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Contents

1 Introduction
2 Pluralization
3 Nominal number. Eliminating [singular] as a number feature
4 On the plurality of verbs. Lexical cumulativity
5 How many readings? Phrasal cumulativity
6 Evidence for lexical cumulativity
7 The source of phrasal cumulativity
8 Conclusion and questions for further research

1 Introduction

This paper pursues some of the consequences of the idea that there are (at least) two sources for distributive/cumulative interpretations in English.

One source is lexical pluralization: All predicative stems are born as plurals, as Manfred Krifka and Fred Landman have argued.

Angelika Kratzer suggests that the other source of cumulative/distributive interpretations in English is directly provided by plural DPs.

What is the role of events in all of this?

Events have played a major role in the semantics of plurality since the pioneering work of Barry Schein and Peter Lasersohn.

2 Pluralization

Are there plural verbs and how did they become that way?

- The common view:
  A verb like fall denotes a relation between individuals and events. Verb meanings start out singular; singular individuals are being linked to singular events.

- A newer view:
  Krifka (1992) and Landman (1996) suggest that verbs are born as plurals. fall could also link plural individuals to plural events.

What about the VPs?

VPs and bigger verbal projections can be plural too, but their plurality cannot always be inherited from their verbs. So there must be another source of pluralization.

Sternefeld (1998), Sauerland (1998), Beck (2000), and Beck and Sauerland (2000) have proposed that there is an optional and freely available operator in the syntax that pluralizes predicates.

The claims of this paper

- There is a distinctive theoretical place for lexical pluralization.
- The pluralization of phrasal verbal projections is constrained. It can only occur in the immediate neighborhood of a DP with plural agreement morphology.

How do to pluralize a predicate?

The domain of entities De should contain both singular and plural individuals.

Following Link (1983), we construe plural individuals as sums and assume that De is cumulative: whenever x and y are in De, so is x+y.

In addition we need a domain of events Ds.

The sum operation is also defined for events and Ds can also be assumed to be cumulative.

Following Krifka (1989), we extend the sum operation to ordered pairs built from members of De and Ds:

\[ <\text{Mary, fall}_1> + <\text{John, fall}_2> = <\text{Mary + John, fall}_1 + \text{fall}_2> \]

We can define pluralization as an operation that maps sets that come with a sum operation to their smallest cumulative superset.
Pluralizing fall

(1) (a) [[fall]] = {<Mary, fall1>, <John, fall1>}
(b) [[*fall]] = {<Mary, fall1>, <John, fall1>, <Mary+John, fall1+fall2>}

Kratzer is using set talk, which allows a simple definition of the pluralization operation for predicates whose denotations let us define a plausible sum operation.

The transition to Schönfinkel's denotations is straightforward. The operation that pluralizes functions of type \(D_{e<st>\to\cdot},\) for example, can be defined as
\[
\lambda R_{e<st>}, \lambda x, \lambda e_0 \left[ <x,e_0 > \in \ast \{ <x,e>: R(x)(e) \} \right].
\]

Kratzer will use "\(\ast\)" also as the symbol for the corresponding cross-categorial pluralization operation.

Some questions
- Where do pluralization operators show up?
- Why do they show up where they do?
- How are they related to plural morphology on nouns and verbs?
- What is their semantic effect?
- If there is pluralization, shouldn’t there be singularization too?

3 Nominal number. Eliminating [singular] as a number feature

There is no such thing as singular number. Therefore, we do not expect operators that singularize.

Cumulativity

Manfred Krifka has explored cumulativity as an important property of nominal and verbal predicates.

Krifka’s Universal: Simple predicates in natural language typically are cumulative.

Apparent counterexamples: singular count nouns like child, chair, chin

Following Link (1983), the extensions of singular count nouns are taken to be sets of singularities. Hence, they could not be cumulative:

If Josephine is a child, and Beatrice is too, the sum of Beatrice and Josephine is not a child.

However, child, chair, or chin are not necessarily simple predicates. They may already be complex by the time we get to see or hear them. They each might consist of a root (\(\sqrt{\text{child}}\), \(\sqrt{\text{chair}}\), \(\sqrt{\text{chin}}\)) and a piece of nominal inflection.

