1. Overview

Sluicing, first noted by Ross (1969), is an ellipsis phenomenon in which the TP of an interrogative is elided, stranding an overt wh-phrase in the CP domain.

1) Bernie knows that someone in Iowa voted for Trump, but he doesn't know who [TP in Iowa voted for Trump]E.

This project presents novel English data in which the elided content and the antecedent content in a sluiced construction contain opposite polarity.

2) I don't think that Trump, will comply with the debate requirements, but I don't know why [TP he won't comply with the debate requirements]E.

Main Contributions:

✧ The data challenge current accounts of identity conditions on sluicing. They demonstrate that a greater mismatch between antecedent and elided content is possible than previously thought.
✧ The project shows that a complete theory of sluicing must account for the ability of pragmatically and contextually enriched meanings to serve as antecedents in sluicing constructions.

Structure of the Talk:

§2 OVERVIEW OF PREVIOUS ANALYSES: e-GIVENness and why it fails when applied to the polarity reversal data.
§3 A MODIFIED ACCOUNT: Local Givenness and its application to neg-raising examples.
§4 BEYOND NEG-RAISING: Local Givenness applied to a greater variety of polarity reversal examples.
§5 CONCERNS OF OVERGENERATION: How a pragmatic theory of sluicing interacts with general discourse constraints.
§6 CONCLUSION

1 Thank you to Pranav Anand, Rachelle Boyson, and Jim McCloskey for bringing this phenomenon to my attention and for inspiring/providing much of the project's data. Thank you to Pranav Anand, Bill Ladusaw, and Jim McCloskey for invaluable discussion of the ideas presented here, as well as to audiences at UCSC and UC Berkeley. Finally, thank you to the undergraduate annotators of the Santa Cruz Ellipsis Project for their work in classifying the original corpus data. This project has in part been supported by a UC Santa Cruz Institute of Humanities Research cluster grant to the Santa Cruz Ellipsis Consortium, and by the National Science Foundation Grant No. 1451819: The Implicit Content of Sluicing.
A methodological prologue: The corpus examples given here were identified by undergraduate annotators trained by the Santa Cruz Ellipsis Project and were verified by graduate students and faculty working on the Ellipsis Project. Many examples presented have more than one possible interpretation for the pre-sluice (i.e. the un-elided form of the example). The claim is not that the pre-sluices provided here are the only interpretation available for each example, but merely that they are felicitous, freely available interpretations.

2. Previous Analyses

The dominant semantics-based account of sluicing is Merchant's (2001) theory of e-GIVENness, which imposes a bidirectional semantic entailment identity condition on ellipsis.

**e-GIVENness:**
An expression E counts as e-GIVEN iff E has a salient antecedent A and, modulo \( \exists \)-type-shifting:

i) A entails F-clo(E), and ii) E entails F-clo(A)

**Focus condition on TP-ellipsis:**
A TP \( \alpha \) can be deleted only if \( \alpha \) is e-GIVEN.

e-GIVENness correctly predicts the sluicing possibility in example (1), repeated here as (3).

3) Bernie knows that \([_{TP} \text{someone in Iowa voted for Trump}]_A\), but he doesn't know who \([_{TP} \text{in Iowa voted for Trump}]_E\).

\[
A = \exists x[\text{in Iowa}(x) \land \text{vote for Trump}(x)]
\]
\[
F\text{-Clo}(E) = \exists x[\text{in Iowa}(x) \land \text{vote for Trump}(x)]
\]
\[
E = \exists x[\text{in Iowa}(x) \land \text{vote for Trump}(x)]
\]
\[
F\text{-Clo}(A) = \exists x[\text{in Iowa}(x) \land \text{vote for Trump}(x)]
\]

However, e-GIVENness fails to predict the sluicing possibility in (2), repeated here as (4).

4) I don't think that \([_{TP} \text{Trump will comply with the debate requirements}]_A\) but I don't know why \([_{TP} \text{he won't comply with the debate requirements}]_E\).

