

Scalar reasoning and the semantics of *let alone*

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1 Introduction

- The construction of interest:

(1) Oswald hasn't climbed the Berkeley hills, **let alone** Mt. Everest.

- My purpose is to explore the semantics and pragmatics of *let alone*, and specifically to propose a new analysis of the expression.
- Fillmore et al. (1988) analyze *let alone* as asserting the conjunction of two propositions that are identical except for the CORRELATE (*the Berkeley hills*) and the REMNANT (*Mt. Everest*):

(2) $\neg\text{climb}(\text{the-berkeley-hills})(\text{oswald}) \wedge \neg\text{climb}(\text{mt-everest})(\text{oswald})$

- They identify (p. 529) a problem with their CONJUNCTION ANALYSIS: in sentences with *barely*, the two 'conjuncts' are not identical in meaning:

(3) He barely reached Denver, let alone Chicago.
 a. \neq He barely reached Denver, and he barely reached Chicago.
 b. \approx He barely reached Denver, and he did not reach Chicago.

- The proposal: The main at-issue entailment of a *let alone* sentence is a single proposition, namely the clause that is overtly expressed. An additional background entailment expresses a scalar relationship between the remnant and correlate:

(4) a. *At-issue entailment*: $\neg\text{climb}(\text{the-berkeley-hills})(\text{oswald})$
 b. *Background entailment*: **the-berkeley-hills** < **mt-everest**

- In the rest of this talk, I will:

- lay out in more detail Fillmore et al.'s conjunction analysis, highlighting the key properties of the *let alone* construction,
- propose a novel analysis, and
- return to the problem with *barely*, and show how it follows from my proposal.

2 Scalar reasoning

- If *let alone* does express the conjunction of two propositions, they must be identical except for the correlate and remnant since the second proposition cannot be realized overtly:

(5) Oswald hasn't climbed the Berkeley hills, let alone Mt. Everest.

(6) *Oswald hasn't climbed the Berkeley hills, let alone Oswald hasn't climbed Mt. Everest.

- Some type of ellipsis, either syntactic or semantic, must be responsible (Fillmore et al. suggest gapping).
- But there must be some additional meaning beyond simple propositional conjunction, since *let alone* and *and* are not interchangeable:

(7) Oswald hasn't climbed the Berkeley hills, and Oswald hasn't climbed Mt. Everest.

- Fillmore et al. say that *let alone* comes with an additional semantic requirement:

(8) *Semantic requirement on let alone* (Fillmore et al. 1988:528)
 [O]ne of the two propositions, syntactically that expressed by the initial, full clause, is stronger than the other.

- Intuitively, this is true of the sentence in (5):

(9) Oswald hasn't climbed the Berkeley hills. \Rightarrow Oswald hasn't climbed Mt. Everest.

- Since the relevant notion of informativity cannot be logical entailment, they propose to formalize it as asymmetrical entailment in a SCALAR MODEL.

- The scalar model here is crucial: it is a presupposed set of interrelated propositions (see also Kay 1990).



- Thus, $\text{climb}(\text{mt-everest})(\text{oswald})$ asymmetrically entails $\text{climb}(\text{the-berkeley-hills})(\text{oswald})$ since **the-berkeley-hills** is lower than **mt-everest** on a contextually salient scale of mountains ranked by difficulty or height.

- When a downward entailing operator such as negation is present the entailment pattern flips (Ducrot 1973:239, Fauconnier 1975:362).

- There are two bothersome properties of Fillmore et al.'s analysis:

– First, if the first conjunct entails the second conjunct, why is it necessary to assert the second conjunct at all? Why couldn't the asserted content of (5) just be:

(11) $\neg\text{climb}(\text{the-berkeley-hills})(\text{oswald})$

– Second, it is not clear how the scalar model fits in with more standard approaches to the interpretation of sentences.

