The Real-time Status of Island Constraints

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This talk is about one of those problems that no attempt to clarify is likely to resolve.
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Real-time Grammatical Accuracy

• Basic Question: how much of what we know about language can be used immediately?

• Stored lexical information: pretty much everything (includes local combinatorics, e.g. argument structure)

• What about constraints on larger combinations of lexical material, e.g., constraints on long-distance structural relations…?
Wh-Questions

Englishmen cook wonderful dinners.
Wh-Questions

Englishmen cook wonderful dinners.
Wh-Questions

Englishmen cook what
Wh-Questions

Englishmen cook what
Wh-Questions

What do Englishmen cook
Wh-Questions

What do Englishmen cook gap
Wh-Questions

What do Englishmen cook?
Long-distance Wh-Questions

Few people think that anybody realizes that Englishmen cook wonderful dinners
Long-distance *Wh*-Questions

Few people think that anybody realizes that Englishmen cook what.
Long-distance Wh-Questions

What do few people think that anybody realizes that Englishmen cook?
Island Constraints

Few people believe anybody who claims that Englishmen cook what
Few people believe anybody who claims that Englishmen cook what
Island Constraints

What do few people believe anybody who claims that Englishmen cook

Relative Clause

gap
What do few people believe anybody who claims that Englishmen cook _gap_

Island Constraints

Relative Clause
Island Constraints

- Questions:
  - Does real-time structure-building respect island constraints?
  - Why do island constraints exist?
Island Constraints

- Questions:
  - Does real-time structure-building respect island constraints?
  - Why do island constraints exist?
Does the Parser Respect Islands?

Yes!

- Kluender & Kutas 1993ab [ERP violation paradigm] wh-island
- McKinnon & Osterhout 1996 [ERP violation paradigm] wh-island
- Berwick & Weinberg 1984 [computational arguments]
**Does the Parser Respect Islands?**

**No!**

- Freedman & Forster 1985 [sentence-matching] NP w/ possessor
- Neville *et al.* 1991 [ERP violation paradigm] NP w/ possessor
- Stevenson 1993 [comprehension, matching] complex NP
- Kurtzman *et al.* 1990 [speeded-grammaticality] infin.-in-subject

**??**

Island Constraints

• Questions:
  – Does real-time structure-building respect island constraints?
  – Why do island constraints exist?
‘Processing Accounts’ of Islands

What do few people believe anybody who claims that Englishmen cook  

- Recurring Idea:
  Island constraints are at least partly ‘extra-grammatical’; they reflect constraints on processing mechanisms.

(Kuno, 1976; Fodor, 1978; Erteshik-Shir & Lappin, 1979; Berwick & Weinberg, 1984; Deane, 1990; Pritchett, 1991; Kluender & Kutas, 1993; Snyder, 2001, etc., etc.)
‘Processing Accounts’ of Islands

What do few people believe anybody who claims that Englishmen cook *gap*

- Recurring Idea:
  Island constraints are at least partly ‘extra-grammatical’;
  they reflect constraints on processing mechanisms.

If true, then those island constraints should never be violated during parsing.
But...

- It is not even true of the *grammar* that it disallows long-distance dependencies that cross islands...
Parasitic Gaps

the proposal to expand the school ultimately overburdened the teachers.
Parasitic Gaps

the proposal to expand the school ultimately overburdened the teachers.
Parasitic Gaps

which people did the proposal to expand the school ultimately overburden
Parasitic Gaps

which school did the proposal to expand ultimately overburden the teachers.
Parasitic Gaps

which school did the proposal to expand ultimately overburden the teachers.

Generalization (*Subject Island Constraint*)
No long-distance dependencies across subject boundaries
Parasitic Gaps

which school did the proposal to expand ultimately overburden .

Generalization (informal)
Violations can be rescued by subsequent well-formed gaps.
Parasitic Gaps

which school did the proposal to expand ultimately overburden

which school did the proposal that expanded ultimately overburden

Updated Generalization (informal)
A subclass of violations can be rescued by subsequent gaps.
Experiment 0

• Is the syntactic phenomenon ‘real’?

