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WAYS OF PLURALIZING EVENTS

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Abstract

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The central claim of this dissertation is that there is more variation than previously recognized in the types of plural events that verbal predicates can denote. To make this argument the dissertation presents a detailed description and analysis of a series of pluractional suffixes in the Mayan language Kaqchikel that derive verbal predicates that cannot be satisfied in single-event scenarios. The guiding theoretical question is to determine the relationship between pluractionality and better understood semantic phenomena such as nominal plurality and quantification. Based on original fieldwork on Kaqchikel, I argue for a broad three-way distinction between pluractional affixes, where: (i) the first class generates pluractional predicates with denotations similar to a formally distinct subclass of group nouns like *grove*, *bouquet*, *horde*, etc., (ii) the second class generates pluractional predicates similar to bare plurals, and (iii) the third class generates pluralities similar to those that are introduced when interpreting a quantifier like *every*. I further argue for a morphosyntactic spilt between the first type of pluractional affix and the latter two. The former composes with verb roots directly before they undergo cumulative closure, while the latter two apply to verb stems that have been cumulatively closed.

While pluractional verbs have types of plural reference familiar from the nominal domain, verbs in general establish plural reference in different ways than nouns, which follows from the fact that events, unlike individuals, are individuated in terms of their participants and spa-

tiotemporal location. I argue that to individuate the events that constitute an event plurality, pluractionals structure the way that a spatiotemporal trace function or theta-role function maps an event to its domain. In the case of the first two pluractional affixes, the temporal trace is crucial. In the last case, the pluractional targets a verb's thematic role. By structuring the relations between events and functionally related domains, the Kaqchikel pluractionals are semantically similar to Krifka's (1986,1992) incremental theme role or certain distributive adverbial modifiers in languages like English and Japanese (Brasoveanu & Henderson 2009 and Nakanishi 2007, respectively). By separating out the trace-based individuation requirements, not only is it is easier to see that there are fine-grained similarities between types of plural nominal and verbal reference, but differences between pluractional verbs and their nominal counterparts are accounted for.

Along the way, the dissertation develops novel analyses of a series of unexplained phenomena in Kaqchikel and English. In support of the analysis of the third class of pluractionals, I develop an account of *dependent indefinites* in Kaqchikel and other languages that explains why they are licensed by being interpreted both in the scope of a quantifier and as an argument of certain pluractionals. The analysis not only permits a better understanding of dependent indefinites in Kaqchikel, but it clarifies their place in a crosslinguistic typology of similar expressions (Balusu, 2006; Choe, 1987; Farkas, 1997, 2002; Yanovich, 2005, among others). Finally, I argue that insights from the analysis of pluractional affixes in the first part of the dissertation help explain the behavior of so-called pluractional adverbials in English, such as *one by one* or *house by house* (Beck & von Stechow, 2007; Brasoveanu & Henderson, 2009). While pluractional adverbials are different than Kaqchikel pluractionals due to their close connection to verbs of scalar change (Hay et al., 1999; Kennedy & Levin, 2008), they are similar in that they derive plural event predicates by structuring the relationship between the event argument and a functionally related domain, in this case, a domain of degrees. The proposal is that these adverbials fix the unit along which the progress of a verb of scalar change is measured, and by requiring at least two such increments, the modified predicates can only be satisfied by plural events.

For Lily

Acknowledgments

It's right that dissertations should start by honoring those who saw the author through to the end. Here my debts run deep.

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I have had many advisors during my time at Santa Cruz. I could not have imagined a better committee for myself. Doing a PhD is doing an apprenticeship, and my master was, without a doubt, Adrian Brasoveanu. Not only do I owe him a huge intellectual debt, but he taught me the being of being a linguist. We wrote abstracts, and handouts, and papers together at his house. I don't know how many practice talks I have given to an audience of only Adrian. I am so thankful for his friendship and mentorship. Judith Aissen has also played a huge role in my life, both in and outside of linguistics. I have always hoped to model in my life her deep commitment to Mayan languages and to improving the social situation for Mayas in Mexico and Guatemala. Judith has a love for languages as whole systems. If your analysis has implications outside of the artificial bounds you've laid out for it, well, you better go there. I always hope to go there. Last, but not least, Donka Farkas has been incredibly important in my growth as a semanticist. For Donka, an analysis is lacking unless there are deep theoretical insights underlying it. It should not just capture the generalizations, but tell us something about what languages are like. I'm still learning to work at that next level of theorizing, but I owe it to Donka for pushing me to push my work into that place. Finally, I need to thank Roger Schwarzschild for serving on my Qualifying Examine committee where a significant portion of the data presented here and their analyses were previewed. His sharp questions and encouragement pointed the way for the additional fieldwork that led to many of the generalizations presented in this dissertation.

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While I have received much support in writing this work, all shortcoming or errors in the analysis or data are my own.

Roma ri ch'ab'äl jun chïk rachulew.

–Magda Sotz Mux

Chapter 1

Introduction

Imagine looking in on a classroom at a public elementary school in the United States. It's the beginning of the schoolday and we watch the students recite the pledge of allegiance in unison. How many recitations were there? On one perspective it is perfectly reasonable to say that there was one recitation—the collective one. At the same time, the scenario seems to require many more than one. For instance, if George is one of the students, then it's surely true in this scenario that George recited the pledge of allegiance. Following the same logic for each student, we find ourselves committed to there being as many as n recitations. Intuitively, reaching an answer depends on the criteria we use for individuating events. The goal for this dissertation is to investigate how this question is resolved in natural language, that is, how natural language encodes ways of counting events.

To narrow down the investigation, the empirical focus of this work is verbal pluractionality (Cusic, 1981; Newman, 1980; Wood, 2007, inter alia). Pluractional morphemes (hereafter pluractionals), can be defined informally as verbal derivational morphology deriving predicates that cannot be satisfied in single-event scenarios. They are especially pertinent for the question at hand because they are able to specify which events to treat as one, while at the same time requiring a plurality of them. The following examples from the Mayan language Kaqchikel illustrate the phenomenon. Example (1) gives the root $\sqrt{}$*tzuy* 'sit' in a simple non-pluractional intransitive sentence, while (2) gives that same root derived by a variety of pluractional affixes, whose semantics we will investigate over the course of this dissertation and in more detail presently.

(1) *X-i-tzuy-e'.*
COM-A1s-sit-P.ITV
'I sat.'

(2) a. *X-i-tzuy-**ulöj**.*
COM-A1s-sit-**ulöj**
'I sat many times.'

b. *X-in-Ø-tzuy-**utzu'***
COM-E1s-A3s-sit-**utzu'**
'I made the motion of sitting there repeatedly.'

c. *X-in-Ø-tzuy-**ula'***
COM-E1s-A3s-sit-**ula'**
'I sat in various places.'

What unites the four pluractional sentences in (2) is that they are false if there is only one event of the kind described by the predicate. What is striking is that, in addition, these morphemes can considerably alter the character of the events constituting the resulting plurality. In these observations lie the two primary questions woven throughout this work: (i) how do pluractionals define the atoms that constitute plural events, and (ii) what should be the formal representation of the resulting pluralities?

What types of pluralities do pluractionals denote?

In tackling this second question, the dissertation fits into a long strand of research that looks for formal parallels between nominal and verbal denotations. For instance, it was not long after verbs were given an event argument in Davidson 1967; Castañeda 1967 that semanticists attempted to reduce the telic/atelic distinction to the mass/count distinction (Taylor, 1977; Bach, 1981, 1986). The idea is that telic verb phrases, like count nouns, denote in the space of atomic events, while atelic verb phrases, like mass nouns, have events with no atomic parts in their denotation. Parallels have also been drawn between predicative distributivity and nominal count plurality. Landman (2000), for instance, calls an event atomic just in case its participants are. Under this assumption, distributive predicates are just those with a plural event argument. Thus, distributivity is the reflex of count plurality in the event domain.

While these previous proposals for noun-verb denotational parallels have been deeply influential, the work done in their wake has not looked much beyond this most basic mass/count distinction. This is surprising given that subsequent research on nouns has yielded a large and varied typology of nominal plurality, including groups (e.g. Landman 1989b,a; Lasersohn 1995; Link 1983/2002; Barker 1992) and evaluation pluralities commonly associated with quantification (e.g. van den Berg 1996; Brasoveanu 2007; Nouwen 2003). Moreover, it is well known that neither mass nouns nor count nouns are uniform classes. Consider the work on *furniture*-type mass nouns (e.g. Rothstein 2010; Wierzbicka 1985) or the large literature on the semantics of bare plurals (e.g. Carlson 1977; Condoravdi 1992; de Mey 1981; Zweig 2009), which have a very different semantics than their determiner-bearing counterparts. If we assume that natural languages use similar ontologies across nominal and verbal domains, we either expect to find similar fine-grained distinctions in the verbal domain or we should have arguments for why predicates of individuals, but not predicates of events, should make certain distinction and not others.

This work takes up the challenge of investigating denotational parallels between nouns and verbs beyond the mass/count distinction. The research strategy is to focus on a unitary class of phenomena in one language, namely pluractionality in Kaqchikel. The advantage of this approach is that the same tests can be run in a controlled way across pairs of suffixes, which is done throughout this dissertation. Once we uncover subtypes of pluractionality, we extend the analysis by comparing individual pluractional affixes in Kaqchikel with pluractionals in other languages.

Based on original fieldwork, I show that pluractionals in Kaqchikel derive predicates of at least three different types of plural events, each of which is familiar from the nominal domain, namely COUNT, GROUP, and EVALUATION pluralities. At the same time, there are important differences between plural event predicates and plural nominal predicates of all three types, which I argue can be explained in terms of ontological differences between individuals and events.

Count pluralities and group pluralities

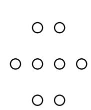
The first part of the dissertation leverages contrasts between the pluractionals in (3-4) to motivate a distinction between predicates denoting count-like event pluralities and those denoting group events.

(3) COUNT PLURALITY
*X-i-tzuy-**ulöj**.*
COM-A1s-sit-**ulöj**
'I sat a lot.'

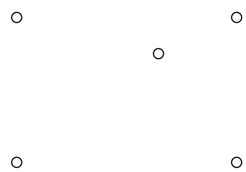
(4) GROUP PLURALITY
*X-in-Ø-tzuy-**utza'***
COM-E1s-A3s-sit-**utza'**
'I made the motion of sitting there repeatedly.'

In particular, the suffix in (3) is shown to derive pluractional predicates comparable to bare plurals under their existential reading. The strongest argument is that *löj*-pluractionals, like bare plurals, have both dependent and distributive readings (de Mey, 1981; Zweig, 2009). After analyzing *–löj*, we contrast it with the reduplicative pluractional *–Ca'* in (4). The differences motivate an analysis in which they denote group events. Crucially, these groups do not correspond to plural entities in the denotation of canonical group nouns like *team* or *committee*. Instead, the relevant pluractional predicates are similar to a distinguished, and unrecognized subclass of group nouns, like *grove*, which denote individuals with inherent spatiotemporal properties. For instance, the trees constituting a grove should be arranged more like (5) than (6). In contrast, there is no similar spatial property constraining what makes a good *team* or *committee*.

(5)



(6)



By homing in on the parallels between the pluractional in (4) and *grove*-type group nouns, the analysis improves on previous accounts of pluractionals in other languages making reference to groups (Wood, 2007; Tovena & Kihm, 2008). It also sheds light back on the proper semantics for *grove*-type group nouns, which have not previously been investigated.

Evaluation pluractionality and quantification

The third type of pluractionality discussed in the dissertation differs from the first two in its relation to quantification. The relevant suffix in Kaqchikel, shown in (7), forces a distributive interpretation of the internal argument of transitive verbs.

(7) EVALUATION PLURALITY

*X-e-in-q'et-**ela'***	*ri*	*ak'wala'.*
COM-A3p-E1s-hug-**ela'**	the	children

'I hugged the children individually.'

While a true quantifier is distributive in virtue of how it interprets its scope formula with respect to individuals satisfying its restrictor, I argue that the pluractional in (7) creates distributive dependencies in a scopeless way. At the same time, distributive pluractionality shares properties with bona fide quantifiers, in contrast to other pluractionals in the language, which must be accounted for.

In particular, it licenses the appearance of a special class of reduplicated indefinites that cannot appear unless they can be interpreted as covarying in the scope of a quantifier. For example, (8) only allows the reading where the numeral takes narrow scope and covaries with respect to the universal. When there is no quantifier, the sentence is ungrammatical. Crucially, however, it becomes grammatical if we add the pluractional suffix.

(8) ***K-onojel*** *x-ø-ki-b'ixa-j* ***ox-ox*** *b'ix.*
E3p-all COM-A3s-E3p-sang-SS **three-RED** song
'All of them sang three (different) songs.'

(9) Every^x student sang three different songs.

G	...	**x**	**y**
g_1	...	$student_5$	$song_1 \oplus song_2 \oplus song_3$
g_2	...	$student_1$	$song_7 \oplus song_6 \oplus song_5$
g_3	...	$student_4$	$song_{11} \oplus song_4 \oplus song_{12}$

To solve this puzzle, I present a new account of how reduplicated indefinites are licensed that explains what quantifiers and the distributive pluractional have in common. I argue that reduplicated indefinites are licensed when they are clausemates with an expression that introduces the type of plurality that is introduced when applying a quantifier to its restrictor, prompting a reappraisal of accounts of similar indefinites in other languages (Balusu, 2006; Choe, 1987; Farkas, 1997, 2002; Yanovich, 2005, among others). I then argue that interpreting the distributive pluractional results in the same type of plurality, even though is not a scope-taking operator.

Building the account requires extending work on quantificational anaphora to these two constructions in Kaqchikel (van den Berg, 1996; Brasoveanu, 2007). These approaches evaluate formulas relative to sets of variable assignments. Example (9) above illustrates the effect of interpreting the quantifier *every^x student*, which would require each assignment in **G** to store an individual student under **x**. Looking at the column under **x**, we see what has been called an *evaluation plurality* (Brasoveanu, 2010b), which can be picked up by a plural pronoun later in discourse. Part II of the dissertation argues that the third type of pluractional introduces evaluation pluralities as well, providing new evidence for their existence from a different domain, while at the same time arguing for a new type of pluractional plurality.

How do pluractionals derive predicates of plural events?

While the Kaqchikel facts support an analysis that makes reference to three different types of event pluralities, it is still unclear how pluractionals define the atoms that constitute plural events. It is worthwhile to take a moment to consider this question because it does not come up for the average count noun. An individual that satisfies the plural predicate DOGS has as its constituents individuals satisfying the singular predicate DOG. But this is not the case for many pluractional predicates. Consider the pluractional *–Ca'*, which when applied to achievements, suppresses their result state. Thus, events satisfying the pluractional predicate in (10) do not have parts satisfying the base predicate *ch'är* 'to split'.

(10) *X-Ø-in-ch'ar-**ach'a'*** *ri* *tros.*
COM-A3s-E3s-split-**Ca'** the stump
'I kept chopping at the stump.'
SPEAKER COMMENT: It's like if your axe is really dull.

The informal characterization of the events that constitute the plurality satisfying *ch'arach'a'* in (10) is that they are temporal subslices of normal splitting events in the denotation of the underlying predicate.

Example (10) is particularly striking, but effects like these are pervasive. Consider the case of distributive pluractionality, repeated from above in (11). Once again, the kind of events that can satisfy the underlying predicate are different than those that satisfy the pluractional predicate. In particular, (11) not only requires a plurality of events, but each event must have an atomic participant. In this way, the pluractional defines what counts as a single relevant event—it must have an individual child as its theme—and then it requires a plurality of them. This is not the case for the underlying predicate, which could be satisfied by an event consisting of a plurality of group hugs.

(11) *X-e-in-q'et-***ela'** *ri ak'wala'.*
COM-A3p-E1s-hug-**Vla'** the children
'I hugged the children individually.'

Thus, the identity of the elements constituting the pluractional event are dependent on its participants in ways that arbitrary plural events are not. But instead of individuating events via times like in (10), we want to say that plural events satisfying *q'etela'* in (11) have parts that are individuated by looking at slices of a plural participant.

These types of effects emerge in my account from the fact that events are dependent on spatiotemporal trace and thematic role functions for their individuation in ways that individuals are not. Consider, for instance, that my roommate's dog Diby is the same individual whether he is walking around the house or walking around the dog park, but *Digby's walking around the house* and *Digby's walking around the dog park* are not identical walking events under anyone's theory of events as particulars. My account of pluractionals builds off of this fact. While the resulting pluractional pluralities might be formally distinct, in each case, the elements that constitute them are individuated by way of spatiotemporal trace functions or theta-roles.

Under my account pluractional predicates do not directly impose the requirement that the event argument be mereologically complex. Instead, they place conditions on an event's spatiotemporal trace or theta-role function that could only be satisfied by plural events. In particular, pluractionals will contribute a partition of the event argument's spatiotemporal trace or one of its participants. They then require that each cell of the partition be the trace or participant of some other event. By individuating events in this way, the account correctly predicts that pluractionals should not only derive plural predicates, but have effects on both aktionsart and distributivity.

For instance, pluractional predicates like *ch'arach'a'* in (10) will denote spatiotemporally defined group events, that is, atomic events whose temporal trace is partitioned by a plurality of events satisfying the underlying predicate. If atomic events have contiguous temporal traces, then the analysis correctly predicts that the individual events composing groups must be contiguous. Moreover, if the result state of an achievement or accomplishment does not count for contiguity, then we correctly predict aspectual coercion to take place to minimize the culmination, which is what we observe in (10).

Similarly, we can account for the distributive entailments of (11) if the pluractional contributes a partition of the verb's internal argument and uses that partition to individuate events constituting a pluractional plurality. For example, I argue in Part II that for any event satisfying *q'etela'* there must be a fine-grained partition of its image under the theme theta-role—here a plurality of children—and each element of the partition—here individual children—must be the theme of a hugging event that is part of the event satisfying the pluractional predicate. In this way, we can see distributivity as a consequence of how the pluractional defines which atomic events can constitute a pluractional plurality.

These are just two examples of an effect we see throughout the dissertation, which is that pluractionals must individuate events in the course of building a plural predicate, and that the individuation criteria have ramifications for both aspect and distributivity.

Extensions to English

In building the analysis of derivational pluractionality in Kaqchikel, a recurring idea is that the parts of a plural event are individuated with the help of some domain to which events are related via homomorphism (see Nakanishi 2007 for the use of a similar idea to analyze the distributive interpretations of Japanese split numerals). The use of event-argument homomorphisms is an idea most closely associated with the classic account of incremental theme verbs in Krifka 1986, 1992. The final substantive chapter of the dissertation ties together pluractionality and incrementality by means of an investigation of so-called pluractional adverbials like those in (12).

(12) a. John ate the cake **piece by piece**.

b. Mary searched the ship **bulkhead by bulkhead**.

c. Lily drank the beers **one by one**.

While previous approaches focus on the fact that these X-BY-X adverbials require plural events or distributivity (Beck & von Stechow, 2007; Brasoveanu & Henderson, 2009), the approach I develop accounts for the distribution of these adverbials within a larger theory of scalar change (Hay et al., 1999; Kennedy & Levin, 2008). The idea is that X-BY-X adverbials fix the unit along which the progress of a verb of scalar change is measured. By requiring at least two such increments, these adverbials modify predicates so that they can only be true of plural events. While English pluractional adverbials are slightly different than the core cases of pluractionality in Kaqchikel, they share similarities. They fix what counts as one (the unit), and then indirectly create plural event predicates by putting conditions on a domain to which events are related (here a scalar one).

The general picture this dissertation paints is one in which the variety of plural events is richer than previously acknowledged. While richer, the types of plural events are familiar from the nominal domain, allowing us to conclude that natural language uses similar ontologies across the domains of individuals and events. Where nouns and verbs differ is in how plurality is managed, which is to be expected given the ontological differences between events and individuals. Instead of using part-whole relations alone, pluractional morphemes structure plural events via functionally related domains: times, individuals, degrees, etc.

1.1 Outline of the dissertation

The chapters that follow are organized into three parts. Part I is centered on a distinction made in the typological literature between *event-internal* and *event-external* pluractionals (Cusic, 1981; Wood, 2007, inter alia). It argues that this distinction reduces to a contrast between *grove*-type group plurality and count plurality in the event domain, and shows that two pluractionals in Kaqchikel instantiate the relevant patterns. The second part looks closely at the parallels between pluractionality and quantification. This part of the dissertation builds an analysis of distributive pluractionality in Kaqchikel, showing its close connection to bona fide quantification. The final part of the dissertation looks at verbal plurality and reference to degrees. In particular, it builds a new account of English pluractional adverbials that draws close connections between verbal plurality and theories of scalar change.

In chapter 2 I begin the investigation by laying out previous work on the split between *event-internal* and *event-external* pluractionals. Intuitively, event-external pluractionals require a plurality of events that can take place intermittently on different occasions and in different locations, like *John chopped down a tree occasionally*. In contrast, event-internal pluractionals require the continuous repetition of an event (or some subphase of an event satisfying the description given by a root), like *John kept chopping at a tree*.

In chapter 3 I show that the Kaqchikel suffix *–löj* in (3) has the properties of an event-external pluractional. Based on the behavior of *löj*-pluractionals with respect to various types of distributively interpreted subjects, I propose that *–löj* derives verbal predicates analogous to existential bare plural nominals. While there are important similarities between the plural events in the denotation of *löj*-pluractional and bare plurals there are also differences. I show that the pluractional suffix targets the event argument's temporal trace in the course of deriving a plural predicate, and that an analysis cast only in terms of part-whole relations is insufficient.

Chapter 4 turns to the Kaqchikel suffix *–Ca'*, shown in (4), and event-internal pluractionality. I first show that *–Ca'* behaves like a prototypical case of event-internal pluractionality. I then build a unified account of its core properties. In particular, *–Ca'* can only apply to predicates that are semelfactive or coerced into semelfactives, and the events they denote are opaque to all forms of distributivity. These distinctions can be explained if event-internal pluractionals denote predicates of spatiotemporally defined group events, comparable to *grove* in the nominal domain. Finally, I present a series of arguments for the new idea that event-internal pluractional markers apply to verb roots directly, while event-external pluractionals apply only after cumulative closure. This has important ramifications for theories that assume some form of the *cumulativity universal*, that is, that all natural language predicates are cumulatively closed (Landman, 1996; Kratzer, 2005; Krifka, 1989, 1992). The view we come to is that all predicates are cumulatively closed before inflection, though operators below the level of the word can apply either before or after cumulative closure.

Chapters 5 and 6 constitute Part II of the dissertation. The focus is on the pluractional –*la'*, which not only requires a plurality of events, but generates distributive entailments about the theme argument of transitive verb stems. I argue that this pluractional derives predicates of event pluralities like those introduced when interpreting a distributive quantifier, and that these pluralities are formally distinct from those introduced by the pluractional predicates we have seen before. Distributivity comes, not from scope-taking, but from the way that events in this plurality are individuated, which is mediated by theta-role functions. The fact that –*la'* is not scope-taking, but introduces pluralities similar to bona fide distributive quantifiers, is used to explain similarities and differences between pluractional distributivity and quantificational distributivity over individuals.

Finally, in chapter 7 I move from Kaqchikel to English in order to investigate adverbials like *piece by piece*, *one by one*, etc., which on the face of it appear similar to derivational pluractionality in other languages. It should be immediately clear, though, that these adverbials cannot be exactly the same since they have nominal content that stereotypical cases of pluractionality do not. That being said, I show that they are similar to pluractionals in that they derive predicates of plural events indirectly by operating on an domain against which an event can be measured. In particular, X-BY-X adverbials set the unit for verbs of scalar change and require that at least two such changes take place. Thus, predicates modified by X-BY-X adverbials can only be satisfied by plural events. In addition to clarifying the connection between X-BY-X adverbials and pluractionality, the chapter explores the ramification of the account for theories of verbs of variable telicity based on scalar change (Hay et al., 1999; Kennedy & Levin, 2008).

1.2 Methodological note

The uncited Kaqchikel data presented here come from fieldnotes I collected between 2005 and 2011, though I worked most intently on pluractionality from June to August 2010 and February to March 2011. I primarily worked with two speakers over the latter two time periods, a woman in her mid-thirties from Chiq'al (Comalapa, Chimaltenango) and a man in his mid-fifties from Pa K'im (Santiago, Sacatepéquez). During this period I also spent this time working on a healthcare neologisms project at Kaqchikel Cholchi, the Kaqchikel branch of the Académia de Lenguas Mayas de Guatemala, and would ask native-speaker linguists there for their judgements and their opinions on possible analyses of the constructions presented here.

I worked almost entirely with elicited data because examples of pluractionals in naturally occurring discourse are rare. Actually, none occur in the ten stories I have collected and translated, nor in the 50 hours of transcribed midwife interviews I am currently digitizing. This is not particularly surprising, though. When we look at the Corpus of Contemporary American English (COCA) for pluractional adverbials like *one by one*, we find they only occur at rate of one per 150,000 words. Moreover, their distribution is heavily genre dependent. That being said, I make use of semi-naturally occurring examples from the Cutzal Chacach et al. 1999 dictionary.

The data presented here were elicited using fairly standard techniques (see Matthewson 2004). The primary elicitation technique was truth value judgement in a context. For example, I present a context like in (13) orally and ask whether a sentence like (14) could be uttered in that context. Acceptance of such a sentence (this one is accepted), is taken as an indication of truth and felicity.

(13) Suppose its a holiday and you hear fireworks explode every minute for an hour.

(14) *X-e-b'oj-löj* *ri* *aj.*
COM-A3p-explode-löj the fireworks
'The fireworks kept exploding.'

The rejection of such a sentence in a context indicates either falsity or infelicity. This was usually cleared up with follow-up questions. While speakers are not always able to separate falsity from infelicity, they are usually good about judging whether you would be lying if you said the sentence at hand in the relative context. This was the test I used for falsity. For example, (16) is judged false in (15) because if you said (16) you would be lying. This shows that *–löj* requires not just plural events, but plural events of a sufficiently large cardinality.

(15) Suppose it's a holiday and you hear fireworks go off two or three times in an hour.

(16) *#X-e-b'oj-löj* *ri* *aj.*
COM-A3p-explode-löj the fireworks
'The fireworks kept exploding.'

I primarily used Kaqchikel as the meta-language for presenting contexts. This was due mostly to sociolinguistic factors. The two speakers I worked closely with just prefer to speak in Kaqchikel. This seeped into all areas of elicitation, including the presentation of discourse contexts. Even though this was the natural situation for my fieldwork, there are cases where presenting the context in Kaqchikel is the best option. For example, Kaqchikel has a pluractional suffix, discussed in Part II, that forces distributive readings of plural internal arguments. Example (17) presents the relevant contrast.

(17) a. *X-e'-in-q'ete-j'* *ri* *ak'wal-a'.*
COM-A3p-E1s-hug-SS the child-PL
'I hugged the children.'

b. *X-e'-in-q'ete-**la'*** *ri* *ak'wal-a'.*
COM-A3p-E1s-hug-PLRC the child-PL
≈ 'I hugged the children one by one.'
i.e., False if I give the children a group hug.

One dimension along which distributive expressions can vary is whether they also allow cumulative readings (e.g. Schein 1993).

(18) Suppose that, between them, 3 copy-editors caught all the mistakes in a manuscript.
a. Three copy editors caught every mistake in the manuscript.
b. #Three copy editors caught each mistake in the manuscript.

In order to know whether the distributive entailments established by *–la'* are more like those established by *each* or *every*, we must test for cumulative readings of distributively interpreted internal arguments of pluractional predicates using a truth value judgement in a context, like in (19).

(19) K'o chi niqanik'o jujun täq kem ütz ütz. Jun samajel ninik'o**la'** nik'aj. Jun chïk samajel ninik'o**la'** nik'aj chïk. *We have to examine some weavings very closely. One worker looks through half of them one by one. The other looks through the other half one by one.*

a. *Ka'i'* *samajel-a'* *x-Ø-ki-nik'o-**la'*** *ri* *kem.*
two worker-PL COM-A3s-E1p-look.through-**-la** the weaving
'Two workers looked through the weavings one by one.'

The test sentence (19a) is judged true in the context (19), showing that distributively interpreted internal objects of pluractional sentences can have cumulative interactions with subject quantifiers. To set up the context in Spanish, though, we would have to paraphrase the pluractional predicate. Although "uno por uno" *one by one* is the closest such paraphrase, even this distributive operator does not overlap completely with *–la'*. For instance, *–la'* can distribute over atomic parts of a singular individual, *–la'* is ungrammatical with stative predicates, *–la'* requires a larger number of events, etc. The general problem is that Spanish and Kaqchikel divide up the space of distributive meaning in different ways, making simple direct paraphrases difficult. If the entailment had not gone through using Spanish, it would not be possible to tell if it were due to a lack of cumulative readings or an inadequate paraphrase. By using Kaqchikel to present discourse contexts, we can be sure that the entailments follow from the semantic contribution of the relevant construction. Using the object language to present meta-contexts is generally the safer choice. It also leads to a lot of discussion about the construction at hand in the object language, which often yields usable data in itself.

In addition to establishing discourse contexts using natural language, I also used non-linguistic tasks. In particular, for more complex contexts, I would give a speaker a command using the pluractional and they would act-out the command. After that, I would have the speaker give me the command. Instead of performing the same action, I would alter what they did minimally and ask if I still did what I was told. For example, given (20), the speaker picked up the napkins one by one. When given the same command, though, I picked up the napkins in three big handfuls. Asked whether I followed her order, the answer was no.

(20) *T-Ø-a-chap-**ala’*** *ri* *su’t.*
COM-A3s-E2s-handle-**la’** the napkins
‘Grab the napkins individually!’

Once again, a negative judgement does not separate falsity from infelicitousness, but once complex discourse contexts like these have been set up via demonstration, it is easy to follow up with “would I be lying” type questions. For example, I could ask whether I would be lying if I reported (21) assuming Maria did exactly what I just did.

(21) *#Mariy x-Ø-u-chap-**ala’*** *ri* *su’t.*
Maria COM-A3s-E3s-handle-**la’** the napkins
‘Maria touched the napkins individually.’

Finally, I also presented contexts for truth value judgements pictorially. This strategy was used considerably less than the others, though. Figures 1.1 and 1.2 present the type of picture I would give. In figure 1.1 we see three children, each with a stack of three tortillas. In contrast, the children in figure 1.2 are sharing three tortillas. I would then ask whether sentences like (22-23) were true relative to the picture.

(22) a. *Ri ak’wal-a’ ni-Ø-ki-tij oxi’ wäy.*
The child-PL ICP-A3s-E3p-eat three tortilla
‘The children are eating three tortillas.’

b. *Ri ak’wal-a’ ni-Ø-ki-tij ox-ox wäy.*
The child-PL ICP-A3s-E3p-eat three-RED tortilla
‘The children are eating three tortillas each.’

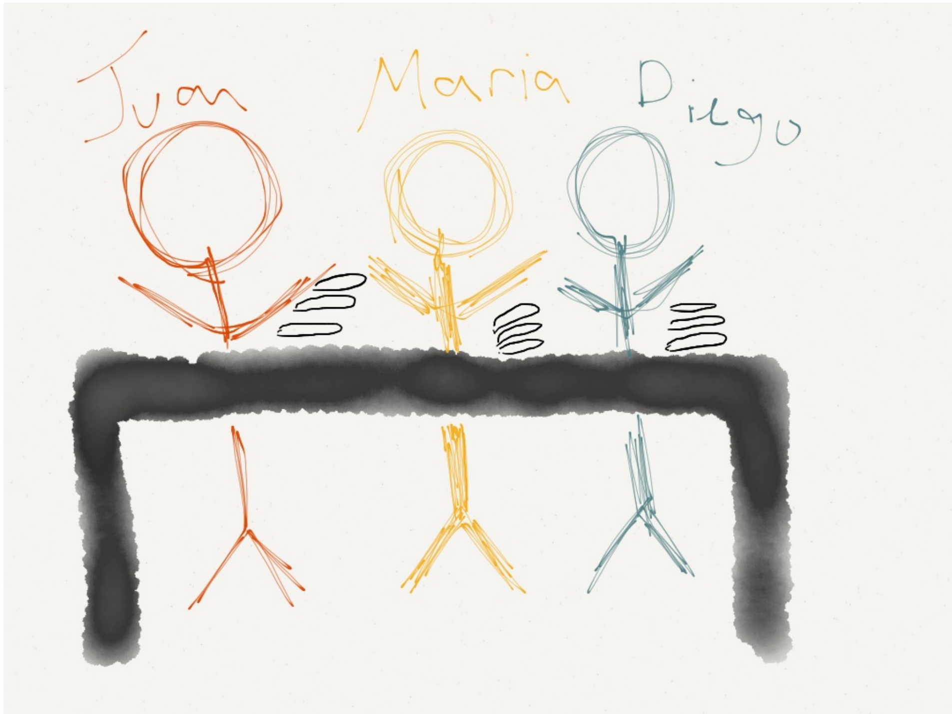


Figure 1.1: Children eating three tortillas each.

(23) a.

Ri	*ak'wal-a'*	*ni-Ø-ki-tij*	*oxi'*	*wäy.*
The	child-PL	ICP-A3s-E3p-eat	three	tortilla

'The children are eating three tortillas.'

b.

#Ri	*ak'wal-a'*	*ni-Ø-ki-tij*	*ox-ox*	*wäy.*
The	child-PL	ICP-A3s-E3p-eat	three-RED	tortilla

'The children are eating three tortillas each.'

The pattern above shows that plain indefinites allow both distributive and cumulative interpretations, while dependent indefinites allow only the distributive interpretation.

While I hope in the future to find examples of naturally occurring pluractionals in texts, elicitation is still the best way to access the truth conditions of expressions in a controlled way. All of the tasks I use are variations on a simple truth value judgement task relative

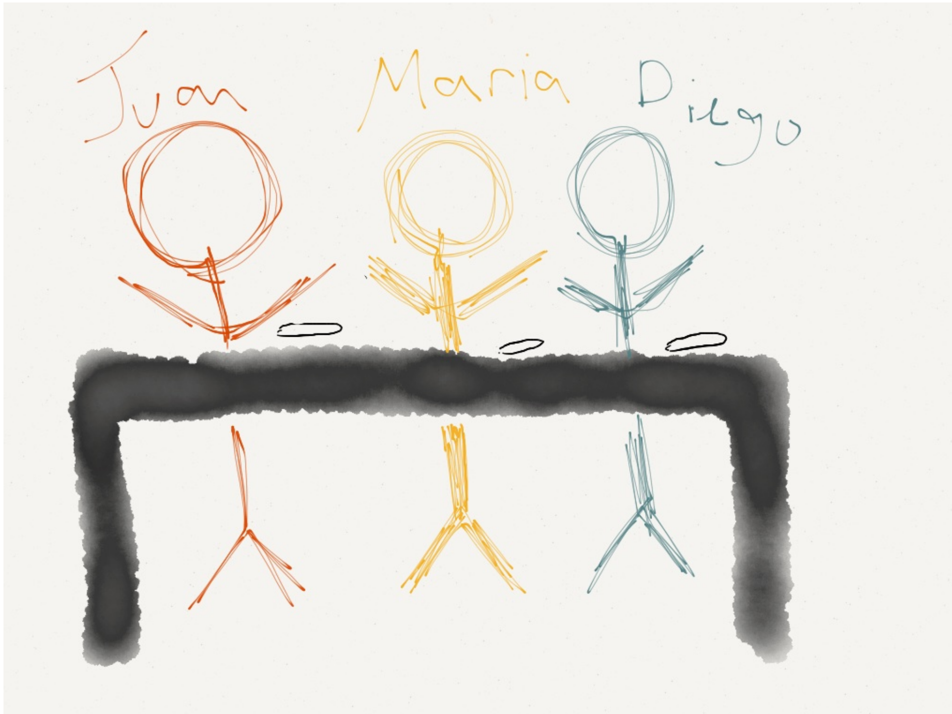


Figure 1.2: Children eating three tortillas total.

to a context. That being said, using a mixture of linguistic and non-linguistic tasks has its advantages. I found that it is easier to get crisp false judgments when sentences were interpreted relative to a linguistically presented context.[1] But, if the context got too long or too complicated, speakers tended to have trouble remembering all of the relevant parts. In these situations, moving to an act-out task or a picture task provided better results.

[1]I had to be especially careful when using the act-out task. The first couple times I tried it, speakers would reject everything as infelicitous because I didn't copy exactly what they did. I think this is because, when expressions are ambiguous, they would perform the most likely interpretation, drawing attention away from other possibilities. After a while, though, I felt that the speakers I worked with became as comfortable using the act-out task to make truth value judgements as with purely linguistic tasks. Even better, the speakers I worked with preferred this sort of task to others. I expect that this is because it is more engaging. I think it is worth doing an act-out tasks for this reason alone, even if you have to spend a little more time making sure you are getting falsity, and not infelicity judgements.

1.3 A Quick Introduction to Kaqchikel

Kaqchikel is one of about thirty extant Mayan languages spoken throughout Meso-America. Kaqchikel is a K'ichean language belonging to the Eastern Branch Mayan languages of Guatemala. In particular, Kaqchikel is spoken in the Western Highlands, north and west of Lago Atitlán, by over 500,000 people (Richards, 2003).

While Kaqchikel is threatened by Spanish, and the rate of biligualism is high in most municipalities (Richards, 2003), the linguistic situation in post-Peace Guatemala seems to be improving. The 2003 Ley de Idiomas provides Kaqchikel co-official status with Spanish in the municipalities in which is it is spoken, and guarantees access to school, healthcare, and legal services in the language (Maxwell, 2011). The availability of these services is still theoretical in the most part, but both the government and parents have shown an interest in improving bilingual education for Kaqchikel-speaking children. In particular, a special branch of the Ministry of Education, the Directorate for Bilingual Education (Dirección General de la Educación Bilingüe, DIGEBI), now provides early bilingual education in rural schools (Maxwell, 2011). Also, there has been a growth in community- and parent-directed bilingual schools under the auspicies of the National Committee for Maya Education (Comité Nacional de Educación Maya, CNEM) (Greebon, 2011). Finally, Maddox 2011 reports that even in towns that suffered heavy language loss during the civil war, there is a growing interest among heritage speakers in reclaiming their language through local cultural and trade organizations.

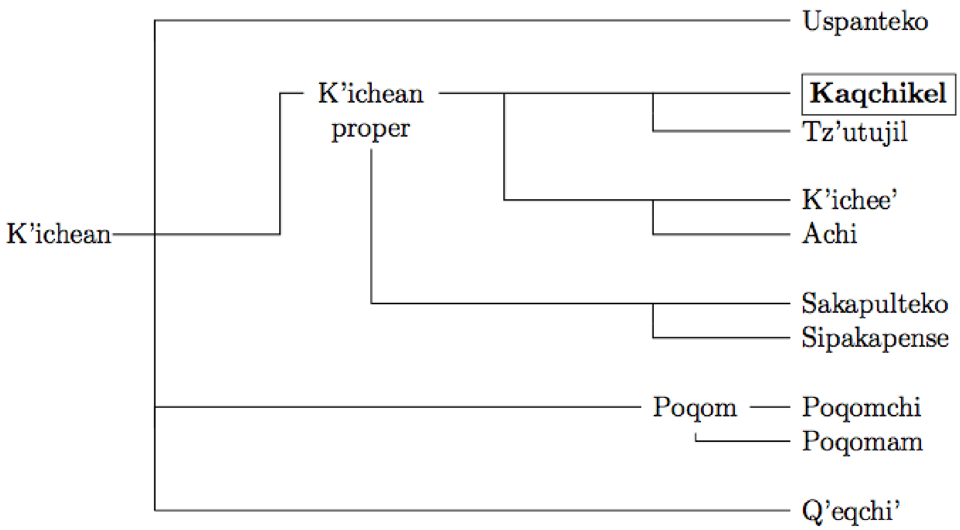


Figure 1.3: K'ichean-branch Mayan languages (after Kaufman 1974; Richards 2003)

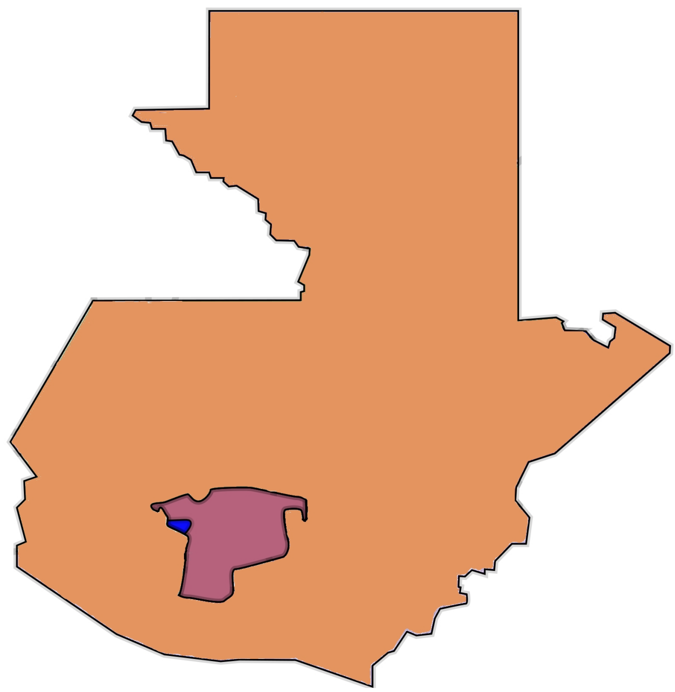


Figure 1.4: Kaqchikel-speaking region following Icke 2007 (Lago Atitlán in blue).

Orthographic note:

The chart below shows the standard Mayan orthography used throughout the dissertation. The velar fricative [x] is written “j", the palato-alveolar fricative [ʃ] is “x", the palatal approximant [j] is “y”, and the glottal stop [ʔ] is an apostrophe.

	bilabial	alveolar	palato-alveolar	palatal	velar	uvular	glottal
stop	p b’	t t’			k k’	q q’	’
affricate		tz tz’	ch ch’				
fricative		s	x		j		
sonorant	m w	n l r		y			

Figure 1.5: Standard Mayan orthography

In addition, Kaqchikel has a tense-lax vowel distinction in final syllables which is represented with a diaeresis.

1.3.1 Alignment and basic order

Like other Mayan languages, Kaqchikel is verb initial and exhibits ergative alignment. But, since Kaqchikel allows PRO-drop in both arguments, most naturally occurring clauses have no overt arguments. Even when there are overt arguments, Kaqchikel makes heavy use of leftward topic and focus movement, obscuring its verb initiality. Figures 1.6 and 1.7 give the ergative and absolutive prefixes (called SET A and SET B in the Mayan literature), while (24) presents a canonical transitive and intransitive clause, illustrating verb initiality and the distribution of the two classes of agreement morphology.

	SG	PL
1st	in- / inw-	qa- / q-
2nd	a- / aw-	i- / iw-
3rd	(r)u- / r-	ki- / k-

Figure 1.6: Ergative or Set A: [before C] / [before V]

	SG	PL
1st	i- / in-	oj-
2nd	a- / at-	ix-
3rd	Ø	e- / e'-

Figure 1.7: Absolutive or Set B: [before C] / [before V]

(24) a. *X-**e**-**ru**-pön* *wäy* *ri* *ixtan-i'.*
COM-**A3p-E3s-**make.tortilla tortilla the girl-PL
'The girls made tortillas.'

b. *X-**e**-b'iyin* *ri* *ixtan-i'.*
COM-**A3p-**E3s-walk the girl-PL
'The girls walked.'