3 The semantics of *let alone*

- The basic intuition behind Fillmore et al.'s analysis is correct: there is some scalar component to the meaning of *let alone*.
- But it is not a scale of informativity relating two propositions, but rather an ordering on the correlate and remnant.
- This is, in fact, built into the scalar model, which derives entailment in the scalar model from a more basic scale relating the correlate and the remnant.
- I propose to state the scalar relationship between the correlate and remnant directly as a second nonconjoined component of *let alone*'s meaning:

- (12) Oswald hasn't climbed the Berkeley hills, let alone Mt. Everest. ↗↘
- a. *At-issue entailment*: $\neg \text{climb}(\text{the-berkeley-hills})(\text{oswald})$
 - b. *Scalar component*: **the-berkeley-hills** < **mt-everest**

- Since it is no longer two propositions that are being related, the at-issue entailment can just be the clause that is realized overtly. No ellipsis is necessary to derive this meaning (see the Appendix for a compositional account).
- Before moving on, notice that the scales are not based on logical entailment (as are the Horn scales used to generate Quantity implicatures). *The Berkeley hills* and *Mt. Everest* are ordered on a scale of difficulty or height.
- Even expressions like the numbers are ordered by some other relation than logical entailment. In (13a), one CD contains a smaller amount of music than two CDs. In (13b), two CDs are less difficult to fit a lot of music on than one CD.

- (13) a. Sure there are a few neat tracks, like the slickly produced and slightly sinister remix of Conjure One's *Redemption*, but there is not enough material here for **one CD, let alone two**.¹
- b. As most Savatage fans already know, Jon has always been plagued with the dilemma of trying to choose which songs to put on the next Savatage record, simply because there has always been too many songs to put on **2 cds, let alone one**.²

3.1 Status of the scalar component

- What is the status of the scalar component? I argue that it is an entailment, but one that is backgrounded relative to the main, at-issue entailment.
- The scalar component is not an implicature:

– Implicatures can be cancelled. The result with *let alone* is a contradiction:

- (14) Oswald won't eat cuttlefish, let alone squid. #In fact, squid is easier to eat than cuttlefish.

- Implicatures cannot be embedded under propositional attitude verbs that establish an indirect discourse context (Bach 1999). But the scalar component of *let alone* can be attributed to the subject of *say*, or a similar verb of saying:

- (15) a. Marv said that Oswald hasn't climbed the Berkeley hills, let alone Mt. Everest.
b. Marv said that Oswald hasn't climbed the Berkeley hills.

- (16) In post-race interviews Dickinson emphasized the difficulties of **getting a horse fit and ready for the Gold Cup, let alone winning it**, and he confided that the stress and tension of training the five had caused him to lose a stone in weight since Christmas. (AD7 514)³

- Conversational implicatures arise through the interaction of conversational maxims and context, while the scalar component of a *let alone* sentence is a conventional property of the expression.

- The scalar component also does not seem to be a presupposition:

- The truth of an at-issue entailment depends on the truth of its presuppositions. But the main entailment seems to be independent of the scalar component:

- (17) A: Oswald doesn't eat squid, let alone cuttlefish.
B: Well, I accept that he doesn't eat squid, but isn't cuttlefish easier to eat than squid?

- Presuppositions are prototypically already in the common ground when triggered. The scalar component, however, is often novel information. The idea that cutting Italy's public expenditure might be easier than raising taxes was not previously introduced:

- (18) The constitutional convulsions of Rome will mean urgent matters such as the fight against organised crime and tackling the burgeoning debt will be postponed. The Mafia pervades Italy now and its tentacles reach across the continent and across the Channel by all accounts. It will have to be fought on a European scale. A more pressing issue for Europe is that no makeshift Italian government is likely to **cut Italy's public expenditure, let alone raise taxes**, to reduce public debt to make the 1993 deadline set for European convergence at Maastricht. (AJD 1030)

- The scalar component is clearly also not an at-issue entailment. It is backgrounded information and cannot be contested in the same way (Karttunen and Peters 1979:12):

- (19) A: Oswald doesn't eat squid, let alone cuttlefish.
B1: # That's not true, cuttlefish is easier to eat than squid.
B2: That's true, but isn't cuttlefish easier to eat than squid?

- Instead, it is more like what Karttunen and Peters (1979) would call a conventional implicature, Bach (1999) a background entailment, or Horn (2002) an assertorically inert entailment.

- While the scalar component is part of 'what is said' and is truth-conditional, it has a secondary status relative to the at-issue entailment.

³This example, and others with reference numbers of the same type, are from the British National Corpus.