Two views on the nature of roots

  Common noun roots have predicative, numberneutral (transnumeral) denotations.
  ↓
  The root \(\sqrt{\text{child}}\) would denote the set consisting of all singular children and their sums.

  Noun roots are referential and refer to kinds.
  ↓
  It would now be part of the job of nominal inflection to turn those roots into predicates.

Roots as referring to kinds

This proposal does not assume any particular mode of individuation or portioning for the denotations of noun roots.

Cross-linguistically, the function of individuating and portioning is often carried by classifiers.

Following Krifka (1995), English has a multiply ambiguous non-overt classifier and the noun forms that are usually categorized as 'singular' are in reality roots with an incorporated classifier.

(2) (a) [[\(\sqrt{\text{zebra}}\)]] = ‘zebra’.
(b) [[CL\(\text{ind}\)]] = \(\lambda x \lambda y \left[ \text{kind}(x) \& \text{individual}(y) \& y \leq x \right] \)
\([\left[ \text{CL\(\text{kind}\)\} = \lambda x \lambda y \left[ \text{kind}(x) \& \text{kind}(y) \& y \leq x \right] \]

The word zebra is a 'singular' predicate by the time we see or hear it. It was turned into a predicate by an incorporated ambiguous classifier, and is therefore ambiguous, too.

(3) (a) This zebra has not been fed.
    (b) This zebra is almost extinct.

On one interpretation, the incorporated classifier maps a kind to the set of its individual realizations. On the other interpretation, a kind is mapped to the set of its subkinds.

As shown in (4a) and (b), the plural noun zebras is ambiguous in the very same way as the 'singular' noun zebra is.

(4) (a) Those zebra have not been fed.
    (b) Those two zebra are almost extinct.

(5) (a) This wine is for table 8.
    (b) You dropped two red wines.

(6) (a) This Pinot Noir is rare.
    (b) We tasted five different Pinot Noirs.
The feature [singular]

\[ \text{classifier} \quad \text{zebra} \]

Figure 1

Either English has no such feature altogether, or it has an ambiguous classifier [singular].

**Mass nouns**

In English they are predicative by the time we see them. Hence, should come with an obligatory classifier. Following Chierchia (1998), that classifier should map a kind into the set of all of its singular or plural realizations.

Thus, predicative mass nouns are already pluralized by their classifier and are not submitted to further pluralization. Unless mass nouns combine with an individual or a kind classifier, they cannot project [plural].

Both mass nouns and non-plural count nouns project only a classifier. Therefore they both lack [plural] and therefore they both trigger singular agreement.

**No feature [singular] in English**

What we call singular might be the absence of plural in the morphology and in the semantics. Non-overt classifiers are responsible for the presence of singular predicates.

What distinguishes English from Chinese or Japanese, then, is that it has obligatory incorporated classifiers for its nouns.

To sum up

- Agreement phenomena show that there is a tight connection between nominal and verbal number.

- If there is no nominal [singular] then there is no verbal [singular] either the connection between nominal and verbal number should then be established via [plural] alone. When we see singular agreement, what we see is inflection that is there because of the absence of [plural].

4 On the plurality of verbs. Lexical cumulativity

We posit referential denotations for noun roots. Thus they are never predicative. Hence, they satisfy Krifka’s Universal trivially.

English nouns may become predicative in the course of a syntactic derivation. But when they do, they are no longer simple.

What about verb roots and verb stems?

Verbs have the characteristic property of taking arguments. Some of those arguments seem to be syntactically acquired in the course of a derivation.

Marantz (1984) and Kratzer (1994) have argued that external arguments are always added in the syntax. Pylkkänen (2001, 2002) makes the same point for applicative arguments.

Some direct internal arguments seem to be introduced syntactically too, via secondary predicates or serialization, for example.

