics

In **Neo-Davidsonian semantics**, adjunction to **XP** yields the conjunction of $[\![\textbf{XP}]\!]$ with a monadic predicate over an event.

(14) a. John runs.
$\textsc{Ag}(\text{John}, e) \wedge \text{run}(e)$

b. **John runs quickly**.
$\textsc{Ag}(\text{John}, e) \wedge \text{run}(e) \wedge \textbf{quickly(e)}$

Algebraic Observation

- If phrases denote sets of events, adjuncts are intersective:
$[\![\textbf{run quickly}]\!] = [\![\textbf{run}]\!] \cap [\![\textbf{quickly}]\!]$
- Arguments are not:
$[\![\textbf{John runs}]\!] = [\![\textsc{Ag}\textbf{(John)}]\!] \cap [\![\textbf{runs}]\!] \neq [\![\textbf{John}]\!] \cap [\![\textbf{runs}]\!]$

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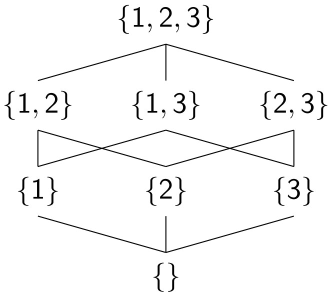
The Semantic Adjunct Algebra

- Let $\mathbb{E}$ be the set of all events, and $2^{\mathbb{E}}$ its powerset.
- We can order the elements of $2^{\mathbb{E}}$ by the subset relation $\subseteq$.
- This yields a Boolean lattice $\mathcal{E} := \langle 2^{\mathbb{E}}, \subseteq \rangle$, where
  - the meet operation $\wedge$ is intersection, and
  - the join operation $\vee$ is union.
- Let f be a semantic interpretation function that maps every phrase/word to an element of $\mathcal{E}$.
- Semantically, adjunction of **A** to **XP** amounts to taking the meet $f(\mathbf{A}) \wedge f(\mathbf{XP})$.

Example Lattice for Adjunct Semantics



Example

Suppose:

- $f(\text{run}) = \{1, 2, 3\}$
- $f(\text{quickly}) = \{2, 3\}$
- $f(\text{John}) = \{1, 2\}$
- $f(\textsc{Ag}(\text{John})) = \{1\}$

Then:

- $f(\text{run quickly}) =$
  $f(\text{run}) \wedge f(\text{quickly}) =$
  $\{1, 2, 3\} \wedge \{2, 3\} =$
  $\{2, 3\} = [\![\text{run quickly}]\!]$
- $f(\text{John runs}) =$
  $f(\text{John}) \wedge f(\text{runs}) =$
  $\{1, 2\} \neq \{1\} = [\![\text{John runs}]\!]$

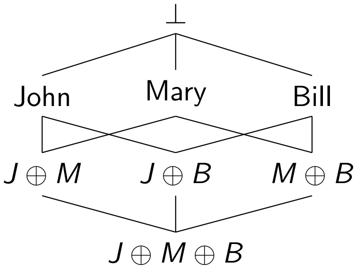
Extension to Coordination

- Coordination is analyzed via **mereological sums**:

$$[\![\text{John and Mary}]\!] = [\![\text{John}]\!] \oplus [\![\text{Mary}]\!] = \text{John} \oplus \text{Mary}$$

- If we take the set of individuals and all possible mereological sums thereof, we once again get a Boolean lattice.
- Semantically, coordination corresponds to meet in this lattice.

Example Lattice for Coordination Semantics



Example

$f(\text{John and Mary}) =$
$f(\text{John}) \wedge f(\text{Mary}) =$
$J \oplus M =$
$[\![\text{John and Mary}]\!]$

An Explanation via Algebra Linking

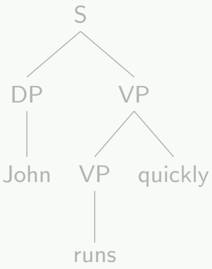
- Adjunction and coordination have similar semantics: meet over a specific lattice.
- **Key idea for syntax**
  - Merger of an adjunct equals meet over a syntactic lattice.
  - Merger of an argument does not.
- **Ojuncts** are introduced by an operation that corresponds to **meet in the syntactic and semantic lattices**.
- If the syntax or semantics is more complicated than meet, then we are not dealing with an ojunct.

Good Continuations

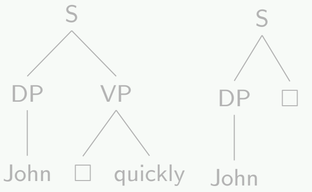
Definition (Good Continuation)

Tree **s** is a good continuation of tree **t** iff
adding **s** above **t** yields a well-formed tree.

