Ellipsis in inquisitive semantics

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1 Introduction

Recent years have seen a proliferation of approaches to ellipsis which make crucial reference to the semantic interpretations of ellipsis sites and their antecedents in various ways. At the same time, recent decades have witnessed a sea change within the field of semantics, with many researchers treating sentence meanings not in terms of mere truth-conditions, but rather in terms of a broader notion of Context Change Potential (CCP) or Information Exchange Potential. It seems natural, then, to ask the question of how this broader notion of semantic content can be brought to bear in the analysis of ellipsis.

In this chapter, we engage this question by focusing on one particular branch of semantic theories with this broader conception of meaning: inquisitive semantics (Groenendijk (2007), Groenendijk & Roelofsen (2009), AnderBois (2012a) *inter alia*, see Ciardelli et al. (2013) for a recent overview). Inquisitive semantics holds that sentence meanings for both declarative and interrogative sentences consist of (or at least determine) sets of alternative propositions. For the study of ellipsis, then, the hypothesis is that semantic conditions on certain ellipsis processes will (or at least may) make reference to this broader, alternative-rich notion of semantic content rather than to mere truth conditions.

The outline for this chapter is as follows: §2 introduces inquisitive semantics; §3 briefly presents the most fully fleshed out account of an ellipsis process using inquisitive semantics: AnderBois (2014); §4 concludes by addressing the questions of Structure, Recoverability, and Licensing from the perspective of the account in §3 and discusses how

they might differ under other possible ways of incorporating inquisitive semantics into a theory of ellipsis.

2 Inquisitive semantics

2.1 What makes a semantics 'inquisitive'?

The core intuition behind inquisitive semantics is that the meaning/CCP of sentences not only includes truth-conditional information, but also includes the issue(s) that it raises, i.e. its inquisitive content. This has been long recognized, of course, for the CCPs of interrogative sentences. Inquisitive semantics extends this idea to capture the intuition that assertions, especially those containing widest scope disjunctions and indefinites, also raise issues in discourse. For example, (1) introduces two alternatives – 'that it will rain', 'that it will snow' – and thereby makes this issue salient in the output context in a way that truth-conditionally equivalent sentences such as 'it will precipitate' do not (assuming that rain and snow are the only forms of precipitation).

(1) (Either) it will rain or it will snow.

Inquisitive semantics therefore builds on a number of recent works on disjunction and indefinites (e.g. Kratzer & Shimoyama (2002), Simons (2005), Alonso-Ovalle (2006)) in what has been called 'Hamblin' or 'Alternative' semantics. These works hold that indefinites and disjunctions introduce alternatives into semantic composition. While the name 'inquisitive semantics' refers to a family of related semantic/pragmatic theories (see e.g. Groenendijk (2011) for discussion), there are two fairly consistent ways in which inquisitive semantics differs from Hamblin semantics. First, the two differ in the ways in which alternative-rich meanings are composed and what their formal properties are. These properties have no clear importance for the study of ellipsis, so we refer the reader to Ciardelli et al. (2013) and references therein for detailed discussion. Second, alternative-evoking (or lack thereof) is treated as an aspect of the top level meaning of assertions and

questions alike and therefore of their contribution to discourse as well.[1]

2.2 Inquisitive semantics across sentence types

We turn now to give a concrete version of inquisitive semantics for both questions and assertions. Given our present purposes, the presentation here is necessarily informal (see Groenendijk & Roelofsen (2009) and AnderBois (2012a) for more detailed formal presentations).

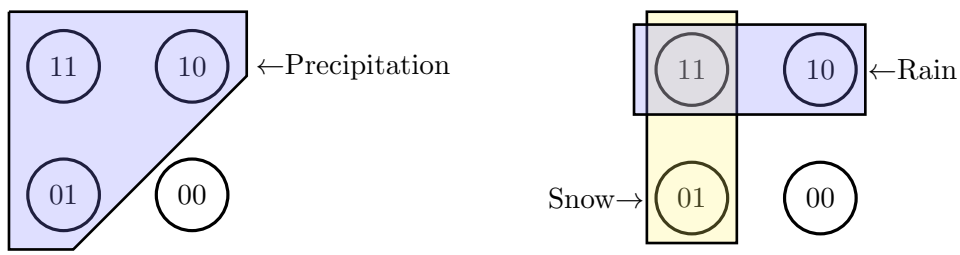
The core formal shift in inquisitive semantics is to treat sentence meanings not as sets of possible worlds (i.e. propositions), as is done classically, but rather as sets of sets of possible worlds (i.e. sets of propositions). This move itself has a precedent in Hamblin (1973)'s semantics for interrogatives, but differs in that expressions other than questions will make use of these richer meanings. In particular, we assume that disjunctions, indefinites, and other forms of existential quantification also contribute alternatives into semantic composition. Following Groenendijk & Roelofsen (2009), we will call a sentence *inquisitive* if its interpretation contains more than one alternative. The idea, then, is that not only interrogatives, but also declarative sentences may be inquisitive in this sense. Furthermore, if covert existential quantification is also taken to be inquisitive (as we suggest in §3.3), the inquisitivity of declaratives will be quite regular.

Taking (1) as an example, we illustrate this idea in informal set notation in (2a) and graphically in the diagram (2b). Diagrams like (2b) provide a pictorial representation of the interpretation of the formula in a toy model. We assume a toy model containing four possible worlds (w_{00}, w_{01}, w_{10}, w_{11}), represented visually by the four named circles. The names here correspond to the truth values of two propositions, p and q. In our current example, then, p = 'that it will rain' and q = 'that it will snow'. The boxes, then, represent *alternatives* in the interpretation of the sentence.

(2) **Classical disjunction:** $[\![p \vee q]\!]_{cl}$ **Inquisitive disjunction:** $[\![p \vee q]\!]_{inq}$

a. { 'that it will precipitate' } { 'that it will rain', 'that it will snow' }

b.



The classical semantics for disjunction is not inquisitive since it produces only a single 'alternative', the proposition that it will precipitate. In contrast, an inquisitive semantics for disjunction produces the alternative-rich interpretation with distinct alternatives for the different forms of precipitation mentioned in the sentence. While these two interpretations differ in their inquisitive content, they contain the same *informative* content, i.e. determine the same truth-conditions. It is the same set of possible worlds which appear in some alternative or other in the interpretation of the two formulas, just structured differently.

Inquisitive semantics therefore allows us to distinguish truth-conditionally equivalent formulas on the basis of the alternatives they evoke. To continue with our toy example, then, we assign a sentence with a disjunction like (1) the alternative-rich interpretation on the right of (2), while assigning (3) the different (yet truth-conditionally equivalent) semantic representation on the left of (2).