In addition to transitive and intransitive clauses, Kaqchikel has a third major matrix clause type build on non-verbal predicates. They bear no aspect marker, as in (24), just a single absolutive agreement marker.[2] Non-verbal predicates play a role in this work because pluractionals in Kaqchikel cannot suffix to them, which I argue is a reflex of the fact that they cannot derive stative predicates more widely.

(25) a. ***E*** *tzuy-ül* *ri* *ixtan-i'.*
A3p sit-P.STAT the girl-PL
'The girls are seated.'

b. ***E*** *jwi'* *ri* *ixtan-i'.*
A3p intelligent the girl-PL
'The girls are intelligent.'

[2]Standardized Kaqchikel orthography prescribes writing the absolutive marker separate from non-verbal predicates. It is an open question whether they are less morphophonologically integrated.

In all the examples thus far, verbal agreement is prefixing. It is more generally the case in Kaqchikel that inflection is prefixing, while derivation is suffixing. For instance, the possessed nouns in (26) bear prefixing agreement with their possessors.[3] The same is true for so-called relational nouns in (27), which are used to express various oblique argument relations, as well spatial relations.

(26) a. ***ki**-tz'i'* *ri* *tixojel-a'*
E3p-dog the student-PL
'The students' dog'

b. ***q**-oochoch*
E1p-house
'Our house'

(27) a. *X-Ø-u-sipa-j* *chi* ***k**-e'* *ri* *tixojel-a'.*
COM-A3s-E3s-give-SS P **E3p**-DAT the student-PL
'He gave it to the students.'

b. *X-Ø-u-xib'ij* ***r**-i'* ***r**-oma* *ri* *job'.*
COM-A3s-E3s-cry **E3s**-REFL **E3s**-PURP the rain
'He got scared because of the rain.'

c. *X-i-b'e* *chi* ***r**-ij* *ri* *jay.*
COM-A1s-go P **E3s**-behind the house
'I went behind the house.'

In contrast, derivation is primarily suffixing. The sentences in (28-31) give canonical examples of verb derivation, including a passive, antipassive, causative, and nominalization, while (32) shows how adjectives derive intransitive verbs.

(28) *X-Ø-sipa-**x*** *chi* ***k**-e'* *ri* *tixojel-a'.*
COM-A3s-give-**PAS** P **E3p**-DAT the student-PL
'It was given to the students.'

[3]This is the same agreement marker cross-referencing subjects of transitive verbs, which is common in languages with ergative alignment.

(29) *X-Ø-sipa-**n*** *chi* ***k**-e'* *ri* *tixojel-a'.*
COM-A3s-give-**AP** P **E3p**-DAT the student-PL
'He gives to the students.'

(30) *X-Ø-u-war-**isa**-j* *ri* *ney.*
COM-A3s-E3s-sleep-**CAUS**-SS the babe
'He put the baby to sleep.'

(31) *Aq'oma-x-**ik*** *ni-Ø-b'an* *chi* *r-e'* *rija'.*
cure-PASS-**NOM** ICP-A3s-do.PAS P E3s-DAT him
'Healing is what was done for him.'

(32) a. *X-Ø-nim-ir.*
COM-A3s-big-ITR
'It got big.'

b. *X-Ø-kaq-ir.*
COM-A3s-red-ITR
'It got red.'

Derivation places a central role in this dissertation because Kaqchikel pluractional morphology is derivational. Like all verbal derviational morphology in the language, it is suffixal, and is sensitive to the both the transitivity and stem class of the verb to which it applies.

1.3.2 Derivation and verb classes

Kaqchikel, like many languages with pervasive ergativity, morphologically distinguishes transitive and intransitive verbs in ways over and above inflection. For example, Kaqchikel has a class of suffixes, called STATUS SUFFIXES in the Mayan literature, that mark the aspectual, transitivity, and stem class of the verbs they suffix. To show that Kaqchikel distinguishes transitive and intransitive verbs, note that imperatives bear the status suffix *–a'*, while intransitive imperatives do not.

(33) a. *T-Ø-a-chap-**a’***.
IMP-A3s-E2s-handle-**SS**
'Grab it!'

b. *K-a-wär(*-**a’**)*.
IMP-A2s-sleep(**-SS**)
'Sleep!'

This same status suffix also distinguishes root from derived transitive verbs. Kaqchikel differentiates transitive verb stems of the form CVC from those that are longer. The former are usually called ROOT transitives, while the latter are called DERIVED transitives. Note that a derived transitive verbs stem, like *sipa-* 'give', does not bear the suffix *–a’* when in the imperative. It continues to bear the derived transitive status suffix *–j*.

(34) *T-Ø-a-sipa-**j*** *chi* *w-e’*.
IMP-A3s-E2s-handle-**SS** E3s-DAT
'Give it to me!'

Kaqchikel distinguishes not just root and derived transitives but also root and derived intransitives. Examples (35) and (36) gives some examples from both classes.

(35) a. *X-Ø-wär*.
COM-A3s-sleep
'He slept.'

b. *X-Ø-b’os*.
COM-A3s-arrive
'He arrived.'

c. *X-Ø-tzaq*.
COM-A3s-fall
'He fell.'

(36) a. *X-Ø-b’iyin*.
COM-A3s-walk
'He walked.'

b. *X-Ø-k'astäj.*
COM-A3s-wake.up
'He woke up.'

c. *X-Ø-atin.*
COM-A3s-shower
'He showered.'

Finally, in addition to CVC root transitive and intransitive verbs, Kaqchikel has a third class of CVC roots that are closely related to verbs, called POSITIONAL in the Mayan literature. Example (37) shows that positionals all have the canonical CVC root shape. Moreover, they have their own class of derivational suffixes, illustrated in(38a-38d), including a stativizer, an intransitivizer, a transitivizer, and an adjectivizer (García Matzar & Rodríguez Guaján 1997; Tummons 2010, see Kaufman 1990 for an early description of similar morphological diagnostics in the closely related language K'ichee').

(37) a. √tzuy seated
b. √ch'eq wet
c. √set circular

(38) a. *At ch'eq-**ël**.*
A2s wet-**P.STAT**
'You're wet.'

b. *X-a-ch'eq-**e'**.*
COM-A2s-wet-**P.ITV**
'You got wet.'

c. *X-Ø-ki-ch'eq-**eb'a'** k-i ri ak'wal-a'*
COM-A3s-E3p-wet-**P.TR** E3p-REFL the child-PL
'The children got each other wet.'

d. *ri ch'eq-**ech'**-aq ak'wal-a'*
the wet-**P.ADJ**-PL child-PL
'the very wet children'

Unlike other CVC root classes, though, positionals cannot appear zero-derived. They do not correspond to stems of any syntactic class.

(39) a. **At ch'eq.*
A2s wet
'You're wet.'

b. **X-a-ch'eq.*
COM-A2s-wet
'You got wet.'

c. **X-Ø-ki-ch'eq k-i ri ak'wal-a'*
COM-A3s-E3p-wet E3p-REFL the child-PL
'The children got each other wet.'

d. **ri ch'eq-aq ak'wal-a'*
the wet-PL child-PL
'the very wet children'

These distinctions are central to the dissertation because pluractionals are sensitive to all of them. Some pluractionals only apply to stems of a particular transitivity class. For instance, *–löj*, the topic of chapter 3, only applies to intransitive stems, whether root or derived. In contrast, *–la'*, the subject of Part II, can only apply to transitive stems. Finally, *–Ca'*, discussed in chapter 4, only applies to CVC root transitives and positionals.

One important note on usage. I will use 'CVC root transitive' or 'CVC root intransitive' to refer to those verb roots that have the canonical CVC form. I use 'root' simpliciter to refer to that smallest morphological unit bearing no derivation or inflectional mophology. Thus the CVC root transitive verb $\sqrt{}$*chap* 'handle' is also a root transitive verb, but $\sqrt{}$*sipa* 'give' is a root transitive verb, but not a CVC root transitive.

This quick introduction covers most of background needed to follow the Kaqchikel examples. Figure 1.8 summarizes my glossing conventions for the Mayan examples. For more information on Kaqchikel grammar see García Matzar & Rodríguez Guaján 1997 and Hendrick Krueger 1986. There are also two larger Kaqchikel dictionaries compiled by native-speaker linguists with many representative example sentences (Cutzal Chacach et al., 1999; Patal Matzul, 2009).

Verb Inflection	Verb Derivation	Nominal/Other Categories
1 = First Person	CAUS = Causative	CLF = Classifier
2 = Second Person	ITR = intransitivizer	DAT = Dative
3 = Third Person	PAS = Passive	P = Preposition
p = Plural Person	P.ADJ = Positional Adjective	PL = Plural
A = Absolutive	P.ITV = Positional Intransitive	RED = Reduplicant
E = Ergative	P.STAT = Positional Stative	
COM = Completive Aspect	P.TV = Positional Transitive	
ICP = Incompletive Aspect	REFL = Reflexive	
IMP = Imperative	SS = Status stuffix	

Figure 1.8: Glossing conventions

Part I

Plural Events

Chapter 2

Event-internal vs Event-external Pluractionality

Two assumptions run through much modern work on the formal semantics of verbs: (i) verbs are predicates of events, and (ii) the domain of events has the same Boolean structure as the domain of individuals. The formal similarity means that in principle the same denotations and operators over those denotations are available for both nouns and verbs. But, does natural language make use of the same variety of denotations in the verbal domain as in the nominal domain? This dissertation answers affirmatively, at least for the space of plural denotations.

In this first part of the dissertation, I compare and contrast the two pluractional derivations in (40b) and (41b) and argue that they derive plural verbs that behave like particular subtypes of plural count and group nouns.

(40) a. *X-Ø-chaq-**e'**.*
COM-A3s-wet-P.ITV
'It got wet.'

b. *X-Ø-chaq-**alöj**.*
COM-A3s-wet-**löj**
'It kept getting wet.'

(41) a. *X-i-ru-tz'ët.*
COM-A1s-E3s-look.at
'He looked at me.'

b. *X-i-ru-tz'et-**etz'a'**.*
COM-A1s-E3s-look.at-**Ca'**
'He kept glancing at me.'

First, I argue that the suffix *–löj* in (40b) derives predicates of events that have significant semantic overlap with bare plural count nouns like (42-43). Just like *kites* in (42), the pluractional predicate *chaqalöj* in (40b) has both dependent and distributive readings, and these readings arise in the same environments as its nominal counterpart (e.g., Zweig 2009; Champollion 2010). Similarly, *löj*-marked predicates, like *firefighters* in (43), have both existential and generic readings (Carlson, 1977; Krifka et al., 1995).

(42) The children flew kites.

(43) Firefighters are available.

While bare plurals and *löj*-pluractionals have similar denotations, they come about them differently. I propose that the pluractional targets the event argument's temporal trace function, requiring that there be a partition of it into small parts, each of which is the trace of an event satisfying the underlying predicate. Like bare plurals in upward entailing contexts, the resulting predicates must be satisfied by plural individuals.[1] Moreover, by modifying an event's temporal trace and thus acting like an event quantifier, the pluractional can mimic the effects of generic operators, accounting for another similarity with bare plurals.

After building an account of *–löj*, I turn to the pluractional *–Ca'* in (41b), which derives a type of group predicate whose nominal counterpart has not been well recognized. In classic accounts of group terms like *team*, *committee*, *family*, etc., groups are atomic individuals that happen to be mapped by a membership function to a non-atomic individual (Barker, 1992). In contrast, I propose that the event argument's temporal trace substitutes for the membership function with *Ca'*-pluractionals. The pluractional places conditions on the trace so that resulting predicates denotes atomic events that are spatiotemporally superimposed on an event plurality. In this way, pluractional predicates like *tz'etetz'a'* become similar to group nouns like like *grove*, *horde*, or *bouquet*, which also denote groups that are defined in terms of the spatiotemporal configuration of their individual parts.

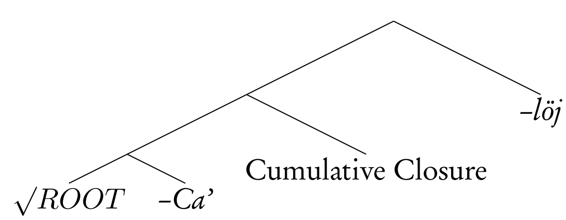
In comparing *Ca'*-pluractional and *grove*-type group nouns, we actually find ourselves using the analysis of the pluractional to explain a variety of facts about this non-canonical type of group noun, which brings us back to the question we started with. While we might expect natural language to make use of similar denotations in both the nominal and verbal domain, we would expect differences to arise based on ontological distinctions between individuals and events. I argue that spatiotemporally defined groups are common in the event domain,

[1] *Löj*-pluractionals behave differently from bare plurals in downward entailing contexts because they are not satisfied by atomic events, that is, they do not have so-called inclusive readings. In fact, no pluractional I have encountered allows this possibility. Though I will not dig into these facts here, their explanation most likely follows from the fact that non-pluractional verbal predicates can be satisfied by both plural and atomic events, while singular count nouns cannot. Thus, the pragmatic competition between bare plurals and singular count nouns out of which inclusive readings arise is not present in the verbal domain (Farkas & de Swart, 2010; Krifka, 1989; Sauerland, 2003; Spector, 2007, among others).

but less common in the individual domain, because events are dependent on space and time for individuation in ways that individuals are not. In this way, thinking about verb denotations allows us to understand nominal denotations better, which is opposite from how most of the literature on noun-verb semantic parallels has developed.

The observant reader will have noticed an important difference between the two types of plural nouns and their verbal counterparts. While both types of pluractional predicates are derived, only the bare plural is morphologically complex in English. We might ask if the two pluractionals are morphosyntactically distinguishable. I argue that they are and that the way they are different has important ramifications for theories that assume some form of the *cumulativity universal*, namely, all natural language predicates are cumulatively closed (Landman, 1996; Kratzer, 2005; Krifka, 1989, 1992, *inter alia*).[2] I provide evidence that while both pluractionals are derivational, *–Ca'* applies closer to the root than *–löj*. Moreover, the semantics of two pluractionals only works if the former applies to predicates of atoms, while the latter applies to cumulatively closed predicates. The picture we come to is like that in (44).

(44)



The fact that different pluractionals interact with cumulative closure in different ways argues against approaches that treat cumulativity as a lexical fact. Instead, it should be represented

[2] Recall that a predicate is cumulatively closed just in case whenever it applies to two individuals it applies to their sum, e.g., *John ran* and *Mary ran* entails *John and Mary ran.*

in the compositional semantics so that operators can take different scopes with respect to it. At the same time, all verbal predicates in Kaqchikel do seem to be cumulatively closed. This prompts a reformulation of the cumulativity universal. It's not all lexical predicates that are cumulatively closed, but all stems. This allows for the possibility that operators apply before cumulative closure, but still requires predicates at the level at which most semanticists work to be cumulatively closed.

Besides its theoretical relevance, the analysis has several crosslinguistic implications. I argue that the formal contrasts distinguishing *–Ca'* and *–löj* are what underlie the distinction made in the typological literature between *event-internal* and *event-external* pluractionality (Cusic, 1981; Xrakovskij, 1997; Wood, 2007). Intuitively, event-external pluractionals require a plurality of events that can take place intermittently, on different occasions, and in different locations, like *John chopped down a tree occasionally*. In contrast, event-internal pluractionals require the continuous repetition of an event (or some subphase of an event satisfying the description given by a root), like *John kept chopping at a tree*. These distinctions, as well as their divergent behavior under distributive predication, can be explained if event-internal pluractionals denote predicates of spatiotemporally defined group events, while event-external pluractionals have bare plural like denotations. I argue that the analysis for Kaqchikel plausibly extends and improves on previous accounts of the internal/external split for various languages (Lasersohn, 1995; Tovena & Kihm, 2008; Wood, 2007).

We begin in sections 2.1-2.2 by detailing the formal and typological preliminaries. In particular, section 2.1 discusses the minimal assumptions we need to get the analysis off the ground, while section 2.2 introduces the distinction between event-internal and event-external pluractionality. Chapters 3 and 4 explore in detail the semantic contribution of the suffixes *-löj* and *-Ca'* respectively, while developing an analysis that meets the desiderata developed by examining previous approaches in section 2.3.

2.1 Formal foundations

2.1.1 Ontology

My ontological assumption follow Lasersohn (1995); Link (1983/2002). I assume that natural language predicates denote in a structured domain of individuals D_e and a structured domain of events D_ϵ. The domain of individuals D_e is the powerset of a designated set of individuals IN minus the empty set $\wp^+(\mathsf{IN}) = \wp(\mathsf{IN}) \setminus \emptyset$. I will assume a denumerable set of variables of type e: $x, x', y, y' \ldots$. Similarly, the domain of events D_ϵ is the powerset of a designated set of events EV minus the empty set $\wp^+(\mathsf{EV}) = \wp(\mathsf{EV}) \setminus \emptyset$. Variables of type ϵ: $\mathbf{e}, \mathbf{e}' \ldots$. Atomic individuals and atomic events are the singleton sets in $\wp^+(\mathsf{IN})$ and $\wp^+(\mathsf{EV})$, respectively, identified by the predicates $\mathbf{atom}_{et}$ and $\mathbf{atom}_{\epsilon t}$. A_ϵ is the set of all atomic events and A_e is the set of all atomic individuals. The 'part of' relation $\leq$ over individuals or events is set inclusion over $\wp^+(\mathsf{IN})$ or $\wp^+(\mathsf{EV})$. The sum operation $\oplus$ is set union over $\wp^+(\mathsf{IN})$ or $\wp^+(\mathsf{EV})$.

Verb roots in Kaqchikel, indicated by the $\sqrt{\text{RADICAL}}$ sign, denote in the space of atomic events: $[\![\sqrt{\text{V}}]\!] \subseteq A_\epsilon$. There is no consensus in the literature about whether this should be the case for verbs in general. Some authors assume that they do (e.g., Landman 2000), while others try to avoid assuming this (e.g., Champollion 2010; Krifka 1998). I make the atomicity assumption because it simplifies the analysis and allows for parallels between the structure of plural nominals and pluractional verbs to be more easily seen.[3]

2.1.2 Cumulative Closure

While verb roots denote sets of atomic events, we never see verb roots on the surface. I assume that all verb roots in Kaqchikel must undergo cumulative closure before they are inflected. Cumulative closure is defined in example (45).

(45) Cumulative Closure (following Krifka 1989).
The cumulative closure of P is the smallest predicate $*P$ such that:

a. $P \subseteq *P$

b. if $a \in *P$ and $b \in *P$, then $a \oplus b \in *P$

We want Kaqchikel verbs to be cumulatively closed precisely because they satisfy the entailment in (45b), which is shown in examples (46-47).

(46) a. *X-Ø-ok xta Maria.*
COM-A3s-enter CLF Maria
'Maria entered.'

b. *X-Ø-ok a Xwan.*
COM-A3s-enter CLF Juan
'Juan entered.'

c. ⇒ *X-e-ok a Xwan chuqa' xta Maria.*
COM-A3p-enter CLF Juan also CLF Maria
'Juan and Maria entered.'

[3]In the end, the assumption that verbs have atoms in their denotations does not matter for my analysis as long as verbs have a base denotation, i.e., elements in the denotation of a verb with no parts also in the denotation of the verb. These could be atomic elements given by the model, as I assume here, or contextually derived. That is, elements that may or may not have parts, but which are treated as atomic for the sake of the conversation (see Rothstein 2010; Chierchia 2010 for approaches to the count/mass distinction that provide the technical means to do this). While I prefer this latter route, I do not take it here because it unnecessarily complicates the formal account.

(47) a. *X-Ø-in-k'waj ri ichaj.*
COM-A3s-E1s-carry the greens
'I carried the greens.'

b. *X-Ø-a-k'waj ri kinäq.*
COM-A3s-E2s-carry the beans
'You carried the beans.'

c. ⇒ *X-e-qa-k'waj ri ichaj chuqa' ri kinäq.*
COM-A3p-E1p-carry the greens also the beans
'We carried the greens and the beans.'

This is the same entailment pattern exhibited by plural count nouns, which motivated their classic analysis as cumulatively closed predicates of atoms in Link 1983/2002. The difference between plural count nouns and verbs, of course, is that the latter do not exhibit plural morphology under cumulative readings. This has motivated previous authors to argue, as mentioned before, that all verbal predicates are cumulatively closed by default (Landman, 1996; Kratzer, 2005; Krifka, 1989, 1992, among others).

While all inflected verbs in Kaqchikel seem to allow cumulative readings, we do not want to assume that all verbs are cumulatively closed in the lexicon. The reason is that whether or not pluractionals apply to a cumulatively closed predicate of events is an empirical question. I will argue that some pluractionals do, while other pluractionals apply directly to roots, which are not cumulatively closed. By treating cumulative closure as an operator in the compositional semantics, instead of a lexical default, we can investigate how other operators take scope with respect to it. Along these lines, I assume an operator like that in example (48) which derives cumulatively closed predicates of events from verb roots. Though more correctly written like (48), I use the abbreviation in (49) to give C the denotation in (50), which is the typographical convention used in the literature.

(48) Cumulative Closure Operator
$\lambda V_{\epsilon t}\lambda e[e \in *\lambda e'[V(e')]]$

(49) $\lambda e[*V(e)] :\Leftrightarrow \lambda e[e \in *\lambda e'[V(e')]$

(50) $[\![C]\!] = \lambda V_{\epsilon t}\lambda e[*V(e)]$

Thus, inflected Kaqchikel verbs, even one of the zero-derived, so-called root verbs like *ok* 'enter', must be derived by C. Abstracting away from tense and agreement for a moment, the verb in an example like (51) is morphosemantically complex, getting the denotation in (52).

(51) *X-in-ok.*
COM-A1s-enter
'I entered.'

(52) $[\![\sqrt{ok}\text{–}C]\!] = [\![C]\!]([\![\sqrt{ok}]\!]) = [\![C]\!](\lambda e[\text{ENTER}(e)]) = \lambda e[*\text{ENTER}(e)]$

2.1.3 Thematic roles and spatiotemporal traces

Finally, above the level of the verbal predicate I assume a neo-Davidsonian clausal semantics, where events are mapped to their participants by some finite set of thematic roles: **ag**, **th**, etc., which are functions of type ϵe from events (type ϵ) to individuals (type e). I use theta-role functions for their argument indexing ability alone. That is, I do not assume that they generate the traditional entailments about their arguments, e.g., (Dowty, 1991). I make the standard assumption that theta-role functions are themselves cumulatively closed as in (53), but I will suppress the $*$-notation to keep formulas simpler.

(53) Relation Closure (based on Krifka 1986)
For any n-place relation R, $**R$ is the smallest relation such that

a. $R \subseteq **R$ and,

b. if $\langle a_1, ..., a_n \rangle \in **R$ and $\langle b_1, ..., b_n \rangle \in **R$, then $\langle a_1 \oplus b_1, ..., a_n \oplus b_n \rangle \in **R$

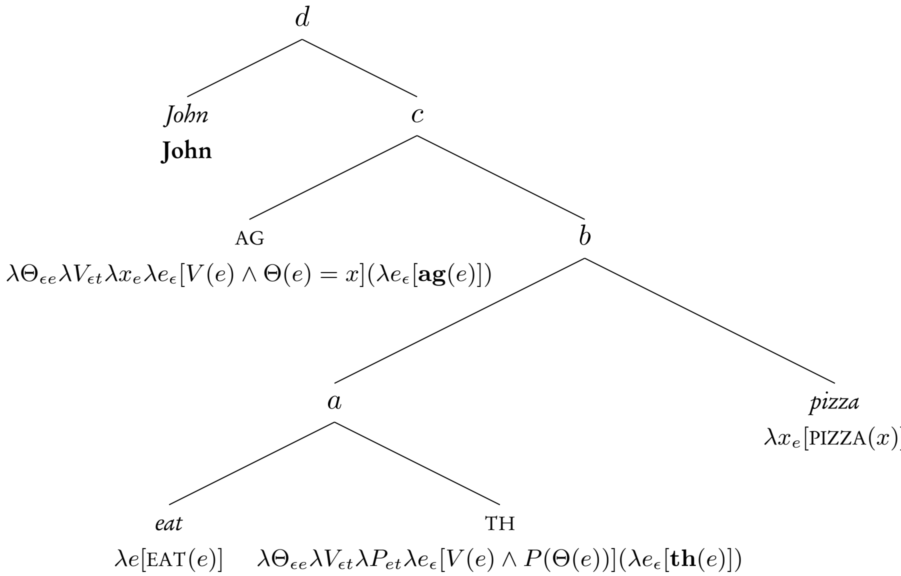
In order to have a compositional clausal semantics, I will assume that theta-roles compose with VPs first and then NPs. There is a type mismatch of course, in which case, one of the following two type-shifters applies depending on whether we have a predicative or referential NP argument.

(54) Predicative Thematic Shifting
$\lambda\Theta_{\epsilon e}\lambda V_{\epsilon t}\lambda P_{et}\lambda e_{\epsilon}[V(e) \wedge P(\Theta(e))]$

(55) Referential Thematic Shifting
$\lambda\Theta_{\epsilon e}\lambda V_{\epsilon t}\lambda x_e\lambda e_{\epsilon}[V(e) \wedge \Theta(e) = x]$

The composition of *John ate pizza* is in (56). We need an application of referential thematic shifting as well as an application of predicative thematic shifting, but after existential closure, the resulting formula will be true if there is an event of eating with **John** as its agent and a theme satisfying PIZZA.

(56) John ate pizza.



(57) a. $\lambda P_{et}\lambda e_\epsilon[\text{EAT}(e)\wedge P(\mathbf{th}(e))]$

b. $\lambda e_\epsilon[\text{EAT}(e)\wedge \text{PIZZA}(\mathbf{th}(e))]$

c. $\lambda x_e\lambda e_\epsilon[\text{EAT}(e)\wedge \text{PIZZA}(\mathbf{th}(e))\wedge \mathbf{ag}(e)=x]$

d. $\lambda e_\epsilon[\text{EAT}(e)\wedge \text{PIZZA}(\mathbf{th}(e))\wedge \mathbf{ag}(e)=\mathbf{john}]$

In addition to thematic roles connecting events and their participants, I also assume that there are trace functions τ and σ assigning to events the time and space in which they occur. I will mostly be working with τ because Kaqchikel pluractionality is temporally based (though other languages have spatially-based pluractionality and the account extends to these languages by switching σ for τ). As is standard (Krifka, 1998), τ is a partial function on D_ϵ mapping events to one-dimensional intervals representing temporal extent. I assume that these temporal intervals are the domain for a non-atomic mereology of time, where $\leq$ is the subinterval relation. Following Krifka 1998; Hinrichs 1985, temporal intervals are also ordered by the temporal precedence relation $\prec$ which is irreflexive, asymmetric and transitive. Moreover, every two temporal intervals are ordered by $\prec$ or $\leq$, but not both.

Like thematic roles, I assume that trace functions are sum homomorphisms. This has an important consequence. Sum events can have a discontinuous temporal trace. For instance, if $\tau(e) = t$ and $\tau(e') = t'$, then $\tau(e \oplus e')$ exists and is equal to $\tau(e) \oplus \tau(e') = t \oplus t'$, which is discontinuous. In words, if I wrote yesterday from 10-11am and then again from 1-3pm, then the temporal trace of my writing yesterday exists and is that discontinuous stretch of time consisting of 10-11am and 1-3pm. While sum events can have discontinuous temporal traces, I assume that atomic events must be mapped to convex intervals. Thus, in the situation just described, if e'' is atomic, then $\tau(e'')$ cannot equal $\tau(e) \oplus \tau(e')$, though $\tau(e'')$ can be the smallest closed interval including $\tau(e) \oplus \tau(e')$, namely 10am-3pm.

This concludes the basic formal assumptions underlying the analysis. In the next section I will introduce the contrast between event-internal and event-external pluractionality, which has played a prominent part in the literature on pluractionality.

2.2 Typological preliminaries: event-internal vs event-external pluractionals

Yurok has two pluractional morphemes that have been traditionally called iterative and repetitive (Garrett, 2001). Examples (58-59) illustrate that the character of the plural events they describe are very different.

(58) ***Tek**wtek'weses* *ku* *popsew*
REP.cut.IMP ART bread
'Slice the bread (into slices)!'

(59) *kipun* *kw**eg**eskwes-ek*
winter have.a.cold.**ITR**-1SG
'I get colds in the winter.'

The repetitive in (58) describes an event that has repetitions as part of its character. Bread does not get sliced up unless it gets cut multiple times. Moreover, an event of slicing up bread is confined to a single occasion and with a single patient. In contrast, the iterative in example (59) describes a plurality of events that cohere less. The colds happen on different occasions and they do not add up to an event with a singular character, like slicing up bread. One of the major results in the pluractionality literature is the discovery that this opposition in Yurok appears crosslinguistically, where pluractional markers tend to either behave more like (58) above or more like (59) (Cusic, 1981; Lasersohn, 1995; Yu, 2003; Xrakovskij, 1997; Wood, 2007).

The first type, called event-internal by Garrett (2001), requires a plurality of events with the character of a single event. Examples (60) to (63) present some cases of event-internal pluractionality that have been cited in the literature. The Kaqchikel example (63) will be argued to have event-internal semantics in chapter 4.

(60) SYRIAN ARABIC (Cowell, 1964, p. 253)
safaʔ 'to slap/clap' → *saffaʔ* 'to clap' (as in applause)

(61) CENTRAL ALASKAN YUP'IK (Jacobson, 1984, p. 497)
nere– 'to eat' → *Neremciurtuq* 'He nibbled.' (lit. eat a little at a time)

(62) YUROK (Wood, 2007, p. 151)
pegon– 'to split' → *pegpegon*– 'to split in several places' (like making kindling)[4]

(63) KAQCHIKEL
chup– 'to turn off' → *Xuchupucha*' 'He kept flicking it on and off.'

Event-internal pluractionals have the following properties crosslinguistically, which are illustrated in the examples above.

- First, they preferentially target achievements and semelfactive predicates. In the examples above, we find predicates like *slap*, *slip*, and *turn off*. Moreover, chapter 4 argues that the Kaqchikel pluractional in (63) requires aspectual coercion when modifying activities and accomplishments.

- Second, the repeated events all take place on a single occasion. For instance, Syrian Arabic *saffaʔ* means to applaud, which is just a lot of clapping on a single occasion. To see this, notice that it is not possible to say that the audience applauded the show if only one person claps once at each performance. This is true even if there were so many performances that the same number of claps were performed as in a normal applause.

- The third property of event-internal pluractionality is that a large number of the relevant events must take place. Consider the Yurok *pegpegon*– 'to split in several places', which in its very translation precludes an event in which its object splits twice.

- The next property is certainly related to the requirement that event-internal pluractionals take place on the same occasion, but it is slightly different. The repeated events

[4]see Wood 2007, ex. 7a, p. 148

should have little downtime between them. For instance, speakers find *Xuchupucha'* in (63) most appropriate if the repetitions come fast.

- The repeated events of an event-internal pluractional have a shared telos or take place in the same location. This is illustrated in the example we started with. In (58), each event of cutting a slice off of the bread adds up to an event of slicing up the bread. It wouldn't do to just take the same number of slices from a number of different loaves.

- Finally, examples (60-63) show that event-internal pluractional predicates are often paraphrasable by single lexical items in languages without pluractional morphology, like English. This is related to the fact that often the repeated events of an event-internal pluractional need not satisfy the underlying predicate. Consider the Yup'ik *Neremciurtuq* 'He nibbled.', from *nere–* 'to eat' in (61). Nibbling is related to eating, but its character is different enough that *John nibbled his lunch* does not entail that *John ate his lunch*.

The properties are summarized in (64) for quick reference.

(64) Characteristics of Event-Internal Pluractionality
  a. aspectual selection for semelfactives and achievements
  b. contiguous repetition
  c. one occasion
  d. high cardinality
  e. shared telos or theme
  f. failed entailments to the base predicate

Event-external pluractionals contrast with event-internal pluractionals on most of the properties in (64), but at the same time, they show more variation on the diagnostics. Examples of event-external pluractionality are presented in (65-68).

(65) EVENKI (Nedjalkov, 1997, p. 251)
ana– 'to push' → *ana-kta–* 'to push several times'

(66) CENTRAL ALASKAN YUP'IK (Jacobson, 1984, pp. 429-430)
atur– 'to sing' → *Aturauq* 'He is singing various songs.'

(67) YUROK (Wood, 2007, p. 143)
nep– 'to eat' → *negep–* 'to eat regularly'

(68) KAQCHIKEL
ch'in– 'to ring' → *Nich'inilöj* 'It rang various times.' (like a bell tower counting out the hour)

- First, event-external pluractionals apply freely to predicates of any aktionsart class. They can target accomplishments and activitives (like *atur–* 'to sing' above), as well as semelfactives and activities.

- Unlike event-internal pluractionals, event-external pluractionals allow significant downtime between the repeated events, and this downtime is variable. For example, the *Nich'inilöj* 'It rang various times,' does not require much downtime, but the same suffix can be used in a sentence like *Xib'iyinilöj* 'I kept having to walk,' to describe walking to many fields during a days work where the distance between the relevant walking events is quite large.

- In addition to repetitions on a single occasion, event-external pluractionals also have readings that involve what have been called repetitions across occasions (Cusic, 1981), which are habitual or generic. An example is the Yurok *negep–* 'to eat regularly' in (67), which has a habitual reading (Wood, 2007).

- Even though event-external pluractionals can apply to events with high cardinality, the are often able to describe events with a low cardinality, in contrast to event-internal pluractionals.[5] The Kaqchikel pluractional *–löj* has this property. The belltower ringing in (68) need not ring many times, but it must ring several times.

- Another difference between event-external and event-internal pluractionality is illustrated by Yurok *negep–* 'to eat regularly', as well as the original example of event-external pluractionality in (59). Note that these pluractional predicates do not share a telos or theme. The plurality of events they describe are independent.

- Finally, note that event-external pluractionals like those in (65-68) are often translated with adverbials like *several times*, *repeatedly*, *many times*. This reflects the fact that, like the English translations, sentences with event-external pluractionals entail minimally different sentences without the pluractional. For example, it follows from *Nich'inilöj* 'It rang various times' in 68 that it rang.

These properties are summarized for quick reference in (69).

(69) Characteristics of Event-External Pluractionality
  a. aspectually promiscuous
  b. non-contiguous repetitions
  c. habitual (occasion) readings

[5] Others specify exactly two repetitions (e.g., the affix *na-* in Slave Rice 1989, in which case they are often called duplicative/reversative in descriptive grammars. It is an open question how these suffixes relate to pluractionality more generally.

d. low cardinality
e. entailments to the base predicate

The typological generalizations present the following analytic puzzle: What is the formal difference that underlies the event-internal/event-external distinction? Moreover, the generalizations reveal two desiderata that a successful analysis must meet: (i) Explain why the various properties of event-internal and event-external pluractionals are correlated, and (ii) Explain why event-external pluractionals exhibit a wider range of interpretive possibilities. I provide an answer to these questions in the chapters to come based on analyses of the suffixes –*Ca'* and –*löj*, exemplified in (63) and (68) respectively. I argue that event-external pluractionals are the eventive equivalent of count nouns and that their interpretive flexibility is due to the arbitrariness of sum formation. In contrast, event-internal pluractionals denote groups, which must be defined under some grouping criterion, in this case spatiotemporal. Before building the analysis of the event-internal/external distinction in Kaqchikel, we summarize the previous accounts of the split in other languages, which yields more desiderata and also shows how previous authors have approached pluractionality in general.

2.3 Previous approaches to the internal/external split

The previous accounts of the internal/external split can be broadly categorized into two camps. The first takes temporal structure to be primary, while the second takes plurality to be primary. Within the latter camp, most common contrasts between subtypes of plural nominal reference have been used as a basis for explaining the contrasts between event-internal and event-external pluractionals. I review both classes of proposals in this section because I propose a hybrid account. In my account, event-internal and event-external pluractionals place very similar temporal conditions on events, but the former class will denote group events, while the latter will denote non-atomic pluralities of events. These two features interact to explain the various aspects of the internal/external split.

2.3.1 Cusic 1981: Origins of the internal/external split

The internal/external distinction originates in Cusic's work. While he is more interested in laying out the semantic field of pluractionality than explaining the distinctions, he draws analogies between species of pluractionality and subtypes of plural nominal reference. In particular, he argues that event-external pluractionality corresponds to simple nominal plurality, while event-internal pluractionality corresponds to mass reference (Cusic, 1981, pp. 55,122).

The primary evidence is that the individuals that mass nouns denote have a large "cardinality", though they usually cannot be counted directly. Moreover, the parts that make up a mass entity tend to be homogenous and packed close together. Finally, the parts that make up a mass entity tend to be conceived of as internally simplex. These properties seem to match up well with those events that fall in the denotation of event-internal pluractionals: (i) There must be many pluractional subevents, (ii) they cannot be counted, (iii) they must be temporally contiguous, (iv) and they tend to be semelfactive events, which we might think of internally simplex. In contrast, event-external pluractionals have simple plural reference. The argument here is that the pluractional subevents are more individuated and can diverge from the whole: (i) they can happen at different times and places, (ii) they can have different participants, and (iii) the can be internally complex. Though not cast in these terms, the idea is that event-external pluractionals accept arbitrary sums of events satisfying the predicate, which our event mereology provides.

While this analysis has intuitive appeal, Cusic (1981) does not extend language internal tests for the mass/count distinction from the nominal domain into the verbal domain. This is crucial if we want to explain event-internal/event-external distinction in terms of nominal reference. Based on language internal tests in Kaqchikel, I show that both types of pluractionals have count reference, though different subtypes count reference.

2.3.2 Lasersohn 1995: The first formal account

Lasersohn's work on pluractionality is situated within a larger work on plurality, events, and plural predication. It is meant to be a first pass and used as an illustration of how his theory extends to unfamiliar phenomena, but it is the first attempt at a model-theoretic treatment of pluractionality and informs all later work. Lasersohn approaches the problem by presenting a schema for giving the denotations of pluractional morphemes. The parameters along which a particular pluractional morpheme can vary are lifted off of the typological literature, in particular, Cusic 1981. The core schema for the semantics of pluractionals is given in (70).

(70) V–PLRC$(X) \Longleftrightarrow \forall e \in X[P(e)] \wedge CARD(X) \geq n$

For Lasersohn, pluractional predicates have sets of events in their denotation whose cardinality exceeds n and whose members satisfy P. If n is set to 2, and $P = V$, then the pluractional would have a semantics similar to plural count nouns. If n is contextually set, the result is a pluractional with a 'many-event' reading. Finally, if $P \neq V$, then the pluractional subevents are not necessarily in the denotation of the predicate to which the pluractional applies. Lasersohn uses this last contrast as the basis for the event-internal/-external distinction. The idea is that event-external pluractionals will have $P = V$, while event-internal pluractionals will have $P \neq V$, where P describes a subphase of those events in V. Essentially, Lasersohn's account zooms in on the fact that event-internal pluractionals often require repetitions of events that would not satisfy the predicate that the pluractional derives.

In addition to these central parameters along which a pluractional can vary, Lasersohn also proposes a non-overlap parameter that further individuates the events that are members of those sets that satisfy the pluractional predicate. Example (71) shows how this works. The schema contains a function f that can be either the temporal trace function, the spatial trace function, or a thematic role. This function can be either contextually or lexically specified depending on the pluractional morpheme.

(71) V–PLRC$(X) \Longleftrightarrow \forall e, e' \in X[P(e) \wedge P(e') \wedge \neg(f(e) \circ f(e'))] \wedge CARD(X) \geq n$

'A pluractional event in the denotation of V-PLRC has a cardinality greater than n and every two events that compose it satisfy P and do not overlap.'

Finally, in the case of temporal and spatial non-overlap, pluractionals also contain a contextually or lexically specified parameter fixing the amount of space/time between pluractional subevents.

(72) V–PLRC$(X) \Longleftrightarrow \forall e, e' \in X[P(e) \wedge P(e') \wedge \neg(f(e) \circ f(e')) \wedge$
$\exists y[between(y, f(e), f(e'))] \wedge \neg \exists e''[f(e'') \leq y \wedge P(e'')]]$
$\wedge CARD(X) \geq n$

'A pluractional event in the denotation of V-PLRC has a cardinality greater than n and every two events that compose it satisfy P and do not overlap and there is y amount of space/time between them.'

Example (72) is Lasersohn's final story about pluractionals. They all denote the same sort of model-theoretic objects—sets of events—which in his wider theory are used to model plural count nouns. What is different from count plurality is that pluractionals come with a list of parameters that must be filled either lexically or contextually which place further constraints on those sets of events in the denotation of the pluractional predicate. The difference between event-internal pluractionality and even-external pluractionality is whether $P = V$ or not.

The problem with the account in Lasersohn (1995) is that the setting of P relative to V is not related to the setting of any of the other parameters. Thus, it predicts the existence of a pluractional where $P \neq V$, $n = 2$, the overlap parameter for time is large, and the overlap parameter for space is small. The resulting pluractional would have a mix of those properties associated with event-internal and event-external pluractionality, but morphemes like this do not exist. While we can give event-internal and event-external pluractionals the correct denotations using the schema in Lasersohn 1995, it does not predict why we see the particular clustering of properties crosslinguistically that we do in fact see. This is a desideratum for any analysis of the internal/external split, and one I meet in chapters 3 and 4.

2.3.3 Wood 2007: A group-based account

Wood 2007 is a typological survey of the semantics of pluractionals that also aims to deepen the understanding of the event-internal/-external distinction. The idea is that event-internal pluractionality is group reference, while event-external pluractionality is simple plural reference.

The analysis assumes that verbs have their denotation in the set of atomic events. Event external pluractionals are the verbal counterparts of simple count plurality, that is, pluractionality corresponds to cumulative closure.

(73) a. $[\![\textit{jump}]\!] = \lambda e[jump'(e)]$
b. $[\![\textit{jump}\text{–PLRC}_{external}]\!] = \lambda e[*jump'(e)]$

This is supposed to capture the fact that there seem to be fewer constraints on the pluractional sub-events of event-external pluractional predicates in comparison to event-internal pluractional predicates. There can be few or many of them, they can occur one after the other or intermittently, they can fall under predicates of any aktionsarten, etc.

In contrast, event internal pluractionals are formed via the groupification operator $\uparrow$ of Landman 1996, 2000, which is a partial function on D_ϵ mapping pluralities to groups. The idea is that event internal pluractional predicates denote sets of events that are equivalent to groupified pluralities satisfying the underlying predicate.[6]

(74) a. $[\![\textit{jump}]\!] = \lambda e[jump'(e)]$
b. $[\![\textit{jump}\text{–PLRC}_{internal}]\!] = \lambda e \exists e'[*jump'(e') \wedge e = \uparrow e']$

While the intuition is appealing and on the right track, as a formal tool, groupification does not do much on its own. It serves only to block distributing pluractional subevents over a plural participant.[7] The rest of the properties of event-internal pluractionals have to be derived by putting additional conditions on what sorts of pluralities of events can be groupified. For instance, they should occur in the same time, in the same place, towards a similar goal, be internally simplex, etc. Once again, the cluster of properties that are found

[6] I've altered the formulas slightly because Wood 2007 writes $\lambda e[\uparrow *jump'(e)]$, which does not say what is intended.