---

2 \( \exists \)-type-shifting is a type-shifting operation that raises expressions to type \( \langle t \rangle \) by existentially binding unfilled arguments (Schwarzschild 1999). Existential type-shifting is needed in Schwarzschild's account in order to raise the type of any expression to that of a proposition, as the entailment conditions of GIVENness hold between propositions and not, for example, between VPs. I adopt the same mechanism here, as done in Merchant (2001), in order to existentially close over the trace of a moved wh-phrase so that entailment holds over propositions in the antecedent and elision sites. For example, in (1) the trace of the wh-phrase who undergoes existential closure, raising the type of the elision site to \( \langle t \rangle \): ExClo(1) = \( \exists x[\text{in Iowa}(x) \land \text{vote for Trump}(x)] \)

3 Tense is set aside here for expositional purposes. Nothing in the account presented hinges on its presence or absence.
A entails F-clo(E): No.
A = comply with debate requirements(t)
F-Clo(E) = \neg\text{comply with debate requirements}(t)

E entails F-clo(A): No.
E = \neg\text{comply with debate requirements}(t)
F-Clo(A) = \text{comply with debate requirements}(t)

**INTERIM CONCLUSION I**: Bidirectional semantic entailment accounts are too restrictive and fail to predict the existence of polarity reversal data.

3. A Modified Account

This section presents a modified theory of the identity conditions on sluicing and shows how the theory derives the correct predictions for the polarity reversal example given in (2).

3.1 Pragmatic Identity for Sluicing

*Proposal*: The identity condition licensing elision of a proposition in sluicing constructions is pragmatic in nature.\(^4\)

**Context** \(c\): the set of worlds compatible with what is accepted as true by participants in a conversation at a particular point in the conversation (cf. Stalnaker's (2002) *context set*).

**Local context** \(c_L\): the set of worlds compatible with the presuppositions of the local proposition.

The local context allows propositions to be entered into the discourse as temporary assumptions without being entered into the global discourse context (Karttunen & Peters 1979, Heim 1983, Kadmon 2001).

**Context update:**

a. If \(c_L\) entails the presuppositions of a proposition \(p\), then \(c_L + p = \{c_L \cap p\}\)

b. If \(c_L\) does not entail the presuppositions of \(p\), then either:
   i. undefined, or
   ii. the presuppositions of \(p\) are accommodated, \(c_L + p = \{(c_L \cap ps(p)) \cap p\}\)

**Local Givenness**: A TP \(\alpha\) can be deleted iff \(ExClo([\alpha]^c)\) expresses a proposition \(p\), such that \(c_L \subseteq p\) and \(p\) is uniquely salient.

\(^4\) Note that this is not a novel proposal. See e.g. Roberts (1996/2012) and Ginzburg & Sag (2001) for a QUD-based licensing approach.
Informally, a TP can be elided iff it expresses a proposition that is entailed by the local context and is uniquely salient.

3.2 Accounting for Neg-Raising Polarity Reversal Sluices

Recall that the polarity reversal example given in (2) contains the neg-raising verb *think*.

5) Hillary doesn't *think* that Trump will comply with the debate requirements.

*Available Interpretation:* Hillary thinks that Trump will not comply with the debate requirements.

6) Hillary doesn't *know* that Trump will comply with the debate requirements.

*Impossible Interpretation:* Hillary knows that Trump will not comply with the debate requirements.

What is special about neg-raising verbs like *think* vs. non-neg raising verbs like *know*? In (5), '¬think that p' commits the speaker (in a defeasible way) to 'think that ¬p'.

**Gajewski’s (2007) Excluded Middle Presupposition:**
(building on work by Horn (1972, 1978, 1989), Bartsch (1973), and Abusch (2005))
The ability of matrix negation to scope below a neg-raising verb is due to a pragmatic convention. Gajewski proposes that neg-raising verbs are conventionally associated with a pragmatic excluded-middle presupposition, while non-neg raising verbs are not.