(3) It will precipitate.

Extending such a semantics to indefinites and other forms of existential quantification is fairly straightforward at an intuitive level.[2] Whereas a disjunction specifies alternatives one by one, an indefinite produces a set containing one alternative per individual in the restrictor set. For example, a sentence like (4) will receive an interpretation with n alternatives, one per each of the n individuals in the interpretation of 'student'.[3]

(4) Prof. Ramírez met with a student.

(5) { 'that R met with Al', 'that R met with Bella', 'that R met with Chad', . . . }

In this section, we have introduced the basic conception of sentence meaning in inquisitive semantics with a focus on the two main alternative-evoking elements: disjunction and existential quantifiers such as indefinites. Simple sentences containing these elements make salient a set of alternatives and simultaneously contribute the information that the world of evaluation lies within some alternative(s) in this set. In §2.4, we provide a semantics for questions which makes the parallel with indefinites and disjunction explicit, while also capturing the difference between the two classes. Before doing so, however, we introduce a class of operators which interact with the inquisitive component of formulas to which they apply.

2.3 Negation and other operators

Thus far, we have given an informal introduction to an inquisitive semantics for disjunction and existential quantification. This semantics holds that sentences containing these elements make salient in the discourse a set of alternatives in a way that truth-conditionally equivalent sentences may not. While this intuition seems fairly clear for the simple sentences we have looked at thus far, it turns out only to hold of sentences which contain *wide-scope* disjunctions and existential quantifiers. For example, a disjunction within the scope of negation, as in (6a), seems to be no more inquisitive than its non-disjunctive counterpart, (6b).

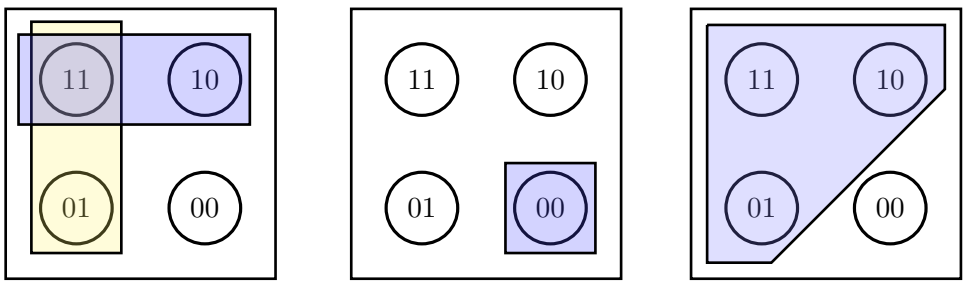
(6) a. It's not the case that it rained or snowed.

b. It's not the case that it precipitated.

Moreover, this behavior in fact follows from the way negation is naturally defined in inquisitive semantics (see Roelofsen (2013) and references therein for detailed discussion of its mathematical foundations). Since sentence meanings are sets of alternatives,

negation rejects each of these alternatives as in ((7), middle), returning the maximal alternative which does not overlap with any of these. One important consequence of this is that, while it preserves truth conditions, double negation is no longer semantically vacuous since it eliminates the alternative-rich structure of the formula to which it applies, ((7), right).

(7) $[\![\exists x.\varphi(x)]\!]$ $[\![\neg\exists x.\varphi(x)]\!]$ $[\![\neg\neg\exists x.\varphi(x)]\!]$



It follows, then, that not just any sentence containing an inquisitive element will be inquisitive, but rather those where the inquisitive element takes widest scope. We have illustrated this here for negation, other operators may also have this property, such as the Comma operator found in appositive relative clauses. This fact is parallel to the observation (e.g. Chung et al. (1995), Romero (1998)) that inner antecedents for sluicing must take wide scope (indeed, licensing of sluicing is often used as a diagnostic for scope of indefinites).[4]

2.4 Questions

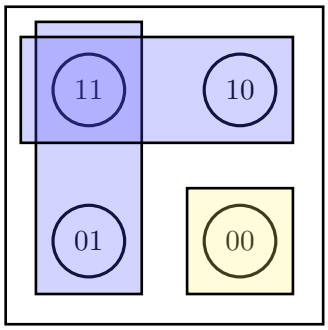
While inquisitive semantics assigns a more question-like semantics to sentences with wide-scope disjunctions and existential quantifiers, we still need to distinguish these latter elements from questions. The basic approach in inquisitive semantics – at least in matrix clauses – is to differentiate the two in terms of their *informative potential*. For ease of exposition, we will simply use the term 'informativity' below, though in all cases the relevant notion is possible informativity rather then actual (see AnderBois (2012a) for detailed discussion). The inquisitive semantics for disjunction in the right side of (2) not

only introduces a set of alternatives, it also includes the truth-conditional *information* that some alternative or other holds. That is to say that a declarative with a wide-scope disjunction rules out the possibility that none of the alternatives hold. Intuitively, and perhaps definitionally so, questions are not possibly informative in this way.

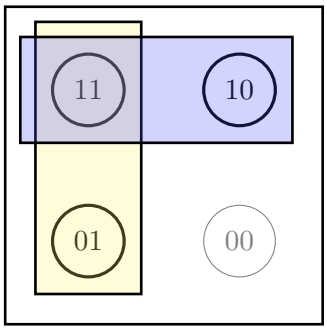
The literature on inquisitive semantics has seen two ways to cash out this insight, which we can call *absolute* and *relative* uninformativity. We can illustate these two approaches for the wh-question in (8), recalling that we keep the pictures to two positive alternatives. The absolute uninformativity approach is exemplified by Groenendijk & Roelofsen (2009), who propose a Q(uestion) operator which adds in the 'no one' alternative, as in the left picture of (9). The second option, due to AnderBois (2012a), is to claim that questions have an existential presupposition and that the alternative set of the question is uninformative only relative to this presupposition. We can indicate this pictorially by shading out the worlds presupposed not to be live options (just world 00 in this case):

(8) Who told John about the party?

(9) **Two different inquisitive semantics for questions:**



[**Absolute uninformativity**]



[**Relative uninformativity**]

Here, we will follow AnderBois (2014) in adopting this latter option. Ultimately, however, the decision between these two approaches is an empirical one, resting largely on the longstanding question of whether questions contribute existential presuppositions. Beyond the unresolved nature of this question for English, it is of course possible that

both options are needed across languages or across question constructions within a single language (e.g. argument vs. adjunct *wh*-questions, *wh*- vs. alternative questions).

3 Sluicing is sensitive to inquisitive content

Having introduced inquisitive semantics, we turn now to apply it to the analysis of ellipsis and, in particular, AnderBois (2010), AnderBois (2014)'s account of both merger and sprouting subtypes of sluicing. Finally, §4 will conclude by exploring other possible ways of incorporating the core insights of inquisitive semantics into a theory of ellipsis, drawing on related theories such as dynamic semantics and QUD approaches to discourse.

