On the Plurality of Verbs

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Abstract

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. Lexical pluralization should be available in any language and should not depend on the particular make-up of its DPs. I suggest that the other source of cumulative/distributive interpretations in English is directly provided by plural DPs. DPs with plural agreement features can 'release' those features to pluralize adjacent verbal projections. If there is a lexical source for distributive/cumulative interpretations, there should be instances of such interpretations with singular DPs. But there should also be cases of distributive/cumulative interpretations that require the presence of DPs with plural agreement morphology.

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. Yet to the present day, there is no consensus about the need of event-based accounts of plurality. Non-event-based analyses of plural phenomena continue to be proposed. The phenomena discussed in this paper all present small or not so small conceptual problems for event-less analyses, but can be given elegant accounts within frameworks that incorporate some version of a Davidsonian event semantics. The hope is, then, that an event semantics for plurals might at least be a good bet about reality.

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1. Pluralization

Are there plural verbs? And if there are, how did they become that way? Take the verb *fall*. *Fall* denotes a relation between individuals and events: individuals who fall are being related to their falls. I don't know why, but most of us grew up believing that verb meanings start out 'singular': in the case of *fall*, singular individuals are being linked to singular events. My views changed when Manfred Krifka (1992) and Fred Landman (1996) suggested that verbs are born as plurals. *Fall* could then also link plural individuals to plural events from the very start[1]. This cannot be the end of the story, however. VPs and bigger verbal projections can be plural, too, and their plurality cannot always be inherited from the plurality of their verbs. There must be another source of pluralization, then. 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, both those that are basic and those that are syntactically derived. If they are right, the plurality of verbs is just a special case of a much more general phenomenon. In this paper, I will argue that there is a distinctive theoretical place for lexical pluralization, and that pluralization of phrasal verbal projections is not at all unconstrained. It can only occur in the immediate neighborhood of a DP with plural agreement morphology.

Before we begin, let us get the technicalities out of the way. How do you pluralize a predicate? Here is a recipe. First, our basic domains have to be right. The domain of entities D_e should contain both singular and plural individuals. Following Link (1983), we construe plural individuals as sums and assume that D_e is cumulative, that is, closed under sum formation: whenever x and y are in D_e, so is x+y, the sum of x and y. In addition to D_e, we need a domain of events D_s. The sum operation is also defined for events, and, consequently, D_s can be assumed to be cumulative, too. Following Krifka (1986), we extend

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[1]. I am assuming a weak notion of plural, where singularities are special cases of pluralities (Link 1983). See Sauerland, Anderssen, and Yatsushiro (2004) for recent support (including processing and acquisition data) of this assumption.

the sum operation to ordered pairs and other tuples built from members of D_e and D_s. The sum of the pairs <Mary, $fall_1$> and <John, $fall_2$>, for example, would be <John+Mary, $fall_1$+$fall_2$ >. Pluralization can now be defined as an operation ∗ that maps sets that come with a sum operation to their smallest cumulative superset[2]. Here is an illustration of what ∗ might do to the extension of *fall*. Suppose there are just two falls, one by Mary, and one by John. We have then:

(1) a. [[*fall*]] = {<John, $fall_1$>, <Mary, $fall_2$>}

b. [[∗*fall*]] = {<John, $fall_1$>, <Mary, $fall_2$>, <John+Mary, $fall_1$+$fall_2$ >}

Having learned how to pluralize, we can begin to think about the hard 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? And finally, if there is pluralization, shouldn't there be singularization, too? I will start with the last question, and suggest that there is no such thing as singular number. If the suggestion is correct, we do not expect operators that 'singularize', and we are entitled to focus our attention on pluralization alone. To make my point, I have to briefly discuss the interpretation of number marking with nouns.

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

Over the last 15 years or so [3], Manfred Krifka has explored cumulativity as an important property of nominal and verbal predicates, and in the course of this work, the possibility emerged that cumulativity might correspond to a significant semantic universal: "simple

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[2]. See Krifka (1986) and Landman (1996). In my illustration, I am not working with Schönfinkeled verb denotations. I am 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 Schönfinkeled denotations is straightforward. The operation that pluralizes functions of type $D_{<e<st>>}$, for example, can be defined as $\lambda R_{<e<st>>}\lambda x_e\lambda e_s$ [<x,e> ∈ ∗{ <x,e>: R(x)(e) }]. I will mostly use Schönfinkeled denotations, and I will then use "∗" also as the symbol for the corresponding cross-categorial pluralization operation. Basic types used in this paper: e (individuals), t (truth-values), s (events).

[3]. Krifka (1986, 1987, 1992, 1998).

predicates in natural language typically are cumulative".[4] Blatant counterexamples to Krifka's universal seem to be singular count nouns like *child*, *chair*, or *chin*. Following Link, the extensions of singular count nouns are usually taken to be sets of singularities, hence could not be cumulative. If Josephine is a child, and Beatrice is too, the sum of Beatrice and Josephine is not a child. Those two girls are children. 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 (√*child*, √*chair*, √*chin*) and a piece of nominal inflection. Some have argued that common noun roots have predicative, number-neutral ('transnumeral') denotations (Müller (2000), Rullmann and You (2003)). On that proposal, the root √*child*, for example, would denote the set consisting of all singular children and their sums. The denotations of common noun roots would be cumulative, then, and would thus satisfy Krifka's universal. Alternatively, we might consider the possibility that noun roots are referential and refer to kinds, following Krifka (1995) and Yang (2001), who both build on Carlson (1977). Not being predicative at all, common noun roots would satisfy Krifka's universal trivially. It would now be part of the job of nominal inflection to turn those roots into predicates. This last proposal is very much in the spirit of Borer (2005), and is especially attractive since it 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. On an analysis where English common noun roots do not yet denote properties (that is, sets containing portions or individuals), there would be a stage in the derivation of English nouns where they look exactly like their Chinese or Japanese cousins. We would now have to look for classifiers in English, that is, pieces of inflection that could be held responsible for mapping kinds into sets of individuals or portions.

Following up on Krifka (1995), I want to suggest that English has a multiply ambiguous non-overt classifier, and that the noun forms that are usually categorized as 'singular' are in reality roots with an incorporated classifier. Here is an illustration of the proposal for count nouns.

(2) a. [[√*zebra*]] = 'zebra'.

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4. Krifka (1998), 200. See also Landman (1996, 2000).

b. $[[CL_{ind}]] = \lambda x \lambda y$ [kind(x) & individual(y) & $y \leq x$]
$[[CL_{kind}]] = \lambda x \lambda y$ [kind(x) & kind(y) & $y \leq x$]

According to the proposal sketched in (2), 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. It can denote a set of individual zebras (with CL_{ind}), or a set of subspecies of the species 'zebra' (with CL_{kind}). *Zebra* is ambiguous in this way, as shown in (3).

(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. You might call the result a 'singular' predicate, but we have to be careful if we talk that way. It is precisely those 'singular' predicates that are the input for pluralization. As shown in 4(a) and (b), the plural noun *zebras* is ambiguous in the very same way as the 'singular' noun *zebra* is.