But there are also transitive and unaccusative verbs with inherently relational meanings: relate, connect, resemble, surpass, outdo, depend, hinder, cause, …

With many transitive and unaccusative verbs, the kind of event described varies with the kind of direct internal argument in sometimes erratic ways: pick, pop, rise, …

For example, picking a pumpkin, picking cat hair off your pants, picking a lock, or picking someone’s pocket are quite different kinds of activities.

Therefore, it would be hard to account for this dependency under the assumption that a verb’s argument structure is always syntactically constructed.

There seems to be a large group of inherently relational verb roots and this suggests that as a class, verb roots might be predicative from the start.

Then we would expect them to fall under Krifka’s generalization, and have cumulative denotations.

If external and applicative arguments are not true arguments of their verbs, we need thematic role predicates like agent or goal to introduce them. Those predicates’ denotations should then be cumulative, too.

If the denotations of verbs and thematic role predicates are cumulative from the start, we expect effortless availability of a cumulative interpretation - the term is due to Scha (1981, 1984) for sentences like

\[(7) \quad (a) \quad \text{Twenty children ate ten pizzas.} \]
\[(b) \quad \exists x \exists y \left[ \text{child}(x) \land \text{pizza}(y) \land \text{eat}(y)(x) \right] \land \exists x \exists y \left[ \text{child}(x) \land \text{agent}(x)(e) \land \text{pizza}(y) \land \text{eat}(y)(e) \right]\]

On its cumulative interpretation, \(7(a)\) can be true in a wide range of situations, as long as 10 pizzas were eaten in all, and 20 children did the eating. It does not matter how the 10 pizzas were shared among the children.

All predicates in \(7(b)\) have cumulative denotations.

If every basic verb and thematic role predicate has a cumulative denotation from the start, there is no need to repeat that information for every lexical item, of course. Using the \(\ast\)-operator even for those predictable cases is as a reminder.
Cumulativity in an event semantics

(8) Two children lifted two boxes.

Suppose the two children are Casey and Stacey, and the two boxes are Red and Green. Casey lifted Red on her own once, and Stacey did so twice. In addition, Casey and Stacey jointly lifted Green.

We have four events, $e_1$, $e_2$, $e_3$, and $e_4$:

<table>
<thead>
<tr>
<th>Event Number</th>
<th>Box Lifted</th>
<th>Box Lifter</th>
</tr>
</thead>
<tbody>
<tr>
<td>$e_1$</td>
<td>Red</td>
<td>Casey</td>
</tr>
<tr>
<td>$e_2$</td>
<td>Red</td>
<td>Stacey</td>
</tr>
<tr>
<td>$e_3$</td>
<td>Red</td>
<td>Stacey</td>
</tr>
<tr>
<td>$e_4$</td>
<td>Green</td>
<td>Casey+Stacey</td>
</tr>
</tbody>
</table>

(9) Extension of $\text{lift}$

\[\{<e_1, \text{Red}>, <e_2, \text{Red}>, <e_3, \text{Red}>, <e_4, \text{Green}>, \ldots\}\]

(10) Extension of $\text{agent}$

\[\{<e_1, \text{Casey}>, <e_2, \text{Stacey}>, <e_3, \text{Stacey}>, <e_4, \text{Casey} + \text{Stacey}>, \ldots\}\]

(11) (a) Extension of $\star \text{lift}$

\[\{<e_1, \text{Red}>, <e_2, \text{Red}>, <e_3, \text{Red}>, <e_4, \text{Green}>, <e_1+e_2, \text{Red}>, <e_1+e_3, \text{Red}>, <e_1+e_4, \text{Red+Green}>, <e_2+e_3, \text{Red}>, <e_2+e_4, \text{Red+Green}>, <e_3+e_4, \text{Red+Green}>, <e_1+e_2+e_3, \text{Red}>, <e_1+e_2+e_4, \text{Red+Green}>, <e_1+e_3+e_4, \text{Red+Green}>, <e_2+e_3+e_4, \text{Red+Green}>, \ldots\}\]

(b) Extension of $\star \text{agent}$

\[\{<e_1, \text{Casey}>, <e_2, \text{Stacey}>, <e_3, \text{Stacey}>, <e_4, \text{Casey} + \text{Stacey}>, <e_1+e_2, \text{Casey} + \text{Stacey}>, <e_1+e_3, \text{Casey} + \text{Stacey}>, <e_1+e_4, \text{Casey} + \text{Stacey}>, <e_2+e_3, \text{Stacey}>, <e_2+e_4, \text{Casey} + \text{Stacey}>, <e_3+e_4, \text{Casey} + \text{Stacey}>, \ldots\}\]

Assuming the cumulative denotations partially listed in (11), the logical representation (12a) (of the sentence in (8)) correctly comes out true.