3.1 The need to move beyond truth conditions

As a theory of the *semantic content* of questions and assertions, inquisitive semantics is only of direct relevance to ellipsis to the extent that semantics itself is (or pragmatics which is sensitive to semantics). In principle, it would be consistent for inquisitive semantics to provide an appropriate theory of semantic content, yet for ellipsis to be resolved in a purely syntactic (or LF-syntactic) way (as in, e.g. Sag (1976), Chung et al. (1995)). However, there is a large body of work across many different frameworks arguing that semantics/pragmatics do play a crucial role in ellipsis phenomena (Sag & Hankamer (1984), Hardt (1993), Ginzburg & Sag (2001), Merchant (2001), Culicover & Jackendoff (2005), Chung et al. (2011) among many others). Assuming that this is right in some way, inquisitive semantics naturally raises the question of whether this condition will be sensitive not only to truth-conditional information, but also to the inquisitive aspect of semantic content.

There are several different kinds of data which have been argued to support the need for the semantic condition on sluicing to be sensitive to inquisitive content. Except where noted, we focus on data from English, though there is no reason to expect the observations we make to not be more general. In this section, we focus on data from the subtype

of sluicing which Chung et al. (1995) dub 'merger', i.e. cases where there is an overt 'inner antecedent' in the A(ntecedent) clause corresponding to the wh-phrase in the E(lided) clause. In §3.3, we turn to cases of Chung et al. (1995)'s 'sprouting', i.e. cases where there is no overt inner antecedent, with the wh-phrase instead corresponding to an implicit argument or adjunct in the A-clause.

Perhaps the most fundamental observation supporting the relevance of inquisitive semantics for sluicing is the role played by inquisitive elements as inner antecedents. We see this clearly in the contrasts between the felicitous sluices in (10a), whose antecedents are inquisitive sentences, and the infelicitious ones in (10b), whose antecedents are non-inquisitive. Notice that in both cases the corresponding full-clausal versions are felicitous.

(10) a. She said she had spoken to {someone/a student/John or Bill}, but Harry didn't know who.

b. #She said she had spoken to {everybody/most students/the student/him/John and Bill}, but Harry didn't know who.

In addition to this basic observation, it is well-known that these elements must take wide scope in order to serve as inner antecedents (e.g. Chung et al. (1995), Romero (1998), Barker (2013)). As we will see below in a moment, this generalization follows straightforwardly from an inquisitive semantic approach to sluicing. In fact, from the inquisitive semantic perspective, the ability of disjunctions and indefinites to serve as inner antecedents is simply another manifestation of the interrogative-indefinite-disjunction affinity (e.g. Haspelmath (1997), Bhat (2000), Haida (2008)).

While the privileged role of disjunctions and indefinites is of course quite suggestive, this alone leaves somewhat open the possibility that it is some other aspect of these expressions which is crucial. For example, focusing primarily on indefinites, Chung et al. (1995) argue that it is the logical form of these elements (i.e. the fact that they contribute a variable in the Heimian view, Heim (1982)) which is crucial. Merchant (2001) argues that it is the truth-conditions following existential closure of the A- and E-clauses which

is relevant. One kind of data which is problematic for the former view at least (as Chung et al. (1995) note) are disjunctive inner antecedents where the disjunction is not of arguments, as was the case in (10a), but of entire clauses, as in (11).

(11) a. (Either) Freddie is baking a cake again or something is on fire, but I can't tell which (one). AnderBois (2014)

b. Russ is in the back or Ali is working alone, but I can't tell which (one). AnderBois (2014)

As for the latter view, there are several cases of expressions which are truth-conditionally equivalent to overt widest-scope indefinites, yet do not license sluicing (i.e. cannot serve as an inner antecedent). Such cases are unexpected if truth-conditions are all that the semantic condition cares about, but entirely expected from the view of inquisitive semantics since they plausibly have different inquisitive content. Perhaps the most straightforward case where truth-conditions alone prove inadequate are examples like (12) where we see that indefinites and NPIs with double negation and negative quantifiers with single negation (in Standard American English) fail to license sluicing. The would-be A-clauses have counterparts with no negation (e.g. 'Someone left.' for (12b)) which are true in the same circumstances but differ in their ability to license sluicing.

(12) a. #It's not the case that Bill didn't bring a dish, but I don't know which (one). AnderBois (2014)

b. A: It's not the case that no one left.
B: #Who?

c. #It's not true that Bill didn't talk to anyone, and Jane just asked me who.

The second case discussed by AnderBois (2014) are indefinites that occur inside appositive (non-restrictive) relative clauses. In contrast to restrictive relative clauses, the content of appositive relative clauses is generally thought of as having sentence-level scope (or perhaps as being in some sense 'scopeless'), but having no other truth conditional impact. Therefore, a truth-conditional account predicts that inquisitive elements inside of

appositive relative clauses ought to readily serve as inner antecedents for sluicing. As seen by the infelicity of (13), based on examples in AnderBois (2014), this prediction is not borne out.

(13) a. #The valiant knight, who defeated {a masked enemy/someone} in a duel, still wonders who.

b. #Joe, who once killed {a man/someone} in cold blood, doesn't even remember who.

More recently, this generalization has been investigated experimentally by Collins et al. (t.a.) who argue that such examples can be improved by (1) using a *wh*-phrase of the form which + NP in the E-clause rather than a bare wh-word like *who*, and (2) making the issue raised by the E-clause (or a related one) salient in the discourse preceding the target sentence. Given the space limitations of the present work, we will leave a detailed discussion of these issues to future work.[5] However, it is worth noting that both of these manipulations are ones which plausibly raise the salience of the E-issue in the ambient discourse and therefore in our view should not be seen as evidence that the indefinite inside the appositive can in fact serve as the inner antecedent, so much as casting doubt on the logically prior question of whether a linguistic antecedent is strictly necessary in the first place (i.e. whether sluicing is an instance of 'surface' or 'deep' anaphora in the terms of Hankamer & Sag (1976)), as the authors point out. At the same time, the existence of contrasts like (10) make clear that inquisitive elements at least can play a privileged role in licensing sluicing, one which is unexpected for Ginzburg & Sag (2001), as discussed in §4.

As an anonymous reviewer notes, there is one aspect of Merchant (2001)'s account that one might expect could help capture such data: the requirement that the antecedent be *salient*. While salience is often not fleshed out in much detail, it seems a priori plausible that double-negation and apposition reduce the salience of the antecedent and that this is the reason they impede sluicing. However, we find that other elements typically

thought to be sensitive to salience such as pronouns and even VP-ellipsis can readily find an antecedent in these environments as in (14). Therefore, it seems that the effects we are seeing cannot be straightforwardly attributed to salience of the sort relevant for anaphoric processes more generally.