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

4(a) talks about two individual zebras that have not been fed, and 4(b) about two subspecies of the species zebra that are almost extinct. Interestingly, the same ambiguous classifier can sometimes attach to certain mass nouns. If it does, the resulting predicates show the expected ambiguity, and so do the corresponding plural forms:

(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.

5(a) may be used to inform a waiter that a particular glass or bottle of red wine has to go to table 8. 5(b) could be a complaint about your having dropped two particular glasses or bottles of red wine. 6(a) and (b) illustrate the subkind reading of *Pinot Noir* and its plural *Pinot Noirs*. There is some indication, then, that English has an unpronounced classifier that builds predicates from names for kinds, and that the resulting predicates can then be submitted to pluralization.

So far, we haven't seen any need for a nominal number feature [singular]. If there was such a feature in English, there would be no semantic job for it to do. Since there is also no overt morpheme marking nominal [singular] in English, we might suspect that there is no such feature to begin with. Alternatively, we might say that English has an ambiguous classifier [singular]. We can save [singular] in this way, but we are removing it from the list of number features. Be this as it may, here is what the immediate projection of an English count noun root might look like:

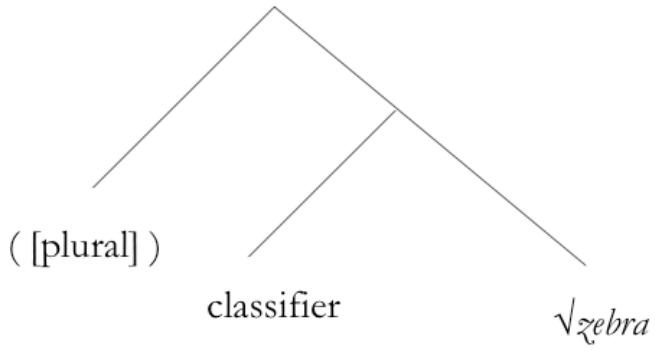

Figure 1

Mass nouns in English are also predicative by the time we see them, hence should come with an obligatory classifier, too. Following Chierchia (1998), that classifier should map a kind into the set of all of its singular or plural realizations. Predicative mass nouns are already pluralized by their classifier, then, and are therefore not submitted to further pluralization. Unless they combine with an individual or a kind classifier, mass nouns cannot project [plural]. Both mass nouns and non-plural count nouns trigger 'singular' agreement in

English. We now understand way. Both types of nouns have only projected a classifier and therefore lack [plural].

That plural marking and agreement can co-occur with a classifier in a language might seem a typological anomaly. Greenberg (1972) and Sanches and Slobin (1973) have explicitly associated the existence of numeral classifiers with the absence of obligatory nominal plural marking and agreement. Borer (2005) takes that typological connection to be a major argument in favor of analyzing the [plural] feature itself as a classifier. However, Aikhenwald's typological study of classifiers (Aikhenwald 2003) does not support a necessary connection between the presence of numeral classifiers and the absence of plural marking and agreement. She mentions a respectable number of exceptions, including (among others) Yuki, Nootka, Tlingit, Tucano, North Arawak, and South Dravidian languages[5]. If the [plural] feature was responsible for both individuation and pluralization, as Borer (2005) proposed, it would be a mere accident that in English, pluralized predicates rely on the very same kinds of individuation as their 'singular' counterparts. On the other hand, if pluralization operates over the alleged 'singular' predicates, we understand why 'singular' and plural nouns in English use the same modes of individuation. To make this explanation palatable, I suggested that there is no feature [singular] in English. What we have been calling 'singular' might literally be the absence of plural - not only in the morphology, but in the semantics as well. Non-overt classifiers are responsible for giving us 'singular' predicates.

Nominal plural is not the main topic of this paper, so I will not be able to pursue the full range of relevant consequences of the suggestion that English has silent classifiers that create predicates for the nominal [plural] feature to operate on. The proposal is compatible with Chierchia (1998) in that it also assumes that English count nouns are predicative by the time we see them. It is that property that prevents them from occupying argument positions. However, in the spirit of Krifka (1995) and Borer (2005), I have suggested that predicative count nouns are syntactically constructed from names for kinds with the help of classifiers. What distinguishes English from Chinese or Japanese, then, is that it has obligatory incorporated classifiers for its nouns. The empirical gain of a constructional approach to the

mass/count distinction is that, in contrast to global parameters of the kind Chierchia proposed, it allows for microvariation and variability within a single language.

Returning to our topic, the main goal in this section was to give at least some support to the idea that there might not be a number feature [singular] in languages like English. That point is important for my overall argumentation, and this is why I spent some time on motivating it. Agreement phenomena show that there is a tight connection between nominal and verbal number, and if there is no nominal [singular], it seems safe to conclude that there is no verbal [singular] either. We expect the connection between nominal and verbal number to be established via [plural] alone, then. When we see 'singular' agreement, what we see is inflection that is there because of the absence of [plural]. I will have to be serious about pluralization, then, but no apologies are needed for my complete neglect of 'singularization'.

3. On the plurality of verbs. Lexical Cumulativity.

In the nominal domain, we were able to maintain Krifka's cumulativity universal by positing referential denotations for noun roots. Noun roots are never predicative, then, hence satisfy Krifka's universal trivially. According to the story developed in the last section, English nouns may become predicative at some stage in the course of a syntactic derivation, but when they do, they are no longer simple. What about verb roots and verb stems? As a class, 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[6]. But there are also transitive and unaccusative verbs with inherently relational meanings: *relate*, *connect*, *resemble*, *surpass*, *outdo*, *depend*, *hinder*, *cause* are in this group. It is hard to imagine that those verbs could merely characterize kinds of states or events without relating them to at

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[5]. Aikhenwald (2003), 100, 249.

[6]. See Kratzer (2005) for a proposal about resultatives.

least one of their participants. With many transitive and unaccusative verbs, the kind of event described varies with the kind of direct internal argument in sometimes erratic ways. Take *pick*[7]. Picking a pumpkin, picking cat hair off your pants, picking a lock, or picking someone's pocket are quite different kinds of activities. And so are activities like plucking apples from a tree, plucking a goose, plucking guitar strings, or plucking a hair from your soup. What popping events are depends on what it is that pops: corks, balloons, eyes, or neighbors who just pop in. The verb *rise* hardly picks out a natural class of events either: you rise when you stand up or get up from bed, smoke may rise above the trees, rebels may rise against a cruel tyrant, lakes may rise, and prices and bread dough, too. If the meanings of those verbs are inherently relational and relate individuals and events, we understand why the type of the event described can depend on the type of direct internal argument in not entirely predictable ways[8]. It would be hard to account for this dependency under the assumption that a verb's argument structure is always syntactically constructed.[9] There seems to be a large group of inherently relational verb roots, then, and this suggests that as a class, verb roots might be predicative from the start. If they are, we would expect them to fall under Krifka's generalization, and they should have cumulative denotations. And if external and applicative arguments are not true arguments of their verbs, but are added in the syntax, we need thematic role predicates like *agent* or *goal* to introduce them. Those predicates should fall under Krifka's universal as well, and their denotations should be cumulative, too.