7) [I don't think that Trump, will comply]_A_, but I don't know why [he, won't comply]_E_.

**Applying Local Givenness to (7):**

i. \( c = W \)

ii. (7A) semantically asserts that it is not true that the speaker believes that Trump will comply.

8) **Semantic Denotation of (7A):**
\[
[A]^{w,g} = \neg \forall w \left[w \in W_{\text{dox},s} \rightarrow \text{comply}(t)(w)\right]
\]

iii. The pragmatic excluded middle presupposition in (9)—conventionally associated with the verb *think*—requires that the speaker either believes that Trump will comply or believes that Trump will not comply.

* But see Collins and Postal (2014) for a re-emergence of the syntactic account of neg-raising.
9) **Excluded Middle Presupposition of (7A):**
\[ \forall w [ w \in W_{\text{dox}, s} \rightarrow \text{comply}(t)(w)] \vee \forall w [ w \in W_{\text{dox}, s} \rightarrow \neg \text{comply}(t)(w)] \]

iv. (7A) + (9) derive the strengthened neg-raised interpretation: Because (7A) asserts that it is not true that the speaker believes that Trump will comply, it follows that the speaker believes that Trump will not comply.

10) **Strengthened Neg-Raised Interpretation of (7A):**
\[ \forall w [ w \in W_{\text{dox}, s} \rightarrow \neg \text{comply}(t)(w)] \]

Possible Trump Beliefs:

(9): Trump will comply or he won't comply.

(7A): ¬ Trump will comply.

v. The assertion of (10) yields a local context that includes only those worlds in which Trump will not comply. I rely here on Anand & Hacquard's (2014) proposal that doxastic reports such as think \( p \) can be used in conversation to pragmatically assert \( p \).

11) **Context + assertion of (10):**
\[ c + (10) = \{ w : \neg \text{comply}(t)(w) \} = c_{L:E} \]

vi. (7E) asserts that Trump will not comply.

12) **Semantic Denotation of (7E):**
\[ \text{ExClo}(\llbracket E \rrbracket^w,g) = \{ w : \neg \text{comply}(t)(w) \} \]
vii. Local Givenness requires that the elided proposition be entailed by its local context. There is mutual entailment between the world sets in (11) and (12), and we therefore predict felicitous elision of the proposition expressed by (7E).

\[ \text{Local Givenness Applied to (7):} \]
\[ \text{Local Givenness} = c_1 \subseteq E = \{w: \neg \text{comply}(t)(w)\} \subseteq \{w: \neg \text{comply}(t)(w)\} \]

4. Beyond Neg-Raising

The polarity reversal analysis in Section 3.2 can be extended to cover similarly behaved examples with other categories of verbs:

4.1 Negative Non-factive Attitude Verbs: Doubt (Asher 1987)

In some contexts, to doubt a proposition \( p \) is to weakly believe \( \neg p \) (Anand & Hacquard 2013).

13) [modified corpus example 99105, Santa Cruz Ellipsis Project]
We doubt that Iraq will comply with the mandate, but we don't know why [they won't comply with the mandate].

If to doubt a proposition \( p \) is to believe weakly that it is not the case that \( p \) or to have a preference for \( \neg p \), then the inference doubt \( p \rightarrow \text{believe} \neg p \) will hold in contexts in which the speaker's preference for, or belief that, \( \neg p \) becomes salient or strong enough to push the commitments of the speaker to \( \neg p \) over \( p \).

Similarity to neg-raising verbs: In neg-raising examples such as (7), matrix negation is interpreted within an embedded proposition: for a proposition \( p \), \( \neg \text{think} p \rightarrow \text{think} \neg p \). While think requires overt negation in the antecedent in order to negate the embedded proposition, doubt negates the embedded proposition as a property of its lexical semantics.