[7] This is only true relative to a particular set of assumptions in Landman (1996, 2000), in particular, the assumption that true thematic roles are not cumulatively closed and that distributive readings are generated with the help of special plural roles.

with event-internal pluractionals are independent in this analysis. Ideally, as many of these extra conditions as possible would follow from the properties of the groups themselves. The analysis I develop in chapter 4 in terms of *grove*-type group plurality meets this desideratum.

2.3.4 Tovena and Kihm 2008: Group-based pluractionality in Romance

Tovena & Kihm (2008) are interested in so-called pluractional verbs in Romance languages, especially Italian and French, which are exemplified in (75-77).

(75) a. *mordere* 'to eat'
b. *mordicchiare* 'to nibble'

(76) a. *saltare* 'to jump'
b. *saltellare* 'to hop'

(77) a. *forare* 'to pierce'
b. *foracchiare* 'to make holes'

While Tovena and Kihm argue against a derivational relationship between these pairs of verbs, they show that the (b) examples above have an event-internal pluractional semantics. They then propose an analysis of event-internal pluractionality that combines elements of Wood 2007 and Lasersohn 1995. In particular, event internal pluractionals have groupified events in their denotation, mediated by a second lexically specified predicate.

(78) $\forall e[\mathrm{V}(e) \Leftrightarrow \exists e'[{*}\mathrm{P}(e') \wedge e =\uparrow e']]$

(79) $\forall e[\textsc{mordicchiare}(e) \Leftrightarrow \exists e'[{*}\textsc{morderePart}(e') \wedge e =\uparrow e']]$

For instance, *mordicchiare* 'nibble' denotes groups of subphases of events in the stem predicate *mordere* 'to eat', given by MORDEREPART. The final difference between the pluractional predicates and their non-pluractional counterparts is that the former also alter the part-whole structure of the internal argument—they must be made mass by the universal grinder (Pelletier, 1975; Pelletier & Schubert, 1989).

The fact that event-internal pluractionals denote groups is used to capture the lack of distributive readings, as in Wood 2007. But, since Tovena and Kihm use a second predicate for event-internal pluractionals like Lasersohn 1995, they can make additional demands of the pluractional subevents. They must be subphases of events satisfying the stem predicate. The massification of the internal argument is supposed to capture the fact that event-internal pluractionals are atelic and in some sense diminutive, though it is not clear exactly how this works. Mass objects with other types of verbal predicates do not exhibit these effects. Moreover, there is no tendency crosslinguistically for event-internal pluractionals to target transitive predicates, as this analysis suggests. Once again it would be preferable if more explanatory work were done by the type of group events event-internal pluractionals denote instead of independent conditions like massification. In my analysis, the aspectual properties of event-internal pluractionality are more closely related to the species of plural reference such predicates have.

2.3.5 van Geenhoven 2004: Pluractionality and atelicity

While many of the previous studies approach pluractionality from the perspective of plurality, van Geenhoven 2004 takes the semantics of aspect and adverbials as a point of departure (see Xrakovskij 1997 for a non-formal, temporal account). In particular, van Geenhoven is interested in the fact, first reported in Mittwoch 1991, that *for*-adverbials with accomplishments with non-quantized internal arguments get a 'continuous' or 'durative' reading, while achievements with non-quantized internal arguments often get a 'frequentative' reading.[8]

(80) The prospectors pumped oil for two weeks.

(81) The prospectors struck oil for two weeks.

This contrast is unexpected under Krifka's (1989,1992) classic approach to *for*-adverbials where the aspectual properties of the VP are determined by the quantization properties of the object alone. Even worse, the frequentative reading can sometimes license *for*-adverbials when the object is quantized in direct opposition to Krifka 1989, 1992. For example, Dowty (1979, p. 89) notes the following example can mean that the father found the tricycle in the driveway frequently over a six week period.

(82) John found his son's tricycle in the driveway for six weeks.

Van Geenhoven's idea, building off of a suggestion by Dowty (1979), is that frequentative readings under *for*-adverbials are due to a covert frequentative adverbial intervening between the VP and the *for*-adverbial. In support of covert markers of frequentative aspect, van Geenhoven argues that it is visibly instantiated in other language in the form of pluractionality. In particular, van Geenhoven examines a variety of suffixes in Western Greenlandic which different flavors of repetition. For example, the suffix *-qattar-* in (83) indicates periodic repetition with a high frequency, while *-llattar-* indicates infrequent aperiodic repetition, and *-tar-*

[8] Recall that a predicate is quantized just in case that when it applies to an individual, it applies to no part of that individual.

is underspecified as to the periodicity and frequency of an event's repetitions.

(83) *Manni-it* *sivisuu-mik* *asiru-**qattaar**-pai.*
egg-ABS.PL lengthy-INS break-**PLRC**-IND.[+tr].3SG.3PL
'He broke eggs again and again.'

(84) *Angu-**llattaar**-poq.*
seal.catch-**PLRC**-IND.[-tr].3SG
'He caught a seal from time to time.'

(85) *Minutsi-t* *arlallit* *attasaasa-t*
minute-ABS.PL several.ABS.PL button-ABS.PL
*tuur-**tar**-pai.*
push-**PLRC**-IND.[+tr].3SG.3PL
'He pushed different buttons repeatedly for several minutes.'

van Geenhoven (2004) takes these pluractional markers as operators over times. Essentially they place constraints on what it means for a predicate to hold at a certain time, in particular, that the temporal trace can be broken up into a certain number of non-overlapping temporal intervals where the predicate holds. Frequency and periodicity are managed through conditions on the downtime between those intervals where the predicate holds.

While not explicitly targeted at the event-internal/-external distinction, we could see the differences between *qattar* on one hand, and *llattar* and *tar* on the other, as a manifestation of the internal/external distinction. If so, the explanation for their differences would follow from differences in the conditions placed on the downtime between pluractional subevents.

Tying this analysis of West Greenlandic back to the phenomenon we started with, first note that all of these pluractional predicates are atelic. If atelicity is cumulativity with respect to times, then Van Geenhoven's analysis predicts this fact. The claim is that all subtypes of pluractionality have mass-like denotations in the temporal domain, that is, they are cumulative with respect to times. Against this backdrop, atelic predicates in general are pluractional and the coerced atelicity of accomplishments/achievements with *for*-adverbials in English is due to covert pluractionality operators. This kind of analysis is appealing, but once again, mass nouns have a variety of properties over and above their interaction incremental theme verbs. Ideally, an analysis that gives pluractionals a mass-like denotation should show that they behave have like mass nouns on a variety of tests.

The test that I develop in chapters 3 and 4 argue that both types of pluractionals in Kaqchikel have count reference, though they different in whether or not they denote group events. The analysis in van Geenhoven 2004 is on the right track, though, in emphasizing the importance of temporal reference for pluractionality. In my account, pluractionals will place temporal conditions on the event argument of a verbal predicate that could only be satisfied by plural events. I then go further and show exactly what type of plural reference is at issue using language internal tests.

2.3.6 Summary of the previous approaches

Event-internal and event-external pluractionals vary on 3 or 4 properties. Different accounts of the split take a different property as basic. For example, Lasersohn 1995 take as basic the fact that event-internal pluractionals repeat sub-phases of the kind of events that satisfy the underived predicate. Wood 2007 treats distributivity is at the heart of the internal/external split, which can be explained in terms of groupification. Tovena & Kihm 2008 combines the insights of the previous two in order to capture more of the generalizations. Taking another path, event-internal and event-external pluractionals are distinguished in Cusic 1981 by an abstract notion of individuation, which is meant to reduce to the mass/count distinction. Finally, pluractionals differ in van Geenhoven 2004 by the amount of downtime between pluractional subevents, which is connected to the event-internal/-external distinction.

Since previous approaches take different contrasts as primary, it should not be surprising that they disagree both on what type of plural reference pluractionals should have and whether it should differ based on subtype. Some take event-internal pluractionals to denote groups, while event-external pluractionals denote simple pluralities (Wood, 2007; Tovena & Kihm, 2008). Others agree that event-external pluractionals denote simple sum events, but treat event-internal pluractionals as mass denoting (Cusic, 1981). Finally, a group of analyses take both types of pluractionals to have the same kind of reference, to either simple sums (Lasersohn, 1995), or mass entities (van Geenhoven, 2004).

The next two chapters weigh in on this debate by analyzing two suffixes in Kaqchikel that instantiate event-internal and event-external pluractionality respectively. My analysis agrees with Wood 2007 and Tovena & Kihm 2008 that the opposition between groups and non-groups underlies the event-internal/-external distinction, though it will go beyond this work by isolating the particular subtype of group/plural reference involved.

I argue that event-external pluractionals denote like bare plurals, while event-internal pluractionals denote like *grove*-type group nouns. At the same time, though, I argue that plural reference in the event domain comes about when pluractionals modify the temporal trace of the event argument, making the analysis similar to van Geenhoven 2004 in which pluractionals are frequency adverbials. In my account pluractionals require a partition of the event's temporal trace where each element of this partition is the trace of an event satisfying the predicate. Whether the event argument is atomic or not will determine whether the pluractional is event-internal or event-external. In addition to capturing generalization about the Kaqchikel pluractionals, we show the analysis meets the desiderata below.

(86) **Desiderata**

- Reduce the internal/external distinction to types of nominal reference.
- Motivate the reduction by running cross-categorial tests on both nouns and verbs.
- Ensure that the core properties of the two types of pluractionals are not independent in order to explain the clustering.

Chapter 3

Event-external Pluralization

This chapter provides an analysis of the Kaqchikel pluractional *–löj*, illustrated in (87-89), which is argued to instantiate event-external pluractionality.[1]

(87)

*X-Ø-chin-**ilöj***	*ri*	*kanpana.*
COM-A3s-ring-**löj**	the	bell

'The bell rang repeatedly.'

(88)

Ri	*ak'wal*	*x-Ø-jil-**ilöj***	*r-oma*	*ri*	*yab'il.*
The	child	COM-A3s-complain-**löj**	E3s-because	the	illness

'The child complained every little bit because of the illness.'

(89)

K'o	*w-äk'*	*yïn*	*n-Ø-qer-**elöj***	*pa*	*toq'a.*
exist	E1s-chicken	I	COM-A3s-cluck-**löj**	at	night

'A chicken of mine clucks a lot at night.'

[1] In all likelihood there are two suffixes *–löj* and *–lüj*, where the latter only appears when the last stem vowel is a high back vowel. For example, some speakers produce *chupulüj*, not *chupulöj* for the derived form of *chup* 'off'. Other speakers, though, continue to use a centralized mid vowel here. I believe that there are two suffixes, but that some speakers do not distinguish [ö] and [ü], which is not surprising because dialects have different lax vowel inventories. While I make the *–löj/lüj* distinction in example sentences, following Hendrick Krueger 1986 and Tummons 2010, I will uniformly write *–löj* in the body of the text.

As shown above, when speakers offer translations of *löj*-marked verbs, they use Spanish adverbials like *varias veces* 'a few times', *muchas veces* 'many times/a lot', *repetidamente* 'repeatedly', and *cada poco* 'every little bit'.

It is clear from the translations in (87-89) that *–löj* derives predicates of plural events, but we want to know what kind of plural predicates they are and whether their interpretation can be assimilated to a species of nominal plurality. This chapter shows that the properties of *löj*-marked predicates follow if *–löj* is an event-external pluractional. Furthermore, I argue that event-external pluractionals in Kaqchikel are similar, though not identical to bare plurals in English. Like bare plurals, *löj*-marked predicates have both dependent and distributive readings in the appropriate environments. They also have the habitual/generic readings that first motivated the special treatment of bare plurals (Carlson, 1977).

Where they are different is that *–löj* has a nontrivial temporal component, which is not surprising given the importance of time for individuating events. The idea is that *–löj* does not generate plural event predicates directly, i.e., by placing a sum requirement on a predicate's argument, but by placing conditions on an event's temporal trace that could only be satisfied by non-atomic events. More concretely, it requires a fine partition of the event argument's temporal trace, where each of the intervals in the partition is itself the trace of an event satisfying the underlying predicate. The resulting predicates will be satisfied by events with the same part-whole structure as those in the denotation of bare plurals, though unlike bare plurals, the Kaqchikel pluractional predicates denote events with cardinality greater than some contextually specified number larger than two. Finally, while *löj*-pluractionals have habitual readings, I argue that these arise via the temporal partition, which mimics the effect of generic operators in some analyses of bare plurals, but is in the end different.

3.1 The morphosyntax of *–löj*

First, note that examples (87-89) all have intransitive predicates. This is not an oversight, but a generalization. The pluractional cannot target transitive predicates, as (90-91) show.

(90) **X-e-ki-tz'et-**elöj** ri ak'wal-a'.*
COM-A3p-E3p-see-**löj** the child-PL
SOUGHT: 'They saw the children repeatedly.'

(91) **X-e-ki-b'an-**alöj** ri jay.*
COM-A3p-E3p-build-**löj** the house
SOUGHT: 'They built the (many) houses (over time).'

The passive forms of these predicates can be derived by *–löj*.

(92) *X-e-tz'et-**elöj** ri ak'wal-a'.*
COM-A3p-see.PAS-**löj** the child-PL
'The children were seen all over the place.'

(93) *X-e-b'an-**alöj** ri jay.*
COM-A3p-build.PAS-**löj** the house
'The (many) houses were built (over time).'

Though the grammatical examples above show *–löj* affixed to CVC root stems, it can apply to non-root intransitive stems. Cutzal Chacach et al. (1999) gives (94) for the stem *sewo* 'fatigue, pant'. It can also suffix derived intransitive stems like (95).

(94) *Ni-Ø-sewe-**löj**.*
ICP-A3s-pant-**löj**
'He panted a lot / continuously.'

(95) *X-Ø-kaq-ir-**ilöj**.*
COM-A3s-red-ITR-**löj**
'It kept getting red.'

Finally, *–löj* is productive with positional roots. It usually describes scenarios of getting to that positional multiple times, or the repeated sounds associated with individuals possessing the positional property. For example, the positional root *sow* in its positional stative predicate form means to be disorganized and made out of paper or nylon. Its *–löj* form is intransitive and means the repeated sound of paper or nylon moving. Example (97) presents a similar case.

(96) Cutzal Chacach et al. 1999, pg. 328

Täq	*k'o*	*ch-Ø-wa*	*kaq'iq'*	*ri*	*wuj*
When	exists	P-E3s-front	wind	the	paper
yalan	*ni-Ø-sow-**olöj**.*				
much	ICP-A3s-disorganized(paper)-**löj**				

'When paper is in the wind it makes a lot of noise.'

(97) Cutzal Chacach et al. 1999, pg. 343

E	*k'o*	*winaq-i'*	*yalan*	*y-e-tin-**ilöj***
A3p	exists	person-PL	much	ICP-A3p-standing(heavy)-**löj**
täq	*y-e-b'iyin.*			
when	ICP-A3p-walk			

'There are people who make a lot of noise when they walk.'

The positional examples are especially interesting because positional roots are usually taken to be category neutral. They must be first derived to be used as a verb, adjective, etc. This is deeply surprising and presents a morphological puzzle. In the early examples we have seen, *–löj selects* for intransitive stems, while in (96-97) the same suffix appears to be *deriving* intransitive stems. We must either treat *–löj* here as an intransitivizing positional derivation or there must be a null morpheme deriving intransitive stems that –löj can target. In the latter case, perhaps this is where the sound semantics come from. I leave this question open for future work, though, along with the general fact that *–löj* targets intransitive stems. While I do not completely understand the morphosyntactic distribution of *–löj*, most important for the account developed in this chapter is that it can affix to arbitrary intransitive stems and need not apply close to the root.

Finally,*–löj* is often proceded by a vowel. This vowel is copied from the stem and appears for phonological reasons. The follow stems can be affixed with *–löj* directly.

(98) a. k'ojlöj, from *k'oj* 'knock'

b. b'aylöj, from *b'ay* 'tremble'

c. q'ojlöj, from *q'öj* 'break (wooden and elongated)'

In the examples that follow, I will write these vowels, but not segment them or represent them in the morphological tier of the interlinearized glosses.

3.2 Aspect and the interpretation of *–löj*

Before building an analysis of *–löj* I present the generalizations that the analysis must account for. In particular, we are interested in those properties that follow if it is an event-external pluractional. I also highlight the aspects of its meaning that show its similarity to bare plurals.

3.2.1 Aspectual insensitivity

First, like event-external pluractionals crosslinguistically, *–löj* can target predicates of most aktionsart classes (see Hendrick Krueger 1986 for evidence from the classic Vendler tests that Kaqchikel has the core aktionsart classes we are familiar with from English (Dowty, 1979; Vendler, 1957)). Only stative predicates are ungrammatical with *–löj*.

(99) ACCOMPLISHMENT
X-Ø-ban-alöj ri jäy.
COM-A3s-do.PAS-löj the house
'The houses were built over time.'

(100) ACHIEVEMENT
X-Ø-b'os-löj.
COM-A3s-arrive-löj
'He kept showing up (and leaving and showing up again).'

(101) SEMELFACTIVE
X-i-tix-alöj.
COM-A1s-sneeze-löj
'I sneezed repeatedly.'

(102) ACTIVITY
X-i-b'iyin-ilöj.
COM-A1s-walk-löj
'I kept having to walk.'
SPEAKER COMMENT: Like if you have fields all over the place and you had to do work at every one.

Non-verbal stative predicates with *–löj*, as in (103), are clearly infelicitous.[2] Stative predicates that take aspect are anomalous with *–löj*, like *etamaj* 'to know' and *k'oj* 'exist'.[3]

(103) *#Kaq-alöj ri ixtän.*
red-löj the girl
'The girl got red various times.'

(104) *#W-etama-löj ru-wäch.*
E1s-know-löj E3s-face
'I knew him various times.'

(105) *#X-i-k'oj-löj pa r-ochoch.*
COM-A1s-exist-löj at E3s-house
'I was at his house various times.'

Second, as expected with pluractionals of both the event-internal and event-external types, the resulting predicates are always atelic. This can be diagnosed using the classic *for*-adverbial test (see Hendrick Krueger 1986 for the applicability of this test in Kaqchikel). For example, while the adverbial jun ramäj 'for an hour' cannot modify intransitive achievements with

[2]Not to be confused with *kaqaläj* 'very red', which is homophonous in some dialecets.
[3]Some speakers like (104), but only with the reading 'get to know', in which case the verb has been coerced into an achievement reading.

singular subjects, as in (106), example (107) is grammatical, which can be attributed to the presence of the pluractional.

(106) *#X-Ø-b'os jun ramäj.*
COM-A3s-arrive one hour
'He arrived for an hour.'

(107) *X-Ø-b'os-löj jun ramäj.*
COM-A3s-arrive-löj one hour
'He arriving (showing up) for an hour.'

Given these facts, an analysis of *–löj* should predict the low degree of selection between the pluractional and the predicate it targets, while predicting its ungrammaticality with stative predicates. Moreover, it should predict that the resulting predicates are uniformly atelic.

3.2.2 Non-contiguous repetition

The second property characteristic of event-external pluractionality is that it does not require contiguous repetition. If *–löj* falls into this class, it should allow non-trivial downtime between the pluractional subevents and this downtime should be variable.

First, I show that downtime between the pluractional subevents is required. It is an important consideration because some VP intensifiers only require event pluralities for verbs of certain aspectual classes (e.g. Doetjes 2007). For instance, English adverbials *a lot* or *keep X-ing*, make good idiomatic translations of *löj*-marked semelfactives and achievements, but they do not always require an event plurality. The activities and accomplishments in (109) can have a durative interpretation where the event or the preparatory process is elongated, unlike (108).

(108) a. He sneezed a lot.
b. He kept sneezing.
c. He summited the mountain a lot.
d. He kept summiting the mountain.

(109) a. He walked a lot.
b. He kept walking.
c. He stirred the soup a lot.
d. He kept stirring the soup.

If this were the case for *löj*-marked predicates, an analysis in terms of plurality would not be appropriate. But, this is not the case. Speakers reject activities with *–löj* in situations where the activity lasted a long time. Instead, there must be starts and stops (see 114 as well).

(110) *X-Ø-b'ixan-ilöj.*
COM-A3s-sing-löj
'She sang many times.'
FALSE if she sang a really really long song.
SPEAKER COMMENT: It's like if you went to a concert
and they kept singing more and more songs.

(111) *X-e'-etz'an-ilöj.*
COM-A3p-play-löj
'They played many times.'
FALSE if they played a game that lasted a long time.
SPEAKER COMMENT: It's like they in many different places,
or played one game, stopped, then played another, etc.

Given that repetition is required, we can ask how much downtime between pluractional subevents is necessary or allowed. What we find is that the amount of time between events is quite variable. For instance, one speaker said she would use the sentence in (112) to describe how a shoe behaves when you are walking and get gum on it.

(112) *X-Ø-tzeb-elöj nu-buküt.*
COM-A3s-stick-löj E1s-shoe
'My shoe kept sticking.'

In this situation the sticking events reoccur with every step, which come at a high frequency and on one occasion. The same speaker, though, said she would use the sentence in (113) to describe fireworks that went off every few minutes for a couple of hours, like on a holiday.

(113) *X-e-b'oj-löj ri aj.*
COM-A3p-explode-löj the fireworks
'The fireworks kept exploding.'

Here there is much more time between explosions than between steps in the previous example.

Finally, in example (114), repeated from (102), we find large amounts of downtime between repeated events of walking. In the scenario produced by a speaker (different from above), the downtime has to be at least as long as it takes to get some work done in your fields.

(114) *X-i-b'iyin-ilöj.*
COM-A1s-walk-löj
'I kept having to walk.'
SPEAKER COMMENT: Like if you have fields all over the place and you had to do work at every one.

This series of examples provides further evidence that *–löj* is an event-external pluractional. Like similar morphemes crosslinguistically, the amount of downtime between repeated events is variable and can be quite large.

3.2.3 Habitual readings

Recall that in opposition to event-internal pluractionals, event-external pluractionals build predicates that can describe events that repeat across occasions. While it is difficult to state in a rigorous way what an occasion is (Cusic, 1981; Wood, 2007), it is easier to describe the relevant readings, which are mostly habitual. The *–löj* pluractional in Kaqchikel allows these readings. For instance, speakers say that it is possible to use *–löj* to describe people's professions or hobbies. This reading is especially salient with the optional adverbials *ojër/ojër kan* 'some/a long time ago'. In examples like (115-116), the suffix *–löj* distributes events over longer periods of time. This contrasts with the previous examples, which distributed events over bounded intervals such as some stretch of walking over a day's work.

(115) *(Ojër kan) x-i-ch'ar-alöj.*
(before DIR) COM-A1s-split.wood-löj
'I used to split wood.'
SPEAKER COMMENT: like as a profession

(116) *(Ojër)* *x-Ø-b'ixan-ilöj.*
(before) COM-A3s-sing-löj
'He used to sing.'
SPEAKER COMMENT: like in a choir

Imperfective *löj*-marked verbs have similar readings, and not surprisingly, they are more salient than with verbs in completive aspect.

(117) *La achin la' n-Ø-xub'an-alöj.*
DEM man DEM ICP-A3s-whistle-löj
'That man is always whistling.'

(118) *La jun achin la' n-Ø-chan-alöj pa r-ochoch.*
DEM a man DEM ICP-A3s-naked-löj P E3s-house
'That man is always naked around his house.'
SPEAKER COMMENT: Like a neighbor who is always working naked in his patio and he doesn't realize you can see him.

In virtue of having both habitual and bounded readings, *löj*-marked predicates are like bare plurals, which have two types of similar readings, shown in (119-120). The bare plurals in (119) are existential, and are intuitively similar to the single occasion plural readings. They make reference to a bounded plurality and are paraphrasable by *some X*.

(119) a. Whenever I walk by that house, **dogs** bark.
b. **Cab drivers** are available.
c. John bought **guitars**

(120) a. **Dogs** bark.
b. **Cab drivers** drive too fast.
c. **Guitars** sound nice accompanying piano.

In contrast, the bare plurals in (120) admit no such paraphrase. They instead have a generic or habitual reading, which is paraphrasable by *all normal X* or *all normal X in relevant situations s*. This makes them similar to *löj*-pluractionals (115-118) under the so-called occasion reading. For instance, (118) can be paraphrased as: *For all e* [*e is normal & e takes place in the man's house house*] (*the man is naked in e*).

In having these habitual readings, –*löj* exhibits the last characteristic property in (69) of event-external pluractionals crosslinguistically. Moreover, the fact that *löj*-marked predicates permit both habitual and single occasion readings make them surface similar to bare plurals.

3.3 Distributive and dependent pluractionality

We turn now to the interaction of –*löj* and distributivity. In pairing individual arguments with events, distributivity can control whether one or many events take place. Consider the English predicate, *lift*, which is ambiguous between a collective reading and a distributive reading.

(121) The students lifted the box (collectively / individually).

Under the the collective interpretation (121) is compatible with a scenario in which the box is lifted only once, that is, in a single event scenario. In contrast, (121) entails a plurality of events took place under its distributive reading. Previous analysis have considered distributive readings as a source of event plurality (Wood, 2007; Greenberg, 2010; Tovena & Kihm, 2008), like in (122) from (Wood, 2007, pg. 65, ex. 23), where the taking of individual objects sums to a plural event that can satisfy the pluractional predicate *d'ava-ty-*. What they have not done is consider the interaction of pluractionals with different types of distributivity.

(122) EVENKI

a. *d'ava* 'take/seize'

b. *d'ava-ty-* 'take/seize several objects one by one'

Recall that DISTRIBUTIVE PREDICATION is a way of predicating a plural individual of a predicate such that its parts satisfy the predicate. For example, the reading of (121) where each student lifts the box arises via distributive predication. It contrasts with the collective interpretation of predicates, like the reading of (121) where none of the individual students satisfy the predicate. Distributive predication further contrasts with DISTRIBUTIVE QUANTIFICATION, shown in (123). Distributive quantification arises via operators that apply a nuclear scope formula to each element of its restrictor formula.

(123) Each student lifted the box (*collectively / individually).

While distributive predication and distributive quantification seem to have similar interpretive effects, a large body of literature shows that they are different (Brasoveanu & Henderson, 2009; Dotlačil, 2010; Champollion, 2010; Roberts, 1991; Winter, 2000; Zweig, 2008, among others). When looking at the behavior of event-external pluractionals across subtypes of distributivity, the following generalizations emerge:

(124) a. Individuals distributively predicated of an event-external pluractional need not participate in a plural event.

b. Individuals applied to an event-external pluractional under distributive quantification must participate in a plural event.

They not only sharpen the previous work on the interaction of pluractionality and distributivity, but they make another connection between bare plurals and event-external pluractionality. Note that *d'ava·ty-* 'take/seize several objects one by one' in (124a) causes a problem for distributive predication as it was characterized. While *d'ava·ty-* is clearly distributive, none of the individuals satisfy this predicate–they individually satisfy the underlying predicate *d'ava* 'take / seize'. I will argue based on similar Kaqchikel data that these facts should be assimilated to dependent readings of bare plurals under certain distributively interpreted subjects.

3.3.1 The interaction of predicative distributivity and *–löj*

First, Kaqchikel has predicates like *lift* in English, which are ambiguous between collective and distributive readings.

(125)

Ri	*ixoq-i'*	*x-Ø-ki-jot-ob'a*	*ri*	*caxa.*
The	woman-PL	COM-A3s-E3p-elevated-tv	the	box

'The women lifted the box (together).' OR 'The women (each) lifted the box.'

Example (125) can describe situations where each woman is the agent of her own event of lifting the box, but it can also describe a situation where there is only one event of lifting the box in which all of the women participated. The former situation describes the reading that arises under distributive predication. Contrast this example with (126), which has the quantifier *chikijujunal* 'each' and can only describe a situation where each woman is the agent of her own event of lifting the box.

(126)

Chikijujunal	*ri*	*ixoq-i'*	*x-Ø-ki-jot-ob'a*	*ri*	*caxa.*
Each	the	woman-PL	COM-A3s-E3p-elevated-tv	the	box

'The women each lifted the box.'

The distributive reading of (126) arises under distributive quantification.

As presented in the generalizations in (124), the readings of *löj*-marked predicates available under distributive predication and distributive quantification are different. The intuitive description of distributive predication above requires each individual in the denotation of the subject to participate in an event satisfying the verb phrase. We should expect, then, that under distributive predication, each individual in the denotation of the subject of a *löj*-marked predicate should have to participate in an event satisfying the pluractional. This is not the case. A good test are predicates of creation/destruction, which denote events that individuals can only participate in once. If, under a distributive reading, each individual in the denotation of a plural subject had to participate in a plural event, we should see infelicity. This is not the case, as (127-129) show.

(127) *Y-e'-ajmaj-löj.*
COM-A3s-flee-löj
'They go fleeing, one after another.'

(128) *X-Ø-ban-alöj ri jäy.*
COM-A3s-do.PAS-löj the house
'The houses were built over time.'

(129) *X-e-kam-alöj.*
COM-A3p-die-löj
'They died over time.'
SPEAKER COMMENT: Could be used to describe how people die during a plague.

(130) *X-Ø-tz'am-alöj ri säqmolo'.*
COM-A3s-take.PAS-löj the eggs
'The eggs were taken over time.'
SPEAKER COMMENT: It's like you're selling eggs at the market
and they were sold a few at a time all afternoon until gone.

The naturally occurring example in (127) illustrates the point. The predicate *ajmajlöj* is clearly interpreted distributively, but no one person participates in a plural event. The same is true in examples (128-130). None of the houses in (128) have to be built more than once. The same could be said for eggs and takings in (130) and people and deaths in (129). What these examples show is individuals that are distributively predicated of an event-internal pluractional need not participate in an event that satisfies the pluractional predicate.

3.3.2 The interaction of distributive quantification and *–löj*

In contrast, quantificational distributivity with *löj*-marked predicates of creation / destruction are odd.

(131) *#Chikijujunal ri jay x-Ø-ban-alöj.*
each the house COM-A3s-do.PAS-löj
'The houses were each built many times.'

(132) *#Chikijujunal x-e-kam-alöj*
each COM-A3p-die-löj
'They each died many times.'

If the predicate denotes events that are in principle repeatable by the same participants, the use of *chikijujunal* 'each' is perfectly grammatical. But unlike with predicative distributivity, each individual must participate in an event satisfying the pluractional predicate separately, as examples (133-134) show.

(133) *Chikijujunal x-e-b'ixan-ilöj.*
each COM-A3p-sing-löj
'Each of them kept singing (more and more songs).'

(134) *Chikijujunal x-e-b'e-löj.*
each COM-A3p-go-löj
'Each of them dilly-dallied.' (i.e., went here and there)

Finally, while all of the examples with *–löj* in this section have distributive readings, the pluractional itself does not require distributivity. For instance, without the overt distributive quantifier, (133) permits a collective 'choir' reading, as in (135). In this way, it is different than the Kaqchikel pluractional considered in Part II.

(135) *X-e-b'ixan-ilöj.*
COM-A3p-sing-löj
'They kept singing (more and more songs together).'

Summarizing, the data support the two generalization in (124). Individuals applied to an event-external pluractional under distributive quantification must participate in a plural event, while individuals distributively predicated of an event-external pluractional do not.

By obeying these two generalizations, event-external pluractionals behave like existential bare plurals with respect to distributivity. Example (136) shows that bare plurals with singular subjects license a more-than-one inference. John must have ridden more than one horse.

(136) John rode horses.

The same inference is found with collectively interpreted plural subjects.

(137) a. The students lifted boxes (together).

b. The students built rafts (together).

These facts are not surprising if bare plurals are, in fact, plural. What *is* surprising is that plural subjects under distributive predication need not satisfy a predicate with a plural object.

(138) a. The students flew kites.
b. The students read books.

If distributive predication means applying a predicate to each individual in the denotation of a plural subject, then (138a) under a distributive reading should require a predication of *fly kites* to each atomic part of *the students*, in which case, the same more-than-one inference should arise as in (136). Each kid should have to fly more than one kite, but this is not the case. This odd reading of bare plurals in (138) has been called DEPENDENT in the literature (de Mey, 1981; Zweig, 2008, 2009; Champollion, 2010), and it looks exactly like the readings of *löj*-marked predicates in (127-130), captured in generalization (124a).[4]

If bare plurals and event-external pluractionals have similar dependent readings, the prediction is that the more-than-one inference should return in the scope of a distributive quantifier. Example (139) shows that this is the case.

(139) a. The students each flew kites.
b. Every student read books.

Once again, the bare plurals behave like event-external pluractionals, in particular (132), where the quantifier *chikijujunal* 'each' requires each student atom to participate in an event

[4]The relevant readings also look like cumulative readings, e.g., *The students hit the targets*, which could be true in a situation where each individual student hit at least one target and all targets were hit (Scha, 1981). It is an open question whether dependent readings of bare plurals can be assimilated to cumulativity Beck (2000); Roberts (1990), though see Zweig 2009 for a dissenting view. The analysis I propose for *–löj* will in fact account for the relevant readings in terms of cumulativity.

plurality satisfying the pluractional predicate.

Given these similarities between event-external pluractionals and bare plurals, an adequate analysis should capture the generalizations in (124) and extend to predict the distribution of dependent readings of bare plurals. The analysis chapter 3.5 presents does just this. Event-external pluractionals denote plural individuals that are structurally indistinguishable from those denoted by bare plurals. This will allow a unified analysis of the behavior of *löj*-marked predicates and dependent plurals in the presence of different types of distributivity.

3.4 Summary

This section has shown that the properties of *löj*-marked predicates are those of event-external pluractionals crosslinguistically. They are summarized below as generalizations the analysis must capture.

- *–löj* targets predicates of any aktionsart class (excluding statives).
- The resulting predicates are uniformly atelic
- The amount of downtime between the events in these pluralities is variable.
- *löj*-marked predicates have habitual readings, i.e., the repetition need not be confined to a single occasion.
- *löj*-marked predicates have dependent readings under distributive predication, but not distributive quantification.

In addition, this section has argued for a close connection between the last two generalizations and bare plurals. In accordance with the desiderata in (86), the analysis must not only capture these generalizations, but make explicit the connection between event-external and bare plurality. The properties detailed in this section should follow from this connection and not remain independent parameters that are free to vary. The next section argues for just such an account.

3.5 *–löj* and non-atomic event reference

The challenge for any account of the generalizations above that also meets the desiderata in (86) is that *–löj* has nontrivial temporal effects, while sharing characteristics with bare plurals. Theoretical notions like downtime, atelicity, or aktionsart have no clear parallels in the nominal domain. This makes it difficult to reduce the type of plural reference found with *löj*-marked predicates to a species of nominal plurality. This section argues that the challenge can be met if we keep separate the kind of plural entities a predicate denotes from how the entities that make up those pluralities are individuated. I argue that *löj*-marked predicates denote plural individuals with the same part-whole structure as those in the denotation of count nouns. Where they differ is that the pluractional individuates the events that constitute the plurality through their temporal trace. The result is that for those areas of meaning that care about parts and wholes, like distributivity, *löj*-marked predicates and bare plurals will behave similarly. But, since the parts of a pluractional event are defined temporally (which does not make much sense in the individual domain), the analysis can give a unified explanation of all of the characteristics of event-external pluractionality.

Before giving the analysis, we must lay out one formal preliminary which I borrow from the account of the minimal parts problem via stratified reference in Champollion 2010. Champollion defines a function ϵ that maps a comparison class to a predicate of individuals very small relative to some measure and the members of the comparison class (see Champollion 2010, ex. 58 for the definition.To use one of Champollion's examples, the function ϵ is part of the denotation of atelic adverbials like *for ten hours*, in which case it would map the interval *ten hours* to a predicate of intervals very short relative to *ten hours*, for example, $\lambda t[hours(t) \leq 0.5]$.

My analysis treats *–löj* as an eventive modifier that places conditions on the event argument's temporal trace that can only be met by non-atomic events. This is how it unites the temporal and plural aspects of *–löj*'s meaning. Example (140) gives the denotation of *–löj*, while figure 3.1 illustrates its temporal contribution.

(140) $[\![\text{-}l\ddot{o}j]\!] = \lambda V_{et}\lambda e[V(e) \wedge \exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e)) \wedge \forall t \in \mathsf{P}\exists e'[\begin{array}{l}\text{i. } \tau(e') = t \wedge \\ \text{ii. } e' \leq e \wedge \\ \text{iii. } \mathbf{atom}(e') \\ \text{iv. } \epsilon(\tau(e))(t)\end{array}]]]$

According to (140), *–löj* is an intersective modifier that introduces a partition of the event argument's temporal trace.[5] The partition is visualized in figure 3.1, where the arrows represent the temporal trace function and times $t_1, ..., t_3$ are assumed to be disjoint. The denotation

[5]The notion of partition is usually discussed in set-theoretic terms, but there are equivalent definitions in mereological terms. This is needed because time is assumed to form a mereology in this account.

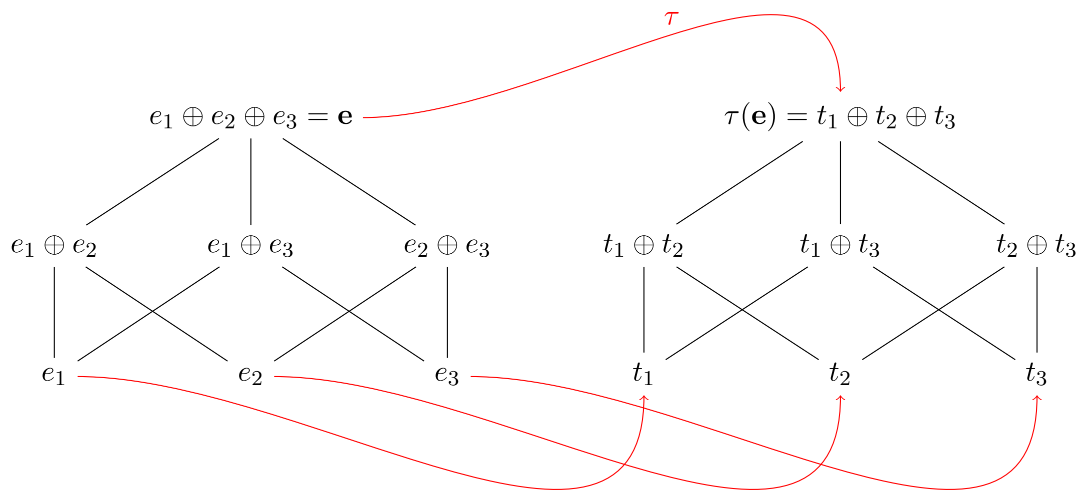


Figure 3.1: *-löj* as a temporal modifier

in (140) requires that for each time t in the partition, there is an atomic event e' satisfying the other three conditions. First, t is the trace of e'. The arrows connecting $e_1, ...e_3$ in 3.1 illustrate this condition. Second, each of these events must be part of the main event e. Finally, the last condition says that each of the intervals t is very short relative to the trace of the main event e.[6]

(141) $\mathsf{Part}(\mathsf{P}, x)$ iff

a. $\bigoplus P = x$

b. $\forall x(x \in P \rightarrow \neg\exists y(y \in P \wedge x \circ y))$

The definition in (141) says that P is a partition of x just in case P is a set of non-overlapping entities that sum to x.

[6]The formalization of the last condition borrows from the account of the minimal parts problem via stratified reference in Champollion 2010. Champollion defines a function ϵ that maps a comparison class to a predicate of individuals very small relative to some measure and the members of the comparison class (see Champollion 2010, ex. 58 for a definition and Champollion 2010, pg.113-119 for discussion related to the minimal parts problem).

It should be clear how the denotation for *–löj* given in (140) will connect its temporal properties with its similarity to bare plurals. Predicates bearing *–löj* will only apply to non-atomic events, because only non-atomic events can have parts whose temporal traces partition temporal trace of the main event. Thus, *–löj*-marked predicates will be predicates of sum events with atomic parts, just like bare plurals are predicates of sum individuals with atomic parts. Where they are different, though, is that events that constitute the sum must be arranged in time in a particular way. The rest of this section is devoted to showing how the temporal partition and the non-atomicity condition explain the behavior of *–löj*, while assimilating *löj*-marked predicates to bare plurals as much as possible.

3.5.1 Accounting for aspectual insensitivity and entailment

Recall that *–löj* can felicitously apply to intransitive stems of any aktionsart class, excluding statives. The explanation for this distribution follows from the semantic contribution of *–löj*. Figure 3.2 illustrates the part-whole structure of a simple hypothetical event in the denotation of a *–löj*-marked predicate like (142), whose denotation is in (143).

(142) *Iwïr* *x-i-b'iyin-ilöj.*
Yesterday COM-A1s-walk-löj
'I walked many times yesterday.'

To use one of Champollion's examples, the function ϵ is part of the denotation of atelic adverbials like *for ten hours*, in which case it would map the interval *ten hours* to a predicate of intervals very short relative to *ten hours*, for example, $\lambda t[hours(t) \leq 0.5]$.

(143) $[\![\text{-}b\text{'}iyinil\ddot{o}j]\!] = \lambda e[*\text{WALK}(e) \wedge$

$$\exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e)) \wedge \forall t \in \mathsf{P} \exists e'[\begin{array}{l} \text{i. } \tau(e') = t \wedge \\ \text{ii. } e' \leq e \wedge \\ \text{iii. } \mathbf{atom}(e') \\ \text{iv. } \epsilon(\tau(e))(t) \end{array}]]]$$

(144) a. $\{e_1, e_2, e_3\} \subset [\![\lambda e[*\text{WALK}(e)]]\!]$
b. $\{e_1, e_2, e_3\} \subset A_\epsilon$(toms)
c. $\mathsf{P} = \{t_1, t_2, t_3\}$
d. $t_1, ..., t_3$ are very short compared $t_1 \oplus t_2 \oplus t_3$

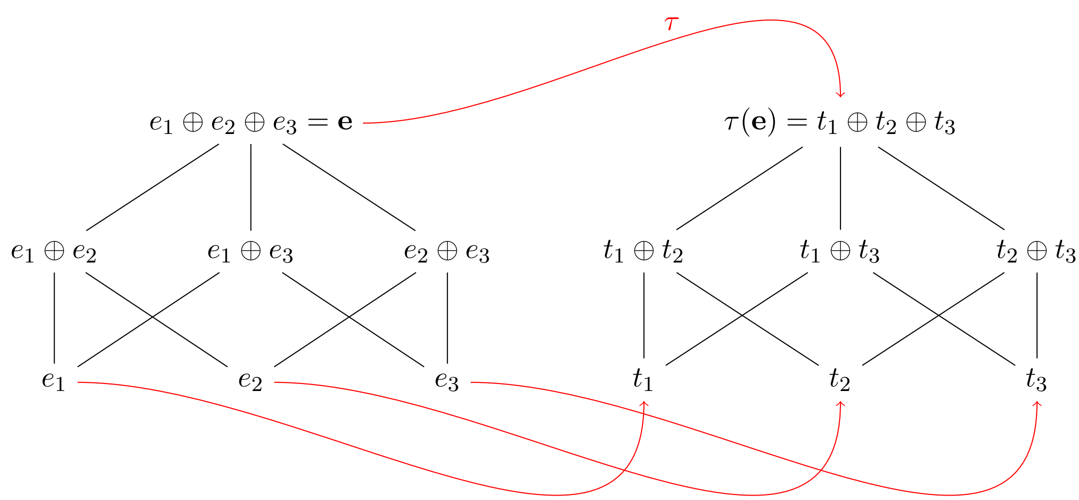


Figure 3.2: *–b'iyinilöj*

In figure 3.2 and (144), e is the sum of three walking events, each of which is mapped to a unique, non-overlapping temporal trace that is very short relative to $\tau(e)$. (Event-external predicates might usually need events of larger cardinality than this, but for reasons of space, I assume three is enough). Not only must the events that induce the temporal partition of e be atoms, they must also satisfy the same predicate as e, in this case *–b'iyin* 'walk'. The reason is that ∗WALK is cumulatively closed and WALK denotes in the space of atoms, so e must be an atomic event of walking or some sum of walkings.