There is a major prediction of the 'cumulativity from the start' hypothesis for verbs and thematic role predicates, which has made it attractive for many researchers since it was first proposed in Krifka (1992)[10]. If the denotations of verbs and thematic role predicates are

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[7]. The following examples are all taken from the McGraw-Hill Children's Dictionary.

[8]. Dependencies of this kind do not seem exist between external arguments and the events described by their verbs. This was the main motivation for Marantz (1984) to suggest that external arguments are not true arguments of their verbs.

[9]. See Kratzer (forthcoming) for more arguments supporting the conclusion that not all of a verb's arguments are introduced in the syntax. Borer (2005) presents an opposing view.

[10]. See in particular Landman (1996, 2000).

cumulative from the start, the effortless availability of a cumulative[11] interpretation for sentences like 7(a) below is expected. We can represent that interpretation as in 7(b):

(7) a. Twenty children ate ten pizzas.

b. ∃e∃x∃y [*child(x) & /x/ = 20 & *agent (x)(e) & *pizza(y) & /y/ = 10 & *eat(y)(e)] [12]

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. For the 20 children to count as the plural agents of the pizza-eating event, they each have to have eaten at least part of one of the pizzas, and together, they must have consumed all 10 of them. 7(b) captures such scenarios. All predicates in 7(b) have cumulative denotations. As in Landman (1996, 2000), the basic predicates of our metalanguage are singular predicates that are pluralized with the *-operator, which maps sets that come with a sum operation to their smallest cumulative superset. 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. However, using the *-operator even for those predictable cases is still pedagogically useful as a reminder that we are dealing with cumulative denotations. I will follow this practice for clarity.

To see the impact of verb cumulativity in an event semantics in more technical detail, I will work through a very simple illustration, sentence (8):

(8) Two children lifted two boxes.

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11 . The term is due to Scha (1981,1984). Kroch (1974) coined the name 'serially distributive reading' for the salient interpretation of *The men in the room are married to the girls across the hall* (p. 204 f.). Sauerland (1998) uses the term 'co-distributive reading'.

12 . For any individual x, /x/ is only defined if there is a set of atomic individuals that x is the sum of. If defined, /x/ is the number of atomic individuals that x is the sum of, that is, /x/ = /{y: y ≤ x & atom(y)}/.

On the intended cumulative interpretation, (8) is again compatible with a wide range of situations, as long as two children did the lifting and two boxes were lifted in all. The children might have acted individually or jointly. The boxes might have been lifted one at a time or both together. And either box or the two boxes together might have been lifted once or several times. How does (8) manage to cover so many different kinds of situations? 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, then, which can be characterized as in Table 1:

	Box lifted	**Box lifter**
e_1	Red	Casey
e_2	Red	Stacey
e_3	Red	Stacey
e_4	Green	Casey+Stacey

Table 1

In truth-conditional semantics, the extensions of predicates depend on relations that hold in the actual world. A customary, non-cumulative, extension for *lift* would pair actual lifting events with the objects actually lifted, for example. Disregarding Schönfinkelization, the relation would include the pairs listed in (9) (assuming our scenario is true):

(9) Extension of *lift*

{<e_1, Red>, <e_2, Red>, <e_3, Red>, <e_4, Green>,.....}

The customary extension of 'agent' would include the pairs in (10):

(10) Extension of *agent*

{<e_1, Casey>, <e_2, Stacey>, <e_3, Stacey>, <e_4, Casey +Stacey>,.....}

So far, we have a close match between what might be 'basic' relations in the actual world and the relations in the extensions of the predicates. Intuitively, there are four box lifting events and three different agents. One of the agents is a plural individual, and that means that there is collective action. These kinds of denotations reflect nicely what is going on in the world as we see it. At this stage, extensions satisfy what Fred Landman has called the 'Collectivity Criterion'[13]. All plural individuals paired with an event are collectively involved in that event. All plural agents are collective agents, then. Enters Cumulativity, and our extensions seem to turn to mush:

(11) a. Extension of **lift*

{<e_1, Red>, <e_2, Red>, <e_3, Red>, <e_4, Green>, <e_1+e_2, Red>, <e_1+e_3, Red>,
<e_1+e_4, Red+Green>, <e_2+e_3, Red>, <e_2+e_4, Red+Green>,
<e_3+e_4, Red+Green>, <e_1+e_2+e_3, Red >, <e_1+e_2+e_4, Red+Green>,
<e_1+e_3+e_4, Red+Green>, <e_2+e_3+e_4, Red+Green>,
<e_1+e_2+e_3+e_4, Red+Green>, ... }

b. Extension of **agent*

{<e_1, Casey>, <e_2, Stacey>, <e_3, Stacey>, <e_4, Casey+Stacey>,
<e_1+e_2, Casey+Stacey>, <e_1+e_3, Casey+Stacey>, <e_1+e_4, Casey+Stacey>,
<e_2+e_3, Stacey>, <e_2+e_4, Casey+Stacey >, <e_3+e_4, Casey+Stacey>,
<e_1+e_2+e_3, Casey+Stacey>, <e_1+e_2+e_4, Casey+Stacey>,
<e_1+e_3+e_4, Casey+Stacey>, <e_2+e_3+e_4, Casey+Stacey >,
<e_1+e_2+e_3+e_4, Casey+Stacey >, ... }

The cumulative extensions in 11(a) and (b) include more than just the basic relations between individuals and events we might be prepared to recognize. There are more lifting events than we ever dreamed of, and, strangely, the sum of Casey and Stacey is the plural agent of most of them. There is nothing intrinsically bad about this state of affairs, however, as long as the truth conditions we predict are right. Are they?

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[13]. Landman (1996, 2000).

Assuming the cumulative denotations partially listed in (11), the logical representation 12(a) correctly comes out true. The open sentence 12(b) is satisfied by several variable assignments, including the one in 12(c):

(12) a. ∃e∃x∃y [∗child(x) & /x/ = 2 & ∗agent(x)(e) & ∗box(y) & /y/= 2 & ∗lift(y)(e)]

b. [∗child(x) & /x/ = 2 & ∗agent(x)(e) & ∗box(y) & /y/= 2 & ∗lift(y)(e)]

c. ‘e’ → $e_1+ e_2+ e_3+ e_4$

‘x’ → Casey+Stacey

‘y’ → Red + Green

Having cumulative denotations yields correct results not only for plural VPs, as in 13(a) and (b) below, but also for singular VPs, as in 13(c) and (d). Assume the same scenario as before and look at the following sentences:

(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.

13(a) to (d) should all come out true, and they do. 13(a) is verified by e_1+e_2, e_1+e_3, and $e_1+e_2+e_3$. 13(b) is verified by e_4. The fact that Stacey, but not Casey, lifted Red twice is in principle retrievable from 13(a) 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, there is only one such event, e_1. We can also retrieve the information that Casey and Stacey lifted Green collectively[14]. There is one event in

[14] . Lasersohn (1988, 1990, 1995).

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.

Some breaks have to be built in to prevent the sentences below from winding up true on our scenario:

(14) a. Red was lifted fourteen times.
b. Casey and Stacey together did eleven liftings.