4.2 Remember

Can we appeal to a syntactic account of neg-raising or a deconstructionist account of negative attitude verbs? In some contexts, to not remember an eventuality \( e \) is to believe that \( e \) did not happen (see Karttunen's (1971) 'implicative' verb, Higginbotham's (2003) obligatory de se interpretation).

14) [corpus example 91594, Santa Cruz Ellipsis Project]
Context: [O]n the day the Japanese invaded Pearl Harbor, Hummel was rounded up and locked in an internment camp along with about 2,000 other foreigners. . .

Sluice: “I don't know why [I wasn't scared], but I really cannot remember being scared,” [Hummel] said. “It all seemed like great fun.”
Remember is not a neg-raiser nor is it a negative attitude verb. However, in certain contexts it licenses the pragmatic inference that ¬remember \( p \rightarrow \neg p \).

**Summary:** Neg-raising verbs like think, negative attitude verbs like doubt, and remember all license polarity reversal sluices by matrix negation of the antecedent scoping pragmatically into the embedded proposition of the antecedent.

And now for something completely different.

### 4.3 Exclusive Disjunction
Can we simply enrich our bidirectional entailment account to include pragmatic content, instead of merely semantic content?

15) [corpus example 22987, Santa Cruz Ellipsis Project]
**Context:** On Dec. 10, [Senator] McCain sent a letter to the FCC urging the five-member board to end two years of deliberations and decide whether Paxson Communications should be given a license for a Pittsburgh station. Angela J. Campbell, an attorney for opponents to the deal, told the Globe that McCain's letter likely 'tipped' the scale in favor of the decision.

**Sluice:** “Senator McCain said, 'Do it by December 15 or explain why \([\text{you didn't do it by December 15}]\),' and the commission jumped to it and did it that very day,” Campbell told the Globe.

16) [constructed example]
**Context:** Students in a semantics class were given the option to do an extra credit problem, and were required to mark the number of the problem that they did on a spreadsheet accessible by the course's professor and TA. Both the professor and TA thought that John, a student in the class, would have chosen to do a problem. They look at the spreadsheet and see that nothing is marked down under John's name. The TA says to the professor:

**Sluice:** [John either didn't do an extra credit problem]_{A}, or he didn't mark which one, [he didn't do it]_{E}.  

Karttunen's (1974) Local Context for Exclusive Disjunction:
For propositions \( p, q \) such that \( p \lor q \) is uttered in a context \( c \):
- \( c_L \) for \( p = c \),
- \( c_L = c + \neg p \).
Informal Application of Local Givenness to (16):

i. Assertion of Exclusive Disjunction in (16):

(16) asserts that either (A) John didn't do an e.c. problem or (E) John did an e.c. problem.

The disjunction is exclusive because the two disjuncts are opposites: they cannot both be true (or false) at the same time.

ii. Karttunen's Local Context for Disjunction:

\( c_{L-A} \) for John did not do an e.c. problem = \( c \)

\( c_{L-E} \) for John did an e.c. problem = \( c + \neg A = c + \neg [\text{John did not do an e.c. problem}] \)

= John did an e.c. problem

iii. Local Givenness:

(\( E \)) John did an e.c. problem must be entailed by its local context.

(\( c_{L-E} \)) John did an e.c. problem \( \rightarrow \) (\( E \)) John did an e.c. problem

iv. Local Givenness is satisfied and we correctly predict felicitous elision in (16).