• Pencil-and-paper acceptability rating study
  n=32, subjects who participated in on-line study (beforehand)

• Sentences based upon those used in on-line studies, 8 different lists, Latin Square design

• Ratings for ‘good’ and ‘bad’ gaps, individually and in combination with one another, ±finite
Experiment 0

![Graph showing acceptability ratings for Gap Type: Good, Bad, Both with INF and FIN conditions.](image-url)
Experiment 0

![Graph showing acceptability rating for Good, Bad, and Both gap types, with bars indicating INF and FIN conditions.](image-url)
Island violations judged to be very bad.

Effect of infinitive vs. finite is very small.
Parasitic gap phenomenon is real.

Addition of good gap makes infinitive rating almost as good as if there were no gap inside an island!
Updated Generalization (informal)

A *subclass* of violations can be rescued by subsequent gaps.
Parasitic Gaps

Challenges:
1. Gaps are allowed inside a subclass of islands
2. These gaps may precede the ‘good’ gaps that license them
3. Is the parser forced to sacrifice accuracy, incrementality, or both?

which school did the proposal to expand ultimately overburden

which school did the proposal that expanded ultimately overburden
Parasitic Gaps

Possible approaches:
1. **Conservative**: no gaps inside islands, until licenser appears
   - sacrifices full incrementality
2. **Risky**: gaps only inside islands that support parasitic gaps
   - preserves accuracy and incrementality
3. **Reckless**: gaps inside any island
   - sacrifices accuracy
Experiment 1: Filled-Gap Effect
Experiment 1

Materials

a. …what … *infinitival verb* ...
   [infinitive, gap ok]

b. … whether ..*infinitival verb* ...
   [infinitive, no gap]

c. … what … *finite verb* ...
   [finite, gap not ok]

d. … whether … *finite verb* ...
   [finite, no gap]
Experiment 1

Materials

a. The outspoken environmentalist worked to investigate what the local campaign to preserve the important habitats had actually harmed in the area that the birds once used as a place for resting while flying south. [infinitive, gap]
b. …whether the local campaign to preserve… [infinitive, no gap]
c. …what the local campaign that preserved… [finite, gap]
d. …whether the local campaign that preserved … [finite, no gap]
Experiment 1

Materials

a. The outspoken environmentalist worked to investigate what the local campaign to preserve the important habitats had actually harmed in the area that the birds once used as a place for resting while flying south.  

b. …whether the local campaign to preserve…  

c. …what the local campaign that preserved…  

d. …whether the local campaign that preserved …  

Critical verb was always strongly transitive - avoids spurious analysis as intransitive.
Experiment 1

- Self-paced reading, word-by-word moving window
- 2 x 2 factorial design: ±gap, ±finite
- 24 sets of items (4 lists); 96 fillers
- n=48 (+5 removed for low comprehension accuracy)

- Yes/no question after every trial
- Comprehension accuracy = 86.7%

- Since the potential gap position in the subject NP was always filled, participants never actually encountered a parasitic gap
... investigate what the campaign to preserve ...
... investigate what the campaign that preserved ...
Experiment 1: Summary

- Reading times at verb inside subject NP show a contrast between infinitival and finite clauses.
- Effect of gap vs. no-gap in infinitival conditions may reflect formation of wh-dependency into an island.
- Concerns…
  - Dependency-formation effect: YES
  - Filled-Gap effect: NO
  - Similar to Pickering et al. 1994 - effect at verb, long object NP
cf. Crain & Fodor 1985, Stowe 1986 - effect after verb, pronoun NP
  - Need more direct measure of interpretation of wh-dependencies
Experiment 2: Plausibility I
Traxler & Pickering (1996)

a) We like the book that the author wrote unceasingly and with great dedication about while waiting for a contract.

b) We like the city that the author wrote unceasingly and with great dedication about while waiting for a contract.

c) We like the book that the author who wrote unceasingly and with great dedication saw while waiting for a contract.

d) We like the city that the author who wrote unceasingly and with great dedication saw while waiting for a contract.