True, there were fourteen events in which Red was lifted, and there were eleven liftings whose agents were Casey and Stacey. A basic principle of counting says that if I count you as an entity, I can't count your head separately. The same principle applies to counting events. If I count e_1, e_2, and e_3 as events of lifting Red, none of the other events in which Red was lifted can be counted, since they all contain at least one of those three events as a part. If that was the whole story, though, what would prevent me from claiming that Red was lifted exactly once, pointing to $e_1 + e_2 + e_3$ as my verifying event? Or exactly twice, with $e_1 + e_2$ and e_3 as the relevant verifying instances? What really seems to count in counting is atomicity. The extension of $*$*lift* contains exactly three atomic pairs that connect Red to a lifting event. Red was lifted exactly three times, then. And the extension of $*$*agent* contains exactly one atomic pair that connects Casey and Stacey to a lifting event. They did exactly one lifting together, then. All in all, it looks like cumulation preserves the information we want to extract from a verb's extension. Within an event semantics, cumulating predicate extensions does not lead to a loss of information we might need to get the semantics of adverbs like *twice* or *three times*, or *individually* or *together* right, for example[15].

[15]. A more complete test run is needed, though, see Kratzer (forthcoming), chapter 4. The pioneering work in this area was done by Peter Lasersohn (Lasersohn (1988, 1990, 1995). The toughest examples were constructed by Roger Schwarzschild (1991, 1992, 1993-94), 1996). And some of the crucial insights come from Barry Schein's work (1986, 1993).

4. How many readings? Phrasal Cumulativity

There is an ongoing debate about the number of readings for sentences like (8), repeated below as (15):

(15) Two children lifted two boxes.

Our analysis so far says that 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. It doesn't matter how they did it. Is it right to lump together all those interpretations that others have taken pains to distinguish[16]? VP-ellipsis constructions provide the best test I know of for individuating readings[17]. In the interpretation of VP-ellipsis constructions with ambiguous VPs, the ambiguity in the overt and in the silent VP must be resolved in the same way. This is illustrated in (16):

(16) I went to the bank, and you did, too.

Since *bank* is ambiguous the overt VP in (16) is ambiguous. I might have gone to a bank to deposit a check, for example, or to the bank of the Connecticut River to relax. Whatever interpretation you pick for the first VP, you have to pick the same interpretation for the second VP. Now consider (17):

(17) The two boys lifted the two boxes, and the two girls did, too.

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[16]. See e.g. Landman (2000). Schwarzschild has consistently argued against multiplying readings in his works on plurality. Schwarzschild (1990, 1991, 1992, 1993-94, 1996). I am aspiring to Schwarzschild's superego, but am exploiting the resources of an event semantics along the lines of Schein (1986, 1993).

[17]. Zwicky and Sadock (1975), Cruse (1986). Schwarzschild (1996) uses VP-ellipsis cases to argue that the distributive-collective 'ambiguity' is essentially a pragmatic one (chapter (5)).

Is (17) 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? I think the answer is 'yes', which shows that we are right in lumping together collective and cumulative interpretations into a single reading. Other combinations yield similar results. (17) would also be true, for example, if the boys lifted the two boxes just once, but the girls lifted them multiple times, and so on.

In addition to the cumulative interpretation we have been investigating, (15) has two distributive interpretations. (15) can also describe events where each one of two boys lifted two boxes. Such events might involve up to four boxes. And for some people, (15) might also be used to describe events where two boxes were each lifted by two boys. This time round the events might include up to four boys. Landman (1989) argued that when a plural DP produces distributive interpretations of this kind they should be derived by pluralizing its sister predicate[18]. The two distributive interpretations of (15), for example, can be produced as shown in (18) and (19):

(18) a. (2 children) $*$ [lifted 2 boxes]
b. (2 boxes) $*$ λ_1 [2 children lifted t_1]

(19) a. $*\lambda x \lambda e \exists y[*box(y) \& /y/ = 2 \& *lift(y)(e) \& *agent(x)(e)]$
b. $*\lambda x \lambda e \exists y[*child(y) \& /y/ = 2 \& *lift(x)(e) \& *agent(y)(e)]$

19(a) is the denotation of the predicate that can be obtained by starring the subjects sister constituent, as in 18(a). 19(b) is the denotation of the predicate that results from movement

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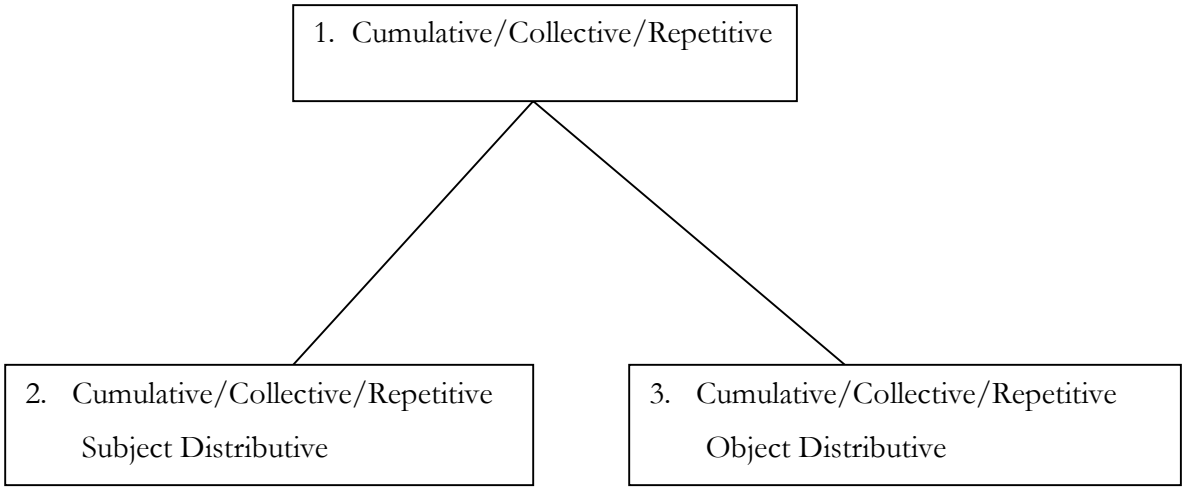
[18]. Landman draws a distinction between sums and groups in all of his works on plurality, and the analysis of Landman (1996, 2000) actually produces 8 readings for sentences like (15). Schwarzschild (1993-94), who is not working within an event semantics, argues explicitly for lumping together collective, cumulative, and distributive interpretations by starring all plural VPs, but builds context dependence into the definition of cumulativity. I am following the spirit of Schwarzschild throughout this paper, but in line with Schein (1986, 1993), Moltmann (1996), and Beck (2002), I expect the necessary contextual distinctions to come in via contextually restricted quantification over events.

of the direct object over the subject and starring the object's sister constituent, as shown in 19(b). Since starring a predicate always extends the original extension, both 18(a) and (b) still cover all the scenarios we discussed before. That is, 18(a) and (b) lump together the collective, cumulative, and repetitive interpretations of (15) with one of its two distributive interpretations. 18(a) can now also describe events in which up to two boxes were lifted. And the events picked out by 18(b) might include some where up to four boys did the lifting. If pluralization of verbal predicates is the correct way of accounting for distributive interpretations, we are committed to lumping together interpretations in a particular way. Here is the clustering of interpretations we predict for (15) so far:



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, as I will suggest below, 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. That kind of movement is bound to be costly, hence object distributive interpretations are expected to be dispreferred, if they are available at all. The LF 18(a) should then represent the default interpretation of (15). 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. If distinctions between distributive, cumulative, or collective action are needed for the semantics of adverbs like *together* or *individually*, for example, they can be easily retrieved in an event semantics, as Peter Lasersohn has shown[19].