Simplified Example



good continuations of [$_{\text{VP}}$ runs]



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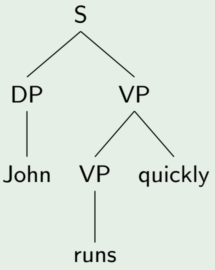

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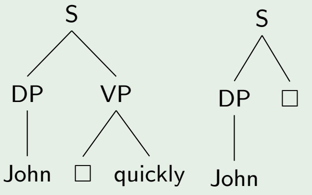

Arguments, Adjuncts, and Continuations

- **Observation 1: Identifying trees with their continuations**
  Every tree can be associated with its set of good continuations. We also call this its **continuation set**.
- **Observation 2: Argument Merge is non-intersective**
  If tree **t** is merged with argument **r**, the two have **disjoint** continuation sets.
  - The good continuations of **t** must include an argument like **r**.
  - The good continuations of **r** cannot include an argument like **r**.

Arguments, Adjuncts, and Continuations [cont.]

- **Observation 3: Adjunction is intersective**
  If tree **t** can have an adjunct **a**, they have **overlapping** continuation sets.
  - The set of good continuations for **a** includes trees without **a**.
  - By optionality, the set of good continuations for **t** does, too.

  In fact, the continuation set of the tree t' that results from adjunction of **a** to **t** is exactly the intersection of their continuation sets.

Continuation Lattice

- Let $\mathbb{C}$ be the set of all continuations, and $2^{\mathbb{E}}$ its powerset.
- We can order the elements of $2^{\mathbb{E}}$ by the subset relation $\subseteq$.
- This yields the Boolean lattice $\mathcal{C} := \langle 2^{\mathbb{E}}, \subseteq \rangle$, which has exactly the same properties as the event lattice and the mereology lattice.
- Let f be a function that maps every phrase/word to an element of $\mathcal{C}$.
- Adjunction of **A** to **XP**, yielding t, must obey the property that $f(t) = f(\mathbf{A}) \wedge f(\mathbf{XP})$.

Conclusion

- **Why do we see (strong) island effects?**
  Because islandhood is a necessary consequence of optionality and requirements at target site.
- **Why are there exceptions?**
  Because some adjuncts/conjuncts have complex semantics that requires a more powerful operation
  $\Rightarrow$ does not capture optimality

Remaining Problems

- adjunct/conjunct semantics can be more complicated (causation, tense, distributivity)
- cross-linguistic variation
  (e.g. extraction from relative clauses in Scandinavian)
- Why do resumptive pronouns repair island violations?

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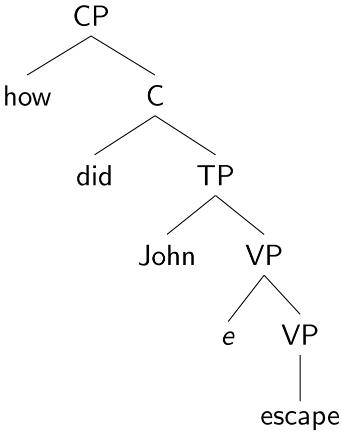
Why Islands May Move

Displacement of an ojunct possible via base merger



Base Merge Exemption

1) Tree is an ojunct extension

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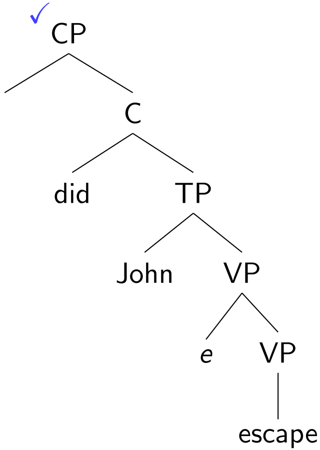

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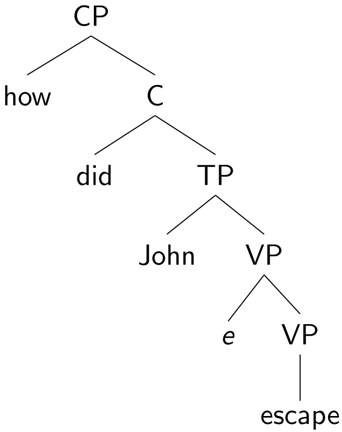
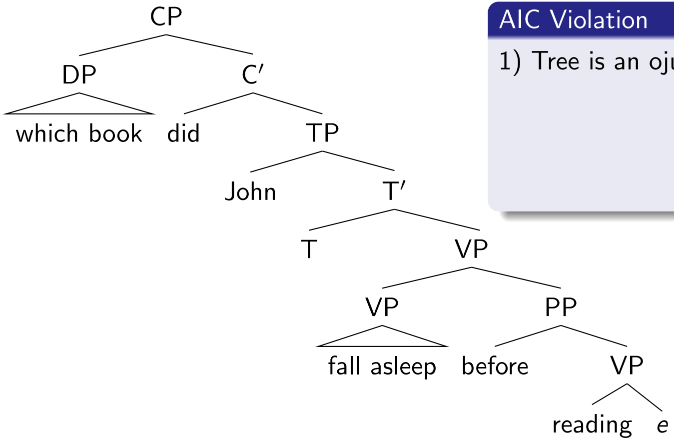