The open sentence (12b) is satisfied by several variable assignments, including the one in (12c):

(12) (a) $\exists x \exists y [\text{child}(x) \land x/y = 2 \land \text{agent}(x)(e) \land \text{box}(y) \land y/y = 2 \land \text{lift}(y)(e)]$

(b) $[\text{child}(x) \land x/y = 2 \land \text{agent}(x)(e) \land \text{box}(y) \land y/y = 2 \land \text{lift}(y)(e)]$

(c) $'x' \rightarrow e_1 + e_2 + e_3 + e_4$

$'y' \rightarrow \text{Red + Green}$

(13) (a) Casey and Stacey lifted Red.

(b) Casey and Stacey lifted Green.

(c) Casey lifted Red (at least) once.

(d) Stacey lifted Red (at least) twice.

(13a) is verified by $e_1 + e_2 + e_3 + e_4$. (13b) is verified by $e_4$.

The fact that Stacey, but not Casey, lifted Red twice (cf. (13d)) is in principle retrievable from (13a) and (b) as well. There is an event (namely $e_2 + e_3$) that has Stacey as its agent, and also has two proper subevents, each of which is a lifting of Red by Stacey.

As for Casey’s liftings of Red (cf. (13c)), there is only one such event, $e_1$.

We can also retrieve the information that Casey and Stacey lifted Green collectively. There is one event in which Green alone was lifted, $e_4$, and that event has a plural agent, Casey and Stacey, but no subevent in which Green was lifted by Casey or Stacey alone.

(14) (a) Red was lifted fourteen times.

(b) Casey and Stacey together did eleven liftings.

What really seems to count in counting is atomicity.

The extension of $\star \text{lift}$ contains exactly three atomic pairs that connects Red to a lifting event. Red was lifted exactly three times, then.

The extension of $\star \text{agent}$ contains exactly one atomic pair that connects Casey and Stacey to a lifting event. They did exactly one lifting together, then.

To sum up

- Cumulation preserves all information we want to extract from a verb’s extension.

- We have all the information we might need to get the semantics of adverbs like twice or three times, or individually, or together right.

5 How many readings? Phrasal cumulativity

(15) Two children lifted two boxes.

There is a reading of (15) that lumps together what are traditionally called collective and cumulative interpretations, and doesn’t distinguish between one-time and repetitive liftings.

(15) can truthfully describe any singular or plural event of lifting two boxes, as long as two children did the lifting.

Is it right to lump together all the interpretations that others have taken pains to distinguish?
Evidence from VP-ellipsis

The ambiguity in the overt and in the silent VP must be resolved in the same way (cf. (16)).

(16) I went to the bank, and you did, too.
(17) The two boys lifted the two boxes, and the two girls did, too.

By contrast, (17) is true in a situation in which the two boys jointly lifted each of the two boxes, but the two girls each lifted a different one of the two boxes on her own. Hence, there is no case of ambiguity.

We are right in lumping together collective and cumulative interpretations into a single reading.

Distributivity

In addition to the cumulative interpretation, (15) has two distributive interpretations.

Landman (1989) argued that when a plural DP produces distributive interpretations of this kind, they should be derived by pluralizing its sister predicate.

(18) (a) (2 children) \*lifted 2 boxes]
(b) (2 boxes) \*λx [2 children lifted t]
(19) (a) \*λxλy [\*box(y) & /y/ = 2 & \*lift(y)(e) & \*agent(x)(e)]
(b) \*λxλy [\*child(y) & /y/ = 2 & \*lift(x)(e) & \*agent(y)(e)]

Since starring a predicate always extends the original extension, both 18(a) and (b) still cover all the scenarios we discussed before.