The usual ambiguity tests should tell us whether we have individuated our readings correctly. In ellipsis constructions, for example, it should be possible to mix distributive and cumulative or collective interpretations[20]. Look at the following example:

(20) The two chefs cooked a stew, and the two students did, too. The chefs were very experienced, so they each prepared a Moroccan tagine. The two students worked together on a Boeuf Bourguignon.

The text in (20) does not feel inconsistent. It can only be perceived as consistent, though, if we are allowed to mix distributive and collective interpretations for the two conjuncts in the VP-ellipsis construction.

Roger Schwarzschild has observed that separating distributive and collective/cumulative interpretations can have undesirable consequences in the scope of negation. Here is a variation of one of his examples.[21]

(21) Beasly, better make sure those guys don't win a car this week!

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[19]. Without events, retrieving those distinctions is a bit of a trial, but Schwarzschild has done it. Schwarzschild (1993 - 94).

[20]. Schwarzschild (1996), chapter 5.

[21]. Schwarzschild (1993-94), 232, example (72). I changed the example to one that cannot be reduced to lexical cumulativity.

Like Schwarzschild's original example, (21) is to be understood as a demand made by a head mobster on one of his "flunkies". The relevant observation is that "Beasly's goose is cooked" if those guys win a car, whether as a group or individually. Beasly cannot save himself by arguing that he understood the demand only distributively or only collectively.

In this section, 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. We need *-operators that can pluralize phrases, then. Once we have those *-operators, do we still need Lexical Cumulativity? Can't those *-operators alone do the jobs we thought Lexical Cumulativity was responsible for?

5. Evidence for Lexical Cumulativity

The assumption that verbs start out with cumulative denotations has come under attack. Not because it was shown to be wrong, but because the generalizations it expresses looks like a special case of a much more general phenomenon. Several authors, most prominently Wolfgang Sternefeld, Uli Sauerland, and Sigrid Beck[22], 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, whether it is lexical or phrasal, basic or syntactically derived.

My immediate goal in this section is to show that the proposal of Sternefeld, Sauerland, and Beck overgenerates, and that there is still a theoretically distinguished place for Lexical Cumulativity and Krifka's Cumulativity Universal.

Look at the following examples, which all have singular indefinite objects and describe iterated events:

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[22] . Sternefeld (1998), Sauerland (1998), Beck (2000, 2001), Beck and Sauerland (2000).

(22) What does this intern do?

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.[23]

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. They look as if they were taking wide scope over an operator that pluralizes events (Zucchi and White (2001), van Geenhoven (2004)): A single parking lot is guarded habitually, a single elderly lady is cooked for repeatedly, a single ball is bounced again and again, and so on. This phenomenon shouldn't exist if we allowed free optional insertion of unpronounced star operators. 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. λe∃x [ball(x) & ∗bounce(x)(e)]

b. ∗ λe∃x [ball(x) & ∗bounce(x)(e)]

24(b) describes possibly repeated events in which more than a single ball might be bounced. In contrast, since *ball* is 'singular' (hence only describes singular balls), each event described by 24(a) can only have a single ball in it. In an event semantics, the facts in (22) and (23), fall

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[23]. Zucchi and White (2001), van Geenhoven (2004).

out if verbs are born as plurals. No obligatory scoping or a narrow scope "frequentative aspect" operator (van Geenhoven (2004)) has to be stipulated. To see this more clearly look at the computation of the denotation of the VP in (25):

(25) [bounce a ball]$_{VP}$.

a. $\lambda x\, \lambda e\, *\text{bounce}(x)(e)$

b. $\lambda R_{<e<st>>}\, \lambda e \exists x\, [\text{ball}(x)\ \&\ R(x)(e)\ ]$

c. $\lambda e \exists x\, [\text{ball}(x)\ \&\ *\text{bounce}\ (x)(e)]$

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

In a Davidsonian event semantics, the events described are always 'minimal' in the sense that an event of bouncing this ball, for example, is an event in which this ball is being bounced and which contains nothing above and beyond that ball and whatever it takes for it to be bounced. Crucially, it can't have a second ball in it. Since the relation described in 25(a) is cumulative, the property 25(c) can describe an iterated event made up of events which themselves have the property 25(c). However, whenever 25(c) is true of an event e and a subevent e' of e, the ball in e' is bound to be the same as the ball in e. Otherwise, e would have two balls, rather than one. Each event in the iteration, then, has the same ball in it. This is a direct consequence of standard Davidsonian event predication. This is how event predication is understood.

I haven't quite explained the facts in (22) and (23) yet, however. The assumption that verbs are born with cumulative denotations doesn't mean that verbs have to describe plural events, of course. 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 therefore 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. What is interesting for our story is that 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. In German, for example, both 26(a) and 26(b) imply that a single phone number was dialed for five minutes. That

even 26(a) should have that interpretation is surprising in a language that otherwise marks scope relationships between adverbs and DPs overtly.

(26) a. Ich hab' fünf Minuten lang eine falsche Telefonnummer gewählt.
I have five minutes long a wrong telephone number dialed.
I dialed a wrong phone number for five minutes.

b. Ich hab' eine falsche Telefonnummer fünf Minuten lang gewählt.
I have a wrong telephone number five minutes long dialed.
I dialed some wrong phone number for five minutes.

Lexical cumulativity allows us to explain apparent 'scope' puzzles of the kind seen in (22), (23), or (26). I will spell this out for durative adverbials. The habitual cases should be amenable to a very similar analysis. Suppose the denotation of durational adverbials like *for 5 minutes* is as in (27):

(27) a. $\lambda P_{<st>} \lambda e\, [P(e) \,\&\, e = \sigma e'\, [P(e') \,\&\, e' < e] \,\&\, f_{minute}(e) = 5]$[24]

The definitions in (27) use Link's σ-operator. In our case, the operator maps the events in the set {e': e' < e & P(e')} to their supremum - if it exists. The operation is undefined otherwise. We are talking about the sum of all events e' that are proper parts of e and have

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[24]. The function f_{hour} in (27) is a measure function that measures the time of an event in hours. If durational adverbs were the main concern of this paper, more would have to be said about the properties of such measure functions. When I say that I slept for two hours today, for example, we usually understand this as saying that there was a 2-hour interval during which I slept. The time of the event described is an interval, then. This doesn't have to be so, however. If I am paid by the hour, I may ask for my pay by informing you that I worked on your gutters for 20 hours. In that case, there is no implication that the time of the sum of all events where I worked on your gutters is an interval. Gaps are allowed. I might have worked on your gutters on several distinct occasions. Sometimes, what the measure function has to measure is the minimal interval that includes the times of all the subevents of the event whose time is being measured. When I report that I saw Dr. Spock for 5 years, for example, what I seem to be saying is that the minimal interval that includes the times of all of my visits to Dr. Spock's office is 5 years.