(extends approach used in Tanenhaus et al. 1989, Garnsey et al. 1989, etc.)
Experiment 2

• Replicated Traxler & Pickering’s plausibility effect for simple extractions vs. finite relative clauses inside subject NPs, using self-paced reading.

(with new materials, avoiding use of marginally intransitive verbs)

… satisfies premise for Experiment #3
Experiment 3: Plausibility II
Parasitic Gaps

which school did the proposal to expand
ultimately overburden
which students…

which school did the proposal that expanded
ultimately overburden
which students…
Parasitic Gaps

plausible at ‘expand’
plausible at ‘overburden’

which school did the proposal to expand
ultimately overburden

which students…

implausible at ‘expand’
plausible at ‘overburden’

which school did the proposal that expanded
ultimately overburden

which students…
Materials

a) The school superintendent learned which schools the proposal to expand drastically and innovatively upon the current curriculum would overburden during the following semester. [INF, Plaus]

b) The school superintendent learned which high school students the proposal to expand … [INF, Implaus]

c) The school superintendent learned which schools the proposal that expanded … [FIN, Plaus]

d) The school superintendent learned which high school students the proposal that expanded … [Fin, Implaus]
Experiment 3

- Self-paced reading, word-by-word moving window
- 2 x 2 factorial design: ±plausible, ±finite
- 24 sets of items (4 lists); 72 fillers
- n=47 (+3 removed for low comprehension accuracy)

- Yes/no question after every trial
- Comprehension accuracy - 91.9%

- Since the critical subject NP never ultimately contained a gap, participants never actually encountered a parasitic gap
a. The superintendent made the proposal to expand the schools.
b. The superintendent made the proposal to expand the high school students.

c. The superintendent made the proposal that expanded the schools.
d. The superintendent made the proposal that expanded the high school students.
... which schools/students the proposal to expand ...
Experiment 3 - Finite

FIN, Implaus
FIN, Plaus

... which schools/students the proposal that expanded ...
Experiments 1-3: Summary

• All 3 experiments show immediate sensitivity to island constraints
• Experiments #1 & #3 distinguish two types of subject islands
  – Gaps posited inside infinitival subject NPs
  – Gaps not posited inside finite subject NPs
• Why are the two types of subjects treated differently?
  – Experiment #0 showed the two subjects create equally severe islands
  – Therefore, the difference likely related to possibility of parasitic gaps
• Real-time analysis of subject islands manages to avoid sacrificing either accuracy or incrementality
Implications - Accuracy

- These findings strengthen previous claims about immediacy of island constraints - more fine-grained distinctions
Implications - Previous Findings

- 2 of the experiments showed violation of one type of island, and non-violation of another type of island: *same task, same participants*

- Suggests that variability in previous results cannot just be attributed to methodological artifacts

- Can variability in previous results be due to choice of islands tested, and to possibility of parasitic gaps?
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- This talk! [self-paced reading] RC-in-subject
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- This talk! [self-paced reading] infin.-in-subject

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Implications - ‘Parsing Accounts’

• The existence of parasitic gaps shows that it’s not true that dependencies that cross islands are always impossible.

• If subject parasitic gaps were only marginally acceptable, or were processed non-incrementally, this would be compatible with ‘parsing accounts’ of islands

• But since parasitic gaps are constructed *immediately*, this is more problematic for ‘processing accounts’ of islands
Implications - ‘Parsing Accounts’

Any ‘processing based’ account of why this is bad…

which school did the proposal to expand... ultimately overburden the teachers.

…will fail to explain why the first gap can be created here…

which school did the proposal to expand... ultimately overburden .

(cf. Deane, 1991; Pritchett, 1991)
Conclusions

• The notion that long-distance dependencies cannot cross islands is an over-simplification

• The parser appears to be well aware of this

• Creates a challenge for attempts to ‘explain away’ island phenomena as artifacts of processing

• Further evidence that a good deal of what we know about language is deployed immediately in language processing
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