Lumping the readings together

18(a) and (b) lump together the collective, cumulative, and repetitive interpretations of (15) with one of its two distributive interpretations.

Figure 2

The cumulative/collective/repetitive interpretation for (15) can be derived with lexical cumulativity alone.

The subject distributive interpretation requires starring of the subject’s sister predicate, and
the object distributive interpretation requires movement of the object over the subject and
starring of the resulting sister predicate.

If starring of a plural DPs sister node is obligatory, we only expect two truly distinct readings
for sentence (15), one of which is highly dispreferred.

The difference boils down to whether or not we move the object over the subject.

As far as grammar goes, no distinction is made between subject distributive, cumulative, collective, and iterative interpretations.

All those different ways of understanding (15) correspond to a single reading that can be computed in a straightforward way from a single syntactic representation.

We avoid explosion of computational complexity in this way, not only in the syntax, but also in the semantics.

To sum up

- We have seen what looked like initial support for lexical cumulativity, but we have also seen that lexical cumulativity alone is not enough.

- Phrasal cumulativity is needed to account for certain cases of distributive interpretations. Thus, we need *-operators that can pluralize phrases.

Do we still need lexical cumulativity, if we already have the *-operators?

Can’t those *-operators alone do the jobs we thought lexical cumulativity was responsible for?

6 Evidence for lexical cumulativity

Attacking lexical cumulativity

Several authors have argued that the denotations of verbs can be rendered cumulative through
the freely available optional presence of syntactically represented *-operators that can pluralize
any kind of verbal predicate: lexical, phrasal, basic or syntactically derived.

The goal of this section

- To show that the proposal of Sternefeld, Sauerland, and Beck over-generates.

- There is still a theoretically distinguished place for lexical cumulativity and Krifka’s Cumulativity Universal.
(22) (a) She guards a parking lot.  
(b) He cooks for an elderly lady.  
(c) She waters a garden.  
(d) He watches a baby.  
(e) She cleans an office building.

(23) (a) I dialed a wrong phone number for 5 minutes.  
(b) She bounced a ball for 20 minutes.  
(c) He kicked a wall for a couple of hours.  
(d) She opened and closed a drawer for half an hour.  
(e) I petted a rabbit for two hours.

What is remarkable about those sentences is that the singular indefinite objects invariably fail to distribute. But if *-operators could be inserted freely, they could immediately produce 24(b) from 24(a), for example, hence derive unattested interpretations for the sentences in (22) and (23):

(24) (a) \(\lambda e \exists x [\text{ball}(x) \land \text{bounce}(x)(e)]\)  
(b) *\(\lambda e \exists x [\text{ball}(x) \land \text{bounce}(x)(e)]\)

(24b) describes possibly repeated events in which more than a single ball might be bounced. 

Restrict *-operators?

(25) [bounce a ball]VP  
(a) \(\lambda x \lambda e \text{*bounce}(x)(e)\)  
(b) \(\lambda R<e<st> \lambda x [\text{ball}(x) \land R(x)(e)]\)  
(c) \(\lambda e \exists x [\text{ball}(x) \land \text{*bounce}(x)(e)]\) 

‘being a possibly plural event e such that there is a ball x and e is an event of bouncing x’

The way we defined the *-operator corresponds to a weak notion of plurality, where pluralities always have singularities as special cases. That the sentences in (22) and (23) necessarily describe iterated events does not follow from lexical cumulativity alone.

In (22), habitual aspect seems to be responsible for the necessarily iterative interpretation. In (23), durativity plays a similar role.

Given lexical cumulativity, we still predict the facts in (22) and (23), even if the habitual operator and durational adverbs take scope over the indefinite direct object.

Explaining (22) and (23)

Both (26a) and (26b) imply that a single phone number was dialed for five minutes.

(26) (a) Ich hab’ fünf Minuten lang eine falsche Telefonnummer gewählt.  
(b) Ich hab’ eine falsche Telefonnummer fünf Minuten lang gewählt.

