Locality in the Derivation of Cumulativity

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Overview

This poster is about the so-called cumulativity phenomenon in English. In particular, the poster addresses a question about cumulativity that has been discussed in the literature, namely whether a source of cumulativity requires locality. I will argue that the source of cumulativity requires locality, and that apparent 'non-local cumulativity' has a different source, which I call *the inferential source*. It will also be shown that non-local cumulativity is constrained in the ways that are consistent with the inferential source, but surprising if locality does not exist.

What is Cumulativity?

Sentences with two plurals often permit cumulative interpretations (1) (e.g., Kroch 1974, Scha 1981, Link 1983).

(1) a. **The two boys** typed **the two recipes**.
b. = 1 iff ∀x∈{boy1,boy2}∃y∈{recipe1,recipe2} typed'(y)(x)
∧ ∀y∈{recipe1,recipe2} ∃x∈{boy1,boy2} typed'(y)(x)

Cumulativity has been argued to arise from a grammatical, compositional source, e.g., a covert trivalent operator Cuml (e.g., Beck and Sauerland 2000, B&S).

(2) a. **The two boys** typed **the two recipes**.
b. LF: [The two boys [[Cuml typed] the two recipes]]
c. Cuml(P)(φ)(χ) = 1 iff ∀x∈ χ ∃y∈ φ typed'(y)(x) ∧ ∀y∈ φ ∃x∈ χ typed'(y)(x)
d. (2a) = Cuml(TYPED)({recipe1,recipe2})({boy1,boy2})

One of the issues in the cumulativity literature is about whether the compositional source requires locality, and this is what I'm concerned with here.

No Locality of Compositional Source?

B&S assume that Cuml may take a syntactically derived predicate (3).

(3) a. **The two boys** wanted to type **the two recipes**.
b. LF: [[The two boys]$_2$ [[the two recipes]$_1$ [Cuml [t_2 wanted to type t_1]]]
c. (1a) = Cuml(TWANTED-TO-TYPE)({recipe1,recipe2})({boy1,boy2})

B&S argue that the compositional source requires locality. They observe that (4a) disallows cumulativity with respect to the bold phrases unlike (3a) because QR is generally much harder out of finite clauses than non-finite clause (4b).

(4) a. **The two lawyers** have pronounced that **the two proposals** are against the law.
(Beck and Sauerland 2000, 365)
b. [[The two lawyers]$_2$ [the two proposals]$_1$[[Cuml [t_2 have pronounced ... t_1 ... law]]]

While (4a) does not seem to allow cumulativity, Schmitt (2019) observes that (4a) allows it in richer scenarios. Such cumulativity is also available in other sentences like (5).

(5) [Scenario: Boy1 confirmed that the noodle recipe is flawless. Boy2 confirmed that the broth recipe is flawless.]
The two boys confirmed [$_{CP}$ that **[$_{DP}$ the two recipes]** are flawless].

Based on data like (5), Schmitt proposes that the part structures of plurals can 'project' to the meanings of expressions including those plurals – call this *plural projection*. This enables CP in (5) to denote a doubleton set (6a), and Cuml takes this set, CONFIRMED, and {boy1,boy2}, deriving cumulativity.

(6) a. ⟦*DP*⟧ = {noodle(.recipe), broth(.recipe)}
b. ⟦*CP*⟧ ={THAT-NOODLE-IS-FLAWLESS, THAT-BROTH-IS-FLAWLESS}

In this way, Schmitt's compositional source does not respect locality B&S assume.

Does compositional source really not respect locality?

Confound for Apparent Non-Locality: Inferential Source

Building on Krifka (1989) and Pasternak (2018) a.o., I propose that cumulativity of (5) comes from an inference about the extension of *confirmed* (CF) in the given scenario. First, (5) can be considered to have the truth conditions in (7).

(7) ⟦(5)⟧ = 1 iff <{boy1,boy2},{p_1}> ∈ CF p_1 = λw. the two recipes are flawless in w
READ: (5) is true iff each member of {p_1} was confirmed as a result of each member of {boy1,boy2} having done confirming.

In the scenario of (5), CF involves the two tuples in (8). Given the presence of those, we can naturally assume that the inference in (9) is valid.

(8) **Scenario:** <{boy1}, {q_1}> ∈ CF, q_1 = λw. the noodle recipe is flawless in w
<{boy2}, {q_2}> ∈ CF q_2 = λw. the broth recipe is flawless in w

(9) **Cumulative inference**:
<{boy1}, {q_1}> ∈ CF ∧ <{boy2}, {q_2}> ∈ CF → <{boy1,boy2}, {q_1,q_2}> ∈ CF
READ: If each member of {q_1} was confirmed as a result of each member of {boy1} having done confirming, and each member of {q_2} was confirmed as a result of each member of {boy2} having done confirming, then each member of {q_1,q_2} was confirmed as a result of each member of {boy1,boy2} having done confirming.

Based on the conclusion of (9), the following inference can also be naturally assumed to be valid. The conclusion of (10) satisfies the truth conditions in (7). Therefore, data like (5) do *not* establish that compositional source of cumulativity should be non-local.

(10) **Parts-whole inference**:
<{boy1,boy2}, {q_1,q_2}> ∈ CF ∧ [q_1∧ q_2 $\Leftrightarrow_c$ p_1] → <{boy1,boy2}, {p_1}> ∈ CF
($\Leftrightarrow_c$: contextual equivalence)

Independent Motivations for Inferential Source

Only the inferential source captures the sub-atomic cumulativity in (12) with respect to *the two boys* and the parts of the referent of *the ramen recipe*. In other words, only the inferential source captures the truth of (12).