(14) a. It is not true that John didn't bring an umbrella. It was purple and it stood in the hallway. Krahmer & Muskens (1995)

b. John, who helps people if they want him to, kisses them even if they don't ~~want him to help them~~. AnderBois et al. (2015)

A third case where truth-conditional equivalence proves insufficient to license sluicing are certain cases of bare noun incorporation, such as those discussed in detail by Collins (2013) for Samoan. Collins observes that, unlike other truth-conditionally equivalent indefinite-like expressions in the language, incorporated bare NPs do not license sluicing (nor do they license pronominal anaphora) as seen in (15). Collins (2013) pursues an analysis in the closely related framework of dynamic semantics, though clearly this could potentially be treated as a difference in inquisitivity in the current context.

(15) a. Sā fa'apāgotā-foamea le ta'ita'i
PAST arrest-thief the leader
'The chief thief-arrested'

b. #'o ai?
who
Intended: 'Who?'

Thus far, we have seen several cases in which sentences with identical truth conditions to those provided by overt indefinites are unable to license sluicing. We turn now to one further kind of support for the relevance of 'issues' to sluicing: the fine-grained patterns of variation across different types of nouns and wh-words investigated by Barros (2013) (see also Dayal & Schwarzschild (2010), Barker (2013) for related observations). Barros observes that the felicity of sluicing varies depending on complex[6] interactions between the nominal content of the inner antecedent and the properties of the

wh-remnant. For nouns in the A-clause, Barros claims that the felicity of such sentences depends on whether the noun is a 'basic-level' noun or not (in the sense of Brown (1958), Cruse (1977) and others). Basic-level nouns are nouns that have a privileged status tied to their encoding a 'neutral' level of specificity (i.e. presumably for non-linguistic reasons). For example, out of the blue it would sound more natural to talk about my 'cat' than my 'mammal' even though clearly both are equally truthful descriptors for a cat.[7]

(16) a. #Jack has a profiterole, but Fred doesn't know what (exactly).

b. #Jack ordered an éclair, but Fred doesn't know what (exactly).

c. #Jack got a cat, but Fred doesn't know what (exactly).

(17) a. Jack had a drink, but Sally can't recall what (exactly).

b. Jack ordered food, but Sally doesn't know what (exactly).

c. Jack ordered an appetizer, but Sally can't recall what (exactly).

Beyond variations based on the specificity of the noun itself, Barros argues that the animate *wh*-word *who* differs from the inanimate *what* in allowing more 'specific' nouns in the inner antecedent:

(18) Sally met with a {scientist/geologist/seismologist}, but I don't know who.

Glossing over important details, the basic idea Barros pursues is that *wh*-words lexically specify a particular level of specificity, that is, they specify an issue whose alternatives have a particular level of granularity. For sluicing to be felicitous, then, the descriptive content of the noun or other inner antecedent material must not be more specific than the level specified by the *wh*-word. *Who* and *what* differ in the level of specificity they specify, leading to the asymmetry seen above. Barker (2013) makes similar observations and proposes the generalization in (19):

(19) **The Answer Ban:** the antecedent clause must not resolve, or even partially resolve, the issue raised by the sluiced interrogative.

We return to these observations in more detail in a moment once we have presented AnderBois (2014)'s account. For now, let us remark that these observations fit naturally in a view where semantic content is alternative-rich.

3.2 An account based on symmetric inquisitive entailment

Inquisitive semantics is a theory of semantic content, and as such can be implemented within a variety of different theoretical approaches to ellipsis. In this section, we present the most worked out inquisitive semantic account of an ellipsis process, AnderBois (2014)'s account of sluicing (AnderBois (2010), AnderBois (2011) present earlier versions of more or less the same approach). AnderBois (2014)'s approach builds on the approach of Merchant (2001), but incorporates the inquisitive semantic conception of semantic content. Given this, we very briefly review the major features of Merchant (2001)'s account.

Merchant (2001)'s theory of ellipsis assumes, along with many other authors, that pronounced material in the E-clause (i.e. the *wh*-remnant), arises from a fully articulated clausal version, as in (20). From this starting point, an additional mechanism specifies the non-pronunciation of the redundant material in this clause, indicated in strikethrough, an approach commonly known as PF-deletion.

(20) [John talked to someone]$_A$, but I don't know [who$_i$ ~~John talked to~~ t_i]$_E$.

For Merchant, this PF-deletion operation is subject to the condition in (21), which ensures that there is a semantically identical antecedent salient in the surrounding context.[8] The existential type-shifting portion of the definition existentially quantifies over missing arguments in order to be able to apply the definition to ellipsis processes which operate over parts of clauses (e.g. existentially quantifying over the subject in order to compute entailment between verb phrases for VP-Ellipsis).

(21) **Merchant (2001)'s e-Givenness condition:** An IP α can be deleted only if α is e-Given.

(22) **F-closure**[9] The F-closure of α, written F-clo(α), is the result of replacing F-marked parts of α with $\exists$-bound variables of the appropriate type.

(23) **e-Givenness** An expression E counts as e-GIVEN iff E has a salient antecedent A and, modulo existential type-shifting,

a. A entails F-clo(E), and

b. E entails F-clo(A).

AnderBois (2014) departs from this basic setup in two ways, only the latter of which is directly related to inquisitive semantics. First, following Chung (2006) and many subsequent works, the work adopts a 'hybrid' approach which supplements the semantic condition with a lexical identity condition in (24). The numeration is the minimalist term for the list (technically a multiset) of lexical items that comprise the sentence.

(24) **No New Morphemes:** Every lexical item in the numeration of the sluice that ends up (only) in the elided IP must be identical to an item in the numeration of the antecedent CP.

This lexical identity condition is primarily relevant for handling cases of sprouting (see §2.3), but is aimed at capturing the infelicity/ungrammaticality of examples like (25), where the A and E-clauses clearly have the same truth-conditions, yet sluicing is not possible. While it is not impossible to imagine that certain such cases can be captured semantically (e.g. AnderBois (2010) attempts such an account for (25a)), we set aside this possibility here. It should be noted, however, that even accounts of ellipsis which do not posit silent linguistic material (e.g. accounts of 'fragment answers' by Ginzburg & Sag (2001) and Jacobson (2013)) similarly treat such data as arising from a minimal (morpho-)syntactic condition regarding the syntactic category of the E-remnant.