¹<http://www.amazon.com/review/RMESEA76BRQAW,04/17/2008>

²<http://profile.myspace.com/index.cfm?fuseaction=user.viewprofile&friendid=20881425,04/17/2008>

3.2 Deriving the ‘second conjunct’

- If the sentence in (20) just expresses the pair of propositions shown, what do we make of our intuition that it also entails (21)?

- (20) Oswald hasn’t climbed the Berkeley hills, let alone Mt. Everest. \rightsquigarrow
- At-issue entailment:* $\neg\text{climb}(\text{the-berkeley-hills})(\text{oswald})$
 - Scalar component:* $\text{the-berkeley-hills} < \text{mt-everest}$

(21) $\neg\text{climb}(\text{mt-everest})(\text{oswald})$

- It is a contextual entailment produced by updating the Common Ground with both the at-issue and background entailments.
- The background entailment when added to the Common Ground does more than just state a scalar relationship. In order make the background entailment relevant to the current issue, the speaker and hearer adjust their Common Ground to obey the scale.
- We can model this formally using Roberts’s (1996) question under discussion (QUD) framework and the question semantics of Groenendijk and Stokhof (1984) and Groenendijk (1999):

- (22) **Model:**
 $D_e = \{\text{Oswald, the Berkeley hills, Mt. Everest}\}$
 $D_s = \{w_1, w_2, w_3, w_4\}$

$$\begin{aligned} \llbracket \text{climb}(\text{the-berkeley-hills})(\text{oswald}) \rrbracket &= \{w_1, w_2\} \\ \llbracket \text{climb}(\text{mt-everest})(\text{oswald}) \rrbracket &= \{w_2, w_3\} \end{aligned}$$

- (23) **QUD Stack:**
 1. What (mountains) has Oswald climbed?

- Adding the QUD induces a partition on the context set C:

$$(24) \quad \begin{array}{c} \text{C} \\ \{w_1, w_2, w_3, w_4\} \end{array} \Rightarrow \begin{array}{c} \text{+ QUD in (23)} \\ \left\{ \begin{array}{l} \{w_1\}\{w_3\} \\ \{w_2\}\{w_4\} \end{array} \right\} \end{array} \Rightarrow \begin{array}{c} \text{+ Background entailment of (20)} \\ \left\{ \begin{array}{l} \{w_1\}\{w_3\} \\ \{w_2\}\{w_4\} \end{array} \right\} \end{array}$$

- When the background entailment from (20) is added, the speaker and hearer restrict the context set to conform to the scale, drawing on assumptions about how the world usually works. Generally, if somebody is not able to climb a very easy mountain, they will not have climbed a more difficult one.
- Subsequently updating the Common Ground with the at-issue entailment in (20) will pick out the partition in which Oswald has not climbed the Berkeley hills: $\{w_4\}$.
- Since every world in which Oswald has not climb the Berkeley hills are now also worlds in which he has not climbed Mt. Everest, the Common Ground entails that he has not climb Mt. Everest.
- This inference really is an entailment since it cannot be cancelled and can be contested just like any other entailment:

(25) Oswald hasn’t climbed the Berkeley hills, let alone Mt. Everest. #In fact, he has climbed Mt. Everest.

(26) A: Oswald doesn’t eat squid, let alone cuttlefish.
 B: That’s not true, Oswald eats cuttlefish.

- This parallels the behavior of parallel logical entailments arising from relations of hyponymy:

(27) Oswald doesn’t own a dog. #In fact, he owns a greyhound.

(28) A: Oswald doesn’t own a dog.
 B: That’s not true, Oswald owns a greyhound.

4 The puzzle again

- The meaning of *barely* is standardly analyzed as having two components:

(29) He barely reached Denver.
 a. *Proximal component:* He came close to not reaching Denver.
 b. *Polar component:* He reached Denver.

- Both components are entailed (see Atlas 1997, Sevi 1998, Horn 2002), though the polar one is backgrounded in some sense. It is not, however, an implicature since it cannot be cancelled:

(30) He barely reached Denver. #In fact, he didn’t reach Denver.

(31) # It barely rained, and (in fact) it didn’t rain.