Lexical cumulativity allows us to explain apparent ‘scope’ puzzles of the kind seen in (22), (23), or (26).

Durational adverbials

Suppose the denotation of durational adverbials like for 5 minutes is as in (27):

(27) (a) \(\lambda P,e \lambda x [P(x) \land e = \sigma e' [P(x') \land e' < e] \land \text{fminute}(e) = 5]\)  
(b) *\(\lambda x [\text{number}(x) \land \text{*dial}(x)(e) \land e = \sigma e' [\text{number}(x') \land \text{*dial}(x')(e') \land e' < e]]\)  

The definition in (27) uses Link’s *-operator. In our case, the operator maps the events in the set \(\{e' : e' < e \land P(x') \} \) to their supremum – if it exist.

Following Morzycki’s Program of Modified Modification (Morzycki 2004) and the independently developed analysis of durational adverbs in van Geenhoven (2004), we would eventually want to split up the denotation of durational adverbials like for 5 minutes into at least two parts:

(28) (a) \(\lambda P,e,\lambda x [P(x) \land e = \sigma e' [P(x') \land e' < e]]\)  
(b) \(\lambda e \text{fminute}(e) = 5\)

The denotation of dial a number for 5 minutes, for example, can now be computed by applying the denotation of for 5 minutes to the denotation of dial a number the VP dial a number is thus clearly in the scope of for 5 minutes.

The result is the denotation in (29):

(29) \(\lambda e \exists x [\text{number}(x) \land \text{*dial}(x)(e) \land e = \sigma e' [\text{number}(x') \land \text{*dial}(x')(e') \land e' < e]] \land \text{fminute}(e) = 5\)

Assuming lexical cumulativity, iterative interpretations for verbs are possible from the very start. Iterativity without concurrent object distributivity is the automatic result of introducing an ordinary singular indefinite in the early stages of a syntactic derivation.

To sum up

- Habitual operators and durational adverbs do no longer have to pluralize the predicates they operate over, or introduce quantification over sub-events.
- They merely have to make sure that those predicates do not describe any singular events, but are properly plural in a lexically defined sense.
- We no longer have to stipulate obligatory narrow scope for such operators.
- The desired interpretations can be derived, even if the relevant aspectual operators are sitting above direct objects.
- *-operators cannot be inserted freely. If they could, we wouldn’t expect the ‘failure of distribution’ effect illustrated in (22) and (23).
- What is the force that produces phrasal cumulativity, hence, many cases of distributivity?
7 The source of phrasal cumulativity

What makes phrasal cumulativity possible?

It cannot be an accident that none of the sentences in (22) or (23) contained any plural DPs. Maybe phrasal *-operators are necessarily tied to the presence of plural DPs in some way or other.

Schwarzschild (1993-94), for example, proposed that all plural VPs are obligatorily translated with the *-operator, hence always have cumulative denotations.

Reformulating Schwarzschild

At the level where semantic interpretation takes place, sister constituents of plural DPs are pluralized, regardless of whether they are still in their base position or have moved away.

Plural DPs

Following Sauerland (2005), when a plural DP is built from a determiner and a plural noun, for example, both the noun and the determiner come with their own number projection.

\[
\begin{array}{c}
\text{D} \\
\text{classifier} \\
\text{N}
\end{array}
\]

Figure 3

What is the role of the higher [plural]?

It can’t seem to be interpretable within its DP.

Suppose that nominal [plural] is always interpretable, and it always carries the cross-categorial plural operator then the higher [plural] is forced to move out before semantic interpretation takes place.

Moving as little as possible, it could become a verbal inflectional head right below its DP. In this way, a DP could literally create its own agreement projection, possibly on top of another verbal projection.

When [plural] migrates out of its DP, we get a *-operator that pluralizes the DP’s sister node, possibly showing up as overt verbal agreement.

\[
\begin{array}{c}
\text{Pluralized sister predicate} \\
\end{array}
\]

Figure 4

An immediate prediction of this proposal is that pluralization of phrasal verbal projections should require the presence of DPs with [plural] agreement features in English.