(25) a. #[The cake was eaten]$_A$ but we don't know [who ~~ate the cake~~]$_E$.

b. #[John is jealous]$_A$, but I don't know [who ~~John is jealous of~~]$_E$

The second difference from Merchant (2001) is that the symmetric entailment condition analogous to (21) is formulated with respect to inquisitive semantic contents, rather than just truth-conditions. Groenendijk & Roelofsen (2009) give the formal definition for entailment in (26). To unpack this definition a bit, recall first that the interpretations of any given formula will be sets of alternatives. Given this, to see if φ entails ψ, we check to see if each alternative in $[\![\varphi]\!]$ is a subalternative of some alternative or other in $[\![\psi]\!]$. Thinking in terms of the pictorial representations above, then, entailment checks to see if each box in the interpretation of φ fits inside some box or other in the interpretation of ψ. Symmetric entailment then, means that the interpretations of two formulas have the *same* alternatives.

(26) **Entailment:** φ *entails* ψ *iff* $\forall\alpha \in [\![\varphi]\!]$, α *is such that* $\exists\beta \in [\![\psi]\!]$ *such that* $\alpha \subseteq \beta$

One important thing to note about this definition is that it does not take into account the presuppositions of either formula, just the alternatives in the proposed output state[10]. As we saw in §2.4, the existential presupposition is the only thing distinguishing the interpretation of an interrogative and a corresponding declarative with a wide-scope indefinite. This therefore allows for the condition on sluicing to be formulated as follows:

(27) **Symmetric Entailment Condition on sluicing:** Given a structure $\begin{array}{c} \mathrm{CP}_E \\ \diagup\ \diagdown \\ \mathrm{C}_{+Q} \quad \mathrm{IP}_E \end{array}$,

IP_E can be elided only if there is some salient antecedent CP_A such that:

a. CP_E *entails* CP_A, and

b. CP_A *entails* CP_E

This condition essentially adapts Merchant's e-givenness condition to the inquisitive setting (we set aside issues related to F-closure, see footnote 9). Given the deep semantic connection between interrogatives and indefinites/disjunctions in inquisitive semantics, however, it can be stated over the entire clause (CP), rather than just the deleted portion, IP. Since the E-clauses in sluicing are necessarily interrogative, the inquisitive

entailment condition in (27) derives what AnderBois (2014) calls the 'inner antecedent generalization' in (28).

(28) **Inner antecedent generalization:** An expression α can serve as an inner antecedent for sluicing only if α makes an inquisitive contribution.

Beyond this, as argued by Barros (2013), Barker's 'answer ban', (19), follows as a particular case of (27). If the A-clause resolves (or partially resolves) the issue raised by the E-clause, the E-clause by definition does not entail the A-clause and therefore fails the condition in (27). Accounting for all of the data of this sort does require a more fine-grained semantics for *wh*-words than we will give here, so we again refer the reader to Barros (2013) for further details.[11]

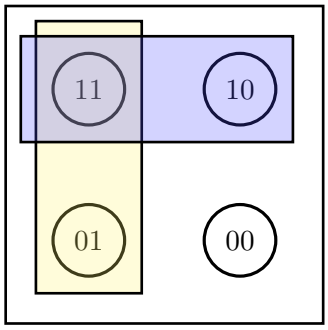
With this in place, we now show how the account tackles basic cases of sluicing as well as the infelicitous cases discussed in §3.1. First, let's consider a basic case where the inner antecedent is an overt indefinite 'someone'. The inquisitive interpretation of the A-clause *someone left* will be a set of alternatives of the form 'x left', (31, left). The interpretation of the E-clause, *who left*, consists of the same set of alternatives (31, right). While the E-clause additionally includes a (non-inquisitive) existential presupposition, the entailment condition in (27) ignores this, and so, the symmetric entailment condition is met and (29) is correctly predicted to be felicitous. We can visually verify that (27) is met by looking at the diagrams in (31) and seeing that the alternatives on the two sides are the same. Disjunction behaves the same, differing only in the that the specific nature of the antecedent obliges the use of the D-linked *which* in the E-clause (see Dayal & Schwarzschild (2010), Barros (2013) for discussion of the conditions on *which*).

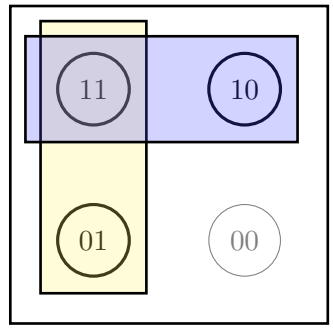
(29) [Someone left]$_A$, but I don't know [who ~~left~~]$_E$

(30) a. $(29)_A \rightsquigarrow \exists x.\text{leave}'(x)$

b. $(29)_E \rightsquigarrow \exists x.\text{leave}'(x)$ (Presupposes: $!\exists x.\text{leave}'(x)$)

(31) $[\![(29)_A]\!]$ $\Leftrightarrow$ $[\![(29)_E]\!]$

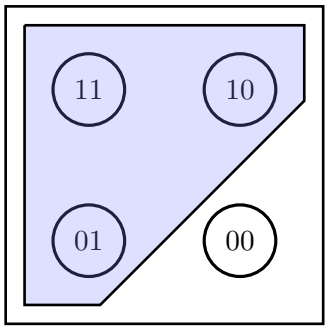


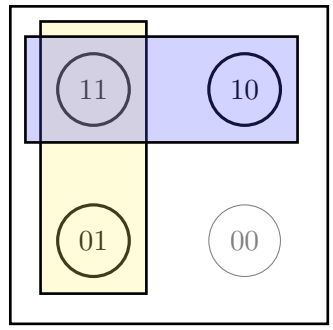


Turning to the infelicitous cases, we look first at double negation. Above, in (7), we saw that double negation in inquisitive semantics preserves truth-conditions, as one would expect, yet eliminates the inquisitive content of the formula to which it applies. The result is that an attempted sluice in (32) is interpreted as in the picture in (33). Applying the inquisitive entailment condition, we find that the E-clause does entail the A-clause since each of the alternatives of the form 'that x left' is a subalternative of some alternative or other in the interpretation of the A-clause (namely, the single alternative 'that someone or other left'). In the reverse direction, however, the entailment does not hold. Given the single alternative in the A-clause, we cannot find any super-alternative in the E-clause. Since the symmetric entailment condition fails, the account correctly predicts that sluicing will not be possible in this case.

(32) #[It's not the case that no one left]$_A$, but I don't know [who ~~left~~]$_E$.

