

## Cumulative Interpretations and the Need of the Plural Projection

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**1. Introduction.** To mainly capture an interpretation of the so-called *flattening* examples like (1), Schmitt (2019) proposes a new compositional source of cumulative interpretations, which we call the *plural projection* (PP). The relevant interpretation of (1) is the one judged true in the scenario in which the events in (2) all happen (see below for the use of  $\{\}$ ).

(1) The two boys made Abe type [**the two recipes**]<sub>PL</sub> and create this blog.

(2)  $\{e'_1\}$ : Abe typed recipe1.  $\{e'_2\}$ : Abe typed recipe2.  $\{e'_3\}$ : Abe created blog1.

$\{e_1\}$ : Boy1 caused  $e'_1$ .  $\{e_2\}$ : Boy2 caused  $e'_2$ .  $\{e_3\}$ : Boy2 caused  $e'_3$ .

As *singular* DPs can generally enter into cumulations (c.f., Lønning 1987), (3) is true in the same scenario as (1), on the assumption that the two recipes referred to in (1) constitute the ramen recipe referred to in (3).

(3) The two boys made Abe type [**the ramen recipe**]<sub>SG</sub> and create this blog.

To derive the interpretation of the *SG flattening* in (3), we need a source of cumulations that does not need multiple  *plurals*, unlike the PP. Crucially, we demonstrate that such a cumulative source known as the *lexical source* (LS) (e.g., Krifka 1989) can also capture the *PL flattening* in (1) *for free*. Hence, (1) cannot be used to support the need of the PP.

**2. The PP captures the PL flattening.** The interpretation of (1) shows a cumulation between *the two boys* and *the two recipes*. The cumulation is ‘non-local’ in the sense that those plurals don’t compose directly or serve as the arguments of the same predicate. Likewise, (1) shows a non-local cumulation between *the two boys* and the predicate conjunction. How can such cumulations be captured compositionally? To solve this question, Schmitt (2019) assumes any semantic domains contain pluralities, and proposes the PP, which enables the part-structures of plurals to ‘project’ to the meaning of their embedding expressions; in (1), for example, the PP enables the matrix predicate to denote the function plurality *made’(type’(recipe1)(abe))+made’(type’(recipe2)(abe))+made’(create’(blog1)(abe))* or *f+g+h* for short (note that *f+g* and *f+g+h* reflect the part-structures of *the two recipes* and the predicate conjunction, respectively). As a result, the non-local cumulations can be captured as ‘local’ cumulations between *B(oy1)+B2* and *f+g+h*.

**3. The PP cannot capture the SG flattening.** Singulars like *the ramen recipe* are assumed to denote singularities like *ramen(.recipe)*, unlike plurals, as supported by data like (4); if *the ramen recipe* denotes a plurality like *noodle(.recipe)+broth(.recipe)*, (4b) should sound as natural as (4a).

(4) a. **The noodle recipe and the broth recipe** are completely correct and completely wrong.

b. **#The ramen recipe** is completely correct and completely wrong. (c.f., Paillé 2020)

Given that *the ramen recipe* denotes ramen, the PP predicts that the matrix predicate in (3) denotes **made’(type’(ramen)(abe))+made’(create’(blog1)(abe))**. In other words, the PP wrongly predicts that (3) means: boy1 and/or boy2 made Abe type the *whole* ramen recipe.

In light of examples like (4), we represent plurality/singularity and mereological structures differently (c.f., de Vries 2017). We represent singular and plural individuals/events as singleton and non-singleton sets, respectively. On the other hand, we represent the mereological structures of individuals as sums. According to these assumptions, *the ramen recipe* denotes  $\{\text{ramen}\}$ , which is equivalent to  $\{\text{noodle}+\text{broth}\}$  in the scenario we adopt throughout this abstract, where the noodle and broth recipes constitute the ramen recipe. Importantly, neither  $\{\text{ramen}\}$  nor  $\{\text{noodle}+\text{broth}\}$  is equivalent to  $\{\text{noodle}, \text{broth}\}$ , which is the denotation of *plural* DPs like the subject in (4a). Note also that we use  $\varepsilon$  for event variables, which refers to a singleton or non-singleton set of events (e.g.,  $\{e_1\}$ ,  $\{e_1, e_2\}$ ). With these assumptions, we formulate our analysis below.

**4. The LS can capture the SG flattening.** Using the event semantics, we demonstrate that the LS can capture the non-local cumulations between *the two boys* and *this ramen recipe*/predicate conjunction in (3) as the local cumulative *made*-relation between  $\{B1, B2\}$  and  $\{e'_1, e'_2, e'_3\}$ ; note that  $\{e'_1, e'_2\}$  reflects the part-structure of *the ramen recipe* and  $\{e'_1, e'_2, e'_3\}$  reflects the part-structure of the predicate conjunction.

We propose that (3) receives the truth condition in (5), which informally reads: there are events  $\varepsilon$  and  $\varepsilon'$  such that  $\varepsilon$  is an event of the two boys having caused  $\varepsilon'$ , which consists of  $\varepsilon'_i$  and  $\varepsilon'_j$ ;  $\varepsilon'_i$  is an event of Abe typing the ramen recipe and  $\varepsilon'_j$  is an event of Abe creating the blog.