(Horn 2002:61)

- What the puzzle is again: Under Fillmore et al.’s conjunction analysis, *let alone* sentences with *barely* should express the conjunction of two propositions that are identical except for the remnant and correlate:

(32) He barely reached Denver, let alone Chicago. \rightsquigarrow

(33) $\text{barely-reach}(\text{denver})(\text{he}) \wedge \text{barely-reach}(\text{chicago})(\text{he})$ *Fillmore et al.’s analysis*

- Under their analysis, we expect (32) to entail that: 1) he came close to reaching Chicago, and 2) he did, in fact, reach Chicago.

- Instead, we understand that while he reached Denver, he never made it to Chicago.

- The proposal I am making does not have this problem. A *let alone* sentence only asserts the ‘first conjunct’, the clause that is realized overtly:

(34) a. *At-issue entailment:* $\text{barely-reach}(\text{denver})(\text{he})$

b. *Background entailment:* $\text{denver} < \text{chicago}$ *my analysis*

- As before, once the background entailment has been added to the Common Ground, asserting the at-issue entailment should lead to additional contextual entailments.

- The at-issue entailment in (34) conveys that Oswald came close to not reaching Denver: while he did get to Denver, he did not go any farther. Since Chicago is ordered after Denver, it follows that he did not reach Chicago.

5 Conclusion

- ⇒ In sum, I have proposed that *let alone* only asserts the clause that is realized overtly. When the Common Ground has been updated with an additional background entailment relating the correlate and remnant on a contextually salient scale, additional contextual entailments arise beyond what is asserted.
- ⇒ This proposal is able to account for previously problematic *let alone* sentences with *barely* that have contextual entailments stronger than what we might expect from the surface form of the sentence.

Appendix

I provide a compositional account for *let alone* sentences, such as (35), that involve a single remnant adjacent to its correlate.

- (35) Oswald hasn't climbed the BERkeley hills, **let alone** Mt. EVERest.

I assume that there is no hidden structure and that *let alone* is a phrasal coordinator taking the DPs *the Berkeley hills* and *Mt. Everest* as arguments. A cross-categorial lexical entry for *let alone* can be written as follows (where σ and τ are variables over well-formed types):

- (36) *let alone* \rightsquigarrow
 $\lambda(X, F)\lambda(X', F')[X' < X \wedge X, X' \in F \cap F'] : \langle \langle \sigma^a, \langle \sigma^a, t^a \rangle \rangle, \langle \langle \sigma^a, \langle \sigma^a, t^a \rangle \rangle, t^b \rangle \rangle$

I make two important assumptions: First, I assume that the ordinary and focus semantic values of a given constituent (Rooth 1985, 1992) are represented as members of an ordered pair (Function Application must be modified accordingly to take into account these focus meanings). Thus, the translation of a constituent bearing a pitch accent like *the BERkeley hills* is $\langle \text{the-berkeley-hills}, \{x \mid x \in D_e\} \rangle : \langle e, \langle e, t \rangle \rangle$ —in other words, the tuple consisting of the Berkeley hills and the set containing its alternatives of the same type. Its counterpart without focus, *the Berkeley hills*, is translated as an expression of the same type: $\langle \text{the-berkeley-hills}, \{\text{the-berkeley-hills}\} \rangle : \langle e, \langle e, t \rangle \rangle$. I also assume that focus operators like *let alone* (and its sister *even*) can grab ahold of focus alternatives directly (as opposed to referring to them indirectly via Rooth's (1992) \sim operator).

Second, I adopt a composition scheme very similar to the one that Potts (2005) proposes for conventional implicatures. While the scalar component of *let alone*'s meaning is not a conventional implicature (it is not speaker-oriented, but can be embedded under verbs like *say*), the same basic composition operation can be used to spin off the background entailment. I divide the set of types into at-issue types, superscripted with a , and background types, superscripted with b . If we restrict ourselves to extensions, the set of basic at-issue types consists of e^a and t^a and the basic background types e^b and t^b . If σ^a and τ^a are at-issue types, then $\langle \sigma^a, \tau^a \rangle$ is an at-issue type. If σ^a and τ^b are types, then $\langle \sigma^a, \tau^b \rangle$ is a background type and $\langle \tau^b, \sigma^a \rangle$ is an at-issue type. Nothing else is a type.