Base Merge Exemption

1) Tree is an ojunct extension
2) Tree without ojunct satisfies feature calculus
3) Grammaticality isn't upward entailing $\Rightarrow$ nothing follows

Base Merger Extraction from Ojuncts is Still Impossible



AIC Violation

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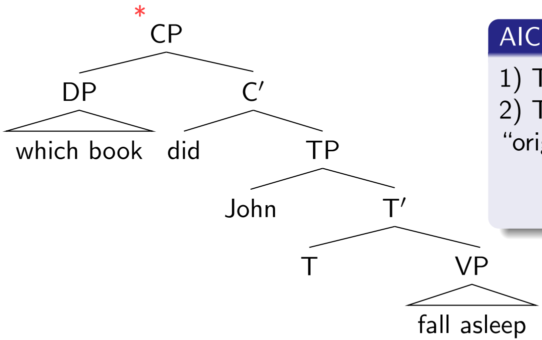

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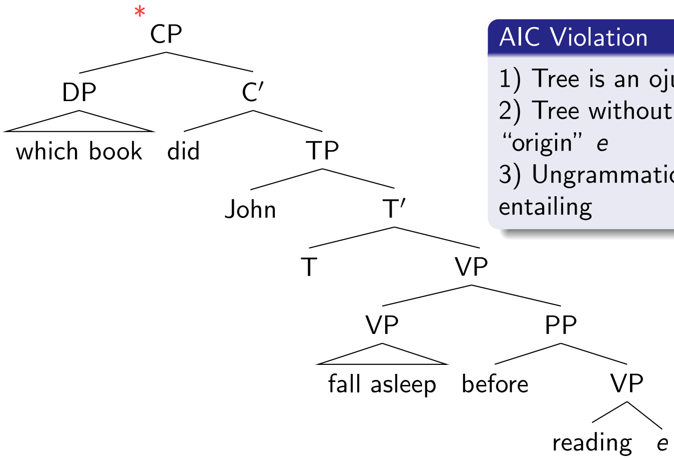

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3) Ungrammaticality is upward entailing

Conjuncts and Agreement

At a surface-level, conjuncts matter for ϕ-agreement and semantic number requirements.

(15) Ed *(and Greg) are brewing beer.

(16) Ed *(and Greg) met.

Possible Answer

- Optionality must hold with respect to morphological dependencies, not specific feature values.
- Semantic requirements are ignored.

Binding and NPIs in Coordinations

(17) a. ? Every woman and no man has ever had a period.

b. * Every woman has ever had a period.

(18) * (Jón og) afar sínir voru
Jón and grandpas POSS-REFL.NOM.PL were
glaðir.
happy.NOM.PL
'(Jón and) his grandpas were happy.'

Worrying, but all cases of extraction are deviant for independent reasons. Optionality is not the issue:

(19) a. * Which actress has (every TMZ reporter and) no fanboy of *t* ever talked to?

b. * Which field did the dean introduce every professor (of *t*) and no student of *t* to any senators?

Consequences

Optionality must be computed over **abstract structures** that allow us to ignore

- concrete ϕ-feature instantiations,
- some semantic requirements
  - size of set denoted by DP,
  - NPI-licensing,
  - binding requirements.

If one relegates these conditions to PF and LF,
then optionality — over syntactic trees with Agree dependencies — should apply to these cases.

Remaining Challenge 1: Cross-linguistic variation

- The class of ojuncts should be relatively stable across languages.
- But there is cross-linguistic variation, e.g. extractability from relative clauses in Scandinavian (Erteschik-Shir 1973).

A (Stipulative) Solution

Extraction from ojuncts is possible if the feature at the target site need not be checked. Languages could differ as to which features must always be checked.

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Remaining Challenge 2: Resumptive Pronouns

No island violations with resumptive pronoun instead of trace (e.g. Lebanese Arabic)

(20) ha-l-muttahame tfeeʒaʔto lamma/laʔanno
this-the-suspect.SgFem surprised.2 when/because
ʕrəfto ʔənno hiyye nhabasit.
know.2 that she imprisoned.3SgFem

'This suspect, you were surprised when/because you knew that she was imprisoned.' Aoun et al. (2001:575)

follows if binding rather than movement is involved

Problems

- Antecedent and adjunct must both be dropped
  $\Rightarrow$ discontinuous ojuncts?
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