Formal Application of Local Givenness to (16):

i. Denotation of \( A \):

\[ [A]^{w,g} = \{ w : \neg \exists x [\text{extra credit problem}(x)(w) \land \text{do}(x)(j)(w)] \} \]

ii. Denotation and Existential Closure of \( E \):

\[ \text{ExClo}(\[ E \]^{w,g}) = \{ w : \exists x [\text{extra credit problem}(x)(w) \land \text{do}(x)(j)(w)] \} \]

iii. Karttunen's Local Context for \( A \) and \( E \):

\( c_{L-A} = c = W \)

\( c_{L-E} = c + \neg A = W \cap \{ w : \neg \exists x [\text{extra credit problem}(x)(w) \land \text{do}(x)(j)(w)] \} \)

iv. Local Givenness:

\( c_{L-E} \subseteq \text{ExClo}(\[ E \]^{w,g}) = \{ w : \exists x [\text{extra credit problem}(x)(w) \land \text{do}(x)(j)(w)] \} \)

\( \subseteq \{ w : \exists x [\text{extra credit problem}(x)(w) \land \text{do}(x)(j)(w)] \} \)

---

6 Note that the \( wh \)-phrase which one is d-linked in the sense of Pesetsky (1987), meaning that it ranges over a salient set in the discourse. As the d-linking is orthogonal to the example here, I suppress this issue for the sake of expositional clarity.
**INTERIM CONCLUSION II:** The proposal that the licensing condition for sluicing is sensitive to (i) the pragmatic enrichment of the antecedent content and (ii) the local context of the ellipsis site correctly accounts for the polarity reversal sluices shown here.

5. Concerns of Overgeneration

The account proposed here jettisons Merchant's (2001) bidirectional entailment account in favor of a unidirectional, contextual entailment account more closely aligned with Schwarzschild's (1999) GIVENness theory. Can the account capture the data that motivated Merchant's bidirectional entailment condition?

17) [Abby called someone an idiot], but I don't know who [Abby insulted t].

Merchant proposes that E must semantically entail A in order to rule out the impossibility of the sluice in (17). However, Dayal & Schwarzschild (2010) point out that the pre-sluice of (17) is also infelicitous:

17’) #Abby called someone an idiot, but I don't know who she insulted.

They propose that the infelicity of (17) is attributed not to an ill-formed sluice, but to the infelicity of the underlying question of the sluice. I adopt their proposal in the following condition:

*The Well-Formedness Condition on Sluicing:*

If a pre-sluice is infelicitous, then the corresponding sluice will not be well-formed.\(^7\)

The Well-Formedness Condition on Sluicing rules out on independent grounds the examples, such as (17), that motivate Merchant's bidirectional entailment condition. By doing so, it obviates the need for the condition.

How, though, does one account for the infelicity of (17’)?\(^8\)

*Maximize Presupposition* (Heim 1991):

Given two contextually equivalent alternatives, speakers must use the alternative whose presuppositions are stronger and happen to be met in the context of use.

18) A: I saw some tigers today at the zoo.
   B: {What/which} #(OTHER) animals did you see today at the zoo?

---

7 Note that the term *infelicitous* was chosen here in order to allow for the proposed amelioration of islands under sluicing (see Merchant 2001).

8 See also discussions in Romero (1997), Ginzburg (2012), and Barros (2014). Barker (2013) proposes to capture this generalization with his Answer Ban constraint; however, the Answer Ban is intended to apply exclusively to sluices, while this is clearly a more general constraint on questions in discourse.
Maximize Presupposition captures exactly the generalization that we want: a question must ask for only new information in a discourse and must presuppose the existence of any partial answers that are already available. Additionally, Maximize Presupposition relates this characteristic of questions to a more general constraint on felicitous utterances in a discourse.

**INTERIM CONCLUSION III (PRELIMINARY):** The data motivating the bidirectional entailment relationship of e-GIVENness can be accounted for independently of a theory of sluicing.