This last observation correctly predicts that sentences with the *–löj* pluractional entail corresponding sentences without *–löj*, which is a property of event-external pluractionals crosslinguistically. Examples (145) and (148) illustrate this entailment pattern.

(145) Iwïr xib'iyinilöj. ⇒ Iwïr xib'iyin.

Where:

(146) *Iwïr* *x-i-b'iyin-ilöj.*
Yesterday COM-A1s-walk-löj
'I walked many times yesterday.'

(147) *Iwïr* *x-i-b'iyin.*
Yesterday COM-A1s-walk
'I walked yesterday.'

(148) Xch'analöj. ⇒ Xch'ane.

Where:

(149) *X-Ø-ch'an-alöj.*
COM-A3s-naked-löj
'He got naked repeatedly.'

(150) *X-Ø-ch'an-e'.*
COM-A3s-naked-iv
'He got naked.'

The entailment between *löj*-marked sentences and their non-pluractional counterparts follows immediately if event predicates are existentially closed and *löj*-marked predicates denote pluralities of events in the denotation of their non-pluractional counterparts. It is the eventive equivalent of entailment that holds between plural and singular count nouns in (151-152) under the non-specific reading of the indefinite.

(151) a. John played guitars. ⇒

b. John played a guitar.

(152) a. John ate sandwiches. ⇒

b. John ate a sandwhich.

The reason that existential bare plural and event-internal pluractionals behave the same here is that both denote existentially bound, cumulatively closed predicates of pluralities. Assuming the existential closure of the event argument, it is generally the case that $\exists e[*Q(e)]$ entails $\exists e[Q(e)]$. The reason is that by the definition of cumulative closure, any event satisfying the antecedent must have at least one part satisfying the consequent. This is the same reason why the bare plural sentences in (151-152) entail the sentences with the singular existential DPs in (151-152).

While *löj*-marked predicate are satisfied by plural events, like (144), it is possible to show that they *cannot* be satisfied by atomic events. The result is that *löj*-marked predicates must have non-atomic plural reference and must compose with event predicates after they have been cumulatively closed. Figure 3.3 illustrates the argument. Suppose *–löj* applied to a non-cumulatively closed predicate, *i.e.*, a predicate that denoted in an atomic domain like WALK in (153). (Note that it does not bear the ∗-operator). As figure 3.3 and example (154) show, the formula in (153) is a contradiction. Any event in the denotation of the verbal predicate would only have itself as a part. Thus, the only partition of that event's temporal trace such that each element is the trace of one its subevents would be the trivial partition. The pluractional would then require that this temporal interval be very short relative to itself, which is contradictory.

(153) $\lambda e[\textsc{walk}(e) \wedge \exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e)) \wedge \forall t \in \mathsf{P} \exists e'[\begin{array}{l} \text{i. } \tau(e') = t \wedge \\ \text{ii. } e' \leq e \wedge \\ \text{iii. } \mathbf{atom}(e') \\ \text{iv. } \epsilon(\tau(e))(t) \end{array}]]]$

(154) a. $\{e_1\} \subset [\![\lambda e[\textsc{walk}(e)]]\!]$
b. $\{e_1\} \subset A_\epsilon$(toms)
c. $\mathsf{P} = \{t_1\}$
d. Contradiction! t_1 is very short compared t_1

This argument shows that *löj*-marked predicates cannot be satisfied by atomic events, and thus *–löj* cannot apply to a verbal stem before cumulative closure. In my account, this conclusion has syntactic effects because cumulative closure is represented in the compositional semantics. The suffix *–löj* must have the distribution in (155).

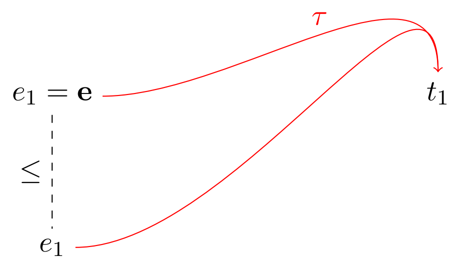
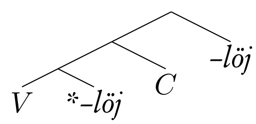


Figure 3.3: *–löj* blocks atomic events

(155)



The tree above does not make many morphosyntactic predictions because we do not know what can scope under the cumulative closure operator. In the next chapter, though, I will argue that event-internal pluractionals must, making the strong prediction that event-external pluractionals like *–löj* must appear further from the root and have a freer distribution. I show that both of these predictions are borne out. For now, what (155) shows is that *–löj* is parasitic on cumulativity, which has morphosyntactic consequences in my account.

The examples considered thus far predict that as long as a verbal predicate is a cumulatively closed predicate of events over which τ is defined, it should be compatible with *–löj*. This is clearly the case for achievements, accomplishments, activities, and semelfactives, which all allow the cumulative readings that have supported treating verbal predicates as cumulatively closed[7]. Given the weak requirements that *–löj* places on its predicative argument—it need

[7]Note that a treatment of event-external pluractionality along these lines precludes an account of the telic-atelic distinction in terms of cumulativity alone, for example (Zwarts, 2005). If telic predicates denoted in an

only be cumulativity closed—the analysis correctly predicts its wide distribution across aspectual categories, which matches the wide distribution of event-external pluractionals crosslingustically.

What needs explanation is the ungrammaticality of *-löj* with statives. Note that they too license cumulative readings, as shown in (156).

(156) *John loves Mary* and *Bill loves Mary* $\Rightarrow$ *John and Bill love Mary*

This fact is predicted in my account if stative predicates are the verbal counterparts of mass nouns.[8] Like mass nouns, stative predicates are not just cumulative, but also homogenous.

(157) Homogeneity

$$\forall x[P(x) \rightarrow \exists y \exists z[y \leq x \wedge z \leq x \wedge \neg(y \circ z) \wedge P(y) \wedge P(z)]]$$

'P is homogenous just in case all x in P have at least two non-overlapping parts in P.'

Homogeneity captures the intuition that stative predicates hold down to instants. For example, if a circle is red in event e, there seem to be no subarts of that event, no matter how short, in which the circle is not red.

atomic domain, while atelic predicates denoted in some cumulatively closed domain, then event-external pluractionals should only target atelic predicates. There do not seem to be any pluractionals of any sort with this distribution.

[8]There is also the possibility that pluractionals cannot apply to stative predicates due to type mismatch. Recall that in many analyses, stative verbs are predicates of a different sort (in the formal sense) than predicates of other aktionsart classes. For instance, Dowty 1979 treats stative verbs as predicates of entities of type s. Another option is to treat stative verbs as predicates of temporal entities directly, either intervals (e.g., Deo 2009) or 'moments' (e.g., Bach 1986). All of these approaches would immediately predict their incompatibility with *-löj* on compositional grounds. While this option should not be ruled out, it would be preferable to derive a deeper semantic incompatibility between *-löj* pluractionality and stative predication.

Note that a homogenous predicate cannot have atoms in its extension because atoms have no parts, and thus cannot have non-overlapping parts also in the predicates' extension. As homogenous predicates, stative predicates denote events with no atomic parts. This directly conflicts with the denotation of *–löj*, which requires *löj*-marked predicates to denote sum events that have atomic parts. In this way, the fact that *–löj* cannot apply to stative predicates has the same explanation as the fact that plural morphology cannot derive mass nouns. Once again, the analysis correctly draws parallels between event-external pluractionality in the event domain and count plurality in the nominal domain. While count plurals and *löj*-marked predicates on the one hand, and mass nouns and stative predicates on the other, are all closed under cumulativity, only the former denote entities with atomic parts. It is this fact that constrains the distribution of plural morphology across morphosyntactic categories.

3.5.2 Deriving vague plural cardinality

We have seen how *–löj* derives predicates of non-atomic events, but notice that the way that non-atomicity is enforced makes additional claims about the cardinality of pluractional events. The formula in (140) requires that the events that partition the pluractional event's temporal trace be short relative to that event. The prediction is that *löj*-marked predicates should denote events that have more than a few parts, but since *short-relative-to* is a vague predicate, their exactly cardinality should be vague. This is borne out in the data, and once again makes *–löj* like event-external pluractionals crosslinguistically, which are satisfied by events of at least paucal number (see the summary in 69 and the discussion above).

First, if *–löj* derives predicates of paucal cardinality, we expect that it should not accept events of cardinality two. The first test is that *löj*-marked predicates of creation / destruction should be infelicitous with subjects of cardinality two. Example (158) shows that this is the case.

(158) *#X-e-kam-alöj ri ka'i'.*
COM-A3p-die-löj the two
'The two died over time.'

Furthermore, speakers judge sentences like (159-160) false in a scenario where it is made explicit that two events took place.

(159) Suppose you sat down, but someone said you were in their chair, so you got up and sat down somewhere else.
X-i-tzuy-ulöj.
COM-A1s-sit-löj
FALSE: 'I sat repeatedly.'

(160) Suppose you hear someone knock twice on your door.
K'o n-Ø-k'oj-löj pa puerta.
exist ICP-A3s-knock-löj P door
FALSE: 'Someone is knocking repeatedly at the door.'

Clearly events of cardinality two cannot satisfy *löj*-marked predicates, but determining a fixed minimum cardinality is no easier. The number varies by predicate and context. In many cases, though, *löj*-marked predicates can be satisfied by events with a few to several atomic parts. For instance, speakers say that (161) can be used to describe a clock tower going off on the hour. For this to be the case, not more than 12 rings. Pressed further, speakers say there need to be several rings, but are reluctant to give an exact number.

(161) *X-Ø-chin-ilöj.*
COM-A3s-ring-löj
'It rang repeatedly.'

Similarly, a speaker offered a scenario for (162) where one slips several times walking home.

(162) *X-i-tzaq-alöj pa b'ey r-oma ri job'.*
COM-A1s-fall-löj P streed E3s-because the rain
'I fell in the street several times because of the rain.'

Speakers are not only reluctant to produce an exact cardinality for events above, but the issue cannot be forced using language internal resources, like cardinality adverbials. The problem is that explicit quantification must count events in the denotation of the pluractional, that is, plural events.

(163) *Oxi' b'ej x-Ø-chin-ilöj.*
three times COM-A3s-ring-löj
'It rang repeatedly on three occasions.'

(164) *Oxi' b'ey x-Ø-k'oj-löj pa w-ochoch.*
three times COM-A3s-knock-löj at E1s-house
'He knocked at my house few times on three occasions.'

Based on these data, the analysis must capture two generalizations: (i) The cardinality of the events that *löj*-marked predicates denote resists quantification, but (ii) it must be at least above some vague paucal range. In my account, these facts follow from the way *–löj* partitions the event argument and is closely related to the fact that *–löj* derives atelic verbs. Before showing this, though, consider an alternative analysis that makes use of the part-whole structure of a plural event. For instance, *–löj* could receive a translation like *m*-words (many, much, etc.) in Rett 2008, where μ is a measure function, in this case mapping a plural individual to the cardinality of the set of its atomic parts. The pluractional would further require that this cardinality be larger than some contextually specified value. Example (165) give the relevant denotation, which is actually quite close to the denotation of pluractionals in Lasersohn 1995.

(165) $[\![$-*löj*$]\!] = \lambda V_{et}\lambda e[V(e) \wedge \mu(e) \geq n]$

The analysis in (165) treats pluractional predicates more like count plurals than my analysis does. It assumes that plurality in the pluractional domain is managed via cardinality predicates, not the structure of an event's temporal trace. The result is that while *löj*-marked predicates under the analysis in (165) have the same kind of plural reference as in my analysis, (165) predicts that the atomic parts of e can be arbitrarily arranged in time. Examples (166-168) show that this prediction is incorrect. The events that *löj*-marked predicates described have to be temporally extended. For instance, while example (166), can describe a plague that kills a lot of people over time, it cannot be truthfully used to describe a situation where a bunch of people die at once. Speakers judge (166) as false in the context of a bus crash that kills a lot of people. Examples (167-168) show the same fact.

(166) *X-e-kam-alöj.*
COM-A3p-die-löj
'They died over time.'
SPEAKER COMMENT: Could be used to describe how
people die during a plague.

(167) Suppose a bunch of fireworks went off at once. Can you say:

#X-e-b'oj-löj	*ri*	*aj*
COM-A3p-explode-löj	the	fireworks

'The fireworks exploded for awhile.'
SPEAKER COMMENT: No, it's like if the fireworks kept going off
every few minutes.

(168) Suppose a bunch of bells ring once, all at the same time. Can you say:

#X-e-chin-ilöj *ri* *kapana*
COM-A3p-ring-löj the bells
'The bells rang various times.'
SPEAKER COMMENT: No, that would be *Xechinicho'* 'They suddenly rang.'

Given that the examples above all have distributive predicates and plural subjects, they entail that multiple events took place. Thus, an approach like (165), which only requires pluractional events to have a contextually specified cardinality greater than two, incorrectly predicts that they should be true in contexts that entail simultaneity. In contrast, my account individuates the events that constitute a pluractional event based on on their temporal traces. This allows the generalization to be captured naturally. The reason is that temporal intervals are unique. If I walked from 4:00pm to 5:00pm, and you did too, the temporal trace of the sum of our walkings is just 4:00pm to 5:00pm. Thus, if all the pluractional subevents in the denotation of a *löj*-marked predicate happen over the same interval, then they cannot be very short relative to the interval of their sum, failing condition (iv) in (169), repeated from (140). The result is that the subparts of a plural event satisfying a *löj*-marked predicate are correctly predicted to be spread out over time.[9]

[9] It is important to note that the account of *–löj* does not completely prohibit simultaneous events from occurring during the course of repeating. The reason is that we only require each element in the temporal partition to be a trace of at least one event. Since two events can have the same trace, some of the pluractional sub-events can occur at the same time. We only bar most of them happening at the same time. While I do not have data about all of the scenarios, speakers do not judge sentences like (167) false if sometimes two fireworks go off at the same time.

(169) $[\![\text{-}l\ddot{o}j]\!] = \lambda V_{et}\lambda e[V(e) \wedge \exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e)) \wedge \forall t \in \mathsf{P}\exists e'[\begin{array}{l}\text{i. } \tau(e') = t\wedge \\ \text{ii. } e' \leq e\wedge \\ \text{iii. } \mathbf{atom}(e') \\ \text{iv. } \epsilon(\tau(e))(t)\end{array}]]]$

Not only does clause (iv) of (169) correctly predict that *löj*-marked predicates denote plural event distributed over time, it also predicts that the exact number should be vague and significantly larger than two. By unifying the explanation of these facts, the analysis improves over one that merely adds a linearity condition to the μ-based analysis in (165), like Lasersohn 1995 or Wood 2007. The reasoning behind the successful prediction of clause (iv) is as follows. The formula in (169) requires that events that sum to e have very short temporal traces relative to e. This forces e to preferentially have a cardinality greater than two. Suppose, for instance, that e is in the denotation of a *löj*-marked predicate and that e is the sum of exactly two events e' and e''. The shortest that e' and e'' can be, given that we want to minimize both, is that their runtimes are half of that of e. Thus, e can only be in a *löj*-marked predicate if half of the runtime of e counts as very short subinterval of e. Presumably this is not the case. The result is that the only way an event can satisfy a *löj*-marked predicate is if it is made up of at least several events, and the more the better. Moreover, (169) also explains why the exact number of events is vague. The reason is that the function ϵ compares intervals on a gradable scale of shortness, which is a vague predicate.

While *löj*-marked predicates are only satisfied by plural events, it is not clear why their cardinality cannot be explicitly counted by cardinality adverbials like *oxi' b'ey* 'three times'.

Recall that these adverbials at best only count pluractional events, as in (170). Here each of the three events must satisfy the *löj*-marked predicate.

(170) *X-Ø-chin-ilöj oxi' b'ej.*
COM-A3s-ring-löj three times
'It rang various times on three occasions.'

This fact is explained if cardinal adverbials express a relativized notion of cardinality that counts smallest individuals in the denotation of a predicate instead of atoms in the model. Example (171) says that cardinality of e relative to V is the cardinality of the set of all parts of e that are in V that do not themselves have parts in V. We can then treat an adverbial like *oxi' b'ey* as a VP modifier that check the cardinality of the VP's event argument relative to the predicate that the VP denotes.

(171) $\textsc{Card}_V(e) :\Leftrightarrow |\{e'|e' \leq e \wedge V(e') \wedge \forall e''[e'' \leq e' \wedge V(e'') \rightarrow e'' = e']\}|$

'The cardinality of e relative to a predicate V is the cardinality of the set of all parts of e satisfying V that have no parts satisfying V.'

(172) $[\![$*oxi' b'ey*$]\!] = \lambda V_{\epsilon t}\lambda e[V(e) \wedge \textsc{Card}_V(e) = 3]$

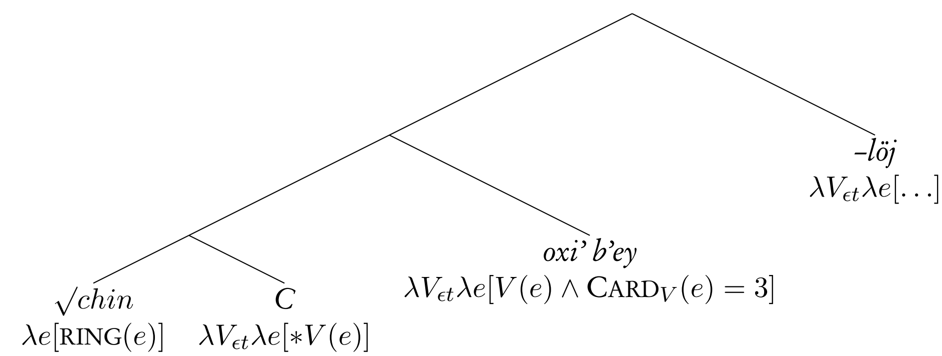
'A function from verbs V to events with three parts satisfying V that have no parts satisfying V.'

When *oxi' b'ey* 'three times' takes the pluractional predicate as an argument it asserts that the event has three parts satisfying the pluractional predicates, not that the event that satisfies the pluractional predicate has three atomic parts. Example (173) gives the denotation for example (170), suppressing the interpretation of *–löj* for readability.

(173) $\exists e[[\![\text{chinilöj}]\!](e) \wedge \mathbf{ag}(e) = x \wedge \textsc{Card}_{[\![\text{chinilöj}]\!]}(e) = 3]$

If cardinality adverbials receive the proposed analysis, the only way to get the unavailable reading in which we count the number of pluractional subevents is for the cardinality adverbial to compose with verbal predicate before the pluractional, like (174), which evaluates to the formula in (175). Note that the cardinality predicate is relativized to the base predicate, *chin* 'ring', not the pluractional predicate *chinilöj*. What is important is that the predicate CARD is relativized to the pluractional predicate—it counts events satisfying the *löj*-marked predicate.

(174)



(175) $\lambda e[*\text{RING}(e) \wedge \textsc{Card}_{\lambda e[*\text{RING}(e)]}(e) = 3 \wedge \exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P}\exists e'[\tau(e') = t \wedge e' \leq e \wedge \mathbf{atom}(e') \wedge \epsilon(\tau(e))(t)]]]$

This possibility of (174) is ruled out in the syntax. Pluractional suffixes are derivational morphemes, and so they must compose before VP adverbials. This is not true for languages like English, where cardinal adverbials can take all possible scopes with respect to those adverbials that are used to translate event-external pluractionals in languages like Kaqchikel, see (176-177). They can even take both wide or narrow scope with respect to other cardinal adverbials, as in (178).

(176) a. John jumped repeatedly twice. (repetitions on two occasions)
b. John jumped twice repeatedly. (two jumps per repetition)

(177) a. John jumped many times twice. (many jumps on two occasions)
b. John jumped twice many times. (two jumps on many occasions)

(178) a. John jumped ten times twice. (ten jumps on two occasions)
b. John jumped twice ten times. (two jumps on ten occasions)

These facts follow immediately if English cardinality adverbials also express relative cardinality. For example, only events of jumping ten times count as one when interpreting the adverbial *twice* in (178a). The reason that there are two available readings in English is that, unlike in Kaqchikel, the morphosyntax does not force a particular scope relation for these pairs of verbal modifiers.

3.5.3 Accounting for habitual readings and variable downtime

Finally, the τ-based account of *-löj* also correctly predicts that the amount of downtime between repeated events is variable, which is one of the characteristic properties of event-external pluractionality. The reason is that sum events can have discontinuous temporal traces.[10] The pluractional requires a partition of the event's temporal trace, but it does not require the cells of the partition to be temporally connected. As illustrated in figures 3.4 and 3.5, if the temporal trace of a plural event has no gaps, then events with temporal traces corresponding to its partition must be contiguous. If a plural event has a discontinuous temporal trace (because it is the sum of non-temporally-contiguous events), it can still be

[10]Recall that, as detailed in section 2.1, I assume that the temporal trace function is a sum homomorphism (Link, 1983/2002; Krifka, 1998). Furthermore, I assume that the discontinuous temporal intervals are measured strictly, that is, if I walked from noon to 1:00pm and from 11:00pm to midnight, the measure of the sum of my walking events on the hour scale is 2, not 12. Note that this assumption is empirically grounded. For example, if I did this yesterday, I could say *I walked for two hours yesterday*, not *#I walked for twelve hours yesterday*.

partitioned, but the pluractional takes no stand on the amount of downtime between cells of the partition.

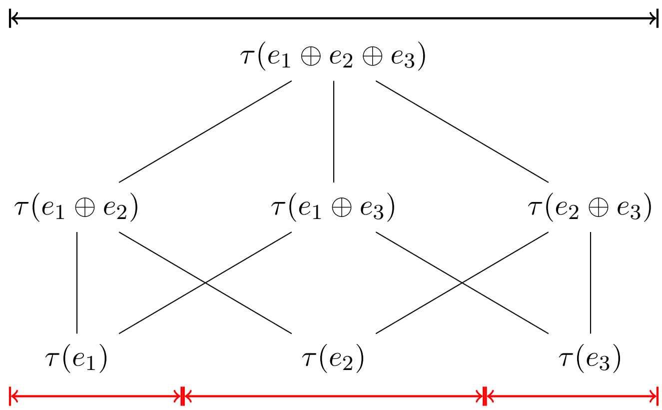


Figure 3.4: Contiguous plural events

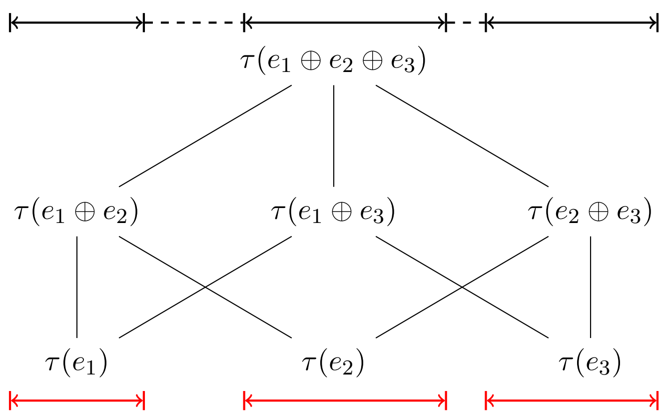


Figure 3.5: Non-contiguous plural events

The fact that events like those in 3.5 can satisfy a *löj*-marked predicate accounts for the wide variety of scenarios these predicates can be used to describe. For instance, if there is not much time between the first and last event, then the many events required by *–löj* will have to be close together (up to contiguity). This would correspond to the single occasion reading, like the example of the shoe sticking in (112), repeated below.

(179) *X-Ø-tzeb-elöj nu-bukü t.*
COM-A3s-stick-löj E1s-shoe
'My shoe kept sticking.'
SPEAKER COMMENT: Like if your shoe had gum on it.

Here we have to squeeze many *sticking* events into a short period of time, hence the shoe sticking on every step. In contrast, if the perspective is a whole day, then there can be large amounts of downtime between pluractional subevents, as in (180), repeated from (102).

(180) *X-i-b'iyin-ilöj.*
COM-A1s-walk-löj
'I kept having to walk.'
SPEAKER COMMENT: Like if you have fields all over the place
and you had to do work at every one.

Finally, we established that *löj*-marked predicates can have habitual readings, which seem to be unbounded.

(181) *(Ojër kan) x-i-ch'ar-alöj.*
(before DIR) COM-A1s-split.wood-löj
'I used to split wood a lot.'
SPEAKER COMMENT: like as a profession

(182) *La achin la' n-Ø-xub'an-alöj.*
DEM man DEM ICP-A3s-whistle-löj
'That man is always whistling.'

(183) *La jun achin la' n-Ø-chan-alöj pa r-ochoch.*
DEM a man DEM ICP-A3s-naked-löj P E3s-house
'That man is always naked around his house.'
SPEAKER COMMENT: Like a neighbor who is always working naked
in his patio and he doesn't realize you can see him.

In this way, *löj*-marked predicates behave like bare plurals, which also have both bounded existential readings, as well as habitual readings like (184).

(184) a. **Dogs** bark.
b. **Cab drivers** drive too fast.
c. **Guitars** sound nice accompanying piano.

One prominent strand of work takes habitual readings of bare plurals to arise when null generic operators bind some combination of individual and situation variables which bare plurals make free for binding (Farkas & Sugioka, 1983; Diesing, 1992; Kratzer, 1995; Krifka, 1995). For example Krifka 1995 gives (185) the truth conditions in (186) under at least one reading.

(185) Planes disappear in the Bermuda Triangle.

(186) $\mathbf{GEN}_{x,s}[\text{PLANES}(x) \wedge \mathbf{in}(x,s) \wedge \mathbf{in}(s, \mathbf{Bermuda.Triangle})](\text{DISAPPEAR}(x,s))$
'It's generally true that if x is a plane and s is in the Bermuda Triagle and x is in s, x disappears in s.'

Note that the paraphrase for (186) is similar to one we could give for (183): 'It is generally true that if x is that man and s is in his house and x is in s, then x is naked in s.' This effect follows, not because of a covert **GEN** operator, but because the pluractional contributes τ-based universal quantification over events. Suppose that a sum event e has a temporal trace that covers all (or most) of the times when that man in (183) is in his house and every part of e has a spatial trace that includes the man. This sum event would like the sum of all situations satisfying the restrictor of the generic operator in the paraphrase. Now suppose that this sum event satisfies the pluractional. This means that it should be exhaustively decomposable into many temporally distributed parts, each of which is an event of that man being naked. This is like saying each of the restrictor situations above is a situation in which the man is naked. The pluractional sentence in (183) can mimic the interpretation of habitual readings of bare plurals because it contain universal quantification over events and can be true of arbitrary event-sums. In this way, the habitual readings of event-external pluractionals are assimilated to the single occasion readings. The only difference is that the former have large events, comprising all of the situations relevant for making a generic claim.

3.5.4 τ-based pluractionality as a source of atelicity

The analysis of *–löj* based on fine-grained temporal partions requires a significant number of pluractional subevents and forces them to be distributed over time. The structure of this distribution immediately predicts that *löj*-marked predicates are uniformly atelic. The primary atelicity diagnostic since at least Vendler 1957; Verkuyl 1972 has been the distribution of *for*-adverbials. As with *for*-adverbials in English, Kaqchikel bare numeral atelic adverbials are odd with achievements and accomplishments (187-188), but examples (189-190) show that they are grammatical with *–löj*.

(187) *??X-e-b'an ri jay ka'i juna'.*
COM-A3p-build.pas the house two year
'The houses were built for two years.'

(188) *#X-Ø-b'os ri achin oxi ramäj.*
COM-A3s-arrive the man three hour
'He arrived for three hours.'

(189) *X-e-b'an-alöj ri jay ka'i juna'.*
COM-A3p-build.pas-löj the house two year
'The houses were built over two years.'

(190) *X-Ø-b'os-löj ri achin oxi ramäj.*
COM-A3s-arrive-löj the man three hour
'He kept showing up for three hours.'

Given these facts, *löj*-marked predicates must share the same property that atelic predicates have which allows them to combine with *for*-adverbials. There are a variety of accounts, but by far the most influential finds its roots in Bennett & Partee (1972); Dowty (1979), which says that atelic predicates have the subinterval property, defined in (191).

(191) Subinterval property a là Bennett & Partee 1972
SUB(P) $:\Leftrightarrow \forall i[\text{AT}(P,i) \rightarrow \forall j[j < i \rightarrow \text{AT}(P,j)]]$
P has the subinterval property just in case if P holds at i it holds at every subinterval of of i.

The problem with an account of atelicity in terms of the subinterval property, is that it cannot, under a strict reading, be true. It is at best an idealization, which was clear even to Dowty (1979). The problem is that for most atelic predicates, it is easy to find subintervals of events in their denotation for which the predicate does not hold. The classic example is *waltz*, which is atelic, even though it is not clear whether an event counts as waltzing if its temporal trace corresponds to only two beats of the dance. This problem for accounts of atelicity in terms of the subinterval property has come to be known as the minimal parts problem.

The minimal parts problem has spawned a series of refinements to the subinterval property. The intuition behind these revisions has consistently been that the subinterval property should hold down to intervals that are long enough to be relevant. The definitions in (192-194) present examples of the type of amendments that have been proposed.

(192) Subinterval property a là Moltmann 1991, 1997
SUB(P) $:\Leftrightarrow \forall e,t[P(e) \wedge \tau(e) = t \rightarrow \forall t'[t'Rt \rightarrow \exists e'[P(e') \wedge \tau(e') = t']]]$

Suppose that t is the trace of a P event. P has the subinterval property just in case all t' that are relevant parts of a t are traces of P events.

(193) Subinterval property a là Link 1991
$\text{SUB}(P) :\Leftrightarrow \forall e, t[P(e) \wedge t < \tau(e) \wedge |t| > \gamma(e) \rightarrow \exists e'[e' \leq e \wedge P(e') \wedge \tau(e') = t]]$
Suppose that e is a P event with trace t. P has the subinterval property just in case all parts of t longer than $\gamma(e)$ are traces of P events.

(194) Subinterval property a là Champollion 2010
$\text{SUB}_K(P) :\Leftrightarrow \forall e[P(e) \rightarrow e \in *\lambda e'[(P(e') \wedge \epsilon(K)(\tau(e')))]]$
Suppose that e is a P event. P has the subinterval property relative to interval K just in case e can be exhaustively divided into short parts (those satisfying ϵK) that satisfy P.[11]

There is a clear similarity between these definitions of the subinterval property and the denotation of *–löj*. They all make use of a contextualized notion of subpart. Moltmann (1991, 1997) goes the furthest and tries to motivate a general relevant subpart relation. Link (1991) and Champollion (2010) spell out in more detail the property that relevant events have. In both cases it is temporal. For Link (1991), e' is a relevant part of e if its temporal trace is longer than $\gamma(e)$, which is meant to be the shortest interval that could possibly serve as a trace of e given the predicate it satisfies. For Champollion (2010), ϵK is a predicate of intervals that are short relative to the interval of time given by the *for*-interval, K. Thus, e' is a relevant part of e if the trace of e' is short relative to the trace of e (which should be as long as whatever a *for*-adverbial requires).

Looking again at the denotation of *–löj*, we find that all *löj*-marked predicates have the properties $\text{SUB}_{Champollion}$ and SUB_{Link} under some mild assumptions.[12] The result is that

[11] Champollion actually proposes to subsume the subinterval property under a broader notion of *stratified reference*, but this is not important for the discussion here.

[12] It is not possible to tell whether all *löj*-marked predicates have the the property $\text{SUB}_{Moltman}$ since it is less clear in that work what counts as a relevant part.

löj-marked predicates are predicted to be atelic in most of these theories, and thus grammatical with *for*-adverbials. It is easiest to make this point following Champollion 2010 because the analysis of *–löj* already borrows the ϵ operator from that account. In Champollion 2010, *for*-adverbials presuppose that the predicates they apply to have the subinterval property, where the standard for determining the relevant parts of an event is given by *for*'s complement.[13] For instance, the sentence *John ran for an hour* has the truth conditions in (195).

(195) $\exists e[*[\![\text{John ran}]\!](e) \wedge \tau(e) \in [\![\text{one hour}]\!]]$

(196) $\forall e[*[\![\text{John ran}]\!](e) \rightarrow e \in *\lambda e'[[\![\text{John ran}]\!](e') \wedge \epsilon([\![\text{one hour}]\!])(\tau(e'))]]$

'Any event in which John ran is exhaustively divisible into events that are very short relative to one hour in which John ran.'

Kaqchikel examples (197-200) show why an achievement like *–tzuye'* 'sit' is odd with a *for*-adverbial (ignoring the durative reading, which intransitives derived by *–e'* do not have in contrast to their English translations), and why it improves under modification by the pluractional *–löj*. Example (199) says that *Juan xtzuje' jun ramäj* 'Juan sat down for an hour' is true if there is an event of John sitting that lasted an hour. The formula in (199) says that it has the subinterval property just in case any event of John sitting can be broken into events of John sitting that are short relative to one hour. This is clearly not the case outside of coerced durative or repetitive readings of sit.

(197) *#Juan x-Ø-tzuy-e' jun ramäj.*
Juan COM-A3s-sit-P.ITV one hour
'Juan sat down for an hour.'

[13] I do not believe that *for*-adverbials are infelicitous with achievements and accomplishments due to presupposition failure. I believe that they contribute a not-at-issue assertion that contradicts the at-issue content.

(198) $\exists e[*[\![\text{Juan sat}]\!](e) \wedge \tau(e) \in [\![\text{one hour}]\!]]$

(199) $\forall e[*[\![\text{Juan sat}]\!](e) \rightarrow e \in *\lambda e'[[\![\text{Juan sat}]\!](e') \wedge \epsilon([\![\text{one hour}]\!])(\tau(e'))]]$

'Any event of John sitting is exhaustively divisible into events of John sitting that are very short relative to an hour.'

Note, though, that the paraphrase of (199) is similar to the paraphrase of *löj*-marked predicates. Examples (200-202) shows why *for*-adverbials are grammatical with löj-marked achievements. It is clear from the truth conditions in (201) that the improvement is due to the fact that the pluractional entails what the *for*-adverbial requires in (202). In particular, *–löj* says that there is a sitting event e whose temporal trace can be carved up in to small parts relative to $\tau(e)$ and that each of these parts corresponds to a sitting event. Crucially, $\tau(e)$, must be at least one hour long, as required by the *for*-adverbial. This ensures that each of the pluractional subevents e' satisfies both $[\![\text{Juan sat}]\!](e')$ and $\epsilon([\![\text{one hour}]\!])(\tau(e'))$, while together summing to e, as required by *jun ramäj* '(for) an hour'.

(200) *X-Ø-tzuy-ulöj* *jun* *ramäj.*
COM-A3s-sit-löj one hour
'He kept sitting down for an hour.'

(201) $\exists e[*[\![\text{Juan sat}]\!](e) \wedge \tau(e) \in *[\![\text{one hour}]\!] \wedge$
$\exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e)) \wedge \forall t \in \mathsf{P} \exists e'[\tau(e') = t' \leq e \wedge \mathbf{atom}(e') \wedge \epsilon(\tau(e))(t)]]]]$

'There is an event of Juan sitting with a trace of one hour. Furthermore, there is a partition of that temporal trace into temporal intervals that are very short relative to one hour and each of those intervals corresponds to an atomic event of John sitting.'

(202) $\forall e[*[\![\text{Xtzululöj a Juan}]\!](e) \rightarrow e \in *\lambda e'[*[\![\text{Juan sat}]\!](e') \wedge \epsilon([\![\text{one hour}]\!])(\tau(e'))]]$

'Any pluractional event of John sitting is exhaustively divisible into events of John sitting that are very short relative to an hour'

What (201-201) show is that the property atelic predicates must have is ensured by the pluractional. The events in the *löj*-marked predicate in (202) are precisely those that can be broken up into events of John walking that are very short relative to an hour.

While it looks like *–löj* and *for*-adverbials place similar constraints on the predicates they modify, there is one crucial difference: the subparts of an event e that satisfy an atelic adverbial need only form a cover of e, while the pluractional must partition e in virtue of partitioning its temporal trace. The result is that bona fide atelic predicates need not have starts and stops when modified by a *for*-adverbial, but as we have already seen, this is necessary when they are modified by *–löj*.

(203) Suppose Juan walks for ten hours straight without stopping. Can you felicitously say:
X-Ø-b'iyin lajuj ramäj.
COM-A3s-walk ten hour
'He walked for ten hours.'

(204) Suppose Juan walks for ten hours straight without stopping. Can you felicitously say:
#X-Ø-b'iyin-ilöj lajuj ramäj.
COM-A3s-walk-löj ten hour
'For ten hours, he kept having to walk.'

The contrast above shows that *–löj* does not derive atelic predicates simpliciter, but a special subset of atelic predicates involving a plurality of non-overlapping events.

Summarizing the analysis, the generalization that *löj*-marked predicates are atelic follows from the denotation of *–löj* in most recent theories of atelicity. The general idea is that *–löj* requires the repetition of events that are short relative to the event they sum to. Similarly, in many account atelic predicates are those that hold of an event just in case they also hold of short subparts of the event. As along as the notion of 'short' used in the definition of the subinterval property is similar to that used in the denotation of *–löj*, all *löj*-marked predicates are correctly predicted to be atelic. This result is another strong argument supporting an analysis like the one presented where, which generates event pluralities by mean of τ-based individuation criteria. When looking the part-whole structure of the events that *löj*-marked predicates denote, though, they will be simple non-atomic individuals, like those in the denotation of plural count nouns. The next subsection argues that this correctly predicts how *löj*-marked predicates interact with various flavors of distributivity.

3.5.5 Accounting for distributive readings

Finally, the analysis of *–löj* correctly predicts that *löj*-marked predicates should pattern like bare plurals when interacting with different subtypes of distributivity. Recall that the interpretation of *löj*-marked predicates follows generalizations in (205), repeated from (124).

(205) a. Individuals distributively predicated of an event-external pluractional need not participate in a plural event.

b. Individuals applied to an event-external pluractional under distributive quantification must participate in an plural event.

The first generalization follows immediately given that theta-roles are sum-homomorphisms and that only non-atomic events can be in the denotation of *löj*-marked predicates. Consider again the following example repeated from (129).

(206) *X-e-kam-alöj*
COM-A3p-die-löj
'They died over time.'
SPEAKER COMMENT: Could be used to describe how people die during a plague.

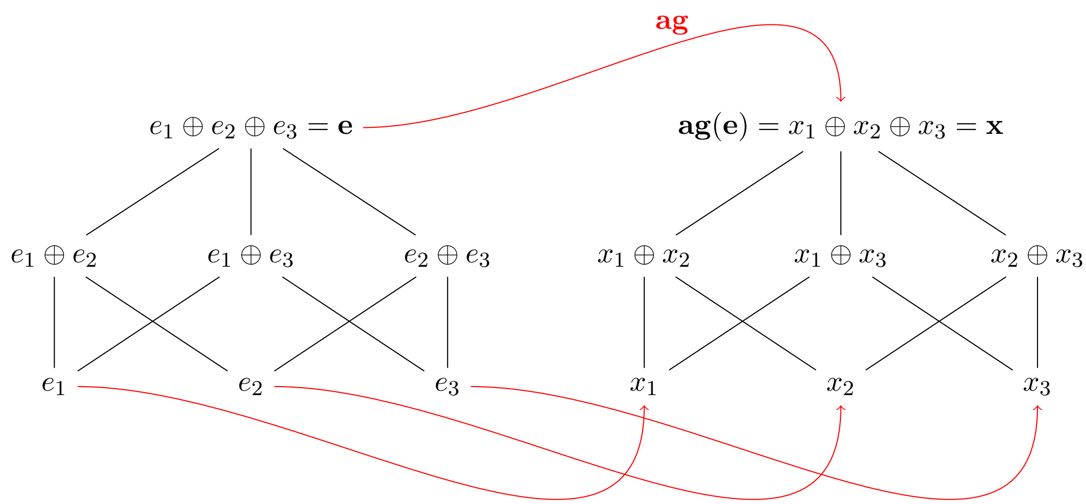
Example (206) has the truth conditions in (207),

(207) $\exists e[{*}\text{DIE}(e) \wedge \mathbf{ag}(e) = x \wedge \neg\mathbf{atom}(x) \wedge \exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P} \exists e'[\tau(e') = t \wedge e' \leq e \wedge \mathbf{atom}(e') \wedge \epsilon(\tau(e))(t)]]$

The formula in (207) is true just in case there is a dying event e whose agent is a non-atomic individual. The pluractional further requires that this event have two properties: (i) it can be broken up into atomic parts whose temporal traces are short relative to the temporal trace of e, and (ii) those temporal traces partition the temporal trace of e. It has already been established that these two conditions require multiple dying events spread out over time, but we have not considered how these events are associated with participants. Given that **ag** is a sum-homomorphism, i.e., $\mathbf{ag}(e) \oplus \mathbf{ag}(e') = \mathbf{ag}(e \oplus e')$, the distributive reading arises when the parts of e that induce its temporal partition are mapped by **ag** to atomic individuals in x. This is illustrated in (208), and the following figure.

(208) a. $\{e_1, e_2, e_3\} \subset [\![\lambda e[{*}\text{DIE}(e)]]\!]$
b. $\mathsf{P} = \{t_1, t_2, t_3\}$
c. $\{e_1, e_2, e_3\} \subset A_\epsilon$(toms)
d. $t_1, ..., t_3$ are short compared $t_1 \oplus t_2 \oplus t_3$
e. $\tau(e_1) = t_1, \tau(e_2) = t_2, \tau(e_3) = t_3$

While the agent of the sum event e is the plural individual $x_1 \oplus x_2 \oplus x_3$, nothing stops the agent role, indicated in red, from mapping the atomic events that constitute e to atomic



individuals.

While the distributive reading is the most salient reading with a predicate like *die*, there are collective readings of pluractional predicates as well, like (209) repeated from (135). Under my analysis, the only difference between (209) and (206) is the way events are mapped to individuals by thematic roles. To capture the collective reading of sentences like (209), the smallest parts of an event in the denotation of a *löj*-marked predicate are mapped by a theta-role to the same plural individual, as in figure (3.6).

(209) Suppose that a choir keeps singing more and more songs. Can you say the following?

X-e-b'ixan-ilöj.
COM-A3p-sing-löj
'They kept singing.'