But distributive/cumulative interpretations that can be produced by lexical cumulativity alone, should also be available for singular DPs (cf. (30)).

(30) (a) She sent her offspring to 5 different boarding schools.
 (b) She sent her offspring to a boarding school.

(31) (a) She sent her children to 5 different boarding schools.
 (b) She sent her children to a boarding school.

(30) look like sentences that has a run-of-the-mill cumulative interpretation (cf. (31)).

Testing the prediction

Why is (32) bad?

(32) *Her offspring each went to a boarding school.

A possible explanation is that floated each needs to agree with [plural].

Mass nouns

The examples in (30) are not isolated cases. Cumulative interpretations are generally available for mass nouns. But if they are, those interpretations were produced by lexical cumulativity.

(33) (a) All that furniture was loaded onto five trucks.
 (b) All that furniture was loaded onto a truck.

(34) (a) Her offspring inherited all her jewelry.
 (b) Her offspring inherited a villa in Tuscany.

Conjoined mass nouns sometimes allow singular agreement, and can then produce distributive/cumulative interpretations.

(35) (a) The moss on the rocks and the moss on the trees is blighted.
 (b) Jane’s china and Alice’s china was stored in separate closets.

(35a) and (b) have distributive/cumulative interpretations. Since the DPs are singular, lexical cumulativity must be responsible.

(36) (a) The sugar for the coffee and the sugar for the cake was stored in a plastic jar.
 (b) Jane’s silverware and Patsy’s silverware was sent to a cousin.

Good cases of essentially phrasal cumulativity can’t seem to be produced in the absence of plural DPs. Sentences (36a) and (b) lack distributive interpretations.

Another consequence of the proposed account of phrasal verbal cumulativity is that it should not be possible to simultaneously cumulate two non-event arguments.
We do not have lexical predicates with more than two non-event arguments to begin with, and plausible assumptions about movement do not seem to allow us to derive any such predicates in the syntax.

Thus, a DP’s sister constituent can only be of type <et> or <e<st>>. Hence, the pluralization operation could not affect any other non-event argument position apart from the one that is about to be saturated by the DP triggering the pluralization.

(37) These 5 teachers gave a bad mark to those 20 protesting students.

Beck and Sauerland (2000) argue that the intended interpretation of (37) can only be derived by pluralizing the following 2-place relation:

$$\lambda x \lambda y \exists z \text{[bad-mark}(z) \& \text{gave}(z)(y)(x)]$$

The key for (37) is neo-Davidsonian association of the agent argument, coupled with movement of the indirect object to a position right above the direct object. The moved DP’s sister predicate would now be pluralized and would wind up with the denotation in (38):

$$\lambda x \lambda e \exists z \text{[bad-mark}(z) \& \text{gave}(z)(e) \& \text{goal}(y)(e)]$$

This pluralized predicate is of type <e<st>>, hence only has one non-event argument.

(39) (\lambda x \lambda e \exists z \text{[bad-mark}(z) \& \text{gave}(z)(e) \& \text{goal}(y)(e)] (those 20 protesting students)

(Note that the \*-operator blocks \*-conversion.)

Next, we add the agent argument and saturate it:

(40) \lambda e [\text{agent(those five teachers)}(e) \& (\lambda y z \exists \text{[bad-mark}(z) \& \text{gave-to}(y)(z)(e)]) (those 20 protesting students)(e)]

The interpretation captured in (40) says that those five teachers were the agents of an event in which those 20 protesting students received one or more bad marks.

Winter (2000)

A surprising consequence of the current analysis of phrasal verbal cumulativity relates to an example presented in Winter (2000).

Winter’s example is meant to show that theories that account for distributive interpretations of plural DPs by pluralizing their sister predicates overgenerate. They seem to predict interpretations that do not in fact exist.

Winter’s objection applies to event-less versions of the ‘nominal distributivity via verbal cumulation’ idea, but not to the event-based account proposed here. Let us see why.

Figure 5

(41) The children are holding a wheel.

Winter observes correctly that in situations of this kind, (41) is false or at least “highly strange”.

On Winter’s own account, (41) would be true just in case each child is holding a wheel.