the property P. The requirement is that that sum be identical to e. Following Morzycki's Program of Modified Modification (Morzycki 2004) and the independently developed analysis of durational adverbs in van Geenhoven (2004)[25], we would eventually want to split up the denotation of durational adverbials like *for five minutes* into at least two parts:

(28) a. $\lambda P_{<st>} \lambda e\ [P(e)\ \&\ e = \sigma e'\ [P(e')\ \&\ e' < e]\ ]$

b. $\lambda e\ f_{minute}(e) = 5$

28(a) contributes iterativity/continuity and could be realized by a non-overt inflectional head in English. 28(b) is the contribution of the adverbial proper, which merely tells us how long the event lasted. 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) $\lambda e_s \exists x\ [number(x)\ \&\ *dial(x)(e)\ \&\ e = \sigma e' \exists x\ [number(x)\ \&\ *dial(x)(e')\ \&\ e' < e]$
$\&\ f_{minute}(e) = 5]$

(29) says that there was an event of dialing some phone number that was composed of proper subevents of dialing a phone number and lasted for five minutes. Given Davidsonian event predication, this implies that the same phone number was dialed throughout the event. If a sum of events involves just one phone number, none of its subevents can involve more than one phone number.

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[25]. Van Geenhoven's paper includes detailed discussion of West Greenlandic, where some of the relevant operators are overt. It seems that the overt West Greenlandic operators discussed by van Geenhoven are related to iterativity/continuity operators ("frequentative aspect" in van Geenhoven's terminology), and are thus not counterparts of our lexical *-operator, which merely indicates lexical cumulativity, a property that should be a universal property of verb stems if Krifka is right. We should not automatically expect a direct connection between the lexical *-operator and overt pluractional operators, then.

We have found a non-trivial consequence of the Lexical Cumulativity hypothesis, then. Assuming Lexical Cumulativity, iterative interpretations for verbs are possible from the very start, and iterativity without concurrent 'object distributivity' is the automatic result of introducing an ordinary singular indefinite in the early stages of a syntactic derivation. Given Lexical Cumulativity, habitual operators and durational adverbs do no longer have to pluralize the predicates they operate over, or introduce quantification over subevents. They merely have to make sure that those predicates do not describe any singular events, but are properly plural in a lexically defined sense. This means that we do 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.

The same data that provided evidence for Lexical Cumulativity also showed that $*-$operators cannot be inserted freely. If they could, we wouldn't expect the 'failure of distribution' effect illustrated in (23) and (24). But if $*-$operators cannot be inserted freely, we are left wondering where phrasal $*$-operators might come from. What is the force that produces phrasal cumulativity, hence many cases of distributivity?

6. The source of phrasal cumulativity

What makes phrasal cumulativity possible? Here is what looks like an obvious answer. It cannot be an accident that none of the sentences in (23) or (24) 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.

"My star, …, appears on the translations of *all* plural verb phrases. I also differ here from Landman (1989), who optionally translates plural verb phrases with a star. My star is obligatory: it is there whenever the verb is plural."

Schwarzschild 1993-94, p. 206

Within the current framework of assumptions, Schwarzschild's proposal has to be rephrased so as to allow for a more articulated sentence structure where VPs project a hierarchy of

functional heads, including habitual operators and heads that introduce external or applicative arguments. The relevant condition could now be stated as requiring that 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. Here is one particularly attractive way of executing this proposal. So far, I have only talked about the syntactic structure of plural NPs. Plural DPs are projected from determiners, and following Sauerland (2005), let us assume that 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[26]. We have structures of the following kind, then:

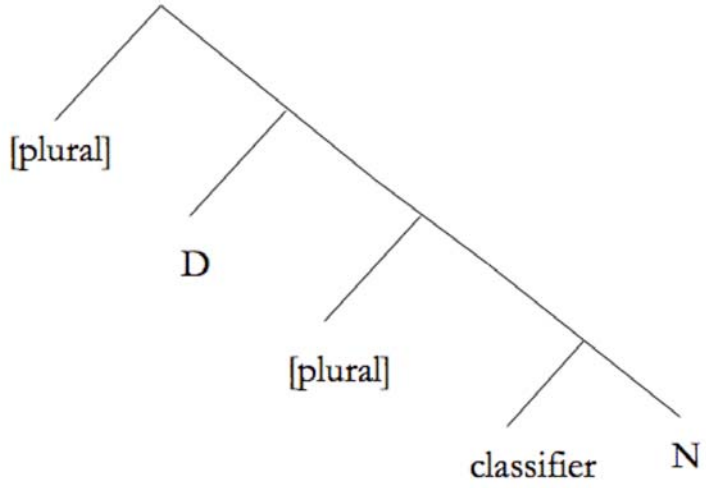

Figure 3

In Figure 3, there are two [plural] projections. The lower [plural] feature is responsible for the pluralization of the noun. According to Sauerland, the higher occurrence of [plural] could be there even if the plural DP doesn't contain any plural NP at all. DPs like *Spencer and Webster* for example, show all the behavior of plural DPs. They can trigger verbal agreement and can have distributive interpretations like other plural DPs. On Sauerland's proposal, the

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[26]. Sauerland assumes the existence of a number feature [singular], though, and takes [plural] to be the unmarked case. The idea I am adopting from Sauerland is that DPs may have two projections of a number

higher [plural] projection can be held responsible for those properties. How exactly? Here is a possible story. While the lower occurrence of [plural] in Figure 3 pluralizes the noun, the higher occurrence of the feature can't seem to be interpretable within DP. Suppose that nominal [plural] is always interpretable, and it always carries the cross-categorial plural operator. Since a higher [plural] feature can't be interpreted within its DP, it 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 like voice, aspect, or tense. Heim and Kratzer (1998) invoke the very same syntactic mechanism for the index of a moved DP that can be reparsed as a binder index for the DP's trace. If indices are agreement features, as proposed in Kratzer (2004), Heim and Kratzer's reparsing of the DP index means that moved DPs create their own verbal agreement projections by 'releasing' one of their features that could not be interpreted otherwise. This allows us to hold on to the generalization that indices are always interpretable. Likewise, allowing plural DPs to create their own verbal [plural] projection makes it possible for us to maintain the generalization that nominal [plural] is always interpretable. We can cut down on uninterpretable features that way.

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. We thus have the following configuration:

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feature. For us, that number feature could only be [plural]. If there is a feature [singular] at all, it has to be a classifier, and not a number feature.

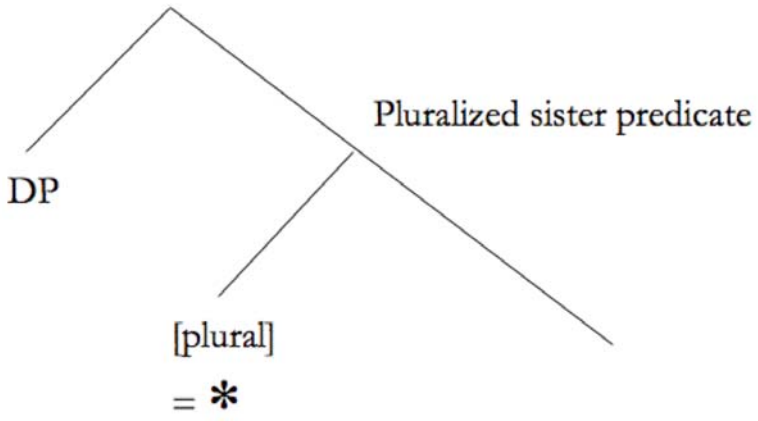

Figure 4

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. Here are some examples that seem to have the right properties to test our prediction.