(210) $\exists e[{*}\text{SING}(e) \wedge \mathbf{ag}(e) = x \wedge \neg\mathbf{atom}(x) \wedge \exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P}\exists e'[\tau(e') = t \wedge e' \leq e \wedge \mathbf{atom}(e') \wedge \epsilon(\tau(e))(t)]]$

(211) a. $\{e_1, e_2, e_3\} \subset [\![\lambda e[{*}\text{SING}(e)]]\!]$

b. $\mathsf{P} = \{t_1, t_2, t_3\}$

c. $\{e_1, e_2, e_3\} \subset A_\epsilon$(toms)

d. $t_1, ..., t_3$ are short compared $t_1 \oplus t_2 \oplus t_3$

e. $\tau(e_1) = t_1, \tau(e_2) = t_2, \tau(e_3) = t_3$

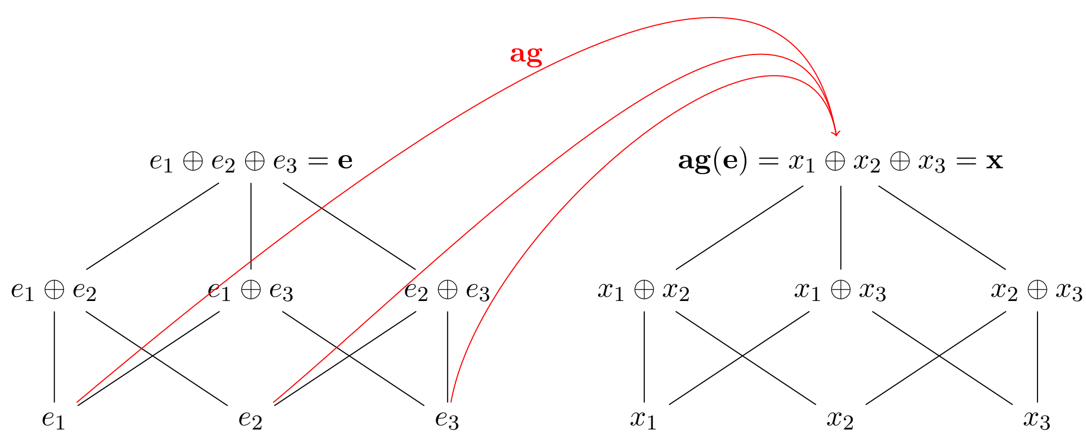


Figure 3.6: Collective reading of *Xeb'ixanilöj*; *cf.* 209

The core idea is that the pluractional builds predicates with only non-atomic events in their denotations. Given that both verbal predicates and theta-role functions are cumulatively closed, there are few constraints on how participants are mapped to events. The only constant is that the event argument must be mapped to the maximal sum of all of the participants of its subevents. In this way, the pluractional, in virtue of building predicates of pluralities, creates the substrate from which distributive dependencies based on thematic assignment can arise.

The situation is different when a distributive quantifier like *chikijujunal* 'each' takes scope over the verb phrase, as in (212). Unlike before, each individual in the domain of the quantifier in example (212) must participate in an event that satisfies the pluractional predicate. For instance, it is false if each of the individuals retrieved by the anaphoric subject only sings once.

(212)

Chi-ki-ju-jun-al	*x-e-b'ixan-ilöj.*
P-E3p-one-RED-NOM	COM-A3p-sing-löj

'Each of them kept singing (more and more songs).'

First, it is clear that *chikijujunal* should be treated like a strong distributive quantifier because it exhibits all of the characteristic properties. Example (213) shows that it cannot have a singular restrictor argument. Example (126), repeated from (214), shows that *chikijujunal* forces distributive readings of mixed predicates. Finally, example (215) shows that, like *each*, *chikijujunal* is ungrammatical with collective predicates.

(213)

**Chi-ru-ju-jun-al*	*a'*	*Xwan*	*x-Ø-el.*
P-E3s-one-RED-NOM	CLF	Juan	COM-A3s-leave

'Each of Juan left.'

(214) Suppose that the women lifted the box up together. Can you report that:

#Chi-ki-ju-jun-al	*ri*	*ixoq-i'*	*x–ki-jot-ob'a*	*ri*	*caxa.*
P-E3s-one-RED-NOM	the	woman-PL	COM-A3s-E3p-elevated-tv	the	box

'The women each lifted the box.'

(215)

**Chi-ki-ju-jun-al*	*ri*	*ixoq-i'*	*x-Ø-ki-möl*
P-E3s-one-RED-NOM	the	woman-PL	COM-A3s-E3p-gather
k-i'	*pa*	*k'ayb'äl.*	
E3p-REFL	in	market	

'The women each gathered in the market.'

Not only is *chikijujunal* best translated as *each*, it also floats like *each*. Note the grammaticality contrast between examples (216) and (217), the latter of which contains the universal quantifier *–onojel* 'all' that cannot be separated from its nominal restrictor.

(216)

(Chi-ki-ju-jun-al)	*ri*	*ak'wal-a'*	*x-e-el*	*(chi-ki-ju-jun-al).*
(P-E3p-one-RED-NOM)	the	child-PL	COM-A3p-leave	(P-E3p-one-RED-NOM)

'The children each left.'

(217)

(K-onojel)	*ri*	*ak'wala-RED'*	*x-e-el*	*(*k-ononjel).*
E3p-all	the	child-PL	COM-A3p-leave	(E3p-all)

'The children all left.'

Supporting evidence that *chikijujunal* has VP-modifier uses comes from its morphology. The glosses above shows that *chikijujunal* is morphologically complex, consisting of the preposition *chi* and a possessed nominalized reduplicated numeral. Given the morphological and distribution facts, I tentatively analyze *chikijujunal* as a VP adjunct, though much more work needs to be done on its syntax. The formula in (218) gives its denotation.

(218) $[\![\text{chikijujunal}]\!] =$
$\lambda V_{\epsilon t}\lambda e[\forall x' < \Theta(e)[\mathbf{atom}(x') \rightarrow \exists e' < e[V(e') \wedge \Theta(e') = x']]]$
'A function from verb phrases to events e whose image under the anaphorically accessible theta-role function Θ has the following property: Each atomic part of $\Theta(e)$ is the Θ-participant of an event e' in e satisfying the verb phrase.'

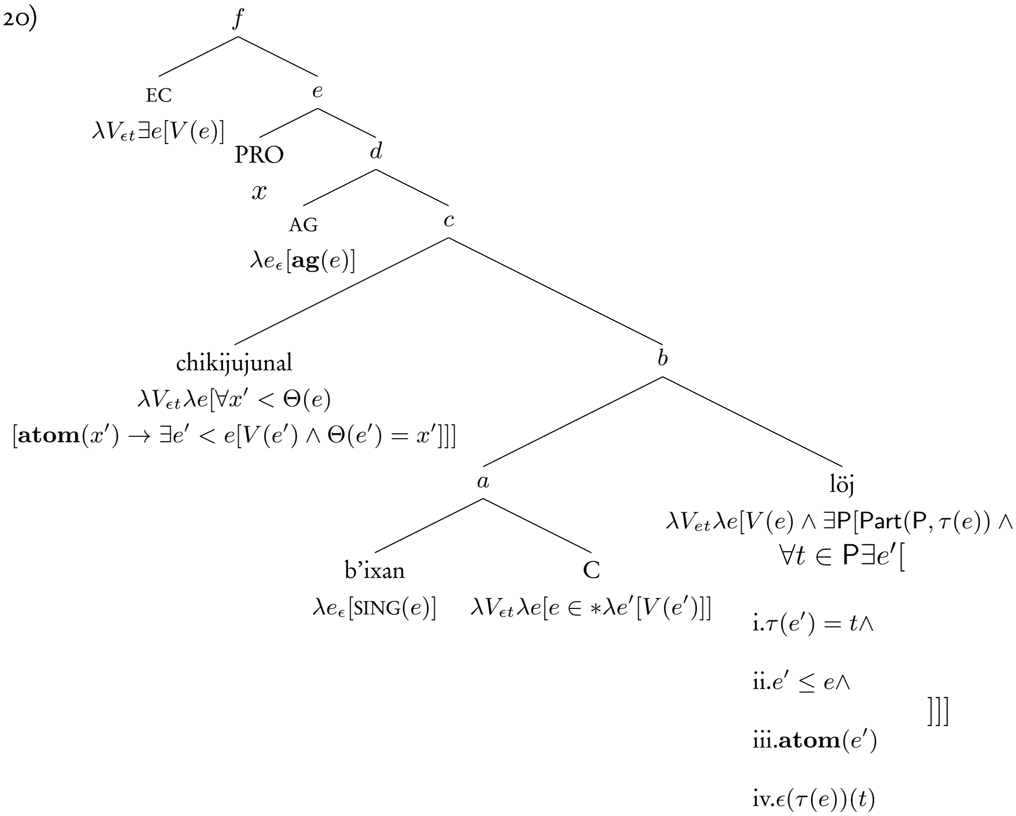
As a VP adjunct, *chikijujunal* is of type $\epsilon t, \epsilon t$. Its pronominal argument is anaphoric to a verbal argument that is provided by a thematic role, see $\Theta(e)$ above. Supporting the analysis is the fact that *chikijujunal* includes an ergative agreement morpheme. This prefix cross-references the argument distributed over.[14] Distributive entailments arise via universal quan-

[14]For instance, we could change *ki–* in example (212) above for the first person plural pronoun *qa–*, in which case the sentence would mean that each of *us* kept singing (supposing we made similar changes to the verb for agreement reasons).

tification over atomic parts of $\Theta(e)$. Since these atoms must be proper parts of $\Theta(e)$, *chikijujunal* cannot target singular nominals. In the scope formula, each of these atoms are required to stand in the same thematic relationship with events satisfying the predicate *chikijujunal* modifies. This accounts for the fact that these adverbials are ungrammatical with collective predicates, like *mol* 'gather', which cannot have atomic subject participants. This same feature of the analysis correctly predicts that the individuals it quantifies over must participate in a pluractional event when it modifies a *löj*-marked predicate. Examples (220-221) provide a fully compositional analysis illustrating this point, as well as providing a capstone for the analysis developed in this chapter.

(219) *Chi-ki-ju-jun-al* *x-e-b'ixan-ilöj.*
P-E3p-one-RED-NOM COM-A3p-sing-löj
'Each of them kept singing (more and more songs).'

(220)



(221) a. $\lambda e[e \in *\lambda e'[\text{SING}(e)]] = \lambda e[*\text{SING}(e)]$

b. $\lambda e[*\text{SING}(e) \wedge \exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P}\exists e'[\tau(e') = t \wedge e' \leq e \wedge \mathbf{atom}(e') \wedge \epsilon(\tau(e))(t)]]]$

c. $\lambda e[\forall x' < \Theta(e)[\mathbf{atom}(x') \rightarrow \exists e' < e[*\text{SING}(e') \wedge \exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e')) \wedge$
$\forall t \in \mathsf{P}\exists e''[\tau(e'') = t \wedge e'' \leq e' \wedge \mathbf{atom}(e') \wedge \epsilon(\tau(e'))(t)]]]$
$\wedge\, \Theta(e') = x']]$

d. $\lambda e[\forall x' < \Theta(e)[\mathbf{atom}(x') \rightarrow \exists e' < e[*\text{SING}(e') \wedge \exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e')) \wedge$
$\forall t \in \mathsf{P}\exists e''[\tau(e'') = t \wedge e'' \leq e' \wedge \mathbf{atom}(e') \wedge \epsilon(\tau(e'))(t)]] \wedge \Theta(e') = x']$
$\wedge\, \mathbf{ag}(e) = x]$

e. $\exists e[\forall x' < \Theta(e)[\mathbf{atom}(x') \rightarrow \exists e' < e[*\text{SING}(e') \wedge \exists \mathsf{P}[\mathsf{Part}(\mathsf{P}, \tau(e')) \wedge$
$\forall t \in \mathsf{P}\exists e''[\tau(e'') = t \wedge e'' \leq e' \wedge \mathbf{atom}(e') \wedge \epsilon(\tau(e'))(t)]]]$
$\wedge\, \Theta(e') = x'] \wedge \mathbf{ag}(e) = x]$

The formula in (221e) gives the final truth conditions for the sentence in (219). It is true just in case there is an event e whose agent is an individual x. Furthermore, each atomic part of x must be the agent of an atomic part of e that is a singing event satisfying the pluractional content of *–löj*, which should now be familiar. It is clear from (221e) that the atomic parts of the plural subject must participate in a pluractional event, not just the subparts of one, as when a predicate is interpreted distributively in the presence of a plural subjects, see (206).

Looking at the big picture, the preceding discussions shows that there are two ways an argument can be interpreted distributively with respect to a pluractional predicate. In the first case, the atomic parts of an individual argument need only participate in the parts of a pluractional event. This type of distributivity is mediated by theta-roles. In the second case, the atomic parts of an individual argument need to participate in a pluractional event. This type of distributivity arises in the presences of a scope-taking distributive operator like *chikijujunal*.

As noted before, the facts are similar to the behavior of bare plurals. For example, (222a) entails that each of the boys flew more than one kite, while (222b) does not, even under a distributive interpretation of the plural subject.

(222) a. The boys each flew kites.
b. The boys flew kites.

These facts support an analysis of event-external pluractionality in which pluractional events are structurally similar to plural individuals in the domain of individuals. The account of *–löj* makes this connection, while accounting for important differences. The analogy goes through because the events in the denotation of a *löj*-marked predicate are just plural individuals like those we want in the denotation of bare plurals (Beck, 2000; Champollion, 2010; de Swart, 2006), though see Zweig (2008, 2009) for arguments that bare plurals should be interpreted inclusively, that is, with singular individuals as well as plural individuals in their denotations). Where they differ is that *–löj* builds plural event predicates by requiring a partition of the event argument's temporal trace, in contrast to plural marking in nouns, which makes reference to sum of individuals directly via cumulative closure and a non-atomicity condition.

3.6 Conclusions

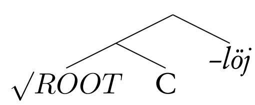
This chapter is an extended argument for two proposals. The first is that *–löj* in Kaqchikel instantiates a specific subtype of pluractionality that has been uncovered in previous typological investigations, the event-external sort. The second is that *–löj* places conditions on an event's temporal trace that can only be satisfied by non-atomic events. In this way, the analysis explains two facets of *löj*-marked predicates. On one hand they behave like bare plural nominals, which also denote non-atomic individuals. On the other hand, the events they denote have a tightly controlled internal temporal structure. The analysis thus argues for a separation of the type of plural reference an pluractional has from how that plural reference comes about. This chapter establishes that pluractionals use an event's temporal trace function to do that latter. This is a recurring theme throughout the rest of the dissertation. The next chapter argues that that pluractional *–Ca'* derives group predicates by placing conditions on the temporal trace function of atomic events. Finally, Part II of the dissertation argues that *la'*-marked predicates have plural reference like distributive quantifiers, but distributivity is the result of the pluractional elaborating on an event's theta-role function. In each case, separating out how pluractionals individuate events allows one to draw connections to types of plural nominal reference, while accounting for the differences between nominal pluralities and event pluralities.

Chapter 4

Event-internal Pluralization

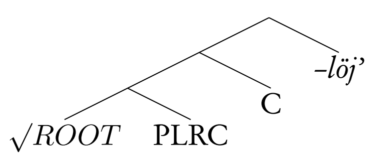
This chapter builds an account of a very different type of pluractionality, but one whose properties are predicted given the analysis of *–löj* and the hypothesis that natural language makes use of similar representations across categories. Recall that *–löj* applies after cumulative closure to derive predicates of pluralities indistinguishable from those in the denotation of bare plural count nouns.

(223)



While *–löj* applies after cumulative closure, the syntax in (223) predicts that in principle there should be pluractionals that can apply before, like PLRC in (224).

(224)



What would such a pluractional look like? Given its syntax, it would have to relate the atoms in the denotation of verb roots with pluralities without duplicating the effect of the cumulative closure operator C. Immediately the parallel with group nominals should come to mind. The predicates in (225) denote atoms that are related to pluralities that are separate from those derived via cumulativity, which (226) shows.

(225) a. team

b. committee

c. squad

(226) a. We played three **teams**.

b. The two **committees** voted independently.

c. Have all of the **squads** report to me.

I argue that this is exactly what we find. The object of investigation is the suffix –*Ca'*, illustrated in (227-230) in bold, which is shown to instantiate the second typologically common type of pluractionality—the event-internal sort.

(227) Cutzal Chacach et al. 1999, p. 58

Ri	*ajch'olonel*	*n-Ø-u-chuq'-**ucha'***	*ru-qül*	*ri*	*mama'*	*wakx.*
the	butcher	ICP-A3s-E3s-wound-**ucha'**	E3s-neck	the	big	cow

'The butcher kept hacking at the big cow's neck.'

(228) Cutzal Chacach et al. 1999, p. 245

Jun	*ak'wal*	*yalan*	*n-Ø-u-qeb'-**eqa'***	*r-i'*	*pan*	*ulew.*
a	child	much	ICP-A3s-E3s-rub-**eqa'**	E3s-REFL	P	earth

'A child rubbed himself on the earth (wearing through his clothes).'

(229) Cutzal Chacach et al. 1999, p. 94

Jeb'ël	*n-Ø-in-jach-**aja'***	*r-aqän*	*ri*	*ti*	*nu-k'ajol*
good	ICP-A3s-E1s-open-**aja'**	E3s-leg	the	little	E1s-child
täq	*xub'an*	*pe*	*ri*	*w-achb'il.*	
when	whistle	here	the	E1s-friend	

'I was opening and closing my baby's legs when a friend whistled for me.'

(230) Cutzal Chacach et al. 1999, p. 371

Jun	*xti*	*moy*	*r-onojel*	*q'ij*	*n-Ø-u-tzin-**itza'***
a	little	blind	E3s-all	day	ICP-A3s-E3s-sound(music)-**itza'**
ri	*ru-q'ojon*	*pa*	*k'ayb'äl.*		
the	E3s-guitar	P	market		

'A blind person strums his guitar all day in the market.'

This chapter argues that *–Ca'* applies before cumulative closure to derive group predicates in the verbal domain, but the type of group predicate is different than those in (225), and is currently unrecognized in the literature. The relevant groups are like those in the denotation of the predicates in (231).

(231) a. grove

b. bouquet

c. horde

The primary difference between *grove*-type groups and the groups in (225) is that the latter make use of a notion of membership, while the former are defined in terms of their spatiotemporal properties. Consider, for instance, that if the members of a team go to different parts of the country, they are still a team, but if the trees in a beech grove are moved to different parts of the forest, the grove disappears.

The fact that languages would make use of *grove*-type groups in the nominal domain is also predicted given what the analysis of *-löj* reveals about pluractionality. The previous chapter established that pluractionals derive plural predicates by elaborating on the way events are mapped by a trace function to intervals. Thus, just like the suffix *–löj*, the suffix *–Ca'* will require a partition of the event's temporal trace. But, in virtue of applying before cumulative closure, the events whose traces are partitioned must all be atomic. The result is that *–Ca'* will act to superimpose a plurality on some spatiotemporal interval that is shared by an atomic event. I then argue that this is exactly what goes on with the group nouns in (231). For example, *grove* will denote atoms whose spatial trace can be broken into small parts, each containing a tree. The result is that by contrasting *–Ca'* with *–löj*, we see that just as plurality in the nominal domain is not uniform, neither is pluractionality. At the same time, the same formal distinctions are made in both the individual and event domains, which is an elegant result about natural language representations and the ontologies of events and individuals. Where nouns and verbs differ is that events are individuated in terms of their spatiotemporal properties, while individuals usually are not. This helps explain why a canonical type of event plurality, namely event-internal pluractionality, has as its nominal counterpart a non-canonical type of group nominal, namely *grove*-type nouns.

4.1 Morphosyntax of *–Ca'*

Before starting the investigation, it is helpful to consider the morphosyntax of *–Ca'*. First, note that *–Ca'*, unlike *–löj* requires actual reduplication. It copies the first consonant of the expression it suffixes to, as shown in (232).

(232) a. chap**acha'**, from *chäp* 'handle'

b. tz'et**etz'a**, from *tz'ët* 'look at'

c. qum**uqa'**, from *qum* 'drink'

While a vowel is also copied in the examples above, as with *–löj* it is only necessary for phonological reasons. Roots that end in the velar fricative can be derived by *–Ca'* without vowel copying, as in (233). For this reason, as with *–löj*, I will write the vowels in the Kaqchikel examples, but not segment or gloss them.

(233) a. tzij**tza**, from *tzij* 'light'

b. tz'aj**tz'a'**, from *tz'äj* 'hit someone naked / wearing tight clothes'

All of the verbs above are CVC root transitives, which provides another point of contrast with *–löj*. In fact, *–Ca'* cannot target intransitive stems, as shown in (234).

(234) a. *b'iyin**iba'**, from *b'iyin* 'walk'

b. *kam**aka'**, from *käm* 'die'

c. *war**awa'**, from *wär* 'sleep'

Finally, *–Ca'* is more root-dependent than *–löj*. It only applies to CVC roots. Recall that *–löj* could suffix a derived intransitive stem. The pluractional *–Ca'* cannot do this. Examples (235-236) show this with the causative suffix *-saj* and the positional transitive derivation *b'a*, respectively.

(235) a. *kamisa**ka'**, from *kamisaj* 'kill'

b. *chojmirisa**cha'**, from *chojmirisaj* 'make straight'

(236) a. *rochob'a**ra'**, from *rochob'a* 'scratch'

b. *jupub'a**ja'**, from *jupub'a* 'smell'

While –*Ca'* cannot target these derived transitive verbs, it can target a special class of non-root transitive (often called derived in the Mayan literature). Examples (237-238) show the relevant pattern. The fact that these roots cannot be inflected directly, shown in (237b-238b), is evidence that they are not CVC root transitive verbs. Instead, they must bear the suffix –*Vj*, which is a type of transitive stem class morphology. Crucially, when these roots are derived by the pluractional, as in (237c-238c), the –*Vj* suffix disappears.

(237) a. *Nin-ch'um-ij.* 'I drink water little by little.'

b. *nin-ch'um

c. *Ninch'um**uch'a'**.* 'I keep drinking at it little by little.'

(238) a. *Nin-k'ux-ij.* 'I hit it with small sticks / stones.'

b. *nin-k'ux

c. *Nink'ux**k'a'**.* 'I hit it constantly with small sticks / stones'

Once again, we find that –*Ca'* must apply to transitive stems and must apply as close as possible to the CVC root, even if that means displacing stem class morphology. I make use of this descriptive result in section 4.6 to support my analysis where –*Ca'* applies closer to the root than *-löj*. Before building the account, though, the following sections present the generalizations that must be captured.

4.2 Aspectual selection for semelfactives

Since event-internal pluractionals are more particular about the aktionsart of the predicates to which they apply, it is useful to lay out the factors that distinguish aspectual classes, especially achievements and semelfactives. Descriptively, both semelfactives and achievements are punctual. Moens & Steedman (1988); Smith (1997) argue that events that fall under their description are conceptualized as instantaneous. To support this position, Rothstein (2004) shows that they are felicitous with *at X time* adverbials, unlike accomplishments and activities, which must be coerced when occurring with these adverbials.

(239) Semelfactive
  a. John coughed at 10pm.
  b. John kicked the door at 10pm.

(240) Achievement
  a. John arrived at 10pm.
  b. John won the race at 10pm.

(241) Accomplishment
  a. #John built the house at 10pm.
  b. #John read *War and Peace* at 10pm.

(242) Activity
  a. #John walked at 10pm.
  b. #John swam at 10pm.

What separates semelfactives and achievements is that only the latter result in linguistically relevant change. For instance, Moens & Steedman (1988) conceptualize linguistically relevant change as that which results in an end state. Since semelfactive events do not have an end state, they are correctly predicated to be infelicitous in the perfect, which Moens & Steedman (1988) argue targets this end state.

(243) Semelfactive
  a. #John has coughed.
  b. #John has kicked.

(244) Achievement
  a. John has arrived.
  b. John has won the race.

The properties of semelfactives are especially important because –*Ca'* preferentially targets them. Previous authors, noting that semelfactive predicates in English have uncoerced repetitive atelic uses, have drawn attention to the fact that atelic events are inherently repeatable (Rothstein, 2004). This repetition is exactly what –*Ca'* requires, as shown in (245-249).

(245)	*X-Ø-u-chap-acha'*	*ri*	*ch'atäl.*
	COM-A3s-E3s-handle-Ca'	the	table

'He kept tapping the table.'

(246)	*X-Ø-u-k'oj-ok'a'*	*ru-chi'*	*ri*	*jay.*
	COM-A3s-E3s-knock-Ca'	E3s-mouth	the	hose

'He kept knocking at the door.'

(247)	*X-Ø-u-k'ut-uk'a'*	*ri*	*po't.*
	COM-A3s-E3s-indicate-Ca'	ri	blouse

'He kept pointing at the blouse.'

(248) *X-Ø-u-t'in-it'a'* *ri* *kem.*
COM-A3s-E3s-hammer(weft)-Ca' the weaving
'He kept hammering the weft of the weaving.'

(249) *X-i-ru-tz'et-etz'a'.*
COM-A1s-E3s-look.at-Ca'
'He kept glancing at me.'

The reason why events that satisfy semelfactive predicates are so easily repeatable is that by producing no linguistically relevant changes, the event's happening cannot itself alter the state of the world in such a way that it would preclude its repetition. Consider example (245). If you touch the table, nothing about the table or your hand changes. You are completely free to touch it again. Contrast this with *build the table*, which is not easily repeated. To do so would require disassembling the table, that is, undoing the event's result state. If –*Ca'* were sensitive to the linguistically relevant end states of events, we should expect its use to be odd with accomplishments. Not only are they not punctual, they have non-trivial culminations. Their infelicity with –*Ca'* is borne out in the data.[1,2]

(250) *#X-Ø-u-b'an-ab'a'* *ri* *jay.*
COM-A3s-E3s-build-Ca' the hose
'He kept building the house.'

[1]I have found one counterexample to this generalization in a Kaqchikel dictionary, which gives *tzijotza'*, from *tzijoj* 'tell stories', with the meaning 'tell stories various times' (Cutzal Chacach et al., 1999, p. 370). I am not sure what is going on in cases like these, but it is also odd from a morphological standpoint.

[2]In the same dictionary many other achievements and accomplishments with nontrivial endstates get "sound" readings. I believe that this is due to the fact that the events are not supposed to culminate, and by focusing on the sound, the dictionary writers are deemphasizing the endstate. For example, (Cutzal Chacach et al., 1999, p. 64) gives –*ch'aqacha'*, from –*ch'aqe'* 'get wet', means 'To make the sound of splashing hands or feet in water repeatedly'.

(251) *#X-Ø-u-tz'ib'a-tz'a' ru-b'i.*
COM-A3s-E3s-wrote-Ca' E3s-name
'He kept writing his name.'
SPEAKER COMMENT: *tz'ib'atz'a'* can only mean he made scribbles back and forth.

(252) *#X-Ø-u-kem-eka' ri po't.*
COM-A3s-E3s-weave-Ca' the blouse
'He kept weaving the blouse.'

Besides being accomplishments, what unites the predicates in (250-252) is that the preparatory process leading to the end state is not homogenous. For instance, building a house requires doing a variety of activities. Similarly, if my name is at all normal, writing it requires that I write various letters. Some accomplishments *are* grammatical with –*Ca'*, but only under coercion. Crucially, these accomplishments must have homogenous preparatory processes and no progress can be made towards the accomplishment's usual culmination. For instance, (253) describes the movement of putting the bottle to your mouth and tipping it back, but you cannot swallow any appreciable amount of liquid, as the speaker's comment shows.

(253) *X-Ø-in-qum-uqa' jun kaxlan ya'.*
COM-A3s-E3s-drink-Ca' a foreign water
'I kept drinking at the coke.'
SPEAKER COMMENT: You don't finish it. You just keep making the motion.

Similarly, we can conceive of digging a hole as repeatedly transporting dirt from one location to another until there is a hole. With –*Ca'* we can move the shovel repeatedly, but not much dirt.

(254) *X-Ø-in-k'ot-ok'a'.*
COM-A3s-E3s-dig-Ca'
'I kept digging at the earth.'
SPEAKER COMMENT: It's like if the ground is hard to dig.

These examples show that the species of pluractionality *–Ca'* encodes is sensitive to culminations. The suffix prefers to apply to semelfactives, but it will apply to accomplishments in as much as the accomplishment can be coerced into the point-like repetition of an event with no culmination. We see the same behavior with both achievements in (255-257) and activities in (258-259).

(255) *X-Ø-in-ch'ar-ach'a' ri tros.*
COM-A3s-E3s-split-Ca' the stump
'I kept chopping at the stump.'
SPEAKER COMMENT: It's like if your axe is really dull.

(256) *X-Ø-in-tzuy-utza'.*
COM-A3s-E3s-sit-Ca' there
'I kept (making the motion of) sitting there.'
SPEAKER COMMENT: Your bottom doesn't really hit the chair.

(257) *X-Ø-u-yuch'-uya' ri su't.*
COM-A3s-E3s-fold-Ca' ri wrap
'I kept folding over the wrap.'
SPEAKER COMMENT: Like if you can't get it lined up even.

(258) *X-Ø-u-chok-ocha' ri ch'ich'.*
COM-A3s-E3s-push-Ca' ri car
'I kept pushing on the car.'
SPEAKER COMMENT: It keeps rolling back into place.

(259) *X-Ø-u-sir-isa' ri koloch'.*
COM-A3s-E3s-roll-Ca' ri ball
'I kept rolling the ball (but only back and forth).'

A consequence of this aspectual coercion is that sentences with *Ca'*-marked predicates do not necessarily entail minimally different sentences without the pluractional. The deciding factor is whether the pluractional requires coercion of the event-description. For instance, the following sentences with pluractionalized semelfactive predicates entail corresponding sentences without the pluractional.

(260) *#X-Ø-u-k'ut-uk'a' ri po't ch-w-e', po man*
COM-A3s-E3s-look.at-Ca' the blouse P-E1s-DAT but NEG
x-Ø-u-k'ut ta chw-e'.
COM-A3s-E3s-point IRR P-E1s
'She kept showing me the blouse, but she didn't show it to me.'

(261) *#X-Ø-u-pitz'-ipa' ri pix, po man x-Ø-u-pitz' ta.*
COM-A3s-E3s-look.at-Ca' the tomato, but NEG COM-A3s-E3s-squeeze IRR
'She kept squeezing the tomato, but she didn't squeeze it.'

The entailment does not go through with predicates that must be coerced into a semelfactive reading. The problem is that the pluractional prevents the culmination that the non-pluractional entails.

(262) *X-Ø-in-ch'ar-ach'a' ri tros, po man x-Ø-in-ch'är ta.*
COM-A3s-E1s-split-Ca' the stump, but NEG COM-A3s-E1s-sit IRR
'I kept chopping at the stump, but I didn't split it.'

(263) *X-Ø-u-tzuy'-utza', po man x-Ø-tzuy-e' ta.*
COM-A3s-E3s-sit-Ca', but NEG COM-A3s-sit IRR
'She kept sitting up and down there, but she didn't sit.'

The fact that event-internal pluractionals can have such a profound effect on the content of the event description suggests an explanation for why many event internal pluractionals are better translated with unique lexical items in languages like English. If the pluractional predicate and the predicate it modifies are so different that entailments no longer hold between them, it isn't surprising that languages without comparable morphology would resort to using unique lexical items. More importantly, the data in (260-263) reveal a close connection between the aspectual selection of event-internal pluractionals and their characteristic lack of entailments to the underlying predicate. This descriptive result once again argues for a unified treatment of the internal/external divide and the parameters along which they vary.

Finally, like *löj*-marked pluractionals, predicates derived by –*Ca'* are uniformly atelic. They all pass the *for*-adverbial test.

(264)	*Lajuj*	*ch'uti'*	*ramäj*	*x-Ø-u-chap-cha'*	*ri*	*ch'atal.*
	ten	small	hour	COM-A3s-E3s-handle-Ca'	ri	table

'He kept tapping the table for ten minutes.'

(265)	*Lajuj*	*ch'uti'*	*ramäj*	*x-Ø-in-tzuy-utza'.*
	ten	small	hour	COM-A3s-E3s-sit-Ca'

'I kept sitting down and getting up for ten minutes.'

Summarizing, *Ca'*-marked predicates can only be satisfied by a plurality of near instantaneous events that do not culminate. In this way, the pluractional –*Ca'* behaves like event-internal pluractionals crosslinguistically, which tend to only apply to semelfactive or achievement predicates. The intuition behind the analysis developed in section 4.6 is that each events in the event plurality must be so temporally contiguous that there is no time for their result states to hold, blocking their culmination. This requires coercion and blocks some entailments. I then argue that the spatiotemporal contiguity requirement is similar to what is found with *grove*-type groups, which denote individuals whose parts fill some bounded space.

4.3 Contiguous repetition on a single occasion

The previous chapter showed how event-external pluractionals like *–löj* place few conditions on the amount of downtime between the constituent parts of a pluractional event. In contrast, *Ca'*-marked predicates pattern with event-internal pluractionals crosslinguistically by denoting events whose atomic parts are nearly contiguous. The following examples illustrate this point in a controlled manner, but even the naturally occurring examples in (227-230) describe scenarios that could only involve contiguous repetitions.

(266) Suppose Juan knocks on the door once every 10 seconds for 10 minutes.

#A	*Xwan*	*x-Ø-u-k'oj-ok'a'*	*ru-chi'*	*ri*	*jay.*
CLF	Juan	COM-A3s-E3s-knock-Ca'	E3s-mouth	the	door

'Juan kept knocking at the door.'
SPEAKER COMMENT: No, it has to be continuous [*seguido*].

(267) Suppose Juan has a rash on his arm and every once in awhile it itches so he scratches it.

#A	*Xwan*	*x-Ø-u-roch-ora'*	*r-aq'a.*
CLF	Juan	COM-A3s-E3s-scratch-Ca'	E3s-hand

'Juan kept scratching his arm.'
SPEAKER COMMENT: No, it would be like this [scratches vigorously back and forth on her arm].

(268) Suppose you see Juan every day and he gives you a dirty look.

#A	*Xwan*	*x-i-ru-tz'et-etz'a'.*
CLF	Juan	COM-A1s-E3s-look.at-Ca'

'Juan keeps looking at me.'
SPEAKER COMMENT: No, it would have to be like this speaker turns his head a bit and shoots a glance over and over].

The scenarios in (266–268) look at downtimes ranging from 10 seconds to days. While *löj-*

marked predicate could felicitously describe such scenarios, –*Ca'* cannot be used. Speakers comments make this clear, especially when they act out scenarios in which –*Ca'* would be appropriate. They always use rapid, almost frantic, contiguous repetitions. It should not be surprising then that *Ca'*-marked predicates do not have habitual readings either.

4.4 Opaqueness to distributivity

Event-internal pluractionals like –*Ca'* behave differently than event-external pluractionals when interacting with distributivity. Recall the pattern with event-external pluractionals like –*löj*. Plural subjects that undergoing distributive predication need not participate in a plural event, while subjects that undergo distributive quantification must. Event-internal pluractionals like –*Ca'*, though, are opaque to distributivity. It is not possible to distribute the parts of an event they denote over individuals. The result is that subjects of *Ca'*-marked predicate must participate in plural events under both distributive predication and distributive quantification.

For instance, example (269) has no reading where each of the individuals in the denotation of the plural subject participates in a single pluractional subevent. The most salient reading of (269) has each of the people repeatedly glancing at me.

(269) Suppose there is a large group of people across the street and they each turn and glance at me once.
#X-i-ki-tz'et-etz'a'.
COM-A1s-E3p-look.at-Ca'
'They kept glancing at me.'

(270) Suppose a bunch of people come by my market and pick up a particular tomato, squeeze it once, and put it down.

#X-Ø-ki-pitz'-ipa' la jun xkoya' la'.
COM-A3s-E3p-squeeze-Ca' that one tomato there
'They kept squeezing that tomato.'

Not surprisingly, appending a distributive quantifier like *chikijujunal* each of them does not generate the target interpretation. For instance, examples (271-272) cannot have a reading where each individual in the denotation of the plural subject participates in a single event. They must all participate in plural events.

(271) Suppose there is a large group of people across the street and they each turn and glance at me once.
#Chi-ki-ju-jun-al x-i-ki-tz'et-etz'a'.
P-E3p-one-RED-NOM COM-A1s-E3p-look.at-Ca'
'They each kept glancing at me.'

(272) Suppose a bunch of people come by my market and pick up a particular tomato, squeeze it once, and put it down.
#Chi-ki-ju-jun-al x-Ø-ki-pitz'-ipa' la jun xkoya' la'.
P-E3p-one-RED-NOM COM-A3s-E3p-squeeze-Ca' that one tomato there
'They each kept squeezing that tomato.'

All that distributive quantifiers do is rule out collective interpretations of pluractional predicates, which are otherwise licit.

(273) Suppose a group of people are trying to push a big bus, but are having trouble moving. It just keeps rocking back and forth.
X-Ø-ki-chok-ocha' ri ch'ich'.
COM-A3s-E3p-push-Ca' the bus
'They kept pushing on the bus.'

(274) Suppose a group of people are trying to push a big bus, but it is having trouble moving. It just keeps rocking back and forth.
#Chi-ki-ju-jun-al x-Ø-ki-chok-ocha' ri ch'ich'.
P-E3p-one-RED-NOM COM-A3s-E3p-push-Ca' the bus
'They kept pushing on the bus.'

By resisting distribution over pluractional subevents, the suffix –*Ca'* behaves radically different than –*löj*. The group-based analysis developed in section 4.6 is able to explain the opacity to distributivity, in addition to the aspectual and temporal generalizations presented above.

4.5 Summary

This section has shown that –*Ca'* differs from –*löj* on a series of tests, confirming the latter's classification as an event-external pluractional, while arguing that former instantiates event-internal pluractionality. The generalizations established are as follows.

- –*Ca'* targets semelfactive predicates directly, and modifies achievements, accomplishments, and activities only with coercion so that there is no culmination.
- *Ca'*-marked predicates facilitate entailments to sentences with their non-pluractional counterparts, just in case the verb is semelfactive.
- The resulting predicates are uniformly atelic.
- There can be little downtime between the events in these pluralities. They are contiguous.
- *Ca'*-marked predicates have only single occasion readings.
- *Ca'*-marked predicates are opaque to distributivity.
- *Ca'* must apply to CVC roots directly.

The next section I propse an analysis of *–Ca'* that is minimally different from *–löj*. It has many of the same formal ingredients, but it is just different enough to account for the generalizations above, while drawing connections to a species of plural nominal reference. In particular, I show that *–Ca'* applies to a predicate of atoms before cumulative closure to derive a predicate of groups. These groups are defined in terms of their spatiotemporal properties, which which is characteristic of pluractionality, but the account is also shown to extend to group nouns like *grove*, *horde*, etc. with only minor modifications.

4.6 A group-based analysis of *–Ca'*

This section argues for an analysis of *–Ca'* in which it shares meaning components with *–löj*, but the way these components are arranged generates major differences. Like *–löj*, *–Ca'* is analyzed as a modifier of event predicates. And like *–löj*, *–Ca'* elaborates on the temporal trace of the event argument. Where they differ is that the latter derives predicates of atomic events that are spatiotemporally superimposed on a plurality of events in the denotation of the underlying predicate. I argue that this aspect of *–Ca'* captures all of its morphosyntactic and semantic generalizations, while drawing deep connections between event-internal pluractionality and *grove*-type group nouns. To start, example (275) gives the meaning of *–Ca'*, while figure 4.6 provides an illustrative example of a *–Ca'* event.

(275) $[\![\text{–Ca'}]\!] = \lambda V_{et}\lambda e\exists \mathsf{P}[\mathbf{atom}(e) \wedge \mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P}\exists e'[\tau(e') = t \wedge e' \leq_m e \wedge \epsilon(\tau(e))(t) \wedge V(e') \wedge e[\tau]e']]$, where:

a. $\leq_m$ is the 'material part' relation defined in Link 1998, but adapted for events.[3]

[3]Link assumes a domain of matter in addition to the domain of individuals. Furthermore, there is a structure preserving homomorphism h mapping the domain of individuals to the domain of matter allowing us to define an operator $\leq_m$ such that $h(x) \leq h(y)$ iff $x \leq_m y$. We can do the same for events, but instead of matter, we can

b. $e[\tau]e'$ means e and e' differ at most with respect to their temporal trace. That is, it is shorthand for $\mathrm{T}(e) = \mathrm{T}(e')$, where T ranges over all trace functions and thematic roles, excluding τ.

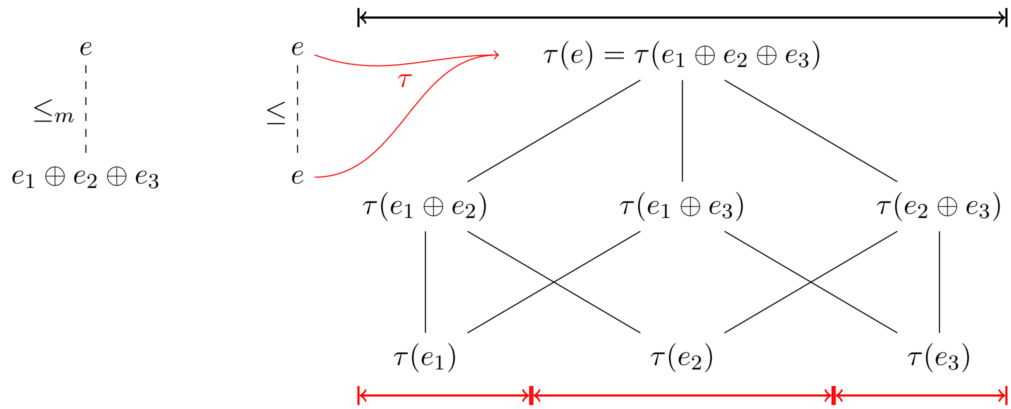


Figure 4.1: An example of a *-Ca'* event.

First, note that *-Ca'* takes an event predicate and returns a predicate of atomic events. This is represented graphically in figure 4.1 by e having only itself as a part. In contrast, e has the material parts e_1, e_2, and e_3. The pluractional then requires a partition of the temporal trace of e, just like *-löj*. In the picture above, the temporal trace of e is represented by the black bar, while the intervals that partition it are shown in red below the figure. As with *-löj*, each of those temporal intervals in the partition must be short compared to the temporal trace of e. We certainly need more events here, but for the sake of space I assume that the red intervals in figure 4.1 are short enough. Finally, *-Ca'* says that each interval in the partition corresponds to an event and that these events meet two conditions: (i) they satisfy the modified predicate, and (ii) they all have the same spatial trace and participants.

This final clause, in combination with the material part condition, makes it possible to

think of this second domain as a finer-grained, non-atomated domain of events.

identify the pluractional subevents with the atoms that the pluractional predicate denotes. Just because two events take the same time does not mean they are related. For instance, think of Mary brushing her teeth at 9am in LA and John eating a sandwich at noon in NY. Trace equivalence ensures that the pluractional event and its pluractional subevents are related by complete superposition. They happen at the same time, in the same space, with the same participants, etc. This is the intuition behind the final clause, but it is possible to provide empirical evidence for it as well.