Winter predicts (41) to be false in his scenario, then $Boy_1$ and $Boy_2$ are holding a wheel, and so do $Boy_2$ and $Boy_3$. The denotation of the unstarred VP in (41) is therefore true of the two pluralities $Boy_1+Boy_2$ and $Boy_2+Boy_3$. If the plural subject the children induces starring of the VP, the denotation of that VP is true of $Boy_1+Boy_2+Boy_3$, and hence of the children. (41) is thus predicted to be true on Winter’s scenario.

Does an event-based scenario fare any better here?

On Kratzer’s account, the sister constituent of the plural subject in (41) expresses a relation between individuals and events, and it is that relation that is cumulated:

(42) (a) $\lambda x \lambda e [\text{agent}(x)(e) \& \exists y [\text{wheel}(y) \& \text{hold}(y)(e)]]$

(b) $\lambda x \lambda e [\text{agent}(x)(e) \& \exists y [\text{wheel}(y) \& \text{hold}(y)(e)]]$

Does the pair consisting of the three boys and the event $e$ represented in Winter’s scenario satisfy the starred relation in 42(b)?

It could only do so if there are pairs $<x_1, e_1>$ and $<x_2, e_2>$ that satisfy the relation in 42(a), where $x_1+x_2 = \text{the children}$ and $e_1+e_2 = e$.

However, the event represented in Figure 5 is most naturally conceptualized as a single event. There are no natural, but only “strange” or artificial ways of conceptualizing it as the sum of two subevents.

The subevents singled out in Figure 6, for example, do not seem to be among the atoms in our domain of events:
Sentence (41) is clearly true in the scenario of Figure (7). Rather than presenting a challenge to our account, Winter’s example provides a surprising piece of support.

To sum up
- Kratzer concludes that plural DPs are themselves sources of phrasal cumulativity - or more concretely, their higher [plural] features are (in the sense of Sauerland (2005)).
- Pluralizing their DP’s sister node seems to be the only way for those features to be put to semantic use.
- Within an event semantics, a DP’s sister node often denotes a relation between individuals and events. Consequently, judgments about the truth of sentences like (15) are bound to be sensitive to the individuation of events.

8 Conclusion and questions for further research
- There are indeed at least two pluralization mechanisms at work in languages like English. One is Lexical Cumulativity, which seems to be universal. The other one is carried by the inflectional feature [plural].
- [plural] is always interpretable, and always denotes the cross-categorial ∗-operator.
- [plural] always originates within a DP and pluralizes nominal or verbal projections, depending on whether it occupies a high or a low position within its DP: the low position provides access to a noun, the high position provides access to a verbal projection.

- A single inflectional feature can thus create subtle variations in the availability of distributive/cumulative interpretations in English.

The results obtained generate expectations for other languages.

Chinese
(43) Tamen mai-le yi-bu chezi.  They buy-Asp one-CL car
They bought a car.
Lin (1998), 201.

To get a distributive interpretation for Chinese sentences like (43), the overt distributivity operator dou has to be used in Chinese. Then, dou is a carrier of the ∗-operator (Lin 1998, Yang 2001).

German
(44) Eine Kanne Milch hat jeweils ein Pfund Käse produziert.
German jeweils is an operator that exclusively pluralize properties of events. It may be given the following interpretation:

\( \lambda e \lambda P. [\lambda P(e) \land e' < e] \)

The lesson from (43) and (44) is that crosslinguistically, phrasal plurality is not always linked to nominal [plural]. The feature [plural] does not have to be the one and only possible source of phrasal plurality, even in a language that also has [plural].

Subject-distributivity
There is some indication that subject-distributivity is hard to get when the subject is left in a low position
(46) Am Nebentisch rauchten vier Männer eine Zigarre.
(46) strongly suggests that the four men were sharing a single cigar.

Maybe those low plural subjects also lack the higher [plural] projection, in which case they wouldn’t be able to pluralize their sister constituent on the current account.

The question is then why those sentences still show overt plural agreement in German. What exactly is the relation between [plural] and verbal agreement?