(33) $[\![32_A]\!]$ $\not\Rightarrow$ $[\![32_E]\!]$





Finally, let's look at the case of the indefinite inside an appositive relative clause. A number of recent works have argued in one form or another that appositive relative clauses have a special discourse status of one sort of another (e.g. Potts (2005), Amaral et al. (2007), Simons et al. (2011), AnderBois et al. (2015)). One aspect of this special status is that appositives represent purely informational updates which do not interact with the Questions Under Discussion (QUDs) in any direct way. AnderBois (2014) proposes that in order to capture this aspect of their meaning, appositives ought to be treated as lacking the alternative-rich structure inquisitive semantics assumes for at-issue assertions, and instead be assigned a single classical proposition of type *st*. Compositionally, this is achieved through the Comma operator in (34):

(34) $[\![\textsc{Comma}(\varphi)]\!] = \{w \mid \textit{there is some } \alpha \in [\![\varphi]\!] \text{ s.t. } w \in \alpha\ \}$

Since inquisitive meanings are captured as non-singleton sets of alternatives, the Comma operator ensures that the formula to which it applies – as it enters the discourse record – will not be inquisitive regardless of its internal composition. As in the case of double negation, then, appositives deliver truth-conditionally equivalent interpretations, yet lack the alternative-rich meanings needed to meet the symmetric entailment condition.

Summing up, we have seen in this section that an account of sluicing based on symmetric entailment defined over inquisitive semantic interpretations captures both the data which motivated Merchant (2001)'s semantic approach (and indeed previous approaches dating back at least to Sag & Hankamer (1984)) as well a number of other sets of data, including several cases where sluicing fails despite truth-conditional equivalence.

3.3 Sprouting

Having examined cases of 'merger' sluicing with overt indefinite or disjunctive inner antecedents, we turn now to cases of so-called 'sprouting' where the *wh*-phrase has no overt correlate in the A-clause. In some cases, of course, there is good reason to believe that,

despite the lack of an overt inner antecedent, there is nonetheless an implicit argument present in the A-clause. For example, a large body of literature dating back to Fillmore (1969) holds that apparently intransitive uses of verbs like *eat* in (35a) include an existential/indefinite implicit argument (see AnderBois (2012b) for recent discussion of sluicing and the typology of implicit arguments). Beyond this, there are cases like (35b) where there is clearly an existential entailment, and arguably also (contextually restricted) existential quantification depending on one's semantics for tense.

(35) a. [Fred ate]$_A$, but I don't know [what ~~Fred ate~~]$_E$.

b. [Fred baked a cake]$_A$, but I don't know [when ~~Fred baked a cake~~]$_E$.

Such data, therefore, have given rise to the claim that in a certain sense, there is no sprouting, but rather that there is always an implicit argument either syntactically (e.g. Fortin (2007), Fortin (2011)) or semantically (Merchant (2001)). While this approach is potentially viable for the above data, Chung (2006) points out that there are other cases where even an existential entailment (let alone a true indefinite) is clearly not present, (36). People can finish projects on their own, and Seth can arrive by car, bike, helicopter, etc. Such cases, therefore, present somewhat the opposite puzzle to what we have seen in §3.1 for merger. Here, the A-clause is not even truth-conditionally equivalent to the E-clause, yet sluicing is possible.

(36) a. [He finished the project]$_A$, but we don't know [with whose help ~~he finished project~~]$_E$. Chung (2006)

b. [Seth arrived]$_A$, but I don't know [on which bus ~~Seth arrived~~]$_E$.

c. A: [Fred learned French]$_A$

B: [For who ~~did Fred learn French~~]$_E$?

For the examples in (36), there is a clear intuition that these instances involve some kind of accommodation. For (36a), this accommodation is pretty easy given the nature of projects. For (36b), the ease of accommodation seemingly depends on various kinds

of world knowledge – Is Seth someone who is likely to take the bus? Are there multiple buses which he could have taken? etc. While B's question in (36c) sounds fairly odd out of the blue, it sounds quite natural in the admittedly unusual context where it is known that Fred only learns languages to impress foreign visitors.

Unconstrained, however, accommodation runs the risk of overgenerating and predicting that sprouting should be possible quite generally. However, there are many cases, as in (37), where sprouting remains infelicitous even though it would seem quite plausible given world knowledge.

(37) a. #Agnes wondered how John could eat, but it's not clear what. Chung et al. (1995)

b. A: The fact that Seth arrived was surprising. B: #On which bus?

These sorts of restrictions on sprouting were first noted by Chung et al. (1995), who attribute them specifically to the presence of syntactic islands, claiming that in contrast to the well-known island-insensitivity of sluicing more generally, sprouting is sensitive to islands. However, subsequent work by Romero (1998) and Merchant (2001) argues on the basis of pairs like (38) that this difference is not limited to islands (since the non-elliptical control in (38b) is grammatical), and is therefore best captured by appealing to independently observable narrow scope of implicit existential quantification. For example, whereas an indefinite and clausemate negation ordinarily give rise to a scope ambiguity, an existential implicit argument like the one in 'Sally didn't eat' unambiguously takes narrow scope relative to negation (i.e. 'Sally didn't eat' does not a have a reading paraphraseable with 'There is a thing/meal x such that John didn't eat x.').

(38) a. *Ramon is glad that Sally ate, but I don't remember which dish.

b. I don't remember which dish he is glad that Sally ate. Romero (1998)

For cases like these with an implicit argument, then, the merger account can be extended straightforwardly. Felicitous sprouting as in (35) is possible because the A-clause

has an indefinite implicit argument and therefore has an interpretation which is inquisitive. In examples like (37a) and (38a), there is still an indefinite implicit argument, but one which cannot take widest scope. Therefore, the whole sentence's interpretation is non-inquisitive and sluicing is correctly predicted to be infelicitous.

What, then, about examples like (36) in which we have seen following Chung (2006) that no implicit argument or even existential entailment is present? Building on the above intuition that at least some cases of sprouting involve accommodation of some sort, AnderBois (2014) proposes an account which is partially semantic and partially pragmatic. On the semantic side, the proposal extends the inquisitivity that we have thus far associated with overt indefinites and disjunctions to existential quantification quite generally, including covert quantification over neo-Davidsonian eventuality arguments. The meaning of a simple sentence like 'John left' not only includes the information that there is some event or other which is a leaving event and of which John is the agent, but also the issue of which event it is that satisfies these requirements. On the pragmatic side, then, the account claims that sluicing is felicitous to the extent that the alternatives in the interrogative E-clause covary with that of the A-clause, an accommodation process AnderBois dubs 'issue-bridging'. The rest of this section spells out both parts of this proposal a bit more, though we refer the reader to AnderBois (2014) for further details.

A central notion in inquisitive semantics is the idea that the kind of indeterminacy we find in indefinites and disjunctions is intimately related (and in some cases compositionally related) to the inquisitivity we find in questions. In both cases, a set of alternatives is made salient, leaving the issue of which alternative(s) in fact hold as at least a safe potential topic for future conversation. For example, the sentence in (39a) introduces a set of alternatives in (39c), makes salient the issue of which of these in fact hold, and conveys the information that at least one does.