It should be clear how the analysis will help assimilate event-internal pluractionals like –*Ca'* to group nouns, which lead dual lives with both singular and plural aspects. *Ca'*-marked predicates denote event atoms that are spatiotemporally and thematically superimposed on an event plurality. The fact that the pluractional events are not sums is the fact from which all of the generalizations in section 4.4 follow. Moreover, the fact that the group events are spatiotemporally defined is what allows the analysis to extend to *grove*-type group nouns. We know that events are individuated via their spatiotemporal properties, that pluractionals elaborate on temporal traces, and that pluractional reference finds parallels in the nominal domain. That a group-based analysis of a canonical type of pluractionality should shed light on a new subclass of group nouns is a major result, and one that supports further research into fine-grained noun-verb denotational parallels.

4.6.1 Accounting for distributivity and cumulativity

Recall that *löj*-marked predicates and *Ca'*-marked predicates display different interactions with distributivity. Individuals that are distributively predicated of an event-external pluractional need not participate in a plural event, while those that are distributively predicated of a *Ca'*-marked predicate must participate in a plural event. Section 3.5 explained the behavior of *–löj* in terms of cumulativity. We argued that distributive predication is a reflection of the way thematic roles map the atomic parts of a non-atomic event to parts of a participant, and that by deriving predicates of non-atomic events, *–löj* creates the substrate for distributive predication. A group-based analysis of *–Ca'* immediately predicts the lack of these readings because *Ca'*-marked predicates are not predicates of non-atomic events. But, while *–Ca'*-marked predicates do not have the same dependent readings that arise under predicative distributivity with *löj*-marked predicates, they do have a different class of distributive readings. I argue that relevant readings provide strong evidence that *–Ca'* must scope under cumulative closure.

Example (276), repeated from (258), cannot have a reading where the individuals take turns trying to push the bus. The denotation of (276), given in (277), predicts this fact.

(276) Suppose a group of people are trying to push a big bus, but it's having trouble moving. It just keeps rocking back and forth.

X-Ø-ki-chok-ocha'	*ri*	*ch'ich'.*
COM-A3s-E3p-push-Ca'	the	bus

'They kept pushing on the bus.'

(277) $\exists e \exists \mathsf{P}[\mathbf{atom}(e) \wedge \mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P} \exists e'[\tau(e') = t \wedge e' \leq_m e \wedge \epsilon(\tau(e))(t) \wedge \text{PUSH}(e') \wedge e[\tau]e']$
$\wedge\, \mathbf{ag}(e) = \sigma(x) \wedge \mathbf{th}(e) = \sigma(y) \wedge \text{BUS}(y)]$

The formula in (277) is true just in case there is an atomic event e whose agent is the sum of some contextually salient individuals and whose theme is a bus. The second line of (277) gives the contribution of *–Ca'*. The temporal trace of this e must be partitionable into small intervals, each of which is the temporal trace of a pushing event and each of which takes place in the same space and with the same participants as e. To generate the kind of reading that *löj*-marked predicates have under distributive predication, e must have parts that $\mathbf{ag}$ could map to subparts of the plural subject. This is impossible, though, since e must be atomic.

Assuming that there are no covert distributivity operators, the formula in (277) further predicts that *Ca'*-marked predicates should only have collective readings. This is not true. Recall from example (269) that the following example, which has no overt distributor, is true in a situation where each individual in the denotation of the subject keeps glancing at me. That is, each of them participate in an event satisfying the pluractional predicate.

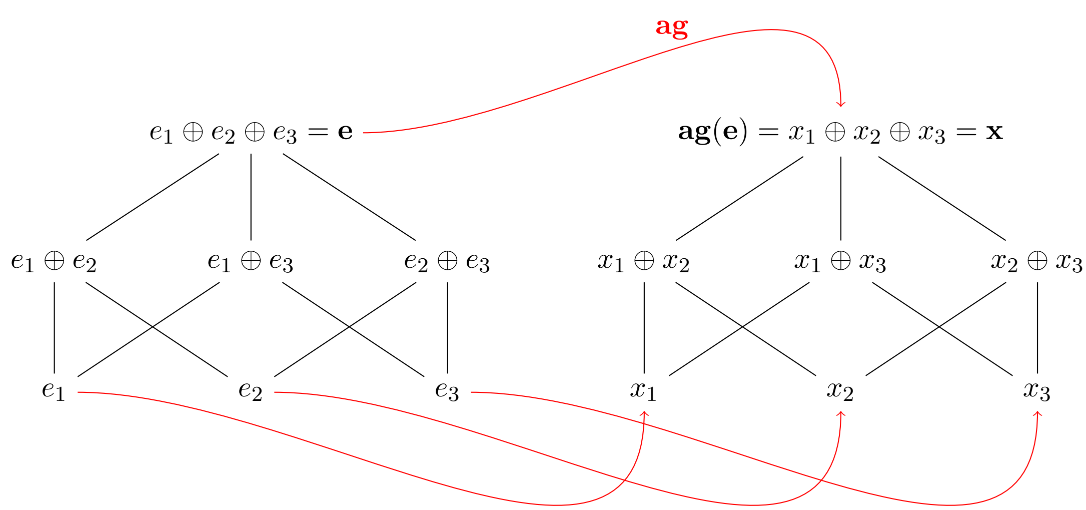
(278) *X-i-ki-tz'et-etz'a'.*
COM-A1s-E3p-look.at-Ca'
'They (each) kept glancing at me.'

The most salient reading of (278) is thus the one that arises under distributive predication. To capture this reading, it must be the case that verbs derived by *–Ca'* are subsequently cumulatively closed. The formula in (279) gives the necessary denotation.

(279) $$\exists e \exists \mathsf{P}[e \in *\lambda e'[\mathbf{atom}(e') \wedge \mathsf{Part}(\mathsf{P}, \tau(e')) \wedge \\ \forall t \in \mathsf{P} \exists e''[\tau(e'') = t \wedge e'' \leq_m e' \wedge \epsilon(\tau(e'))(t) \wedge \text{LOOK}(e'') \wedge e'[\tau]e'']] \\ \wedge \mathbf{ag}(e) = \sigma(x) \wedge \mathbf{th}(e) = \mathsf{Sp}]$$

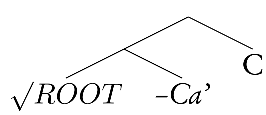
The formula in (279) is true just in case e is an atom or the sum of some atoms satisfying the pluractional predicate. Furthermore, the agent of e is the sum of some salient individuals x and the theme of e is the speaker. These conditions would be met in the situation depicted in figure (4.2), where each event e_1, e_2, e_3 satisfies the pluractional predicate *tz'etetz'a'*. This is parallel to how distributive readings arise with pluractional *–löj* under distributive predication. The difference is that the atoms in figure (4.2) must satisfy the pluractional predicate, while they need not with *–löj*.

Figure 4.2: *Xikitz'etetz'a'; cf.* 278



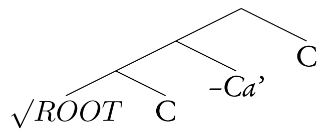
The fact that *Ca'*-marked predicates have the type of distributive readings in (278) aligns with the assumption that all verb stems are cumulatively closed. Since cumulative closure procedes via an operator in the compositional morphosemantics, there are two options. The pluractional *–Ca'* could apply to the root, which denotes a set of atoms, deriving a set of atoms that is then cumulatively closed, as in (280).

(280)



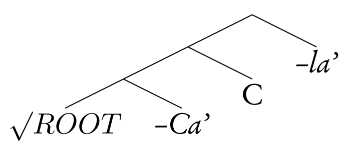
The alternative, shown in (281), is that *–Ca'* could apply after cumulative closure, deriving a predicate of atoms, in which case a second instance of the operator is necessary.

(281)



While example (280) is certainly more parsimonious, these two alternatives are empirically distinguishable. If we had a second pluractional that must apply after cumulative closure, then this theory would predict that –*Ca'* and the second pluractional should permute. While –*löj* is such a pluractional, it is difficult to run this test because *Ca'*-marked predicates are always transitive, but –*löj* selects for intransitive stems. Instead, we can use the pluractional –*la'*, the topic of Part II, to check the prediction. While we cannot present the analysis of –*la'* here, it is shown in the next two chapters that –*la'*, like –*löj*, must apply to a cumulatively closed predicate of events. Given this conclusion and the analysis in (281), the semantics predicts that –*la'* and –*Ca'* should permute. In contrast, if –*Ca'* must compose before cumulative closure, then –*la'* should only be able to apply after –*Ca'*, as in example (282).

(282)



This prediction is borne out. Examples like (283-284) are grammatical, while examples like (285-286) are simply impossible.

(283) *X-Ø-u-chap-acha-la'.*
COM-A3s-E3s-handle-Ca'-la'
'He tapped on each of them.'

(284) *X-Ø-u-pitz'-ipa-la'.*
ICP-A3s-E1s-squeeze-Ca'-la'
'She squeezed each of them rapidly many times.'
Speaker Comment: Like a person who fiddled with all the produce in your stall.

(285) *N-Ø-i-chap-la'-(a)cha'.

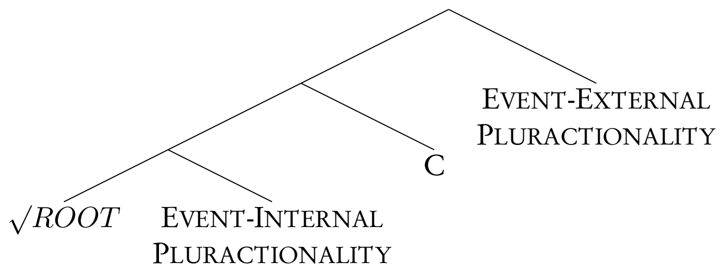
(286) *N-Ø-i-pitz'-la'-(i)pa'.

The evidence is in favor of a theory where only one cumulative closure operator is available, and *–Ca'* applies before cumulative closure, while *–la'* must apply after. Since we have shown in the previous chapter that *–löj* can only apply to cumulatively closed predicates as well, we conclude that they also apply at the stem level after cumulative closure. It should not be surprising then that in Part II I show that *–la'* shares other properties with event-external pluractionals.

Further evidence for this analysis comes from the morphosyntax and morphophonology of the pluractional suffixes themselves. Recall that while the event-internal pluractional –*Ca'* partially reduplicates root material, *–la'* and *–löj* do not. In this way, the event-internal pluractionality is more morphophonologically dependent on CVC roots than *–löj* and *–la'*, which we might expect to reflect how they compose. Moreover, we showed in this chapter's introduction that *–Ca'* must be adjacent to CVC roots, and cannot affix after other derivational morphology, while *–löj* can. In my analysis, the morphosyntax and semantics come together. *–Ca'* always composes with the root directly, while *–löj* cannot, instead composing with intransitive stems after cumulative closure.

To summarize, I have shown how the differences between *–Ca'* and *–löj* with respect to various distributive readings can be captured if the latter, but not the former denote predicates of plural individuals. If –*Ca'* derives predicates of atoms, we correctly predict that these pluractionals should not allow readings where the atomic parts of a plural argument merely participate in pluractional subevents. The semantic differences between event-internal and event-external pluractionality is further reflected in the compositional morphosemantics. In deriving predicates of atoms, event-internal pluractionals can compose before cumulative closure, while event-external pluractionals cannot. The interpretations of –*löj* and –*Ca'* matches their morphosyntax and provide strong evidence that cumulative closure applies once, with the different pluractional operators distributed across the boundary, as in (282).

(287)



The idea that event-internal and event-external pluractionals have a different morphosyntax that reflects their semantic differences is a new one. While it is supported in Kaqchikel, it also makes strong crosslinguistic predictions that would be an interesting area for future morphosyntactic research. Finally, the analysis presents a strong argument that cumulative closure should be represented in the compositional semantics, and not be a lexical default. To capture the distributive interpretations of the two Kaqchikel pluractionals, one must scope over cumulative closure, while the other scopes under.

4.6.2 Accounting for aspectual selection and restricted entailments

The second class of differences between event-internal and event-external pluractionals concerns interactions with the aktionsart of the base predicate. While *–löj* applied freely, event-internal pluractionals like *–Ca'* only compose with semelfactive predicates without coercion. Activities, achievements, and accomplishments are only acceptable if their end states can be removed and their preparatory processes repeated. In addition, the repetitions with event-internal pluractionals like *–Ca'* must be contiguous, unlike event-external pluractionals which allow a variable amount of downtime between pluractional subevents. Finally, sentences with *Ca'*-marked predicates entail minimally different non-pluractionals sentences if the affixed predicate is semelfactive. One of the strengths of the analysis I propose is that it draws these three generalizations together. All will have their explanation rooted in the fact that –*Ca'* derives predicates of atoms.

Recall that event-external pluractionals can denote plural events with non-contiguous repetition because sum events can have discontinuous temporal traces. In contrast, atomic events have continuous temporal traces by assumption.[4] If this is true, the analysis immediately predicts that event-internal pluractionals should require contiguous repetitions. Consider example (288), repeated from (267). Its truth conditions are given in (289).

(288) Suppose Juan has a rash on his arm and every once and a while it itches so he scratches it.

#A	*Xwan*	*x-Ø-u-roch-ora'*	*r-aq'a.*
CLF	Juan	COM-A3s-E3s-scratch-Ca'	E3s-hand

'Juan kept scratching his arm.'
SPEAKER COMMENT: No, it would be like this [scratches vigorously back and forth on her arm].

(289) $\exists e \exists \mathsf{P}[\mathbf{atom}(e) \wedge \mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P} \exists e'[\tau(e') = t \wedge e' \leq_m e \wedge \epsilon(\tau(e))(t) \wedge \text{SCRATCH}(e') \wedge e[\tau]e']]$
$\wedge\, \mathbf{ag}(e) = J \wedge \mathbf{th}(e) = x \wedge \text{ARM}(x) \wedge R(J, x)]$

The formula in (289) is true if there is an atomic event e whose temporal trace can be partitioned into intervals that are traces of scratching events. Each of those events have to have John as its agent and an arm standing in the appropriate relationship to John as its patient. Since e is atomic, its temporal trace must be contiguous, as the black bar shows in figure

[4]Note that this does not mean that atomic events cannot include starts and stops, it just means that those starts and stops are counted as part of the atomic event's runtime. There is evidence for this. Suppose we're out drinking a beer and it takes you a long time to finish yours. I can say *What's wrong with you. It took you an hour to finish that beer.* But you can't reply, *No. I drank that beer in a minute, counting the time I was actually drinking it.*

4.3. Thus, the cells in the partition of its temporal trace, shown in red, must be contiguous. The result is that there can be no downtime between the pluractional subevents satisfying the predicate *roch* 'scratch'.

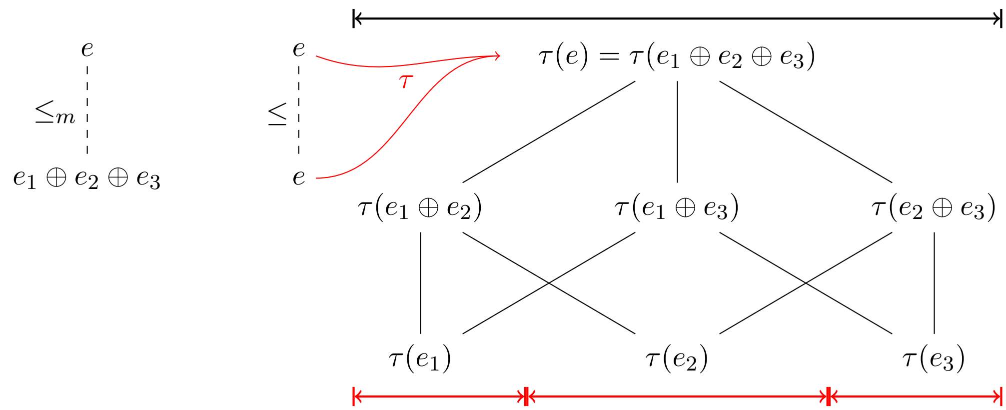


Figure 4.3: *Xurochora'*; *cf.* 288

This correctly predicts that (288) should be infelicitous in the scenario presented. The scratching events are not continuous, as we would expect if their runtimes partitioned the trace of an atomic event.[5]

The fact that a temporal partition of an atomic event must have contiguous cells correctly predicts that *Ca'*-marked predicates should have single-event readings with continuous repetition, but it also predicts that event-internal pluractionals should be picky about the aktionsart of the verbs to which they apply. Recall that *–Ca'* felicitously applies to semelfactive verbs, resisting verbs from other aktionsart classes unless they can be coerced into a semelfac-

[5]Speakers have the intuition that the repetitions entailed by *Ca'*-marked predicates are not just contiguous, but also rapid. Example (288), for instance, cannot appropriately describe slow, but contiguous, scratching. We could account for this fact in one of two ways. The pluractional could, for instance, require the partition P to be maximally fine. This would entail that the repeated events have very short temporal traces, and are thus rapid events. The other option is that the ϵ operator comparing the temporal trace of the main event and the pluractional subevents could require the latter to be much shorter than the former, even more so than with *löj*-marked predicates.

tive reading in which there is no culmination. One of the examples used to establish this generalization is in (290).

(290) *X-Ø-in-tzuy-utza'.*
COM-A3s-E1s-sit-Ca' there
'I kept (making the motion of) sitting there.'
SPEAKER COMMENT: Your bottom doesn't really hit the chair.

The intuition behind my analysis of this generalization is that the non-trivial end-state that has to hold at the end of achievements and accomplishments interferes with the requirement that the pluractional subevents be contiguous. For example, if there is an event of me sitting down, then it must be directly followed by an event (or state) of me being seated that lasts for some minimal amount of time. While this state holds, though, it cannot be the case that I am sitting down again. Thus, any second event of me sitting down cannot be temporally contiguous with the first. For it to be so, we have to remove the intermediate result state in which I am seated. This seems to be exactly what is going on in example (290).

The exact formalization is not important, as long as the culmination is separated from the event satisfying the lexical predicate. I will make use of the following, admittedly crude meaning postulate.

(291) $\text{SIT}(e) \Rightarrow \exists e'[e \prec e' \wedge \text{SEATED}(e') \wedge \mathbf{ag}(e) = \mathbf{ag}(e')]$
e is a sitting event just in case there is event e' immediately following e in which the agent of e is seated.

Now, when *–Ca'* applies to a predicate like *tzuy* 'sit', the result is infelicitous unless the result states required by the meaning postulate are minimized (or ignored all together). This is illustrated by the formula (292) and its graphical representation in 4.4.

(292) $\exists e \exists \mathsf{P}[\mathbf{atom}(e) \wedge \mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$

$$\forall t \in \mathsf{P} \exists e'[\tau(e') = t \wedge \epsilon(\tau(e))(t) \wedge \text{SIT}(e') \wedge e[\tau]e']]$$
$$\wedge\, \mathbf{ag}(e) = \mathsf{Sp}]$$

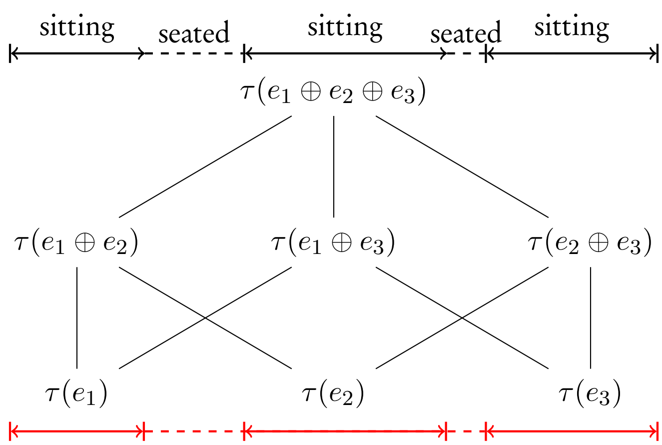


Figure 4.4: Minimize endstates

The illustration in figure 4.4 shows that the only way the pluractional subevents $e_1, ..., e_3$ can partition the trace of e is if the end states required by the meaning postulate are eliminated. The solid bars above represent the temporal traces of sitting events, while the dashed lines represent the temporal traces of endstate events of being seated that follow sitting events. To get contiguous repetitions of sitting, the endstate events of being seated must be minimized, which is the type of coercion observed with *Ca'*-marked achievements and accomplishments. Moreover, it matches speaker intuitions about such pluractional predicates. The repetitions have to be as rapid as possible.

Examples (293) and (294) present special cases of this problem since *qum* 'drink' and *ch'är* 'split' are predicates of destruction. Their meaning postulates would entail an endstate in which their themes are irreversibly changed. In the analysis developed here, the prediction is that by removing the culminations required by their meaning postulates, the themes of these predicates cannot undergo the relevant changes once the predicate has been derived by *–Ca'*. This is borne out, as we have seen.

(293) *X-Ø-in-qum-uqa' jun kaxlan ya'.*
COM-A3s-E31-drink-Ca' a foreign water
'I kept drinking at the coke.'
SPEAKER COMMENT: You don't finish it. You just keep making the motion.

(294) *X-Ø-in-ch'ar-ach'a' ri tros.*
COM-A3s-E31-split-Ca' the stump
'I kept chopping at the stump.'
SPEAKER COMMENT: It's like if your axe is really dull.

It is well documented in previous descriptions of event-internal pluractionals that they often have moderative readings expressing lack of effort or ineffectual effort (Cusic, 1981; Wood, 2007). In my account, this would come about as an implicature due to the fact that event-internal pluractionals cannot culminate. For instance, a speaker explains the conditions under which example (294) would be felicitous by making reference to an ineffectual axe.

Finally, my analysis correctly predicts that a sentence with a *Ca'*-marked predicate only entails its non-pluractional counterpart if the predicate is semelfactive. The reason is that semelfactives predicates entail no culmination that must be suppressed. The existence of a pluractional event thus entails the existence of a series of events satisfying the semelfactive predicate. In contrast, examples like (290) and (293-294) are felicitous in so much as their predicates' meaning postulates can be ignored. This clearly means that they could not entail minimally difference sentences without the pluractional where the predicates' meaning postulates hold. For instance, (294) cannot entail a minimally different sentence without *–Ca'* because in that sentence, the stump would have to split, while in the scenario described by the pluractional predicate, it must not.

The analysis of *-Ca'* developed in this section provides a unified account of two core facts about event-internal pluractionals crosslinguistically: (i) They require contiguous repetitions, preventing downtime between pluractional subevents, and (ii) They apply only to semelfactive predicates, coercing predicates from other aktionsart classes into semelfactives by removing all non-trivial result states. What generates these two results is that event-internal pluractional like *-Ca'* derive predicates of group terms, namely atomic events that are superimposed on an event plurality via the temporal trace function. Since atomic events have a contiguous temporal trace, any plurality of events whose temporal traces partition it must themselves be temporally contiguous. This both suppresses downtime between pluractional subevents, as well as event culminations, which would usually occupy the downtime between repeated achievements and accomplishments.

4.6.3 Atelicity: A loose end

While the analysis of *-Ca'* explains where event-internal and event-external pluractionals diverge, the analysis must not obscure similarities between the two types of pluractionality. First, like *löj*, *-Ca'* derives atelic predicates, but the fact that event-internal pluractionals denote atoms in our account interacts poorly with our treatment of atelicity. Recall the atelic predicates have the following property.

(295) Subinterval property a là Champollion 2010
$\text{SUB}_K(P) :\Leftrightarrow \forall e[P(e) \rightarrow e \in *\lambda e'[(P(e') \wedge \epsilon(K)(\tau(e')))]]$

If e is atomic and K is given by a *for*-adverbial, then it not possible to exhaustively divide

e into P-events that are short relative to K. This incorrectly predicts that event-internal pluractional like –*Ca'* should not be atelic. The solution is to mix the account in Champollion 2010 with earlier treatments cast in terms of temporal intervals (Bennett & Partee, 1972; Link, 1991; Moltmann, 1991, 1997).

(296) Temporal-based Champollion 2010–style subinternal property
$\text{SUB}_K(P) :\Leftrightarrow \forall e[P(e) \rightarrow \tau(e) \in *\lambda t \exists e'[t = \tau(e') \wedge P(e') \wedge \epsilon(K)(t)]]$

This reformulation of Champollion's subinterval property can now apply to both atomic and non-atomic events. This is crucial because, as we have seen, a series of semantic and morphosyntactic properties of event-internal pluractionals follow if they derive predicates of atoms.

4.7 Spatiotemporally-defined group nouns

The previous section argued that the analysis of –*Ca'* captures those properties unique to the pluractional and to event-internal pluractionals crosslinguistically. This section takes a deeper look at the connection between plural reference in the verbal domain and in the nominal domain. The goal is to draw parallels between verbal predicates derived by –*Ca'* and subclass of group nouns, which I call *grove*-type group nouns. Importantly, *grove*-type group nouns are not well recognized as a class distinct from the canonical *committee*-type group nouns. By extending the analysis from the verbal domain to the nominal domain, this section is a case study in analytic gains to be won from the search for fine-grained noun-verb denotational parallels. The result is a new account of *grove*-type group nouns, as well as further strong evidence that natural language makes use of similar types of plural reference across the nominal and verbal domains, and that plural reference to events is the source of pluractionality.

4.7.1 Background on groups

As is well known, there are nouns like those in (297) which are morphologically singular, but in other ways behave like plurals (Jespersen, 1924/1992; Link, 1983/2002; Landman, 1989a; Barker, 1992, among others).

(297) a. committee

b. team

c. squad

d. grove

e. bouquet

f. horde

Called group nouns, these nominals systemically differ from both singulars and plurals. In this section, though, I argue that there are important distinctions *within* the class of group nouns as well. In particular, those in (297d-297f) have different semantics than those in (297a-297d). While nouns like *committee* denote atomic individuals that are related to a plurality via a notion of membership, group nouns like *grove* are atomic individuals that are related to a plurality via spatiotemporal superposition. Not only do the spatiotemporal properties of *grove*-type group nouns explain their unique characteristics, but the denotation they are given is essentially equivalent to that of an event-internal pluractional predicate.

There are a large number of diagnostics which distinguish group nouns from both singular count nouns and singular count plurals. For the moment I focus on *committee*-type group nouns, which provide the benchmark for evaluating the lesser-known *grove*-type group nouns.

First, singular group nominals behave like plurals in licensing collective predicates, as shown in examples (298-298).

(298) a. The students gathered in the park.
b. The committee gathered in the park.
c. *George gathered in the park.

(299) a. The students worked together to win the game.
b. The team worked together to win the game.
c. *George worked together to win the game.

Moreover, group nouns can be the target of certain distributive adverbials like *one by one*, which normally only target plural nominals (Brasoveanu & Henderson, 2009).

(300) a. The students voted one by one.
b. The committee voted one by one.
c. *George voted one by one.

(301) a. The students walked onto the field one by one.
b. The team walked onto the field one by one.
c. *George walked onto the field one by one.

Finally, there is a class of predicates, called stubbornly distributive by Schwarzschild (to appear), which seem to only be able to be predicated of atomic individuals. If group nouns were truly singular, the individuals they denote should fall in the extension of these predicates. Instead, stubbornly distributive predicates can only be predicated of a group's members, showing that they behave like plurals.

(302) Suppose that some players are standing around in a circle.
   a. #The players are circular.
   b. #The team is circular.

(303) Suppose George is on the committee.
   a. The committee members are tall ⇒ George is tall.
   b. The committee is tall ⇒ George is tall.

While these tests reveal the plural character of group nouns, there are also semantic tests distinguishing group nouns from plurals. Most importantly, group nouns have a denotational identity over and above the plurality of their members, which accounts for the difference in entailment patterns in (304). Furthermore, example (305) shows that the predicate *dissolve* only has a gruesome reading with a plural subject. Since the same sentence with a group-denoting subject need not have this reading, groups must be able to fall in the extensions of different predicates than the individuals constituting those groups.

(304) Suppose the colloquium committee and the conference committee have the same members.
   a. The members of the colloquium committee met. ⇒ The members of the conference committee met.
   b. The colloquium committee met. ⇏ The conference committee met.

(305) a. The members of the team dissolved.
   b. The team dissolved.

Though there are a variety of accounts of these facts, I focus on the prominent analysis in Barker 1992. The reason is that the goal of this section is an analysis of *grove*-type group nouns, and the analysis of *committee*-type group nouns in Barker 1992 provides a clear contrast to my account of *grove*-type group nouns.

Barker 1992 lets singular group terms denote atoms in the lattice of individuals with respect to the 'part of' relation, while requiring these atoms to be materially constituted by a collection of discreet entities. Group atoms are connected with their plural parts via a membership function. Formally, the membership function f is an automorphism on the domain of individuals D_e. As an automorphism, f is structure-preserving, namely $f(a \oplus b) = f(a) \oplus f(b)$. In this analysis, group nouns just denote atoms that are mapped to pluralities under f. In figure 4.5, the arrows represent the membership function f for a subset of the lattice. For instance, b and c are normal singular entities because they are atoms and have themselves as members. The sum $b \oplus c$ is a normal plural entity because it is non-atomic and has its parts as members. Finally, a is a group because it is atomic, but has a plural entity as its member, namely $b \oplus c$.

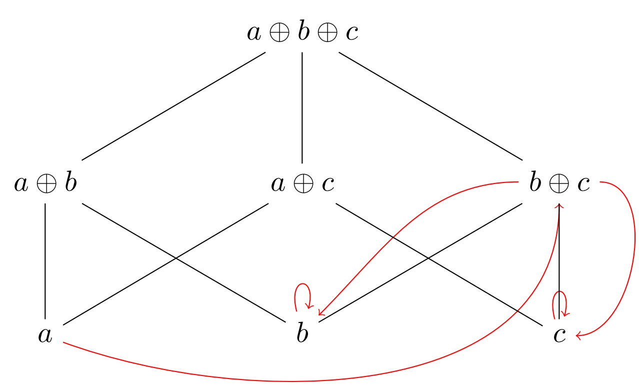


Figure 4.5: Atoms, Groups, and Pluralities

While I do not go into the analysis in detail, it provides all of the power necessary to capture the properties of *committee*-type group nouns. The idea is that a group behaves like a plural in certain constructions because in those constructions it is able to access the plurality of its members via f. Group nouns behave like singulars, in triggering singular agreement for instance, in virtue of the fact that they denote atoms. Finally, we do not incorrectly equate groups and their members. For example, since a and $a \oplus b$ are distinct elements in figure 4.5, they can fall in the extension of different predicates.

4.7.2 Grove-type groups

Taking a broad view, *committee*-type group nouns exist because the notion of membership allows a superposition of an atom with a plurality. We can now ask whether all group nominals make use of the notion of membership. I argue that they do not. In particular, group nouns like those in (231) are radically different from *committee*-type groups nouns.[6]

(306) a. grove
b. bouquet
c. horde
d. forest

Instead of making use of membership, these predicates denote atoms that are spatiotemporally superimposed on a plurality. That is, a *pine grove* requires a plurality of pine trees, but those trees are not "members" of the grove. Instead, *pine grove* denotes atoms whose spatial

[6]While the distinction between *grove*-type group nouns and *committee*-type group nouns is new, this is not the first work to challenge a monolithic treatment of group nouns. In particular, Pearson 2011 draws a distinction between *committee*-type group nouns and "collection nouns". These are group nouns that seem to require an *of*-complement headed by an inanimate NP, for example, *bunch of flowers*, *pile of dishes*, *deck of cards*. While these group nouns share similar properties with *grove*-type group nouns, they are also different. In particular, *grove*-type group nouns do not need an *of*-complement, are not always inanimate, do not trigger plural agreement in British English, and are more opaque to distributors like *one by one*.

trace can be partitioned into small parts, each of which contains a pine tree. In this way they have the same type of plural reference as event-internal pluractionals.

Grove-type group nouns pattern differently than committee-type group nouns on a variety of tests. First, *grove*-type group nouns pattern with singulars in being ungrammatical with some collective predicates, as in (307-308), as well as with collectivizing adverbials, shown in (309-310).

(307) a. Those trees are all alike.
b. That family is all alike.
c. *That grove is all alike.
d. *That tree is all alike.

(308) a. Those soldiers are a group of 15.
b. That family is a group of 7
c. *That horde is a group of 10,000.
d. *John is a group of 1.

(309) a. Those flowers looks good together.
b. That family looks good together.
c. *That bouquet looks good together.
d. *That flower looks good together

(310) a. Those warriors fight well together.
b. That platoon fights well together.
c. *That horde fights well together.
d. *That warrior fights well together

That being said, *grove*-type group nouns are not ungrammatical with all collective predicates. They are grammatical with those that have a spatial component, showing that they are in some sense group denoting. They cannot be treated as predicates of simple atoms.

(311) a. The grove surrounds a small spring.
b. The horde surrounded a small village
c. Mary gathered a bouquet from the garden.

Grove-type group nouns are also different from *committee*-type group nouns in that the individuals that make up the group are not accessible by distributors like *one by one*.

(312) a. The team entered the field one by one.
b. I interviewed the family one by one.
c. The committee voted one by one.

(313) a. *I chopped down the grove one by one.
b. *The horde crossed the Alps one by one.
c. *I smelled the bouquet one by one.

Finally, recall that so-called stubbornly distributive predicates cannot be predicated of groups, but instead distribute down to their members. This is not the case for *grove*-type group nouns.

(314) Suppose a family is standing around in a circle.

#That family is circular.

(315) Imagine a committee with 8, 5 foot tall members, and 2, six foot tall members.

#That is a tall committee.

(316) Suppose a large number of pine trees are standing close together in a circle.

That pine grove is circular.

(317) Imagine a bouquet with mostly small flowers, but two long strands of eucalyptus sticking out.

That is a tall bouquet.

What examples (316) and (317) show is that assessing the properties of *grove*-type group nouns means considering the total configuration of the group's members. For example, a bouquet is as tall as its tallest point, not the average or general height of the flowers that constitute it. In this way, *bouquet* is different than *committee*-type group nouns under stubbornly distributive predication.

The final difference between *grove*- and *committee*-type group nouns concerns the type of individuals they denote. When a committee finishes meeting and its members go home, the committee does not dissolve. Committees are not defined in terms of the spatiotemporal properties of the individuals that constitue them. They are defined in terms of membership and shared goals. The same is true for platoons, teams, and families. *Grove*-type group members are different. If all of the warriors in a horde go home, the horde ceases to exits. Similarly for groves and bouquets. If we take the flowers in a bouquet and place them around the room, the bouquet is no more. These types of group nouns are defined in terms of the spatiotemporal properties of their members. It is this insight that motivates the analysis.

We have established that *committee*-type group nouns can be defined as atoms that are mapped to a plurality by a function representing membership. I propose that *grove*-type group nouns do not make use of membership functions, but the spatiotemporal trace functions that relates atomic individuals to pluralities. I call this function σ on analogy with the event trace function, but I assume it is different. It takes an individual argument and maps it to the spatial extent (a three-dimensional interval) at the evaluation time. I further assume that like time, space is a mereology, where $\leq$ is the spatial subinterval relation. Example (318) gives the schema for translating *grove*-type group nouns.

(318) $\lambda x \exists \mathsf{P}[\mathbf{atom}(x) \wedge \mathsf{Part}(\mathsf{P}, \sigma(x)) \wedge \forall s \in \mathsf{P}$
$\exists x'[\sigma(x') \leq s \wedge x' \leq_m x \wedge \epsilon(\sigma(x), s) \wedge Q(x')]]$

'The set of all atomic individuals x whose spatiotemporal trace can be divided into small parts, each of which contains an individual that is an m-mart of x satisfying Q.'

The primary difference between *groves*, *hordes*, *bouquets*, etc. is the predicate Q. This Q seems to be lexically fixed in some cases, but it can be modified by compounding, i.e., *pine grove*, *viking horde*. In other cases, Q can be altered by means of an *of*-complement, for example, *horde of children*.

(319) $[\![\text{grove}]\!] = \lambda x \exists \mathsf{P}[\mathbf{atom}(x) \wedge \mathsf{Part}(\mathsf{P}, \sigma(x)) \wedge$
$\forall s \in \mathsf{P} \exists x'[\sigma(x') \leq s \wedge x' \leq_m x \wedge \epsilon(\sigma(x), s) \wedge \text{TREE}(x')]]$

(320) $[\![\text{horde}]\!] = \lambda x \exists \mathsf{P}[\mathbf{atom}(x) \wedge \mathsf{Part}(\mathsf{P}, \sigma(x)) \wedge$
$\forall s \in \mathsf{P} \exists x'[\sigma(x') \leq s \wedge x' \leq_m x \wedge \epsilon(\sigma(x), s) \wedge \text{WARRIOR}(x')]]$

(321) $[\![\text{bouquet}]\!] = \lambda x \exists \mathsf{P}[\mathbf{atom}(x) \wedge \mathsf{Part}(\mathsf{P}, \sigma(x)) \wedge$
$\forall s \in \mathsf{P} \exists x'[\sigma(x') \leq s \wedge x' \leq_m x \wedge \epsilon(\sigma(x), s) \wedge \text{FLOWER}(x')]]$

The difference between the *grove*-type group nouns above and *committee*-type groups is that the individuals that make up *grove*-type groups are inaccessible. The membership function f just maps each grove to itself, which is an atom. Furthermore, the spatiotemporal trace function σ does not map a grove to the plurality of trees that occupy its spatial extent, just the space itself. This explains the distribution of *grove*-type group nouns with respect to the tests above.

First, collective predicates that must access the plural individual related to a group noun, like *be all alike*, *be a group of n*, etc., should be ungrammatical with grove-type nominals. More explicitly, an individual x is in one of these predicate only if $f(x)$ is. This seems to be the case.

(322) a. The members of the committee are a group of 10 if and only if the committee is a group of 10.

b. The members of the committee are all alike if and only if the committee is all alike.

Grove-type group nouns cannot be in the denotation of the predicates above because f maps their atoms to atoms, but these predicates can only be true of pluralities.

In contrast, predicates like *surround* and *gather* should be grammatical with grove-type group nouns. First, note that these predicates, while usually requiring a plural subject, are perfectly grammatical with singular, non-group predicates.

(323) a. The heat shield surrounds a central cavity through which the fuel tube extends.[7]

b. The wall surrounds the city

(324) a. He gathered her close and gave her a hug.

b. She gathered her cloak around her before stepping outside.[8]

The generalization is that these predicates merely require their subjects to stand in the right spatial configuration or assume the right spatial configuration by the end of the event. This is usually accomplished with a plural individual, but the requirement can also be satisfied by a spatially extended singularity, like a cloak or wall. The explanation extends to grove-type group nouns, which by definition are spatially extended.

[7] `http://www.freepatentsonline.com/8091362.html`

[8] `http://www.learnersdictionary.com/search/gather[1]`

Similarly, the analysis correctly predicts that *grove*-type group nouns should be ungrammatical with distributive operators like *one by one*. (See Part III for more discussion of *one by one* and the wider class of pluractional adverbials.) For now I assume that *one by one* puts events in correspondence with atoms of $f(x)$ via thematic roles (Brasoveanu & Henderson, 2009). Furthermore, there must be at least two distinct atomic parts of $f(x)$. This constraint is not satisfied by *grove*-type group nouns, which do not make available the pluralities whose existence they entail.

Finally, the analysis correctly predicts that *grove*-type groups can be in the denotation of stubbornly distributive predicates, while they can only be predicated of the atomic members of *committee*-type groups. The idea, following Schwarzschild (to appear), is that stubbornly distributive predicates can only be predicated of atoms. By requiring that an individual x is in the denotation of a stubbornly distributive predicate just in case $f(x)$ is, we correctly predict that these predicates should distribute over the atomic members of *committee*-type groups. In contrast, a *grove*-type group can fall in the denotation of predicates like *circular* and *tall* without generating entailments about the entities over which it is spatiotemporally superimposed.

Summing up, this section motivates a distinction between two classes of group nouns. The first, exemplified by *committee*, denote atomic entities that are mapped to pluralities by a membership function. The second, exemplified by *grove*, denote atoms whose spatiotemporal trace can be partitioned into small cells, each of which contains an individual satisfying some relevant predicate. The next section shows that beyond the surface similarity, there are a series of arguments that event-internal pluractional denote group events that are the formal analogs of *grove*-type groups.

4.7.3 Grove-type groups and event-internal pluractionality

The previous sections developed independently motivated analyses of event-internal pluractionality and a distinguished subclass of group nouns. While the formal similarity between their denotations is clear, we now argue, based on tests that can be run across categories, that*Ca'*-marked predicates and *grove*-type group nouns have the same type of plural reference.

First, consider again the formal similarity between the denotations of the relevant predicates. Example (325) shows the result of deriving a predicate Q with -*Ca'*, while example (326) shows a grove-type group nouns based on the predicate Q.

(325) $\lambda x \exists \mathsf{P}[\mathbf{atom}(x) \wedge \mathsf{Part}(\mathsf{P}, \sigma(x)) \wedge$
$\forall s \in \mathsf{P} \exists x'[\sigma(x') \leq s \wedge x' \leq_m x \wedge \epsilon(\sigma(x), s) \wedge Q(x')]]$

(326) $\lambda e \exists \mathsf{P}[\mathbf{atom}(e) \wedge \mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P} \exists e'[\tau(e') = t \wedge e' \leq_m e \wedge \epsilon(\tau(e), s) \wedge Q(e') \wedge e[\tau]e']]$

The similarity is clear. Both denote predicates of atomic entities and assert the existence of a partition of the temporal/spatiotemporal trace of those entities. Furthermore, each cell in the partition must satisfy a set of conditions: (i) it is small relative to sum of the cells of the partition, (ii) it corresponds to the temporal/spatiotemporal trace of another entity that is a finer-grained part the big entity, and (iii) each of those entity satisfies the predicate Q. There are only two small difference. First, the pluractional subevents must have temporal traces that are equivalent to cells in the temporal partition, while the individuals that constitute a *grove*-type group must have spatiotemporal traces that are less than or equal to cells in the spatiotemporal partition. This is because the trees in a grove or the warriors in a horde need not be touching.[9] Second, the pluractional subevents must be trace-equivalent except for τ, while no such requirement is made of the individuals constituting a grove-type group. This is because individuals are not in the domain of as many trace functions as events. If they were, presumably it would be necessary to add a $x[\sigma]x'$ clause to the formula in example (326). Given the formal similarity between event-internal pluractionals and grove-type groups, it is expected that we find a series of cross-categorial semantic similarities. This is the case.

First, recall that adverbial modifiers like *one by one* place atomic event and atomic individuals in correspondence. Moreover, they can "look inside" *committee*-type group nouns, but not *grove*-type groups. If *one by one* has a similar effect in both the domain of individuals and the domain of events, then the analysis predicts that it cannot distribute over the pluractional subevents of an event-internal pluractional. Both of these propositions are true. Note first that *pa jujun* 'one by one' in both Kaqchikel and English is able to 'look inside' complex events, distributing its parts over the parts of a plural argument. In particular, *gathering* could be thought of as a sequence of arrivals, and example (327) shows that the distributive operator has access to these arrivals.

(327) *Pa ju-jun x-Ø-ki-mol ki' pa k'ayb'äl.*
P one-RED COM-A3s-E3p-group REFL P market
'They arrived in the market one by one.'

In contrast, the same distributor cannot target the pluractional subevents of an event-internal

[9] We could make their denotations more similar if an individual's spatial trace included some contextually specified minimal space surrounding it. Another route, which is more likely, is that the spatial trace of atomic individuals, unlike the temporal trace of events, need not be convex, but coherent in some other way.

pluractional, which is parallel to its behavior with *grove*-type groups. Just for contrast, example (329) shows that event-external pluractionals pattern with bona fide plurals and event-external pluractional predicates.