(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(a) looks like a sentence that has a run-of-the-mill cumulative interpretation. If she had 5 children, the sentence allows for all of the usual cumulative scenarios. Each child might have gone to a different boarding school. All five of them might have gone to all five of the boarding schools. Two of the children might have each gone to three of the boarding schools, and the remaining three children might have gone to the remaining two boarding schools … and so on. This results follows directly from Lexical Cumulativity and the assumption that her offspring is the sum of her five children, as it should be. But why is (32) bad, then?

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

One possibility is that floated *each* needs to agree with [plural]. Interestingly, Oh (2001) has argued that the apparent Korean distributivity marker *sik* is not itself a distributivity operator, but is a particle that must be in the scope of a distributivity operator. If *each* is submitted to such a condition as well, we rule out (32) because of the lack of [plural] in *offspring*. We might be able to maintain, then, that *her offspring* denotes a semantic plurality, namely the sum of her descendants.

Since *offspring* is singular, we do not expect it to produce phrasal cumulativity. Not surprisingly, then, 30(b) implies that all of her children went to the same boarding school. In contrast, the sentences in (31) have a plural direct object, and we immediately see phrasal cumulativity pop up. In addition to a cumulative reading, 31(a) also has a reading where each of her children was sent to a different boarding school. And 31(b) is compatible with a scenario where each of her children went to a different boarding school. This interpretation, too, is the effect of phrasal cumulativity.

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[27], and can then produce distributive/cumulative interpretations. Here are some cases that sound acceptable to the ears of the native speaker I consulted:

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[27]. My dialect of German allows those kinds of singulars quite freely when two NPs with identical mass nouns are conjoined. The judgments of the one other native speaker of German I consulted (a North German

(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.

35(a) and (b) have distributive/cumulative interpretations. Since the DPs are singular, Lexical Cumulativity must be responsible. Good cases of essentially phrasal cumulativity can't seem to be produced in the absence of plural DPs. Sentences 36(a) to (c) lack distributive interpretations. 36(a) says that the two kinds of sugar were stored in the same jar, and 36(b) implies that the silverware went to the same cousin.

(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.

Another consequence of the proposed account of phrasal verbal cumulativity is that it should not be possible to simultaneously cumulate two non-event arguments. Pluralizing predicates with more than one non-event arguments is not an option within the theoretical framework assumed here. In a theory where external and applicative arguments are introduced by independent heads, 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[28]. A DP's sister constituent can only be of type <et> (properties of individuals) or <e<st>> (relations between individuals

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speaker) went more in the direction of my Standard American English consultant, whose use of those singulars is rather restricted. Agreement facts are, of course, a prime target for normative grammars, which might explain the more liberal judgments for a speaker from South Germany, who grew up in an area where various registers of regional dialects were spoken. Interestingly, both of my consultants reported that in many of those cases, they wouldn't want to use the plural either, and would therefore try to avoid those constructions altogether.

[28]. Sauerland (1998) and Beck and Sauerland (2000) invoke a special mechanism for the creation of 2-place predicates in the syntax. Seen from a perspective where moved DPs can create their own agreement projections by 'releasing' their index to become a binder index, that mechanism would allow a DP to move into the agreement projection created by another DP, and set up its own agreement projection within it. Nested agreement projections of this kind are interpretable, but are likely to be ruled out by general constraints on movement.

and events), then, 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. Consider now the following example from Beck and Sauerland (2000)[29]:

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

(29) has a cumulative interpretation. It could be true in a situation, for example, where each of the students got a bad mark from only one of the teachers. Not assuming an event semantics, Beck and Sauerland argue that the intended interpretation of (29) can only be derived by pluralizing the 2-place relation λxλy∃z [bad-mark(z) & gave-to(y)(z)(x)].

In an event-based semantics, the intended interpretation of (29) can be derived without pluralizing more than one non-event argument at a time by adopting an analysis along the lines of Schein (1986, 1993), who extensively discussed cumulative interpretations of this kind. The key for (29) 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 (30):

(30) ∗λyλe ∃z [bad-mark(z) & ∗gave(z)(e) & ∗goal(y)(e)]

The pluralized predicate in (30) is of type <e<st>>, hence only has one non-event argument. Applied to a plurality like those 20 protesting students, the predicate in (30) yields a property that can be true of events in which each of those 20 students received a bad mark, for example[30]:

(31) (∗λyλe ∃z [bad-mark(z) & ∗gave(z)(e) & ∗goal(y)(e)]) (those 20 protesting students)

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[29]. Beck and Sauerland (2000), p. 356.

[30]. Note that the ∗-operator blocks λ-conversion. Like the corresponding unstarred predicate, the starred predicate in (31) is of type <e<st>>, hence yields a predicate of type <st> after being applied to those 20 protesting students.

Next, we add the agent argument and saturate it:

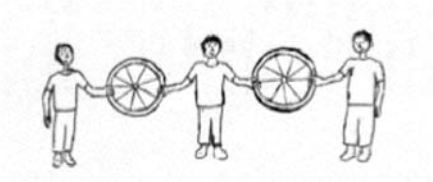
(32) λe [∗agent(those five teachers)(e) & (∗ λyλe ∃z [bad-mark(z) & ∗gave-to(y)(z)(e)])(those 20 protesting students)(e)]

The interpretation captured in (32) says that those five teachers were the agents of an event in which those 20 protesting students received one or more bad marks. This is the desired result.

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. Interestingly, 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.

Winter asks us to judge the truth of sentence (33) in the scenario depicted in figure 5:

(33) The children are holding a wheel.



Winter (2000), 63

Figure 5

Winter observes correctly that in situations of this kind, (33) is false or at least "highly strange". On Winter's own account, all non-lexical cases of distributivity are due to covert monadic distributivity operators that enforce atomic distribution. (33) would then be true just in case each child is holding a wheel. This condition is not satisfied in Winter's scenario.

Winter predicts (33) to be false in his scenario, then. Winter's point is that analyses where plural DPs trigger cumulation of their sister make false predictions in this case. Let's forget about events for a moment, and reconstruct Winter's argument. Boy_1 and Boy_2 are holding a wheel, and so do Boy_2 and Boy_3. The denotation of the unstarred VP in (33) 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. (33) is thus predicted to be true on Winter's scenario.

Does our event-based scenario fare any better here? On our account, the sister constituent of the plural subject in (33) expresses a relation between individuals and events, and it is that relation that is cumulated.