(5)  $\exists \varepsilon, \varepsilon' [\text{made}'_{\varepsilon}(\{B1, B2\}, \varepsilon') \wedge \exists \varepsilon'_i, \varepsilon'_j [\varepsilon'_i \cup \varepsilon'_j = \varepsilon' \wedge \text{type}'_{\varepsilon'_i}(\{\text{abe}\}, \{\text{ramen}\}) \wedge \text{create}'_{\varepsilon'_j}(\{\text{abe}\}, \{\text{blog}\})]]$

It is assumed that *made* has an effect of linking a causing event  $\varepsilon$  with a caused event  $\varepsilon'$  (e.g., Schmitt 2020), and that a version of the non-Boolean *and* (e.g. Lasersohn 1995) equates  $\varepsilon'$  with the plurality of  $\varepsilon'_i$  and  $\varepsilon'_j$ .

(5) merely states that each of B1 and B2 is involved in causing  $\varepsilon'$ , and does not specify exactly who caused which events. So whether (5) predicts (3) to be true in a scenario depends on whether the existence claim about the events  $\varepsilon, \varepsilon', \varepsilon'_i$  and  $\varepsilon'_j$  can be verified in the scenario. Crucially, in the given scenario of (3) sketched in (2), it can be verified. First, based on  $\{e'_1\}$  and  $\{e'_2\}$ , we assume that there is a typing event  $\{e'_1\} \cup \{e'_2\}$  whose agent and theme are  $\{\text{abe}\} \cup \{\text{abe}\}$  and  $\{\text{noodle}\} \cup \{\text{broth}\}$  (6) (c.f., Krifka 1989).

(6)  $\text{type}'_{\{e'_1\}}(\{\text{abe}\}, \{\text{noodle}\}) \wedge \text{type}'_{\{e'_2\}}(\{\text{abe}\}, \{\text{broth}\}) \rightarrow \text{type}'_{\{e'_1, e'_2\}}(\{\text{abe}\}, \{\text{noodle}, \text{broth}\})$

In the given scenario,  $\{\text{ramen}\} = \{\text{noodle} + \text{broth}\}$  is true. Given this and the conclusion of the *cumulative inference* in (6), we also assume that the *parts-whole inference* in (7) goes through.

(7)  $\text{type}'_{\{e'_1, e'_2\}}(\{\text{abe}\}, \{\text{noodle}, \text{broth}\}) \wedge \{\text{noodle} + \text{broth}\} = \{\text{ramen}\} \rightarrow \text{type}'_{\{e'_1, e'_2\}}(\{\text{abe}\}, \{\text{ramen}\})$

In addition, based on  $\{e_1\}, \{e_2\}$ , and  $\{e_3\}$  in (2), the cumulative inference produces  $\{e_1, e_2, e_3\}$ :

(8)  $\text{made}'_{\{e_1, e_2, e_3\}}(\{B1, B2\}, \{e'_1, e'_2, e'_3\})$

Given (6)-(8), (3) is predicted true in the given scenario as  $\{e'_1, e'_2\}$  (for  $\varepsilon'_i$ ),  $\{e'_3\}$  (for  $\varepsilon'_j$ ),  $\{e'_1, e'_2, e'_3\}$  (for  $\varepsilon'$ ), and  $\{e_1, e_2, e_3\}$  (for  $\varepsilon$ ) serve as witnesses for the existence claim in (5).

Note that the cumulative and parts-whole inferences and the meaning of *made* assumed above are independently needed to explain cumulations with a singular DP in *non-flattening* examples:

(9) a. The two boys typed [**the ramen recipe**]<sub>SG</sub>.

b. The two boys made Abe type [**the ramen recipe**]<sub>SG</sub>.

**5. The LS captures the PL flattening for free.** (1) and (3) share the same scenario (i.e., (2)). (1)'s denotation is also same as (5) except that  $\text{type}'_{\varepsilon'_i}$  relates  $\{\text{abe}\}$  with  $\{\text{noodle}, \text{broth}\}$  rather than  $\{\text{ramen}\}$ . Hence, the truth of (1) can be confirmed *with one less premise* (i.e., the parts-whole inference in (7)) than (3).

**6. Conclusion.** We demonstrated that (1) does not support the need of the PP in light of (3), and that cumulative sources, which can derive cumulations with a *singular* DP, can also derive cumulations with its corresponding *plural* DP in general.

**References.** Lønning, J.T.(1987). Collective readings of definite and indefinite noun phrases, *Generalized quantifiers*. Krifka, M. (1989). Nominal reference, temporal constitution and quantification in event semantics, *Semantics and contextual expressions*. Lasersohn, P.(1995). *Plurality, Conjunction and Events*. Paillé, M.(2020). The distribution of controlled exhaustivity, *SALT30*. Schmitt, V.(2019). Pluralities across categories and plural projection, *S&P*. Schmitt, V.(2020). Cumulation Across Attitudes and Plural Projection, *Journal of semantics*. de Vries, H.(2017). Two kinds of distributivity, *NLS*.