(328) *X-Ø-ki-k'uy-uk'a' pa jay pa ju-jun.*
COM-A3s-E3s-knock-Ca' P house P one-RED
#'They knocked once one by one many times.'
'They kept knocking at the house one by one.'

(329) *Ri aj x-e-b'oj-löj pa ka-ka.*
The fireworks COM-A3p-explode-löj P two-RED
'The fireworks kept exploding two by two.'

An analysis that assimilate event-internal pluractionals to *grove*-type group nouns, like the one developed here, immediately captures the generalization that the two classes of predicates behave similarly with respect to cross-categorial distributive operators.

Another similarity between grove-type groups and event internal pluractionals concerns their cardinality entailments. Examples (330-331) show that both *committee*-type and *grove*-type groups are plural in that they the group cannot be constituted by only one individual.

(330) Imagine a lone viking camped near a single pine.
a. #The viking horde is camped in a pine grove.

(331) a. #The president convened a one person committee.
b. #Everyone get into one person teams.

Where *grove*-type groups and *committee*-type groups contrast is that the former need to have a large number of constituent individuals, not just two, which is exactly like event-internal pluractionals.

(332) a. #They were attacked by a horde of only two vikings.
b. #That pine grove has only two trees.

(333) a. That committee has only two members.
b. There are only two people in his family.

Once again, an account that assimilates grove-type group nouns to event-internal pluractionals correctly predicts this similarity. In the account developed here, the reason there must be many individuals constituting the pluralities is that the cells of the spatial partition must be small relative to the sum of the cells of the partition.

Finally, there is one small difference between *grove*-type group nouns and event-internal pluractionals that has not been touched on. Digging deeper, though, we find that this surface difference is a further argument for the crosslinguistic similarity of these two classes of predicates. In particular, the *grove*-type group nouns presented thus far are lexical predicates, while event-internal pluractionals are morphologically derived. If there were complete morphosemantic unification between *grove*-type group nouns and event-internal pluractionals, there should be morphemes that derive *grove*-type group nouns out of arbitrary predicates. That is, just like pluractional affixes, the relevant morpheme should take a predicate P and derive a predicate of atoms whose spatiotemporal trace is covered by P-individuals.

While English or Kaqchikel do not have such a suffix, there are languages that do, even other Mayan languages. For example, Tzotzil has the suffix *–tik* that derives predicates of expanses (Laughlin, 1975). For example, it applies to the plants and trees to form nominals similar to grove.[10]

[10] I would like to thank Judith Aissen for bringing this suffix to my attention.

(334) a. *chichol* ‘tomato’

b. *chichol-tik* ‘field of tomatoes’

(335) a. *la* ‘bush nettle’

b. *la-tik* ‘expanse of ‘la’

(336) a. *lo’bol* ‘banana’

b. *lo’bol-tik* ‘banana grove’

(337) a. *te’* ‘tree’

b. te’-tik ‘forest’

(338) a. *tulan* ‘oak’

b. tulan-tik ‘oak grove’

In addition, it appears to apply more broadly to predicates of all sorts, deriving expanses filled with entities satisfying those predicates.[11]

(342) a. *ton* ‘rock’

[11] In fact, barring homophony, –*tik* has different semantic effects across different categories. For example, when applying to reduplicated root adjectives it has an attenuating effect. While I do no have an account of these facts, we might be able to make use of fact that grove-type group nouns make use of the predicate ϵ, which compares two entities on a measure, requiring one to be small relative to the other.

(339) a. *loko* ‘provocative, over-sexed, boy-crazy’

b. *loko-tik* ‘rather over-sexed’

(340) a. *tzoj* ‘red, pink, orange, brown’

b. *loko-tik* ‘reddish, pinkish, *etc*.’

(341) a. *p’ij* ‘clever, smart’

b. *p’ijp’ij-tik* ‘rather clever’

b. *tontik* 'rocky place'

(343) a. *tuch'ulil* 'scrap'
b. *tuch'ultik* 'in shreds'

(344) a. *ka'ep* 'rubbish'
b. *ka'eptik* 'dump, *lit. expanse of rubbish*'

(345) a. *yi'al* 'river sand'
b. *yi'altik* 'expanse of sand'

Such suffixes are not limited to Mayan. For example, Romanian has the suffixes *–et* and –*iş*, deriving grove-type group nouns from predicates denoting species of trees (Chelaru-Ionita & Bantas, 1978).

(346) a. *brad* 'fir tree'
b. *brăd-et* 'fir-tree grove/forest'
c. *fag* 'beech tree'
d. *făg-et* 'beech grove'

(347) a. *carpen* 'hornbeam tree'
b. *cărpin-iş* 'hornbeam forest'
c. *alun* 'hazel tree'
d. *alun-iş* 'hazel tree grove'

Although the Romanian suffixes do not apply as widely as their Tzotzil counterparts, the point still stands. It would be easy to give suffixes like these a denotation similar to an event-internal pluractional suffix. Just like *–Ca'* displaces a verbal predicate, *–iş/–et* in Romanian, and *–tik* in Tzoltzil would displace a nominal predicate, deriving a new predicate of atoms whose spatiotemporal trace is filled with individuals that fall in the denotation of the predicate they target. In this way, *grove*-type group nouns are like event-internal pluractionals in the way they are lexicalized crosslinguistically. Recall that event-internal pluractionals are oftentimes better translated into languages like English with separate lexical items than by adverbial modification. This carries over into the nominal domain, where some languages treat *grove*-type group nouns as morphologically complex, while others do not.

4.8 Conclusions

The desiderata for an analysis of pluractional reference have three parts. The various characteristics of a given pluractionality type must have a unified explanation, the explanation should make use of plural reference to events, and the type of plural event reference should have a nominal analog. The first desideratum follows from the fact that there are crosslinguistically stable types of pluractionality. If the various properties of pluractionals were independent, there should be no such stability. The last two desiderata follow from the hypothesis that natural language makes use of similar denotations across domains when those domains are similarly structured. This chapter has built an analysis of the pluractional *-Ca'* that meets these desiderata.

First, this chapter establishes that *-Ca'* instantiates a crosslinguistically stable category of event-internal pluractionality and that this type of plural reference is distinct from that made by *löj*-marked predicates. It then argues that *-Ca'* derives atomic predicates, but the atoms they denote are spatiotemporally superimposed on a plurality of events satisfying the underlying predicate, giving *Ca'*-marked predicates a kind of group reference. In line with the first desideratum, all of the characteristics of event-internal pluractional follow from the group-based analysis. Finally, I showed the the kind of group reference involved in event-internal pluractionality explains a split in the types of groups nouns we find crosslinguistically, exemplified by *grove* and *committee*. Accounting for the contrasts between *grove*-type groups and *committee*-type groups means giving the former denotations that mirror event-internal pluractionals. Finally, the chapter presented a few cross-categorial similarities between *grove*-type group nouns and event-internal pluractionals that are predicted under a unified account.

The analysis developed in this chapter has at least three larger theoretical consequences. First, it clearly provides further evidence that natural language makes use of similar representations across domains, and the direction of this argument makes it even stronger. The analysis did not just take a well known type of plural nominal reference and impose it on pluractionals. Instead, we built an analysis of event-internal pluractionality on its own terms, only then showing that it extends to a non-canonical, unrecognized subclass of group nouns.

Second, while the chapter establishes a correspondence between *grove*-type groups and event-internal pluractionals, we can also explain why a canonical type of pluractionality corresponds to a non-canonical type of group plurality. This is due to the differences between individuals and events in our natural language metaphysics. The analysis of *–löj* established that pluractionals individuate events constituting pluralities via temporal traces. This is because events are primarily individuated by space, time, and their participants. It is then expected that group-reference in the verbal domain should make use of spatiotemporal superposition. In contrast, individuals have an identity over and above their spatiotemporal properties. Crucially, identity matters for *committee*-type groups, which make use of the nation of membership, but not *grove*-type group nouns. Consider a committee that votes off a member, replacing them with someone new. The committee might persist, but we would still be able to call it a different committee. The same is not true for a grove. If I chop down a few trees in a grove, whether or not I replace them, I still would not be able to call it a different grove. If identity is linked to membership, then a core type of pluractionality corresponds to a peripheral class of group nouns because events do not make good members. But, since events are defined in terms of their spatiotemporal properties, they naturally participate in spatiotemporally defined groups.

Finally, the analysis of –*Ca'* completes the account of the morphosemantics of the event-internal/-external distinction. While –*löj* must apply after cumulative closure, the event-internal pluractional –*Ca'* must apply before cumulative closure. This conclusion follows, not just from their interpretations, but from morphological and phonological evidence. This is a major result, not just from the perspective of the pluractional literature, but wider semantics literature. How to represent the cumulative entailments of expressions is an open question. This chapter establishes that cumulative closure should be represented in the compositional semantics because event-internal pluractionals like –*Ca'* should be able to scope under it, deriving predicates of atoms from roots.

Part II

Plural Events and Quantification

Chapter 5

A First Pass at Pluractional Distributivity

5.1 Introduction

The previous chapters argued that pluractionals can derive predicates of at least two different kinds of pluralities. The first are non-atomic individuals in the domain, much like those plural individuals in the denotation of plural count nouns. The second are a species of group individuals, which are atoms that are superimposed on a plurality by means of a spatiotemporal trace function. In this part of the dissertation I show the need to recognize a third type of pluractional plurality analogous to that which is introduced when interpreting the restrictor of a generalized quantifier. For instance, notice that the plural pronoun *they* in (348) can be anaphoric to the plurality of students introduced in the restrictor of *every*.

(348) *Every*^{x} student went to bed. *They*$_x$ were too tired to stay up till midnight.

I argue that Kaqchikel has a pluractional introducing event pluralities like those that license the use of *they* above, and that these pluralities are formally distinct from those in the denotation of pluractional predicates we have seen before. In particular, the focus is on the pluractional suffix *–la'*, exemplified in examples (349-350), which generates distributive dependencies between a plurality of events and the predicate's internal argument.

(349)	*X-e'-in-q'etej*	*ri*	*ak'wal-a'.*
	COM-A3p-E1s-hug	the	child-PL
	'I hugged the children.'		

(350)	*X-e'-in-q'ete-**la'***	*ri*	*ak'wal-a'.*
	COM-A3p-E1s-hug-**la'**	the	child-PL
	'I hugged the children individually.'		

Just as in English, many predicates in Kaqchikel are compatible with both distributive and collective readings of their plural objects. Example (349), for instance, is true if I hugged the children individually, gave them a single group hug, or even hugged different-sized subgroups. The situation is completely different if we derive the verbal predicate in example (349) with the pluractional. Example (350) shows that the sentence can now only be true in a situation where I hug the children individually. Group hugs are banned. A good paraphrase of (350) is that there were many hugging events, and for each, I hugged one of the children. The paraphrase captures both aspects of the contribution of *–la'*. It is pluractional in that it entails a multiplicity of events, that is, it is false in a single group hug scenario. It is distributive in that it blocks collective readings of plural objects of transitive predicates. The goal for this part of the dissertation is to understand how the distributive dependencies arise in examples like (350), to see the similarities and differences between pluractional distributivity and distributive quantification, and to capture the relationship between distributivity and plura(actiona)lity.

The proposal I come to reveals an intimate relationship between distributive pluractionality and distributive quantification as treated in van den Berg's Dynamic Plural Logic (DPlL) and its variants (van den Berg, 1996; Brasoveanu, 2007, 2008, 2010a; Nouwen, 2003). Uniting these approaches is the idea that formulas are not interpreted relative to single assignments g, but to sets of assignments G, which we can represent as a matrix. The columns of a matrix, like that in (351), represent variables (or discourse referents). The rows represent assignments $g_1, ..., g_n$ in the set of assignments G. The cells of the matrix are the entities each variable is mapped to under each assignment.

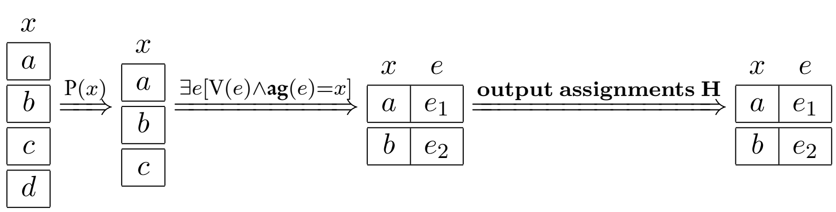
(351)

G	...	x	y	...
g_1	...	$entity_1$	$entity_4$	...
g_2	...	$entity_2$	$entity_4$	...
g_3	...	$entity_3$	$entity_4$	...
...	...	...	...	...

An important consequence is that once we have access to pluralities of variable assignments, we can talk about plurality at the level of discourse reference, that is, over and above the distinctions we make in our mereology of individuals. For instance, g_1 in example (351) might map x to an atomic individual and y to a non-atomic individual, while g_2 maps x to a group. Beyond these distinctions, though, we can see that x is mapped to a plurality of entities under the assignments in G, while y is mapped just to one entity, namely e_4. Brasoveanu (2010b) calls the plurality of individuals stored in x an EVALUATION PLURALITY, in contrast to a DOMAIN PLURALITY, which is a non-atomic entity (or group) in the domain. The distinction between domain plurality and evaluation plurality is important for the discussion at hand because distributive quantifiers, like *every*, introduce evaluation pluralities, and I argue that distributive pluractional operators like *-la'* do too, though in a slightly different way that accounts for their differences.

To preview the analysis, the core idea is that the interpretation of a distributive quantifier and the distributive pluractional both yield similar outputs, but the way in which those outputs come about is different. Not surprisingly, bona fide distributive quantifiers have their usual tripartite form whereby a variable is incrementally updated with respect to its restrictor formula, and then its nuclear scope formula. This is represented graphically in (352) for the schematic sentence "Every P V-ed". First we incrementally update each variable assignment in G with respect to x, checking whether the individual stored in x satisfies the restrictor formula, P. For those that do, we check whether those assignments satisfy the nuclear scope formula. If they do, the result is a set of output assignments H.

(352)



The procedure described in (352) captures two core facts about quantifiers like *every*. First, it is scope-taking; we interpret the nuclear scope formula with respect to assignments that have been altered with respect to x. Second, it is distributive; the nuclear scope formula is interpreted relative to single assignments g, not a plurality of assignments. The effect of scope-taking and distributivity is that in the output set of assignments, like H, has two properties: (i) the variable we quantify over stores an evaluation plurality, and (ii) rows encode distributive dependencies between the variable we quantify over and variables introduced in the nuclear scope formula. For instance, the events of V-ing stored in e covary with respect to the individuals stored in x, which are their respective agents.

While distributive quantifiers generate output assignments like H via incremental update, distributive pluractionals like *-la'* do so in a "flat" way, that is, without taking scope. To see the intuition underlying the analysis, note that in H above, there is a function between variables x and e (treat each row as a pair in the function). In general there must be a functional dependency between the variable *every* quantifies over and variables introduced by indefinites in its scope.

I argue that the pluractional distributivity operator *-la'* mimics this effect by controlling how a theta-role function maps events to individuals. In particular, it breaks up the event argument into its constituent parts, storing them in a new evaluation plural variable, and then requires each of those parts to be mapped by the thematic role to a small part of one of its arguments (usually an atomic part). The effect of interpreting *Vla'* is represented graphically in example (353).

(353)

e	x
e_1	a

$\xrightarrow{e' \text{ stores } e\text{-atoms and } x' \text{ stores x-atoms } \& \Theta(e')=x'}$

e	x	e'	x'
e_1	a	e_2	b
e_1	a	e_3	c
e_1	a	e_4	d
e_1	a	e_5	e

The result of pluractional distributivity in (353) is a plurality of events and distributive dependencies between events and individuals mediated by a theta-role. Importantly, the output of (353) looks similar to (352), even though they come about in different ways. This allows us to explain both similarities and differences between pluractional distributivity and bona fide quantificational distributivity.

While an analysis along the lines of (353) above can account for all of the core semantic properties of *-la'*, chapter 6 focuses on the interaction of *-la'* and a special class of indefinites in Kaqchikel, whose analogs in other languages have been called DEPENDENT INDEFINITES (Farkas, 1997, 2001). Very generally, dependent indefinites seem exactly like plain indefinites except that they must covary with respect to a variable bound by an operator. They are especially interesting because *-la'* patterns closely with distributive quantifiers in their ability to license the appearance of these indefinites. At first pass, this fact seems paradoxical given that bona fide distributive quantifiers are scope-taking and distributive pluractionality is not. In the end, though, this puzzle motivates an analysis that draws together distributive pluractionality and distributive quantification, while also motivating a new analysis of dependent indefinites that accounts for the fact that they are licensed by both. The core idea is that all three constructions introduce evaluation pluralities and the latter is licensed only when it is a clause-mate of an operator introducing a second evaluation plurality against which it can covary.

I preface the analysis in chapter 6 by first developing a simple account of pluractional distributivity in this chapter. Section 5.2 introduces the pluractional morpheme, its distributive entailments, and its scope-taking possibilities. Section 5.3 develops an analysis of pluractional distributivity in terms of theta-role encapsulation like that discussed above. Finally, section 5.4 concludes and looks toward chapter 6, which continues by introducing dependent indefinites and the scope puzzle that arises when we consider the fact that they are licensed by both pluractional distributivity and bona fide distributive quantifiers. The solution makes use of a new account of dependent indefinites that makes special reference to outputs of semantic computations à la Brasoveanu 2010a. This motivates a similar extension of the treatment of distributive pluractionality developed in this chapter.

5.2 Pluractional distributivity and its interpretation

This section presents the core generalizations about the semantic contribution of the suffix *–la'*. The most important are that it requires a plurality of events, the internal argument is interpreted distributively, and this distribution is scopeless (or obligatorily narrowest scope). Examples (354-355) present a series of minimal pairs illustrating the point we started with. The pluractional *–la'* blocks collective readings of a verb's internal argument.[1]

(354) SEMELFACTIVE

a. *X-e'-in-pitz'.*
COM-A3p-E1s-squeeze
I squeezed them.

b. *X-e'-in-pitz'-**ila'**.*
COM-A3p-E1s-squeeze-**la'**
I squeezed them individually.
FALSE if I picked them up in groups and squeezed them

[1] You will note that the Kaqchikel line in the example sentences often has a copied vowel not in morphological gloss, so *–la'* is written *–Vla'*. As we have seen before, the copied vowel is the result of a regular morphophonological process, and so it is not represented in the morpheme by morpheme gloss.

(355) ACHIEVEMENT

a. *X-e'-in-kam-isa-j* *ri* *sanik.*
COM-A3p-E1s-die-CAUS-SS the ant
I killed the ants.

b. *X-e'-in-kam-isa-**ala'*** *ri* *sanik.*
COM-A3p-E1s-die-CAUS-**la'** the ant
'I killed the ants individually.'
FALSE if I killed any subset of the ants simultaneously

(356) ACTIVITY

a. *X-e'-in-kan-oj* *ri* *wuj.*
COM-A3p-E1s-search-SS the book
'I searched for the books.'

b. *X-e'-in-kan-**ala'*** *ri* *wuj.*
COM-A3p-E1s-search-**la'** the book
'I searched for the books individually.'
FALSE if I looked for any subset of the books simultaneously

(357) ACCOMPLISHMENT

a. *X-e-ki-b'än* *la* *jay* *la'.*
COM-A3p-E3p-built that house there
'They built those houses there.'

b. *X-e'-in-b'an-**ala'*** *la* *wuj* *la'.*
COM-A3p-E3p-built-**la'** that book there
'They built those houses there.'
FALSE if they built the houses simultaneously

We might worry that distributivity is just a consequence of event plurality. That is, a collectively interpreted internal argument participating in a plurality of events might be grammatical. Examples (358-359) show that this is not the case.

(358) Suppose you pick up a bag of tomatos and squeeze them many times all at once.
*#X-e'-in-pitz'-**ila'**.*
COM-A3p-E1s-squeeze-**la'**
I squeezed them individually.

(359) Suppose I give some children a bunch of group hugs.
*#X-e'-in-q'ete-**la'*** *ri* *ak'wal-a'.*
COM-A3p-E1s-hug-**la'** the child-PL
'I hugged the children individually.'

While event-plurality is not sufficient for felicitous use of *–la'*, it is necessary. The following example shows that a single event with an atomic participant cannot be in the denotation of a pluractional predicate derived by *–la'*.

(360) Suppose I give one child a single hug.
*#X-Ø-in-q'ete-**la'*** *ri* *ak'wal.*
COM-A3s-E1s-hug-**la'** the child
'I hugged the child individually.'

(361) Suppose I squeeze a tomato once.
*#X-Ø-in-pitz'-**ila'*** *ri* *xkoya'.*
COM-A3s-E1s-squeeze-**la'** the tomato
'I squeezed the tomato individually.'

Given that *–la'* builds predicates of pluralities, we can ask where it falls on the internal/external divide. While *–la'* needs a very different semantics than that of the event-external pluractionals we have seen before, like *–löj*, it generally patterns more like them. First, examples (354-357) have already shown that *–la'* applies felicitously to predicates of all eventive aktionsart classes. Like other pluractionals, it is not grammatical with stative predicates.

(362) **E* *kaq-ala'.*
A3p red-**la'**
'They are each red.'

(363) *#X-e’-in-wetam-ala’.*
COM-A3p-E1s-know-**la’**
‘I knew each of them.’
ONLY: I got to know things about each of them,
lit. “aprendí varias cosas sobre ellos”

Another way that *–la’* behaves like event-external pluractionals is that it does not involve the reduplication of root material. Moreover, when it co-occurs with an event-internal pluractional it always suffixes further from the root.

(364) *X-Ø-u-chap-**acha-la’*** *ri* *xkoya’.*
COM-A3s-E3s-handle-**Ca’-la’** the tomato
‘He kept touching each of the tomatos.’

(365) **X-Ø-u-chap-**ala-cha’*** *ri* *xkoya’.*
COM-A3s-E3s-handle-**la’-Ca’** the tomato
‘He kept touching each of the tomatos.’

Finally, pluractional distributivity is like event-external pluractionals crosslinguistically in that it does not require a large number of events. This is a delicate point. Out of the blue, speakers infer that significantly more than two events happened when a *–la’*-marked predicate is used. This can be seen through translation when we use a plural pronoun without a clear referent.

(366) *X-e-ru-chap-**ala’**.*
COM-A3p-E3s-handle-**la’**
‘He kept grabbing various things.’

(367) *X-Ø-u-tzuy-**ula’**.*
COM-A3s-E3s-sit-**la’**
‘He sat in various places.’

If we try to force the issue and use a *la'*-marked predicate to describe a two-event scenario, the result is marginal.

(368) Suppose there are two children and Juan hugs each. Can you report:
*??X-e-ru-q'ete-**la'*** *ri* *ak'wal-a'.*
COM-A3p-E3s-hug-**la'** the child-PL
'He hugged each child.'

That said, examples of the distributive pluractionality operator used in two-event scenarios are attested. I have witnessed a mother telling her daughter to put on her sandals using the following command.

(369) *T-Ø-a-chap-**ala'*** *a-xajab'.*
IMP-A3s-E2s-handle-**la'** E2s-sandle
'Put (each of) your sandals on!'

Given that people have two shoes (and surely this mother did not want her child to put her shoes on, take them off, and then put them back on), example (369) seems like a genuine case of two-event distributive pluractionality. What I assume is that the many-event reading is the normal case, but it is not entailed. The suffix *–la'* derives predicates of events that are merely non-atomic.

While *–la'* behaves in many ways like an event-external pluractional, we know that the category of event-external pluactionality allows for more variation than event-internal pluractionality. Since we end up giving *–la'* a very different semantics than the event-external pluractionals we have seen, it is probably better to categorize pluractional distributivity as *not* an event-internal pluractional, though it would fall under a broad conception of event-external pluractionality.

We have seen that *–la'* requires a plurality of events and generates distributive dependencies between those events and a verbal argument. There are two important ways that distributive pluractionality and other distributivity operators are different. First, usually distributive operators are ungrammatical when forced to have a singular restrictor. For instance, the following examples are all ungrammatical in English.

(370) a. # John each left.
b. # John left one by one.
c. # John left individually.

In contrast, pluractional distributivity is perfectly grammatical with a singular object. It merely requires repetition, where that argument is the participant in each repeated event. Examples (371-372) illustrate this fact with illuminating speaker comments.

(371) *X-Ø-u-chap-**ala'*** *ri* *ala'.*
COM-A3s-E3s-handle-**la'** the youth
'He touched the boy repeatedly.'
SPEAKER COMMENT: Like a police officer checking someone he arrested for weapons

(372) *X-Ø-u-k'ut-**ula'*** *ri* *po't* *ch-w-e'.*
COM-A3s-E3s-show-**la'** the blouse P-E1s-DAT
'She showed me the blouse repeatedly.'
SPEAKER COMMENT: She showed me all the various designs in the weaving

The generalization is that pluractional distributivity is greedy, but not picky. It requires an object to be interpreted distributively when it can be, but when it can't be, repetition is fine. This generalization plays a special role in motivating the sort of analysis we need for *–la'*.

The second way that pluractional distributivity differs from distributive quantification concerns its scope-taking ability. If pluractional distributivity were like other distributive event quantifiers in Kaqchikel (and English for that matter), we might expect *–la’* to take scope over an indefinite. This is not the case. While the adverbial quantifier *q’ij q’ij* ‘every day’ can take scope over an indefinite *jun* ‘a’, in example (373), this is not possible in example (374).

(373) *Q’ij qij x-Ø-u-kanö-j jun wuj.*
day day COM-A3s-E3s-search-SS a book
‘Every day she looked for a (different) book.’

(374) *X-Ø-u-kano-la’ jun wuj.*
COM-A3s-E3s-search-la’ a book
‘She looked for a (particular) book many times (many places).’

There are two tests showing that narrow scope indefinites in the pluractional distributivity construction are unavailable and not just difficult to construe. First, note that plural anaphora can refer back to a singular indefinite in the scope of a distributive quantifier.

(375) *Q’ij q’ij n-Ø-in-b’än jun chakäch.*
day day COM-A3s-E1s-make a basket
‘Every day I make a basket.’

a. *Nïm* ***ki****-b’anikil.*
big **E3p**-form
‘They are big.’

Thus, following up a sentence that has a *la’*-marked verb and a plain indefinite with a plural anaphor should force a narrow-scope reading of the indefinite under penalty of infelicity. Such examples are uniformly ungrammatical.

(376) *X-Ø-in-kan-ala’ jun wuj.*
COM-A3s-E1s-search-la’ a book
‘I searched for a book in various places.’
SPEAKER COMMENT: For example, if I spent all afternoon
looking all over the house for a particular book.

a. *#Jotöl **k**-ajil.*
high **E3p**-price
'They were expensive.'

(377) *X-Ø-in-tik-ila' jun che'.*
COM-A3s-E1s-plant-la' a tree
'I planted a tree various places.'
SPEAKER COMMENT: For example, if the boss kept telling me to move the tree somewhere else after every time I planted it.

a. ***#E** nïm.*
A3p big
'They were big.'

The fact that we cannot refer back to singular indefinites with plural pronouns in these cases shows that the indefinite cannot introduce a new witness for each of the pluractional subevents, that is, the pluractional distributivity cannot take scope over indefinites as if it were a quantifier.

Another test illustrating the same fact involves predicates of destruction, which are infelicitous with pluractional distributivity and singular objects. This is predicted if *–la'* cannot take scope over the indefinite. If it could, the indefinite would be able to introduce a witness for each pluractional subevent. Since it cannot, and since individuals cannot be killed or consumed twice, the following sentences are infelicitous.

(378) *#X-Ø-in-kam-isa-la' jun sanik.*
COM-A3s-E1s-die-CAUS-la' a ant
'I killed an ant various times.'

(379) *#X-Ø-in-qum-ula' jun mama äk'.*
COM-A3s-E1s-drink-la' a beer
'I drank a beer various times.'

Once again, as with plural anaphora, predicates of destruction should bias the sentence toward a narrow scope reading of the indefinite, if available. The infelicity of these examples shows that it is simply not.

Finally, in talking about the distributive entailments of *–la'*, we have uniformly made reference to the verb's "internal argument" or "object". This is because pluractional distributivity seems to only be able to target the internal argument of transitive verbs. Plural subjects of root transitives are compatible with collective readings, as shown in example (380), even when there is no other plural argument for *–la'* to distribute over.

(380) Suppose a crew of workers kept planting a tree, then digging it up and replanting it elsewhere.
*X-Ø-ki-tik-**ila'*** *jun* *che'*.
COM-A3s-E3p-plant-**la'** a tree
'They planted a tree various places.'

We have seen that the pluractional distributivity is usually greedy. If it has a plural object to distribute events over, it must do so. Example (380) shows that this is not the case with plural subjects. While plural subjects of predicates like that in (380) are compatible with distributive readings, they are not forced.

The effect with root intransitive predicates are a little bit different, but the conclusion is the same. These predicates are simply ungrammatical with *–la'*. Presumably, this is because its semantics makes reference to the verb's internal argument, which root intransitives do not have.[2]

[2]One's first intuition when seeing this kind of generalization is to look and see whether unaccusative and unergative predicates behave differently. I have not been able to find a clear contrast, though. Moreover, I also do not know of any independent unaccusativity diagnostics in Kaqchikel that could be used to control such a test.

(381) **X-e-tzoj-**ola'**.*
COM-A3p-cough-**la'**
DESIRED READING: 'They coughed individually.'

(382) **X-e-ok-**ola'**.*
COM-A3p-enter-**la'**
DESIRED READING: 'They entered individually.'

A final important generalization is that while root intransitives resist derivation by *–la'*, we do find derived intransitives bearing the suffix *–la'*. For example, the passive can apply after *–la'*, in which case the subject can be the target for pluractional distributivity.

(383) *X-e-pitz'-**ilä**-x.*
COM-A3p-squeeze-**la'**-PAS
'They were squeezed individually.'

My account, formulated in terms of theta-roles, captures these facts about pluractional distributivity and the syntax-semantics interface, where an account in terms of structural argumenthood would not.

To summarize, the pluractional distributivity suffix *–la'* behaves like an event-external pluractional and not like the event-internal pluractionals we have seen. It freely applies to predicates of all aktionsart classes except for statives. It requires a simple plurality of events, that is, more than two. Unlike the other pluractionals we have seen, *–la'* is a distributive operator, but it is only opportunistically distributive. If a predicate's internal argument is plural, it blocks collective readings. If it is singular, we do not get ungrammaticality, but a pure plurality-of-event reading where the individual denoted by the object participates in multiple events. The target for the distributivity are underlying objects of transitive verbs.

It cannot distribute over the subjects of root transitive or intransitive predicates, but it can target derived subjects that are underlying objects. In the next section I build an account of pluractionality distributivity that is extended in §6 to account for its interaction with dependent indefinites.

5.3 A θ-role based account of *–la'*

The plan for the analysis is to start with a simple account of pluractional distributivity, that is, one that does not make use of sets of assignments and avoids couching the analysis in terms of discourse-pluractionality. The primary reason is that, in advance of discussing dependent indefinites, there is little evidence for an account in terms of evaluation plurality. Hence, we first consider those ways in which pluractional distributivity is different than true distributive quantification and account for that. We then slightly alter the analysis so that *–la'* generates evaluation pluralities like bona fide distributive quantifiers, which accounts for the fact that both license dependent indefinites.

The core idea is that distributive pluractionality does not take scope, but instead takes control of a theta-role function and ensures that it applies to the smallest relevant parts of an event and its participant. It furthermore requires that the event be non-atomic, which is why it is pluractional. This is similar to other distributive items, which are infelicitous if their keys(/restrictors) are not plural. Example (384) gives the schema for translating a transitive VP with a referential object and a *la'*-marked verb.[3]

[3]The appendix 6.4 shows how to do the analysis compositionally.

(384) Pluractional Distributivity (To be amended in 502)
$\lambda e[V(e) \wedge |e| > n \wedge \forall e' \leq e[\mathbf{atom}(e') \rightarrow \mathbf{atom}(\mathbf{th}(e'))] \wedge \mathbf{th}(e) = x]$

a. $|e| > n$

b. $\forall e' \leq e[\mathbf{atom}(e') \rightarrow \mathbf{atom}(\mathbf{th}(e'))]$

Verbs marked with the distributive pluractional are different in two core ways, which I have indicted in the subclauses of (384). First, the cardinality of its event argument has to be greater than some contextually specified value n. This accounts for the fact that speakers prefer to use the pluractional to describe situations where there is a large number of events, though sometimes produce examples where $n = 1$, like the mother telling her child to put her sandals on. The second contribution of the pluractional is the condition that atomic events must be mapped to an atomic individuals under **th**eme. This generates the opportunistic distributivity we see with *–la'*.

First, the analysis correctly rules out group hug scenarios when the internal argument is plural. Example (386) gives the truth conditions of the example we started with, repeated in (385).

(385) *X-e'-in-q'ete-**la'*** *ri* *ak'wal-a'.*
COM-A3p-E1s-hug-**la'** the child-PL
'I hugged the children individually.'

(386) $\exists e(*\text{HUG}(e) \wedge |e| > n \wedge$
$\forall e' \leq e(\mathbf{atom}(e') \rightarrow \mathbf{atom}(\mathbf{th}(e'))) \wedge$
$\mathbf{th}(e) = \sigma x. * \text{CHILD}(x) \wedge$
$\mathbf{ag}(e) = \mathsf{Sp})$

The formula in (386) is true if there is a non-atomic hugging event e whose agent is the speaker and whose theme is the sum of contextually relevant children. Furthermore, each atomic part of e is mapped to an atomic individual by $\mathbf{th}$. Since $\mathbf{th}(e)$ is the sum of atomic children, then each of those atomic events in e must be mapped to an atomic child. Thus, e must be a plurality of non-group hugs.

An analysis based on thematic dependencies also immediate predicts that when we have a singular object, we get repetition, not ungrammaticality.

(387) *X-Ø-u-k'ut-**ula'*** *ri* *po't* *ch-w-e'.*
COM-A3s-E3s-show-**la'** the blouse P-E1s-DAT
'She showed me the (same) blouse repeatedly.'

(388) $\exists e(*\text{SHOW}(e) \wedge |e| > n \wedge$
$\forall e' \leq e(\mathbf{atom}(e') \rightarrow \mathbf{atom}(\mathbf{th}(e'))) \wedge$
$\mathbf{th}(e) = \sigma x. * \text{BLOUSE}(x) \wedge \mathbf{atom}(x) \wedge$
$\mathbf{ag}(e) = y \wedge \mathbf{goal}(e) = \mathsf{Sp})$

The core point of (388) is that e is mapped by $\mathbf{th}$ to a single atomic blouse. Since there is no problem with a function mapping two different entities to the same value, the pluractional can still require e to be non-atomic, where each atomic event is mapped to an atomic individual, in this case the same blouse. We correctly predict then, that pluractional distributivity should block collective readings of plural objects, but remain grammatical with singular objects under a repetitive reading.

The analysis also correctly predicts that pluractional distributivity should not be able to take scope over an indefinite. Distributivity is not generated by updating a variable assignment, but by placing constraints on how a theta-role maps events to individuals. Examples (389-390) provides the critical sentence and its truth conditions.[4]

[4] I am assuming here that the indefinite moves out of the VP, leaving a trace that composes via referential thematic shifting. See section 6.4 to see how this works compositionally.

(389) *X-Ø-u-kanö-j* *jun* *wuj.*
COM-A3s-E3s-search-SS a book
'She looked for a (particular) book many times (many places).'

(390) $\exists e \exists x(^{*}\text{BOOK}(x) \wedge \mathbf{atom}(x) \wedge {}^{*}\text{LOOK-FOR}(e) \wedge |e| > n \wedge$
$\forall e' \leq e(\mathbf{atom}(e') \rightarrow \mathbf{atom}(\mathbf{th}(e'))) \wedge$
$\mathbf{th}(e) = x \wedge$
$\mathbf{ag}(e) = \mathsf{Sp})$

I assume that the indefinite moves, leaving a trace that is interpreted referentially, but this does not matter. There is simply no way for an indefinite to contribute witnesses that covary with the pluractional subevents. Instead, the indefinite always contributes a single witness, while the pluractional requires atomic events to be mapped to atomic subparts of that witness under a theta-role function.

While I have shown how the analysis accounts for the core properties of pluractional distributivity, namely event plurality, opportunistic distributivity, and narrowest scope, an analysis couched in terms of theta-roles makes two more correct predictions. First, recall that the pluractional cannot distribute over transitive subjects or root intransitive subjects, but it can distribute over intransitive subjects derived by passivization. A theta-role based account predicts this fact because nominal arguments retain their thematic roles when argument structure changes. An account that tied the distributivity to the syntax of objecthood would have trouble accounting for this fact.

The second correct prediction concerns collective predicates. First, note that the schematic truth conditions for pluractional distributivity does not require the pluractional subevents to satisfy the predicate the pluractional derives. It only requires that each of those subevents be mapped to an atomic individual. The prediction is that the pluractional subevents are allowed (though not forced) to satisfy a different predicate than the main event. This prediction is borne out in collective predicates, which we can use with pluractional distributivity. Examples (391-392) present the relavant data.

(391) **X-Ø-in-mol* *jun* *kinäq.*
COM-A3s-E1s-group one bean
'I grouped one bean.'

(392) *X-e'-in-mol-ola'* *ri* *kinäq.*
COM-A3p-E1s-group-Vla' DET beans
'I grouped the beans individually.'

Example (392) would be appropriate for describing a situation where I put the beans in a basket one by one. What example (391) shows is that none of those events of putting individual beans in the basket can fall in the denotation of *mol* 'group'. Example (393) shows how the account of *–la'* predicts its grammaticality with collective predicates.

(393) $\exists e(^{*}\text{GROUP}(e) \wedge |e| > n \wedge$
$\forall e' \leq e(\mathbf{atom}(e') \rightarrow \mathbf{atom}(\mathbf{th}(e'))) \wedge$
$\mathbf{th}(e) = \sigma x.^{*}\text{BEAN}(x) \wedge$
$\mathbf{ag}(e) = \mathsf{Sp})$

While e must satisfy the predicate GROUP and each of its atomic parts e' must have an atomic bean as a participant, none of those pluractional subevents e' have to be in the denotation of GROUP, which is good because they must not be, as example (391) shows.[5]

[5]For this account to go through, we have to alter an assumption that I have been making, namely that before cumulative closure verbs are uniformly predicates of atomic events. Instead, I have to assume that at least some collective predicates are predicates of pluralities before cumulative closure. For example, GATHER would denote pluralities of arrivals (which we could then cumulatively close, e.g., *GATHER). This idea might have wider consequences, allowing us to account for the fact that some collective predicates are more strongly collective than others (Brisson, 2003, among others)

5.4 Interim conclusions

This chapter introduced the distributive pluractional *-la'* in Kaqchikel and provided a first pass analysis. The suffix *-la'* is pluractional because it requires a simple plurality of events, that is, more than two. The pluractional *-la'* is a distributive operator, but it is only opportunistically distributive. If a predicate's internal argument is plural, it blocks collective readings. If it is singular, though, we do not get ungrammaticality, but a pure plurality-of-event reading where the individual denoted by the object participates in multiple events. This is true whether or not that singular object is introduced by an indefinite or not, showing that the pluractional is not scope-taking. Finally, *-la'* targets objects of transitive verbs and intransitive subjects that are derived from underlying objects.

I then showed that we can understand all of these effects if *-la'* introduces a plurality of events and structures the way a thematic dependency connects those events and individuals, namely, it requires atoms to be mapped to atoms. In the next chapter I introduce dependent indefinites in Kaqchikel. They are important because both distributive pluractionality and distributive quantification license their appearance. This motivates an analysis that draws together distributive pluractionality and distributive quantification, even though we have seen that the former is different in a variety of ways. In particular, since distributive pluractionality is scopeless, I argue that distributive quantifiers and distributive pluractionality are similar in the types of pluralities they introduce. This requires recasting the analysis of pluractional distributivity developed here, but it has all of the same ingredients. The pluractional introduces a plurality of events and uses a theta-role to store distributive dependencies between parts of that event and parts of a participant.

Chapter 6

Dependent Indefinites: Licensed by evaluation pluractionality

This chapter introduces a series of special indefinites in Kaqchikel that, at first past, seem to be licensed by scope-taking operators. We find, though, that these indefinites are also licensed by pluractional distributivity. This fact proves to be a serious roadblock for extending previous accounts of similar indefinites in other languages to Kaqchikel. Resolving this puzzle means making these indefinites sensitive to evaluation pluralities, not scope. At the same time, we have to alter the account of distributive pluractionality so that it introduces evaluation pluralities, just like bona fide distributive quantifiers. In this way we build an argument for a third type of pluractionality to contrast with event-internal and event-external pluractionality, namely evaluation pluractionality.

To introduce the puzzle that dominates this section, I start with the empirical observation that in addition to morphologically simple indefinites like *a*, *some*, *one*, *two*, etc., many languages have special versions of these expressions with similar quantificational meanings, but one crucial difference: they must covary with respect to some other variable bound by an operator.[1] Called dependent by Farkas (1997), such indefinites have been reported in the theoretical literature for a variety of languages, including Hungarian (Farkas, 1997, 2001), Romanian (Brasoveanu & Farkas, 2011; Farkas, 2002), Korean (Choe, 1987; Gil, 1993), and Russian (Pereltsvaig, 2008; Yanovich, 2005). One goal for this section is to add Kaqchikel to this list.

Examples (394-395) show the basic contrast. In (394), as in English, the plain indefinite *jun* 'a/one' can take either wide or narrow scope with respect to the universal quantifier *konojel* 'all (of them)'. In contrast, when the indefinite is partially reduplicated as in (395), the wide scope reading is unavailable. The indefinite must covary with respect to the universal quantifier.

(394) *K-onojel x-Ø-ki-kanö-j* ***jun*** *wuj.*
E3p-all COM-A3s-E3p-search-SS **a** book
'All of them looked for a (different) book.'
'There is a book and all of them looked for it.'

(395) *K-onojel x-Ø-ki-kanö-j* ***ju-jun*** *wuj.*
E3p-all COM-A3s-E3p-search-SS **a-RED** book
'All of them looked for a (different) book.'
*'There is a book and all of them looked for it.'

One way to state the generalization is that *jujun* 'a/one' is exactly like *jun* 'a/one' except that it must take narrow scope and covary.

The crucial question is what happens when the covariation that dependent indefinites

[1]See Gil 2011 for the morphological typology of indefinites of this type.

need is not available, that is, when there is nothing to covary against. Examples (396-397) show that dependent indefinites are ungrammatical in a context with only singular arguments and no overt event quantifiers.[2]

(396) **X-e'-in-chäp ox-ox wäy.*
COM-A3p-E1s-touch three-RED tortilla
Desired reading: 'I took (groups of) three tortillas.'

(397) **X-e'-ok ox-ox tz'i'.*
COM-A3p-enter three-RED dog
Desired reading: 'Dogs entered in groups of three.'