(12) [Scenario: Boy1 confirmed the noodle recipe is flawless. Boy2 confirmed the broth recipe is flawless. The noodle and broth recipe constitute the ramen recipe.]
The two boys confirmed that **the ramen recipe** is flawless.

➢ (12) differs from (5) only in that the argument of *flawless* is *the ramen recipe.*

The inferential source captures (12) in the same way as it captures (5) except that p_1 in (7) is a proposition [λw. **the ramen recipe** is flawless in w].

The compositional source with plural projection does not capture (12). First, plural projection can access the part structures of *plurals* but not *singulars*; *the ramen recipe* effectively denotes {ramen(.recipe)} instead of {noodle,broth}. This difference between plurals and singulars is necessary to capture the contrast in (13a-b), a.o..

(13) a. **The two recipes** are completely correct and completely wrong.
b. #**The ramen recipe** is completely correct and completely wrong.
(adapted from Paillé 2020, 84)

Given the above assumption, the embedded clause in (12) denotes {THAT-RAMEN-IS-FLAWLESS}. Cuml relates this set with {abe,bert} cumulatively. Thus, (12) is wrongly predicted true iff Abe and Bert *each* confirmed the whole ramen recipe is flawless.

In this way, inferential source is independently needed to capture (12).

New Evidence for Locality

Only the inferential source correctly captures the lack of cumulativity in sentences like (14b).

(14) [Scenario: That the earth is round is true. That the earth is flat is false.]
a. **That the earth is round and that the earth is flat** are true and false.
b. #**That the earth is round and flat** is true and false.

Under the inferential source analysis, assuming a version of non-Boolean *and* (e.g., Link 1983), we can assume that the matrix predicates in (14) denote (15a). Assuming that CP conjunctions denote sets of propositions, (14a) denotes (15b). On the other hand, (14b) denotes (15c). In (15c), ρ_1 and ρ_2 are both {p_1}, so (14b) is predicted to mean that the proposition p_1 is both true and false, which is contradictory. Thus, the felicity of (14b) is predicted.

(15) a. ⟦*be true and false*⟧ = $\lambda\rho.\exists\rho_1, \rho_2[\rho=\rho_1\cup \rho_2 \wedge \rho_1\in$ TRUE $\wedge\ \rho_2\in$ FALSE]
b. ⟦(14*a*)⟧ = 1 iff $\exists\rho_1, \rho_2$[{q_1,q_2}=$\rho_1\cup\rho_2 \wedge \rho_1\in$ TRUE $\wedge\ \rho_2\in$ FALSE]
q_1 = λw. the earth is round w, q_2 = λw. the earth is flat in w
c. ⟦(14*b*)⟧ = 1 iff $\exists\rho_1, \rho_2$[{p_1}=$\rho_1\cup\rho_2 \wedge \rho_1\in$ TRUE $\wedge\ \rho_2\in$ FALSE]
p_1 = λw. the earth is round and flat w

In contrast, if plural projection is available, the subjects in (14a) and (14b) both denote a doubleton set of q_1 and q_2. Thus, an analysis with plural projection cannot straightforwardly explain the contrast between (14a) and (14b).

There are other examples like (14), exemplified in (16).

(16) [Scenario: The two boxers, Abe and Bert, will fight against each other in a final match. Coach1 believes that Abe would win. Coach2 believes that Bert would win.]
A: Everyone believes that the final match is going to be a draw.
B: a. No! The two coaches believe **that Abe would win and that Bert would win**.
b. #No! The two coaches believe **that the two boxers would win**.

Inferential Source vs. Pasternak's (2018) Analysis

The inferential source is effectively equivalent to Pasternak's (2018) analysis of a type of cumulativity. But there is a crucial difference between them; "q_1∧ q_2 $\Leftrightarrow_c$ p_1" in (10) is "q_1∧ q_2 $\Rightarrow_c$ p_1" in Pasternak's analysis. This difference results in the fact that while Pasternak's analysis fails to capture the falsity of (18a), as Schmitt (2020) observes, the inferential source captures it.

(18) [Scenario: Ada is looking forward to Sue's party: She is certain [that every man at the party will fall in love with her]$_{q1}$. Bea is also looking forward to the party: She hates men and is certain [that only one man will attend: Roy]$_{q2}$. Sue tells me: Ada and Bea are really looking forward to the party…]
a. They believe [that Roy will fall in love with Ada]$_{p1}$.   (Schmitt 2020, 575)
b. ⟦(18*a*)⟧ = 1 iff <{ada,bea},{p_1}> ∈ BELIEVE

(19) **Scenario:** <{ada},{q_1}> ∈ BELIEVE,   <{bea},{q_2}> ∈ BELIEVE,

(20) **Cumulative inference**:
<{ada},{q_1}>∈BELIEVE ∧ <{bea},{q_2}>∈BELIEVE →
<{ada,bea},{q_1,q_2}>∈ BELIEVE

(21) **Parts-whole inference:**
<{ada,bea},{q_1,q_2}>∈ BELIEVE ∧ [q_1∧ q_2 $\Leftrightarrow_c$ p_1] → <{ada,bea},{p_1}>∈ BELIEVE
➢ q_1∧ q_2 $\not\Leftrightarrow_c$ p_1 as q_1∧ q_2 $\not\Leftarrow_c$ p_1 (although q_1∧ q_2 $\Rightarrow_c$ p_1).

Thus, only the inferential source captures the falsity of (18a).

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