A new composition operation is needed, which I call BACKGROUND ENTAILMENT APPLICATION, defined as follows:

- (37) Background Entailment Application

$$\begin{array}{ccc} \beta : \sigma^a & \text{iff } \tau \text{ is } t & \\ \bullet & & \\ \alpha(\beta) : \tau^b & & \alpha(\beta) : \tau^b \quad \text{iff } \tau \text{ is a function} \\ \alpha : \langle \sigma^a, \tau^b \rangle \quad \beta : \sigma^a & & \alpha : \langle \sigma^a, \tau^b \rangle \quad \beta : \sigma^a \end{array}$$

A crucial property of this composition operation is that the at-issue argument, β of type σ^a , of a background functor, α of type $\langle \sigma^a, \tau^b \rangle$, is returned intact and can participate further in the derivation whenever τ^b is t^b . The background expression $\alpha(\beta)$ of type t^b is set aside (which I notate with the metalogical symbol \bullet), though these background entailment must somehow be gathered together so that verbs like *say* can take them as arguments. Whenever τ^b is not t^b , just the background expression is passed upwards. The disjunction in the definition of Background Entailment Application ensures that the at-issue expression is only returned as is when the background expression is a proposition and cannot take any more arguments.

A parsetree showing the composition of (35) is provided on the following page. The background entailment generated is **let-alone(mt-everest)(the-berkeley-hills)**, which, after substituting in the lexical entry in (35), yields the following:

- (38) **the-berkeley-hills** $<$ **mt-everest** \wedge
the-berkeley-hills, mt-everest $\in \{x \mid x \in D_e\} \cap \{x \mid x \in D_e\} : t^b$

What this says is that **the-berkeley-hills** is ordered below **mt-everest** and that both are focus alternatives to one another. This ensures that both the correlate and the remnant, and hence the partial order established by $<$, are relevant to the current QUD.

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$\langle \text{not}(\text{climb}(\text{the-berkeley-hills})(\text{oswald})), \{ \text{not}(\text{climb}(x)(\text{oswald}) \mid x \in D_e) \} : \langle t^a, \langle t^a, t^a \rangle \rangle$

$\langle \text{not}, \{ \text{not} \} \rangle : \langle \langle t^a, t^a \rangle, \langle \langle t^a, t^a \rangle, t^a \rangle \rangle$

$\langle \text{climb}(\text{the-berkeley-hills})(\text{oswald}), \{ \text{climb}(x)(\text{oswald}) \mid x \in D_e \} : \langle t^a, \langle t^a, t^a \rangle \rangle$

$\langle \text{oswald}, \{ \text{oswald} \} \rangle : \langle e^a, \langle e^a, t^a \rangle \rangle$

$\langle \text{climb}(\text{the-berkeley-hills}), \{ \text{climb}(x) \mid x \in D_e \} : \langle \langle e^a, t^a \rangle, \langle \langle e^a, t^a \rangle, t^a \rangle \rangle$

$\langle \text{climb}, \{ \text{climb} \} \rangle : \langle \langle e^a, \langle e^a, t^a \rangle \rangle, \langle \langle e^a, \langle e^a, t^a \rangle \rangle, t^a \rangle \rangle$

$\langle \text{the-berkeley-hills}, \{ x \mid x \in D_e \} : \langle e^a, \langle e^a, t^a \rangle \rangle$

$\text{let-alone}(\text{mt-everest})(\text{the-berkeley-hills}) : t^b$

$\langle \text{the-berkeley-hills}, \{ x \mid x \in D_e \} : \langle e^a, \langle e^a, t^a \rangle \rangle$

$\text{let-alone}(\text{mt-everest}) : \langle \langle e^a, \langle e^a, t^a \rangle \rangle, t^b \rangle$

$\text{let-alone} : \langle \langle e^a, \langle e^a, t^a \rangle \rangle, \langle \langle e^a, \langle e^a, t^a \rangle \rangle, t^b \rangle \rangle$

$\langle \text{mt-everest}, \{ x \mid x \in D_e \} : \langle e^a, \langle e^a, t^a \rangle \rangle$

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