But, a problem. Dayal and Schwarzschild do not discuss sluices such as the following.

\[ [\text{Abby called } [\text{Joe}]_f \text{ an idiot}]_A, \text{ but I don't know who } [\text{else}]_E [\#\text{Abby insulted } t]_E. \]

The Well-Formedness Condition does not rule out such examples. *Else* adds the presupposition necessary to satisfy Maximize Presupposition and the underlying question is therefore felicitous. e-GIVENness correctly rules out the impossible ellipsis site in (19), assuming F-marking on *Joe*:

\[
\begin{align*}
\text{A entails F-clo(E):} & \quad \text{Yes.} \\
\text{A = } & \text{Abby called Joe an idiot} \\
\text{F-Clo(E) = } & \exists x. \text{Abby insulted } x \\
\text{E entails F-clo(A):} & \quad \text{No.} \\
\text{E = } & \exists x. \text{Abby insulted } x \\
\text{F-Clo(A) = } & \exists x. \text{Abby called } x \text{ an idiot}
\end{align*}
\]

A purely unidirectional entailment condition, however, will not:

\[
\begin{align*}
\text{A entails E:} & \quad \text{Yes} \\
\text{A = } & \text{Abby called Joe an idiot} \\
\text{E = } & \exists x. \text{Abby insulted } x
\end{align*}
\]

However, the account proposed here is not a purely unidirectional entailment account. It requires the proposition expressed by the elided TP to be uniquely salient in its local context. The Local Givenness condition is repeated below.

**Local Givenness:** A TP $\alpha$ can be deleted iff $ExClo([\alpha]^e)$ expresses a proposition $p$, such that $c_e \subseteq p$ and $p$ is uniquely salient.

Looking again at (19):

\[ [\text{Abby called } [\text{Joe}]_f \text{ an idiot}]_A, \text{ but I don't know who } [\text{else}]_E [\#\text{Abby insulted } t]_E. \]

The proposition expressed by E, $\exists x. \text{Abby insulted } x$, is not uniquely salient in its local context.

What is saliency? Difficult to define in a rigorous manner. One test:

**Test for saliency:** $p$ is salient at time $t$ if $p$ can be picked out by a propositional discourse anaphor, such as *that*, at time $t$. 

10
That positive polarity sentences license the propositional discourse anaphor *that* is pointed out in Webber (1988), among others. That negative sentences also license discourse anaphora is observed in Asher (1993), Hwang (1992), and de Swart (1996).

20) John didn't know, the answer to the problem. This, lasted until the teacher did the solution on the board. (Asher 1993, pg. 53)

The propositional discourse anaphor *that* is anaphoric to 'activated' entities in the sense of Gundel et al. (1990); that is, it is anaphoric to entities that the speech participants are currently aware of, i.e. have access to due to the entities' presence in the immediate discourse context. This type of anaphoric reference to the sluiced content is possible in the polarity reversal cases:

21) **Context:** On the day the Japanese invaded Pearl Harbor, Hummel was rounded up and locked in an internment camp along with about 2,000 other foreigners. . .

H: I don't know why *I wasn't scared*, but I really can not remember being scared.
B: That's impossible! You were just a child.

In (21), the demonstrative *that* is anaphoric to the sluiced proposition *I wasn't scared*. That is, the meaning of the first sentence in B's utterance is judged to be “It's impossible that you weren't scared.”

**INTERIM CONCLUSION III (FINAL):** The data motivating the bidirectional entailment condition of e-GIVENness can be accounted for by appealing to general constraints regulating coherent discourses and by restricting the elision of propositions to those that are salient in context.

6. Conclusion

**Summary of Main Results**
- Incorporated novel data not previously discussed in the sluicing literature.
- Demonstrated that a complete theory of sluicing must account for the availability of pragmatically and locally enriched meanings to act as licensers for the ellipsis site of sluicing constructions.

**Final Thoughts**
- This presentation shows a way in which a pragmatic theory of sluicing can account for data that are challenging for non-pragmatic accounts.
- The account presented here is not intended to be an exhaustive explanation of the many interesting and challenging facets of sluicing. Two possible ways to move forward:
  - Pursue a purely pragmatic approach to sluicing (in progress).
  - Pursue a hybrid approach to sluicing involving both pragmatic and syntactic restrictions (see forthcoming joint work with Deniz Rudin).
References