(34) a. $\lambda x \lambda e$ [$*$agent(x)(e) & $\exists$y [wheel(y) & $*$hold(y)(e)]]

b. $*$ $\lambda x \lambda e$ [$*$agent(x)(e) & $\exists$y [wheel(y) & $*$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 34(b)? It could only do so if there are pairs $<x_1, e_1>$ and $<x_2, e_2>$ that satisfy the relation in 34(a), where x_1+x_2 = 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:

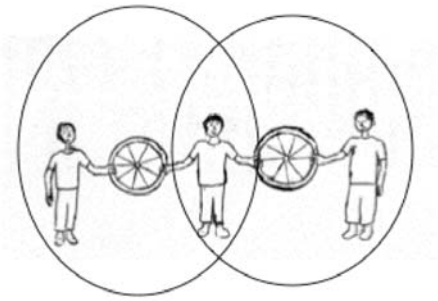


Figure 6

Any serious semantics relies on domains for the basic entities that provide the building blocks for the whole repertoire of denotations. In the extensional semantics assumed here, we have three basic types, for example: e for individuals, s for events, and t for truth-values. The truth-values are just True and False. For the domains of individuals and events, the subdomains containing the atoms play a special role. They contain the individuals and events that singular quantifiers quantify over. Among the atoms in the domain of individuals are the cups in my cupboard, for example. Those cups have parts, of course, and sometimes, we want to quantify over those parts, too. Sometimes. Usually, we do not recognize the parts of a cup as separate individuals - at least not the weird parts. The handles might be the topic of a discussion in some contexts. But there are many oddly individuated parts of those cups that hardly ever qualify. Take the parts of that cup over there that could instantly acquire a more respectable status if the cup was dropped and broke. The cup has all of those parts already, but they don't usually make it into our domain of atomic individuals. The parts of events behave no differently. True, the individuation conditions for events are a bit looser than those of most individuals, but that doesn't mean that anything goes. We can't assume that weirdness of parts should not play a role for events at all. The parts highlighted in Figure 6 are weird in most contexts. The prediction of our event-based account is then that (33) should be judged false or highly strange. There is a real question whether the two required subevents e_1 and e_2 exist in our domain of atomic events. That means that in the end, our account does slightly better than Winter's, which does not explain why (33) may be judged merely strange, rather than outright false in his scenario.

If the problem with Winter's example is related to the lack of properly individuated subevents in the original scenario, we expect (33) to be judged true in scenarios where the relevant subsituations are individuated more clearly[31]. This is so:

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[31] . See Schein (1986, 1993), Schwarzschild (1991, 1996), and (Beck (2002) for discussion of related cases. On Schwarzschild's account, matters of event individuation can indirectly influence the subpluralities we consider via contextually provided covers. His theory then predicts the same judgment for Winter's example as the event-based one. For Schwarzschild's proposal to work, cumulation has to be constrained so as to mirror event individuation. See Schwarzschild (1996), p. 96, footnote 27.

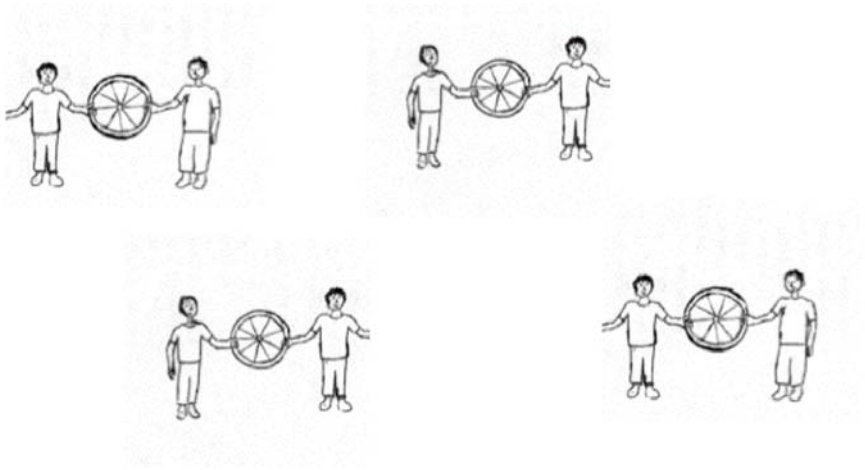

Figure 7

Sentence (33) is clearly true in the scenario of Figure (7). On Winter's account, it should be just as clearly false. Rather than presenting a challenge to our account, Winter's example provides a surprising piece of support.

I conclude, then, that plural DPs are themselves the 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.

7. Conclusion and questions for further research

It seems, then, that 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]. I have argued that [plural] is always interpretable, and always denotes the cross-categorial $*$-operator. Moreover, I have suggested that [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, even within a single language. In the long run, the behavior of [plural] in English might provide us with a general model of how essentially nominal features can provide operators for verbal projections.

While this study has focused on English, the results obtained generate expectations for other languages. Take the Chinese sentence in (35).

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

(35) only has a collective interpretation. "…the entire group of people denoted by *tamen* 'they' collectively bought a car."[32] For (35) to receive a distributive interpretation on the current account, its VP would have to be pluralized. This is expected to be impossible if DPs like *tamen* do not have a higher [plural] projection. If that projection is linked to agreement morphology, it is not necessarily available for all DPs that are semantically plural. To get a distributive interpretation for Chinese sentences like (35), the overt distributivity operator *dou* has to be used. In Chinese, then, *dou* is a carrier of the *-operator (Lin 1998, Yang 2001). If Chinese quantifiers generally quantify over pluralities, as Lin and Yang have argued, we expect *dou* to co-occur with quantifiers and create the distributivity effects that come with them. Those distributivity effects are not properties of the Chinese quantifiers themselves.

Natural languages are also known to have operators that exclusively pluralize properties of events. German *jeweils* is an example[33]. With the use of *jeweils*, we can again produce cumulative/distributive interpretations for sentences that do not have any plural DPs at all. Here is an example:

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[32] . Lin 1998, 201. I am indebted to Jo-Wang Lin for reminding me of this fact.

[33] . Link (1998), chapter 5, Zimmermann (2002). See also the discussion of Chinese event classifiers in Yang (2001), and Matthewson (2000) on Salish.

(36) Eine Kanne Milch hat jeweils ein Pfund Käse produziert.
One can milk has jeweils one pound cheese produced.
'On each occasion, one can of milk produced one pound of cheese.'

(36) is interpreted as talking about a situation that is the sum of multiple events where one can of milk produced one pound of cheese. *Jeweils* may thus be given the following interpretation, which is almost, but not quite, the denotation we posited for the iterativity/continuity component of durative adverbials.

(37) $\lambda P_{<st>} \lambda e\ [e = \sigma e'\ [P(e') \ \&\ e' < e]\ ]$

The lesson from (35) and (36) 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]. The exact source of phrasal plurality may thus not always be easy to determine for a given language. We may have to pay close attention to subtle differences between possible pluralization operations.

There is some indication that subject-distributivity is hard to get when the subject is left in a low position, as in the German sentence (38).

(38) Am Nebentisch rauchten vier Männer eine Zigarre.
At+the next table smoked four men a cigar
'At the next table four men were smoking a cigar'

(38) strongly suggests that the four men were sharing a single cigar. Subjects sitting in low positions are also known to have different agreement properties in some languages, e.g. French *Il est arrivé des enfants* ('there is arrived children'). 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? I have to leave serious investigation of this issue to another occasion.

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