(39) a. Someone left.

b. $\exists x.\text{leave}'(x)$

c. $\left\{\begin{array}{c}\text{John left}\\ \text{Maribel left}\\ \text{Alexis left}\\ \text{Ignacio left}\\ \ldots\end{array}\right\}$

Here, we extend this idea beyond overt indefinites to existential quantification over covert arguments, in this case, the neo-Davidsonian event(uality) argument. As is clear in (40), the proposed semantics for the covert existential is formally entirely parallel to what we have seen in (39). A sentence like (40a) introduces a set of alternatives, (40c), makes salient the issue of which of these alternatives in fact hold, and conveys the information that at least one does.

(40) a. Seth arrived.

b. $\exists e.\text{arrive}'(e) \wedge \textsc{Agent}(\text{S}, e)$

c. $\left\{\begin{array}{c}\text{e}_1 \text{ is an event of Seth arriving}\\ \text{e}_2 \text{ is an event of Seth arriving}\\ \text{e}_3 \text{ is an event of Seth arriving}\\ \text{e}_4 \text{ is an event of Seth arriving}\\ \ldots\end{array}\right\}$

The issue it makes salient is, however, a somewhat odd one, paraphraseable as "Which event is an event of Seth leaving?". The apparent oddity of this issue, however, is due not to anything about the inquisitive quantification itself, but rather the ontological status of events in the first place (as discussed, for example, by Parsons (1990)). Although it is standard to take events to be things in the actual world in more or less the same way that individuals are, it is far less intuitive to do so for events.

With this semantics in place, we turn now to the pragmatic part of the story. For concreteness, we will work with the example in (36b), repeated as (41). The semantics

above holds that the A-clause makes salient a quite fine-grained issue of the form "which event?". The E-clause, on the other hand, makes salient a more coarse-grained issue about some aspect of the event in question, in this case its manner. The inquisitive entailment condition is therefore not met given the difference in the granularity of these two issues.[12]

(41) [Seth arrived]$_A$, but I don't know [on which bus ~~Seth arrived~~]$_E$.

While these two issues are not identical, the claim is that they are sufficiently similar that the E-clause can be accommodated. AnderBois (2014) calls this accommodation process 'issue-bridging', on analogy with bridging definite descriptions like that in (42). The existence of a driver is not simply accommodated directly, but rather by virtue of a salient relationship with something whose existence and discourse salience are already established, *a bus*.

(42) A bus went by. The driver had on sunglasses.

Rather than bridging to an individual, however, indirect sprouting involves bridging to an *issue* introduced in the A-clause. Just as a driver is typically an aspect of a bus, times, locations, manners, etc. are typically aspects of events (see also Barros (2014) for a related approach which works directly with these categories rather than events). Concretely, then, the prediction is that sprouting (and indeed sluicing more generally) should be subject to the condition in (43). One important feature of the account to note is that it relies crucially on the presence of inquisitive material in the A-clause, and thus avoids overgenerating and allowing examples like (37) since the event quantification in question does not take wide scope.[13]

(43) **Covariation condition:** Sprouting is felicitous to the extent that the context allows for the inference that the alternatives in the A-clause covary with the alternatives in the E-clause.

This section has shown two ways to extend the inquisitive semantic account of sluicing to sprouting – one for cases where an indefinite implicit argument is present, and one

for cases where no such argument is found. Both accounts rely on independently known scopal properties of implicit existential quantification to help constrain the account, thus deriving the asymmetries between merger and sprouting first discussed by Chung et al. (1995).

4 Conclusions: structure, recoverability, and licensing

In this chapter, we have informally introduced inquisitive semantics, reviewed the most fleshed out inquisitive semantic account of ellipsis to date – AnderBois (2014)'s work on sluicing – and explored various kinds of data consistent with this view. We conclude here by considering how three major questions in the theory of ellipsis – Structure, Recoverability, and Licensing – are answered under this account as well as briefly considering other potential ways of incorporating inquisitive semantics into the theory of ellipsis. By Structure, we mean the question of what syntactic structure, if any, is found within the ellipsis site itself. Recoverability refers to the way in which the ellipsis site's interpretation is arrived at. Licensing covers any additional constraints or conditions on ellipsis that are not clearly part of the latter two categories.

Since inquisitive semantics is a theory of semantic content rather than of the interfaces between semantics and syntax or phonology, it in principle need not impose any requirements on the theory of ellipsis. This said, for inquisitive semantics to play a role in accounting for a given ellipsis process, the condition on Recoverability must be at least partially semantic in nature. Inquisitive semantics locates alternatives in the interpretation itself, rather than in the LF, and so even an LF-syntactic approach to recoverability such as Chung et al. (1995) will not suffice. A complete theory of ellipsis must of course address the other major questions as well, which we do presently both for the main account described here, AnderBois (2014), as well as briefly discussing how these answers might change under other potential ways of incorporating inquisitive semantics into a more comprehensive theory of ellipsis.

Since the account of sluicing in §3 builds off of Merchant (2001), it addresses these major issues in largely similar ways. On the question of STRUCTURE, both accounts posit silent linguistic material with ellipsis consisting of PF-deletion. Typically, we assume that the deleted material is full interrogative clauses, though nothing in the analysis rules out other underlying structures such as clefts provided that they satisfy the relevant identity conditions (see, e.g. Barros (2014) for a closely related, but non-inquisitive, approach making use of this option).

On the question of RECOVERABILITY, the primary condition is a semantic one: symmetric entailment between A- and E-clauses with entailment crucially being defined over inquisitive semantic representations rather than just truth-conditions. Beyond this, we have departed slightly from Merchant (2001), along with Chung (2006) and others in supplementing this semantic condition with a minimal lexico-syntactic one to handle certain issues that arise in sprouting. Ultimately, then the approach to RECOVERABILITY in §3 is a *hybrid* one, in line with recent works in a variety of otherwise quite different approaches (e.g. Ginzburg & Sag (2001), Chung (2006), Jacobson (2013)).

Finally, for LICENSING, it does not seem that inquisitive semantics imposes any particular constraints on possible accounts. Given the close parallels with Merchant (2001), we refer the reader to Merchant (2001), Ch. 2 (and Lobeck (1995)'s work cited therein) for discussion of this issue. One place where inquisitive semantics does help shape the range of answers to the LICENSING question (or perhaps RECOVERABILITY) is that it provides a semantic account to certain kinds of cases that one might have thought were due to syntactic or other form-based constraints (e.g. the case of double negation above).

However, we again stress that the way the account in §3 answers the question of STRUCTURE is not intrinsic to inquisitive semantics *per se*, and that there are in principle many different frameworks for understanding ellipsis in which inquisitive semantics could be incorporated. Given the tight connection between inquisitive semantic *issues* and Questions Under Discussion (QUDs), one obvious candidate would be to build on Ginzburg & Sag (2001)'s QUD-based approach. In a nutshell, their approach is a structure-

free one which, beyond a minimal condition on form referring to a salient utterance (SAL-UTT), fills in the interpretation of the *wh*-phrase anaphorically from the maximal QUD (MAX-QUD).

On a classical semantics for indefinites and disjunctions, however, this approach offers no clear way to explain the privileged role that these elements play in sluicing (in fact, Ginzburg & Sag (2001) briefly argue against this claim on p. 321). Adding inquisitive semantics to this picture, however, these elements conventionally make salient a *possible* QUD, thus explaining their privileged role. While such an account is in many ways an attractive one, further work on the various linguistic and non-linguistic ways in which QUDs arise in discourse is needed to make it viable. For example, (44) is a case where a clear QUD is established contextually, it would seem, and yet sluicing appears to be quite bad.

(44) **Scenario:** I see the silhouette of someone is knocking on my office door, but can't see the person's face.
#Who? // #I wonder who. // #Do you know who? // Who is it? // Who's there?

Another alternative would be to seize upon the deep parallels between inquisitive semantics and dynamic semantics and draw upon work that treats ellipsis as discourse reference of a special sort such as Hardt (1993) (possibly supplemented with a lexico-syntactic condition of some sort). One challenge for such an approach, however, is that individual discourse reference does not exhibit the same interactions with double negation and appositives as does sluicing, as discussed by AnderBois (2014). Nonetheless, such an approach is in principle possible and, again, would give quite different answers to the question of Structure at least and possibly Recoverability and Licensing as well.

To summarize, inquisitive semantics proposes that the context change potential of sentences containing disjunctions, indefinites, and other existential quantification is 'alternative-rich'. We expect therefore that we might find ramifications of this richer notion of semantic content in various areas of the grammar. We hope to have shown that this is so for el-

lipsis and to have shown one way of modeling such effects by focusing primarily on a particular ellipsis process: sluicing. Given the central role of interrogatives, indefinites, and disjunction in sluicing, these issues are naturally most salient here. However, it should be clear that once we adopt alternative-rich sentence meanings, the question arises of whether other ellipsis processes may similarly require reference to inquisitive semantic representations in some form.

Notes

[1]It should be noted that while this was a driving motivation in many early works in inquisitive semantics (e.g. Groenendijk (2007), Groenendijk & Roelofsen (2009), Ciardelli (2009)), some more recent works have used the moniker 'inquisitive semantics', yet lack this second property (e.g. Farkas & Roelofsen (t.a.) propose that declarative clauses include a closure operator eliminating this possibility).

[2]Formally, it has been argued that this extension is in fact somewhat more fraught in the case of models with non-finite domains. See Ciardelli (2009) for detailed discussion.

[3]While in principle they are equally applicable, pictorial representations like (2b) become unhelpful for larger sets of alternatives.

[4]While other scope-taking elements such as conjunction and universal quantification are defined by most authors in ways that allows their alternatives to be 'passed up' the composition, one could alternatively define them in ways that do not have this effect. The choice ultimately depends on how one wishes to handle scope-taking more generally and we therefore set aside this concern here.

[5]We would also note that it is not entirely clear how to interpret felicity judgments for these data. Reading these sentences, it is relatively easy to figure out what such examples were supposed to have meant after the fact. However, it still seems somewhat unlikely in our opinion that speakers in fact produce such sentences frequently and possible that they have difficulty processing them when encountering them in natural speech. Therefore, it seems quite possible to imagine an analysis of this gradient pattern of judgments in which the grammar of appositives and sluicing does not generate such sentences, but rich context and other 'repair mechanisms' allow speakers to figure out what they are to have meant when encountered in experimental settings. In any case, further corpus and experimental work is needed in this area.

[6]Barros (2013) also notes a further interaction with the presence or absence of *exactly* in the E-clause which we will set aside here.

[7]See Barros (2013) and references therein for further discussion and independent linguistic diagnostics of these categories.

[8]This condition itself builds on the one proposed by Schwarzschild (1999) for deaccenting. It is worth noting, therefore that, as observed by AnderBois (2014), deaccenting appear to be sensitive only to truth-conditions rather than inquisitive content as well. Consider, for example the contrast between (12) and the following (underlining indicates deaccenting):

(i) It's not the case that Bill didn't donate a book to the library, but I don't know which <u>book he donated</u>.

[9]The focus-closure (F-clo) part of the definition is needed primarily to handle two kinds of sluices which we will not discuss here: ones where the wh-phrase contains *else*, as in (i), and so-called 'contrast' sluices like (ii), both examples from Merchant (2001).

(i) Abby called $\textsc{Ben}_F$ an idiot, but I don't know who else.

(ii) She has five $\textsc{cats}_F$, but I don't know how many $\textsc{dogs}_F$.

We set aside these cases here, while not denying their importance.

[10]The idea that such a notion of entailment is relevant for natural language has been independently proposed in the literature on NPI-licensing (von Fintel (1999) *et seq.*), where it has been dubbed 'Strawson entailment'.

[11]Barker (2013), it should be noted, does briefly address Barros (2013)'s claim that the answer ban follows from the inquisitive entailment condition, but expresses skepticism for two reasons. First, Barker apparently was familiar only with AnderBois (2010), which only analyzed cases of merger, whereas AnderBois (2011) and AnderBois (2014) also address sprouting (see §3.3). Second, Barker notes that Ciardelli et al. (2009) propose an inquisitive semantic-based account of epistemic possibility modals like *might* which do not license sluicing:

(i) #John might leave, but I don't know which.

However, while it is true that Ciardelli et al. (2009)'s account of *might* is couched in a version of inquisitive semantics, their approach does not actually claim that 'John might leave' has the same semantics as 'John will leave or John won't leave', and in fact does not claim that 'John might leave' is inquisitive at all (but instead define a new category: 'attentive'). Therefore, even taking this analysis for *might* at face value, we do not predict (i) to be well-formed.

[12]In this particular example, there is a second apparent lack of symmetric entailment: the fact that the E-clause in this example has a presupposition not found in the A-clause. However, this concern is already taken care of given that we have adopted a notion of Strawson entailment.

[13]The account raises a number of issues related to scope-taking which we cannot address here for lack of space. See Charlow (2014) for recent discussion of scope-taking and sluicing in a closely related semantics.

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