The fact that Kaqchikel dependent indefinites must covary with some operator leads to a series of questions. What classes of operators are relevant? Which domains can they operate over? How local must the licensor be? These are all questions that have been investigated in the previous literature. What I do now is survey the previous literature to compare and contrast dependent indefinites in Kaqchikel with similar items in other languages. This allows us to uncover more generalizations about Kaqchikel dependent indefinites, but it also allows us to survey previous approaches. What I show is that while couched in different frameworks, all of these accounts have a similar property. They satisfy the co-variation requirement by forcing dependent indefinites to take narrow scope with respect to some other operator. If there is no operator they can take scope under, as in (396-397), they are predicted to be ungrammatical. Importantly, in these analyses dependent indefinites take scope in the same way as plain indefinites (albeit obligatorily). This makes a strong prediction that turns out to be incorrect when we consider the interaction of dependent indefinites and distributive

[2] We can get a grammatical reading by putting *oxox* in adverbial position with the preposition *chi* or *pa*. But this is a different construction akin to English *three by three*, which I take up in the following chapter.

pluractionality. Example (398) spells out the prediction.

(398)

The dependent indefinite/narrow scope indefinite equality: Everywhere a dependent indefinite is licensed, a plain indefinite should have a narrow scope reading.

Examples (399-400) show that this is not the case. The pluractional cannot take scope over the plain indefinite, but it licenses the appearance of a dependent indefinite.

(399) *X-e'-in-chap-ala' oxi' wäy.*
COM-A3p-E1s-handle-Vla' three tortilla
'I touched three tortillas individually (many times).'
FALSE if there are more than three tortillas involved

(400) *X-e'-in-chap-ala' ox-ox wäy.*
COM-A3p-E1s-handle-Vla' three-RED tortilla
'I touched tortillas in threes.'
FALSE if there are three tortillas in total (or only one touching event).

The contrast between examples (399-400) show quite clearly that we simply cannot assimilate dependent indefinites to narrow scope plain indefinites.[3] The question is then how to alter the semantics of dependent indefinites so that (i) they can covary with respect to a pluractional unlike a plain indefinite, (ii) yet remain paraphrasable with a narrow scope indefinite under more familiar operators. Before getting to the proposal though, I want to dig into previous approaches to clarify the problem in example (398) and to situate Kaqchikel dependent indefinites in a crosslinguistic perspective.

[3]The reader no doubt wonders why I do not use the singular indefinite *jun* and its dependent counterpart *jujun*. While the same point could be made with these items, there is a confound. The reduplicated singular indefinite is ambiguous beween a dependent reading and a reading approximating plural unstressed *some*.

6.1 Previous approaches and the typology of dependent indefinites

We have seen that when a dependent indefinite in Kaqchikel co-occurs with a quantifier, it must covary with respect to variable bound by that quantifier. In other words, the wide scope reading is banned. If there is no quantifier, and thus no way to covary with respect to a second variable, using a dependent indefinite is ungrammatical. What I now consider similar indefinites in other languages in order to build a small typology of dependent indefinites. We find that there are dependent indefinites with both stronger and weaker licensing requirements. Crucially, for the middle category in which Kaqchikel dependent indefinites fall, we must not make the licensing requirement dependent on scope-taking. This conclusion motivates the analysis I develop in the following section.

6.1.1 Strong licensing: Russian nibud'-indefinites

Russian has a series of indefinites formed by *–nibud'* and a WH-word. Example (401) gives representative examples from Pereltsvaig 2008.

(401) a. *kto-nibud'* 'x-person'
b. *kogda-nibud'* 'x-time'
c. *kak-nibud'* 'x-manner'
d. *otčego-nibud'* 'x-reason'
e. *čto-nibud'* 'x-place'

Like Kaqchikel, when a *nibud'*-indefinite co-occurs with a quantifier, it cannot have a wide-scope reading. If it has no quantificational clausemate, ungrammaticality results.

(402) Yanovich 2005, ex. 18a
Každyj mal'čik vstretil kogo-nibud' iz svoix odnoklassnic.
Every boy met who-NIBUD' of his girl-classmate
'Every boy met one of his girl classmates.'
FALSE if they all met the same classmate.

(403) Yanovich 2005, ex. 17
**Petja vstretil kogo-nibud' iz svoix odnoklassnic.*
Petja met who-NIBUD' of his girl-classmate
'Petja met one of his girl classmates.'

Kaqchikel dependent indefinites and *nibud'*-indefinites are similar in this respect, but there are two primary ways in which they are different. First, while both *nibud'*-indefinites and Kaqchikel dependent indefinites are licensed by quantifiers over events, only the former are licensed by quantification over worlds. Examples (404-407) present the relevant contrasts.

(404) Yanovich 2005, ex. 18b
Petja často vstrečal kogo-nibud' iz svoix odnoklassnic.
Petja frequently met who-NIBUD' of his girl-classmates
'Petja frequently met a (different) girl.'

(405) *Jantape' e k'o ox-xo ixtan-i' ch-u-wäch r-ochoch ajaw.*
Always A3p exist three-RED girl-PL P-E3s-face E3s-house lord
'There are always three (different) girls out front of the church.'

(406) Yanovich 2005, ex. 18c
Petja xočet vstretit' kogo-nibud' iz svoix odnoklassnic.
Petja want to meet who-NIBUD' of his girl-classmates
'Petja wants to meet a girl (it doesn't matter which).'

(407) **A Xwan n-Ø-i-rajo' n-Ø-u-tz'ët ka-ka ixtan-i'.*
CLF John ICP-A3s-E1s-want ICP-A3s-E3s see two-two child-PL
READING SOUGHT: 'Juan wants to see two girls (it doesn't matter which).'

The second major difference between *nibud'*-indefinites and Kaqchikel dependent indefinites is that the latter are licensed by distributively interpreted plural arguments, while *nibud'*-indefinites are only licensed by bona fide quantifiers.

(408) *Rije' x-Ø-ki-chäp el ox-ox kab'.*
they COM-A3s-E1p-handle DIR three-RED candy
'They each took three candies.'
FALSE if they took three in total to share.'

(409) Pereltsvaig 2008, ex. 2
**Ego o čëm-nibud' sprosili.*
him about what-nibud' asked.PL
'They asked him about something.'

Since *nibud'*-indefinites are only licensed by quantificational distributivity, and not distributive predication, I say they require strong licensing. This fact suggests a tight connection between quantifiers and *nibud'*-indefinites that is only strengthened by the previous data. If *nibud'*-indefinites are sensitive to the quantificational scope-taking simiplicter, then we might expect them to be indifferent to the domains of those quantifiers. This is precisely the analysis given by Yanovich (2005). He argues that *nibud'*-indefinites are choice functions that come pre-Skolemized, as in (410b). They have an extra argument that can be bound, making them logically equivalent to examples like (410a) where there choice function gets bound by existential closure (Reinhard, 1997).

(410) Every girl kissed a boy.
a. $[\forall x \text{GIRL}(x)]\exists f(\text{KISS}(f(\text{BOY}))(x))$
b. $[\forall x \text{GIRL}(x)](\text{KISS}(f(x,\text{BOY}))(x))$

Yanovich further argues that the extra argument in a skolemized choice function must be bound and can only be bound by a quantifier. If this is the case, then *nibud'*-indefinites are predicted to be necessarily interpreted in the scope of bona fide quantifiers, and we also predict that the domain of the quantifier should not matter, since all are able to bind the argument of the skolemized choice function. Moreover, since individuals cannot bind this argument, as long as predicative distributivity does not come about via covert quantification, the analysis predicts that distributively interpreted plural subjects should not license *nibud'*-indefinites.

6.1.2 Weak licensing: Telugu reduplicated-indefinites

While the strongly licensed dependent indefinites in Russian are closely connected to quantification, other languages have similar indefinites with weaker licensing requirements (or potentially even no licensing requirement). Telugu presents such a case. Balusu (2006) gives an analysis of reduplicated numerals in Telugu, which, like items we are familiar with, bar a wide scope reading when co-occuring with quantifiers like *prati* 'every'.

(411) Balusu 2006, ex. 13

Prati	*pillavaaDu*	*renDu*	*renDu*	*kootu-lu-ni*	*cuus-ee-Du.*
every	kid	two	two	monkey-PL-ACC	see-Past-3PSg

'Every kid saw two monkeys.'
FALSE if there are two monkeys and every kid saw them (at the same time and location).

While Balusu (2006) does not giveexamples in the text, he mentions that Telugu reduplicated numerals, like their Kaqchikel counterparts, are not licensed by covariation under quantifiers over world variables. Similarly, Telugu reduplicated indefinites can, like their Kaqchikel counterparts, introduce witnesses that covary with respect to the individuals in the denotation of a plural co-argument.

(412) Balusu 2006, ex. 9
Pilla-lu renDu renDu kootu-lu-ni cuus-ee-ru.
Kid-PL two two monkey-PL-ACC see-Past-3PPl
'The children saw two monkeys each.'

Where the two constructions diverge is that Telugu reduplicated numerals have what Balusu calls spatial key and temporal key readings in the absence of overt quantifiers or a plural co-argument.

(413) Balusu 2006, ex. 9
Raamu renDu renDu kootu-lu-ni cuus-ee-Du.
Ram two two monkey-PL-ACC see-Past-3PSg
SPATIAL KEY: 'Ram saw two monkeys in each place.'
TEMPORAL KEY: 'Ram saw two monkeys each time'

Kaqchikel dependent indefinites, as we have seen, are ungrammatical in environments like those in example (413), as shown below.

(414) **X-e'-in-tz'ët ox-ox batz'.*
COM-A3p-E1s-see three-RED monkey
READING SOUGHT: 'I saw three monkeys in each place.'
READING SOUGHT: 'I saw three monkeys each time'

The contrast between examples (413) and (414) shows that Telugu reduplicated numerals have significantly weaker licensing requirements than the Kaqchikel dependent indefinites. In fact, the analysis proposed in Balusu 2006 actually places no licensing requirement on reduplicated numerals. They themselves introduce a universal quantifier over a partition of the event argument, see $\pi(e)$ below.

(415) 2-2 MONKEYS JUMPED.
a. $\exists e \exists \pi [\forall e' \in \pi(e) \exists X [\text{TWO.MONKEYS}(X) \wedge \text{JUMPED}(X, e')]]$

b. $|\{X : \text{TWO.MONKEYS}(X) \wedge \text{JUMPED}(X, e)\}| > 1$

Ambiguity in which partition is selected is what generates the three core readings, not variation in potential licensors. The conclusion is that some items that look like dependent indefinites in Kaqchikel either have a very weak licensing requirement that is unconnected to distributivity, or they are able to satisfy a stronger licensing of their own accord by introducing an operator.

6.1.3 The middle case: Romanian/Hungarian dependent indefinites

We have seen indefinites with both stronger and weaker licensing requirements than reduplicated indefinites in Kaqchikel. The final class of cases is just right. They need a licensor, but not a strong one. Dependent indefinites in this category were some of the earliest investigated. Farkas (1997) investigates reduplicated indefinites and numerals in Hungarian. As we have come to expect, Hungarian reduplicated indefinites cannot have a wide scope reading with respect to a co-occurring quantifier.

(416) Farkas 1997, ex. 34
Minden gyerek olvasott egy-egy / hét-hét könyvet.
every child read a-RED / seven-seven book-ACC
'Every child read a / seven book(s)'
False there is exactly a / seven book(s) that they each read.

The reason that we have to treat dependent plain indefinites and dependent numerals separately concerns the second way these items tend to differ cross-linguistically. The dependent plain indefinites can covary with respect to extensional world variables, while the dependent numerals cannot.

(417) Farkas 1997, ex. 44

Ha	*egy-egy*	*tanár*	*megbetegedik*	*helyettesíti*	*egy*	*szülö.*
If	a-RED	teacher	gets sick	replaces-him	a	parent

'If a teacher gets sick, a parent replaces him.'

(418) Farkas 1997, ex. 50

**Ahányszor*	*két-két*	*hires*	*személy*	*meglátogatta*	*a*	*várost*	....
Whenever	two-two	famous	person	visited	the	town	

'Whenever two famous persons visited town ...'

Perhaps we can use the fact that Kaqchikel dependent indefinites behave like the Hungarian dependent numerals, but not the dependent plain indefinite, to argue that all of the reduplicated indefinites in Kaqchikel are numerals, including the numeral *jun*, which is homophonous with the plain singular indefinite. Putting this contrast aside, Kaqchikel dependent indefinites are like Hungarian dependent indefinites are both similar in that they can be licensed by quantifiers over events and by predicative distributivity.

(419) Farkas 1997, ex. 43

Idönk'ent	*egy-egy*	*diák*	*megbukik.*
occasionally	a-RED	student	fails

'Occasionally a student fails.'

(420) Farkas 1997, ex. 36

A	*gyerekek*	*hoztak*	*egy-egy*	*könyvet.*
the	children	brought	a-RED	book.ACC

'The children brought a book each.'

Finally, Hungarian dependent indefinites are ungrammatical without a licensor. They do not have a weak licensing requirement like reduplicated numerals in Telugu.

(421) Farkas 1997, ex. 46

**Mari*	*nem*	*olvasott*	*egy-egy*	*regényt.*
Mari	not	read	a-RED	novel

'Mary didn't read a novel.'

Hungarian is not the only language with dependent indefinites that pattern with those in Kaqchikel. Brasoveanu & Farkas (2011) reports similar facts for Romanian (first reported in Farkas:1997). The particle *cîte* in Romanian forces narrow scope readings of indefinites it modifies.

(422) Brasoveanu & Farkas 2011, ex. 19
Fiecare băiat a recitat cîte un poem.
every boy has recited cîte a poem
'Every boy recited a poem.'
FALSE if there is exactly one poem and every boy recited it.

In the absence of a licensor, *cîte* is ungrammatical, as in example (423). The examples that follow show that *cîte* is licensed by distributive predication and quantifiers over events, but not quantifiers over worlds.

(423) Brasoveanu & Farkas 2011, ex. 22
**Cîte un student a plecat.*
cîte a student has left
'A student left.'

(424) Brasoveanu & Farkas 2011, ex. 20
Din cînd in cînd, trenul se oprea în cîte o gară.
from when in when train.the refl stopped in cîte a station
'Occasionally, the train stopped in a station.'

(425) Brasoveanu & Farkas 2011, ex. 21
Am decis să lucrăm amindoi cîte un album solo.
we-have decided to work both cîte un album solo
'We have decided to both work at a solo album.'

(426) Brasoveanu & Farkas 2011, ex. 25
**Trebuie să plece cîte un student.*
must subj leave cîte a student
'A student must leave.'

How do previous authors deal with the dependent indefinites of the Kaqchikel-type, namely those with neither weak nor strong licensing requirements? The most prominent class of analyses essentially assimilates Kaqchikel-style dependent indefinites to *nibud'*-indefinites with the strong licensing requirement. For example, Farkas (1997) interprets quantifiers like those in (427) according to the rule in (428).

(427) $Q_x[\ldots x \ldots]_R[\ldots]_{NS}$

(428) Farkas 1997, ex. 13
Let e be an expression of the form in (427). e is satisfied in M iff there is an f such that $(e)_f$. This condition is met iff there are Q many functions f' which extend f wrt x such that $(e_R)_{f'}$ such that f' has a (possible trivial) extension f'' sich that $(e_{NS})_{f''}$.

a. A function f' extends f wrt to a set of variables X iff f' agrees with f on all assignments except for the variables in X. We write $f'(f/x)$ to say that f' extends f with respect to x.

Sentences with narrow scope indefinites have the following satisfaction conditions.

(429) Every child read a book.

(430) The expression in (429) is satisfied in M iff there is a function f with the following property: for every $f'(f/x)$ such that $(x)_{f'} \in [\![child]\!]^M$, there is an extension $f''(f'/y)$ such that $(y)_{f''} \in [\![book]\!]^M$ and $\langle (x)_{f'}, (y)_{f''} \rangle \in [\![read]\!]^M$.

The satisfaction conditions in (430) illustrate how to define the notion dependence. The variable y is dependent on x because y is indexed by a function that is extended by the function that indexes x. Furthermore, we can say that y covaries with respect to x if y is dependent on x and y is assigned at least two different values by the functions that index it in (430).

Against this backdrop, Farkas (1997) proposes that dependent indefinites contribute variables that must covary with respect to another variable, which entails that they are dependent in the manner detailed above. Because variables can become dependent only in virtue of taking narrow scope with respect to an operator that extends assignment functions in a pointwise way, namely a quantifier, dependent indefinites in this account must take narrow scope. The immediate prediction is that anywhere a dependent indefinite is licensed, a narrow scope interpretation of a plain indefinite is also licensed.

Other accounts, though formulated differently, make the same prediction. For example, Brasoveanu & Farkas (2011) build an account of Romanian *câte* in a version of Independence-Friendly Logic (Hintikka, 1973; Sandu, 1993; Hodges, 1997; Väänänen, 2007, a.o.). In this logic, variables are indexed with those quantifiers they are (in)dependent of/on. Brasoveanu & Farkas (2011) accomplish this by indexing indefinites with variables bound by higher quantifiers against which they are allowed to covary. Example (431) shows how indefinites are interpreted in their system (Brasoveanu & Farkas, 2011, ex. 40-41).

(431) $[\![\exists^{\mathcal{U}} x[\phi](\psi)]\!]^{G,\mathcal{V}} = \mathbb{T}$ iff $\mathcal{U} \subseteq \mathcal{V}$ and $[\![\phi]\!]^{H,\mathcal{V}\cup\{x\}} = \mathbb{T}$, for some H such that:

a. $H[x]G$

b. $[\![\phi]\!]^{H,\mathcal{U}\cup\{x\}} = \mathbb{T}$

c. $\begin{cases} \text{if } \mathcal{U} = \emptyset : h'(x), & \text{for all } h, h' \in H \\ \text{if } \mathcal{U} \neq \emptyset : h'(x), & \text{for all } h, h' \in H \text{that are } \mathcal{U}\text{-identical} \end{cases}$ where:

Two assignments h, h' are $\mathcal{U}$-identical iff for all variables $u \in \mathcal{U}$, $h(v) = h'(v)$.

We can think of the set $\mathcal{U}$ above as the variables x is allowed to covary with. If $\mathcal{U}$ is empty (see the first condition in 431c), then the indefinite has widest scope, since the variable it introduces can covary with no other, that is, $h(x) = h'(x)$, for all $h, h' \in H$. Brasoveanu & Farkas (2011) propose that dependent indefinites introduce another condition to rule this case out, which I show below.

(432) Brasoveanu & Farkas 2011, ex. 71
$h(x) \neq h'(x)$ for at least two h, h' in H that are not $\mathcal{U}$-identical.

Since two assignments are necessarily $\mathcal{U}$-identical if $\mathcal{U}$ is empty, the condition in (432) forces $\mathcal{U}$ to be non-empty and thus the indefinite must take scope under a quantifier and the variable it introduces must potentially covary with some other variable in $\mathcal{U}$. Finally, the condition that $h(x) \neq h'(x)$ for at least two h, h' in H means that this variable must actually covary.

Understanding the analysis in detail is not important, as along as the following point is clear. The condition in (432) forces a dependent indefinite to be interpreted in a subset of the ways a plain indefinite can be interpreted, that is, only by the second clause in (431c). Once again, this means that if a dependent indefinite is licensed, then a plain indefinite with a narrow scope reading is also possible (i.e., set $\mathcal{U} \neq \emptyset$).

We can now see why the Kaqchikel pluractional causes problems for extending approaches like these to Kaqchikel dependent indefinites. While Kaqchikel dependent indefinites behave like Romanian and Hungarian dependent indefinites, we cannot assimilate them to dependent indefinites in Russian by requiring that they be licensed through scope-taking. The problem is that distributive pluractionality licenses dependent indefinites, but cannot take scope over a plain indefinite. Examples (433-434) repeat the contrast.

(433) *X-e'-in-chap-ala'* *oxi'* *wäy.*
COM-A3p-E1s-handle-Vla' three tortilla
'I touched three tortillas individually (many times).'
FALSE if there are more than three tortillas involved

(434) *X-e'-in-chap-ala'* *ox-ox* *wäy.*
COM-A3p-E1s-handle-Vla' three-RED tortilla
'I touched tortillas in threes.'
FALSE if there are three tortillas in total (or only one touching event).

There is simply no way to reconcile these facts with the analyses in Farkas 1997; Brasoveanu & Farkas 2011. If the dependent indefinite must take narrow scope to be licensed in example (434), the plain indefinite in example (433) should have the same possibility, but it does not. The problem is not just with extending these analyses to Kaqchikel. There are minimal pairs in Hungarian that illustrate the same problem. Example (435) shows that Hungarian preverbs can be reduplicated to yield a pluractional reading, but the indefinite *egy* cannot produce a witness for each of the pluractional subevents.

(435) Brasoveanu & Farkas 2011, ex. 77
Az éjszaka folyamán egy gyerek ***fel-fel****-ébredt.*
the night during a child **PART-PART**-woke
'During the night, a child kept waking up.'
SPEAKER COMMENT: The same child has to wake up and wake up multiple times.

If dependent indefinites must take narrow scope in order to covary under penalty of ungrammaticality, the prediction is that reduplicated preverbs should not license a dependent indefinite. Example (436) shows that, just like in Kaqchikel, this is not the case (p.c. Donka Farkas).

(436) *Az éjszaka folyamán* ***egy-egy*** *gyerek* ***fel-fel****-ébredt.*
the night during **a-RED** child **PART-PART**-woke
'During the night, a (different) child kept waking up.'
SPEAKER COMMENT: Different children woke up and there were multiple wakings.

What these data show is that, unlike Russsian *nibud'*-indefinites, we cannot tie the licensing condition of Kaqchikel/Hungarian-style dependent indefinites too closely to quantification. The other option is to try to assimilate them to dependent-indefinites in Telugu, which have only a weak licensing condition. Perhaps we can treat them basically the same, while adding a condition to restrict their distribution in languages like Kaqchikel, Hungarian, and Romanian.

To my knowledge, no one has worked out such an account in detail, though Szabolcsi (2010, p. 138-9) lays out what such an account might look like. Recall that the account in Balusu 2006 has two components: (i) Dependent indefinites introduce a universal quantification over a partition of the event argument, and (ii) Dependent indefinites come with some sort of not-at-issue cardinality requirement.

(437) 2-2 MONKEYS JUMPED.
  a. $\exists e \exists \pi[\forall e' \in \pi(e) \exists X[\text{TWO.MONKEYS}(X) \wedge \text{JUMPED}(X, e)]]$
  b. $|\{X : \text{TWO.MONKEYS}(X) \wedge \text{JUMPED}(X, e)\}| > 1$

Balusu (2006) proposes that covariation with respect to a universal quantifier is an illusion mediated by the event partition. When we have a universal quantifier, we use the trivial partition, as in (438), where we assume $\pi(e) = \{e\}$.

(438) EVERY KID SAW 2-2 MONKEYS.
  a. $\exists E[\forall y[\text{KID}(y) \rightarrow \exists e \in E \exists \pi[\forall e' \in \pi(e)$
     $[\exists X[\text{TWO.MONKEYS}(X) \wedge \text{SAW}(u, X, e')]]]]]$
  b. $|\{X : \text{TWO.MONKEYS}(X) \wedge \exists y[\text{KID}(y) \wedge \text{SAW}(y, X, E)\}]| > 1$

Example (438) says that there is an event E and for each individual boy there is an event $e \leq E$ and for every element in the partition $\pi(e) = \{e\}$ there are two monkeys that the boy saw in e. Furthermore, at least two sets of two monkeys were seen by a boy. The idea in Szabolcsi 2010 is that languages like Hungarian, Romanian, and Kaqchikel always use the trivial partition. Without some higher scoping operator, using the trivial partition blocks covariation and the dependent indefinite is unlicensed (presumably because the plurality condition fails). Since the account makes use of both an event partition and scope-taking quantifiers to license dependent indefinites, it has a chance to explain the troubling data from pluractionality. We simply say that the pluractional relaxes the requirement that dependent indefinite quantify over trivial event partitions.

This analysis is good, and the analysis I propose in the next section is in the spirit of the Balusu 2006; Szabolcsi 2010–proposal. That said, I believe that the account outlined above has a series of problems that I repair in my treatment. First, note that the Balusu 2006; Szabolcsi 2010–proposal requires quantification over a singleton domain to be the normal case for dependent indefinites in languages that have stronger licensing requirements than Telugu. Usually, though, universal quantification over singleton domains in natural language is infelicitous. A second related problem is that dependent indefinites in these languages would have vacuous universal quantification as part of their meaning. All the positive semantic work is done by the plurality condition in Szabolcsi's extension of Balusu 2006. It would be better if we could just dump the partition and the vacuous universal quantification that comes along with it, deriving ungrammaticality without a licensor in some other way. This is what I do in the next section.

In addition to these difficulties, the plurality condition has its own problems. First, its grammatical status is not at all clear. How are we supposed to interpret it relative to the sentence in which the dependent indefinite occurs? Both Szabolcsi (2010) and Balusu (2006) suggest it might be a scalar implicature like that which accompanies bare plurals in the analysis of dependent plurals given by (Zweig, 2008, 2009). The analogy does not go through, though. Recall that the plurality implicature in (Zweig, 2008, 2009) is licensed inside the scope of a universal in order to block dependent readings of bare plurals with quantificational clausemates. In contrast, the plurality condition in (438) must be interpreted outside the scope of the universal for precisely the opposite reasons. Moreover, the plurality condition cannot be an implicature because it is not cancelable. Otherwise, we would not be able to talk about how dependent indefinites need to be licensed. Balusu (2006) suggests the idea that maybe the plurality condition is a presupposition, but it would be strange indeed to presuppose most of the lexical content of your main assertion, as example (438) shows is necessary. The account I propose in the next section argues that the plurality condition is neither a presupposition, not an implicature, but a *post-supposition*, which will be explained.

Finally, the Balusu 2006; Szabolcsi 2010–proposal is far from compositional. The problems are only compounded if we want to extend the analysis to account for the fact that pluractionality licenses dependent indefinites. The Balusu 2006; Szabolcsi 2010–proposal runs into the same problems as the quantification-based accounts unless the pluractional can somehow make it possible to use non-trivial event partitions. Recall, though, that the the triviality requirement must be contributed by the dependent indefinite or we cannot account for the fact that dependent indefinites in languages like Kaqchikel, but not Telugu, need to be licensed. The result is an impasse that cannot be solved compositionally. The best we could do is to say that dependent indefinites have a different denotation when they are clausemates of a pluractional.

In the face of these difficulties, I do not believe that the analysis of dependent indefinites in Telugu can be easily extended to account for the behavior of dependent indefinites in Kaqchikel, Hungarian, and Romanian, especially if it is to also make sense of their interaction with pluractionality. At the same time, we have seen that these dependent indefinites cannot be licensed by means of scope-taking without running into empirical problems. In the next section I propose a new account of dependent indefinites that can account for those that pattern like they do in Kaqchikel. The proposal makes use of a not-at-issue cardinality condition like that in Balusu 2006, but one that is less complex and can be integrated in a compositional way. Moreover, we are able to understand how dependent indefinites are licensed without forcing them to contribute vacuous universal quantification.

6.2 Dependent indefinites and distributive pluractionality are evaluation plural

As we have seen, the problem with the most prominent previous approaches to Kaqchikel-style dependent indefinites is that they require them to take narrow scope. Since dependent indefinites take scope using the same mechanisms as plain indefinites, this incorrectly predicts that pluractional distributivity should not license them. In this section I develop an analysis of dependent indefinites that captures the fact that they are licensed by pluractionality, but are paraphrasable with narrow scope indefinites in other contexts. The proposal I pursue here is that dependent indefinites contribute a variable like a plain indefinite, but also contribute a constraint that the variable is *evaluation plural* (Brasoveanu, 2010b), that is, not constant in a context, which I take to be a set of variable assignments (Brasoveanu, 2007; van den Berg, 1996; Nouwen, 2003, among others). Example (439) presents the relevant contrast.

(439)

H	$\ldots$	x	$\ldots$
h_1	$\ldots$	$entity_2$	$\ldots$
h_2	$\ldots$	$entity_2$	$\ldots$
h_3	$\ldots$	$entity_2$	$\ldots$

vs

G	$\ldots$	x	$\ldots$
g_1	$\ldots$	$entity_1$	$\ldots$
g_2	$\ldots$	$entity_2$	$\ldots$
g_3	$\ldots$	$entity_3$	$\ldots$

Here we have two sets of assignments, G and H, and a variable x. Each assignment in H maps x to the same entity, so it is evaluation singlar. In contrast, the assignments in G map x to more than one entity, making the variable evaluation plural. I argue that dependent indefinites introduce a variable like x and the constraint that x be evaluation plural in the output set of assignments. That is, they require that the set of assignments that result from interpreting a formula with a dependent indefinite look like G with respect to x.

What I show is that distributive quantifiers and the Kaqchikel pluractional can both create output contexts that license dependent indefinites. In order to draw a difference between plain indefinites and dependent indefinites, though, I argue that they create them in very different ways. Distributive quantifiers do this by evaluating the nuclear scope incrementally relative to each assignment that satisfies the restrictor. As we have seen, the pluractional does this by directly constraining a neo-davidsonian theta-role. Since the former case is scopal, while the latter is scopeless, we predict that plain indefinites should not take scope under the pluractional operator. That being said, since the constraint contributed by dependent indefinites is a constraint on the structure of sets of variable assignments, and not LFs directly, it can be satisfied in both scopal and scopeless manners.

6.2.1 Formal preliminaries

The backdrop for the account is a version of Dynamic Plural Logic (DPlL) in van den Berg 1996 that has been stripped to its bare essentials. First and foremost, instead of single variable assignments g, we make use of sets of total variable assignments G, called contexts. Formulas are interpreted relative to pairs of sets of total assignments $\langle G, H\rangle$. These represent input and output contexts, where H is the result of evaluating ϕ in a context G. As we have seen before, a set of assignments can be represented as a matrix.

(440)

H	...	x	y	...
h_1	...	$entity_1$	$entity_4$	...
h_2	...	$entity_2$	$entity_4$	...
h_3	...	$entity_3$	$entity_4$	...
...	...	...	...	...

Following Brasoveanu (2010b); van den Berg (1996); Nouwen (2003), i.e., domain-level singularity/plurality depends on individual cells of the matrix. It is determined by checking whether an assignment h in H maps a variable to a singular individual or a plural individual. Evaluation singularity/plurality depends on columns of the matrix. It is determined by checking whether or not the assignments in H map a variable to more than one individual across a column.

So far we have been treating domain-level singular/plurality at an intuitive level, but it can be formalized exactly as I have done in previous chapters. Also as before, I assume that a finite set of thematic roles (**ag**, **th**, etc.) connect the domain of events with the domain of individuals, and that these θ-roles, in addition to basic lexical relations (STUDENT, HUG, etc.), are cumulatively closed (though I suppress the common star notation).

We can now show how basic formulas are interpreted, as well as introduce special formulas for managing domain-level and evaluation-level plurality. In addition to the domains discussed before, models consists of the basic interpretation function $\mathfrak{I}$, which assigns to any $n-$ary relation R of type τ a subset of $\mathfrak{D}_\tau^n$. As noted before, formulas are interpreted relative to pairs of sets of total assignments $\langle G, H\rangle$. Atomic formulas are tests (they only pass on input contexts that satisfy them).

(441) $[\![R(x_1, \ldots, x_n)]\!]^{\langle G,H\rangle} = \mathbb{T}$ iff $G = H$ and $\forall h \in H$, $\langle h(x_1), \ldots, h(x_n)\rangle \in \mathfrak{I}(R)$

Domain-level cardinality is managed via the predicate **atom**.

(442) $[\![\mathbf{two}(x)]\!]^{\langle G,H\rangle} = \mathbb{T}$ iff $G = H$ and for all $h \in H$,
$|\{x' : x' \leq h(x) \wedge \mathbf{atom}(x')\}| = 2$

(443) $[\![\mathbf{three}(x)]\!]^{\langle G,H\rangle} = \mathbb{T}$ iff $G = H$ and for all $h \in H$,
$|\{x' : x' \leq h(x) \wedge \mathbf{atom}(x')\}| = 3$

We also have tests for evaluation-level cardinality. They work by gathering all values of a variable under a set of assignments, as in (444), and checking the cardinality of the resulting set, as in (445).

(444) $G(x) := \{g(x) : g \in G\}$

(445) $|G(x)|$ is the cardinality of the set of individuals $G(x)$

(446) $[\![x = n]\!]^{\langle G,H\rangle} = \mathbb{T}$ iff $G = H$ and $|H(x)| = n$

(447) $[\![x > n]\!]^{\langle G,H\rangle} = \mathbb{T}$ iff $G = H$ and $|H(x)| > n$

Dynamic conjunction is defined as relation composition.

(448) $[\![\phi \wedge \psi]\!]^{\langle G,H\rangle} = \mathbb{T}$ iff there is a K s.t. $[\![\phi]\!]^{\langle G,K\rangle} = \mathbb{T}$ and $[\![\psi]\!]^{\langle K,H\rangle} = \mathbb{T}$

Quantification procedes via pointwise manipulation of assignment functions. We overload the notation [•] to define random assignment in the object language.

(449) Random assignment: $[\![[x]]\!]^{\langle G,H\rangle} = \mathbb{T}$ iff $G[x]H$, where

a. $G[x]H := \begin{cases} \text{for all } g \in G, \text{ there is a } h \in H \text{ such that } g[x]h \\ \text{for all } h \in H, \text{ there is a } g \in G \text{ such that } g[x]h \end{cases}$

We'll translate plain indefinites according to the following schema. Note that brackets [•] demarcate the restrictor and parentheses (•) the nuclear scope.

(450) $\exists x[x = 1 \wedge \textbf{atom}(x) \wedge \phi](\psi)$ "one ϕ-atom is ψ"

VPs bring along their theta-roles and are translated with existential quantification over the event argument. Putting it together, the sentence 'A student left' is translated as in (451).

(451) A student left $\rightsquigarrow$
$\exists x[x = 1 \wedge \textbf{atom}(x) \wedge \text{STUDENT}(x)](\exists e(e = 1 \wedge \text{LEFT}(e) \wedge \textbf{ag}(e, x)))$

The formula in example (451) just abbreviates the dynamic version in (452).

(452) $[x] \wedge x = 1 \wedge \textbf{atom}(x) \wedge \text{STUDENT}(x) \wedge [e] \wedge e = 1 \wedge \text{LEFT}(e) \wedge \textbf{ag}(e, x)$

Given the definition of truth in (453), examples (451-452) are true relative to an input set of assignments just in case there is an accessible set of output assignments storing in x one atomic student who is the agent of one leaving event stored in e. It is important to note that the evaluation-level cardinality constraints $x = 1$ and $e = 1$ ensure that a simple indefinite or existential quantification over events does not introduce a multiplicity of entities into the discourse satisfying the restrictor and nuclear scope.

(453) Truth: a formula ϕ is true relative to an input context G iff there is an output set of assignments H s.t. $[\![\phi]\!]^{\langle G,H\rangle} = \mathbb{T}$.

6.2.2 Dependent indefinites

The heart of our proposal is that dependent indefinites are not like simple indefinites with a requirement forcing narrow scope, but indefinites that contribute an evaluation plurality. That is, reduplicated numerals place the constraint $x > 1$ on the variable they introduce, where a normal indefinite or numeral contributes the constraint $x = 1$.

(454) one $\rightsquigarrow \exists x[x = 1 \wedge \mathbf{atom}(x) \wedge \phi](\psi)$

(455) one$_{dependent}$ $\rightsquigarrow \exists x[x > 1 \wedge \mathbf{atom}(x) \wedge \phi](\psi)$ (to be amended in 458)

This requires that x be assigned different values across any set of assignments that satisfy the expression containing the reduplicated numeral. Moreover, I argue that this constraint is satisfied on output contexts, which I explain now.

In a dynamic framework, we can think of presuppositions anaphorically as tests on input contexts (van der Sandt, 1992; Kamp, 2001, among others). Some have proposed that natural language makes use of the mirror image notion as well, that is, post-suppositions, or tests on output contexts (Constant, 2006; Brasoveanu, 2010a; Farkas, 2002; Lauer, 2009). Just like presuppositions are introduced locally and can "float" up to be interpreted relative to the input set of assignments, post-suppositions are introduced locally, but passed along uninterpreted until they can be interpreted globally relative to an output context. In defining post-suppositions for DPlL, we follow Brasoveanu (2010a) closely. Post-suppositions are marked via $\overbrace{\text{overbraces}}$, as ϕ is below.

(456) $[\![\overbrace{\phi}]\!]^{\langle G[\zeta], H[\zeta'] \rangle} = \mathbb{T}$ iff ϕ is a test, $G = H$ and $\zeta' = \zeta \cup \{\phi\}$.

(457) Truth: a formula ϕ is true relative to an input context $G[\emptyset]$ iff there is an output set of assignments H and a (possibly empty) set of tests $\{\psi_1, \ldots, \psi_m\}$ s.t. $[\![\phi]\!]^{\langle G[\emptyset], H[\{\psi_1,\ldots,\psi_m\}] \rangle} = \mathbb{T}$ and $[\![\psi_1 \wedge \ldots \wedge \psi_m]\!]^{\langle H[\emptyset], H[\emptyset] \rangle} = \mathbb{T}$.

As we see in (456), post-suppositions don't update input sets of assignments, they just get added to the input set of tests ζ and constrain permissible output sets of assignments through the second conjunct in (457). A post-suppositional formula therefore gets something like obligatory widest scope, but instead of being first to update an input context, it is last to update an output context.

Updating the definition in (455), dependent indefinites are translated according to the following schema. For dependent numerals, replace **atom** with the appropriate cardinality predicate (**two**, **three**, etc.).

(458) one$_{dependent} \rightsquigarrow \exists x[\overbrace{x > 1} \wedge \mathbf{atom}(x) \wedge \phi](\psi)$

To see the translation in (458) in action, consider example (459), which has the reduplicated form of the indefinite/numeral *jun* 'one'. This forces a narrow scope reading of the indefinite with respect to the distributive quantifier.

(459)

K-onojel	*ri*	*tijoxel-a*	*x-Ø-ki-chäp*	*ju-jun*	*wäy.*
E3p-all	the	student-PL	COM-A3s-E3p-touch	a-RED	tortilla

'All of the students took a tortilla.'

$\rightarrow$ FALSE if they took one tortilla total (perhaps to share).

I assume *konojel* can be translated as a universal quantifier and follow the basic strategy in Brasoveanu (2008), decomposing universal quantification into a maximization operation over the restrictor and a distributive operation over the nuclear scope formula, that is, $\forall x[\phi](\psi)$ abbreviates $\mathbf{Max}^x[\phi] \wedge \delta(\psi)$. The max operator $\mathbf{Max}^x$ introduces a new variable x and stores H the maximal set of individuals satisfying the formula it scopes over.

(460) $[\![\mathbf{Max}^x(\phi)]\!]^{\langle G,H \rangle} = \mathbb{T}$ iff $[\![[x] \wedge \phi]\!]^{\langle G,H \rangle} = \mathbb{T}$ and
   a. For all H', if $H(x) \subseteq H'(x)$ and $[\![[x] \wedge \phi]\!]^{\langle G,H' \rangle} = \mathbb{T}$ then:
   b. $H'(x) \subseteq H(x)$

The distributive operator δ takes the output of maximization and distributively updates the singleton assignments $\{g\}$ in G with the nuclear scope formula. Finally, we sum all the resulting assignments.

(461) $[\![\delta(\phi)]\!]^{\langle G,H \rangle} = \mathbb{T}$ iff there exists a partial function $\mathcal{F}$ from assignments g to sets of assignments K, i.e., of the form $\mathcal{F}(g) = K$, s.t.
   a. $G = \mathbf{Dom}(\mathcal{F})$ and $H = \bigcup \mathbf{Ran}(\mathcal{F})$
   b. for all $g \in G$, $[\![\phi]\!]^{\langle \{g\}, \mathcal{F}(g) \rangle} = \mathbb{T}$

A concrete example is given below in graphical form. Examples (462-463) give equivalent translations of (459), where (463) gives the dynamic version couched in terms of max and δ, while (462) gives the $\forall/\exists$ shorthand making relative scope easier to see.

(462) $\forall x[\mathbf{atom}(x) \wedge \text{STUDENT}(x)]$
   $(\exists y[\overbrace{y > 1} \wedge \mathbf{atom}(y) \wedge \text{TORTILLA}(y)]$
   $(\exists e(e = 1 \wedge \text{TAKE}(e) \wedge \mathbf{ag}(e, x) \wedge \mathbf{th}(e, y))))$

(463) $\mathbf{Max}^x(\mathbf{atom}(x) \wedge \text{STUDENT}(x)) \wedge \delta([y] \wedge \overbrace{y > 1} \wedge \text{TORTILLA}(y) \wedge \mathbf{atom}(y) \wedge [e] \wedge e = 1 \wedge \text{TAKE}(e) \wedge \mathbf{ag}(e, x) \wedge \mathbf{th}(e, y))$

First, we store the maximal set of assignments in variable x. Then, we update each singleton assignment with the nuclear scope formula. In this case, that means finding a tortilla and a taking event in which the student took that particular tortilla. If we can successfully do this for each singleton assignment, then the sentence is true.

(464)

x
$student_3$

$$\xRightarrow{[y] \wedge \overbrace{y > 1} \wedge e=1 \wedge \textsc{tor}(y) \wedge \ldots \wedge \mathbf{ag}(e,x) \wedge \mathbf{th}(e,y)}$$

x	e	y
$student_3$	$take_3$	$tortilla_8$

x
$student_6$

$$\xRightarrow{[y] \wedge \overbrace{y > 1} \wedge e=1 \wedge \textsc{tor}(y) \wedge \ldots \wedge \mathbf{ag}(e,x) \wedge \mathbf{th}(e,y)}$$

x	e	y
$student_6$	$take_8$	$tortilla_9$

x
$student_{17}$

$$\xRightarrow{[y] \wedge \overbrace{y > 1} \wedge e=1 \wedge \textsc{tor}(y) \wedge \ldots \wedge \mathbf{ag}(e,x) \wedge \mathbf{th}(e,y)}$$

x	e	y
$student_{17}$	$take_2$	$tortilla_5$

$$\xRightarrow{\textbf{output set of assignments H}}$$

x	e	y
$student_3$	$take_6$	$tortilla_8$
$student_6$	$take_8$	$tortilla_9$
$student_{17}$	$take_2$	$tortilla_5$

Example (464) shows graphically why we want the evaluation plurality constraint that the dependent indefinite contributes to be interpreted relative to the output context. If it were interpreted locally, that is, in the scope of the distributivity operator, we would have to satisfy $y > 1$ as we interpret the nuclear scope relative to each student. That is, we would incorrectly require each student to take at least two tortillas. Instead, the test $\overbrace{y > 1}$ is interpreted relative to the output set of assignments H, where it is satisfied due to the fact that the indefinite takes narrow scope and covaries with respect to x and e. The same constraint rules out the case where the indefinite takes wide scope and stores the same tortilla across $H(y)$, pictured in (465).

(465) $\overset{\mathbf{H}}{\Rightarrow}$

x	e	y
$student_3$	$take_6$	$tortilla_5$
$student_6$	$take_8$	$tortilla_5$
$student_{17}$	$take_2$	$tortilla_5$

Moreover, note that an account in terms of evaluation plurality also predicts the unavailability of the narrow scope reading of the indefinite where, just so happens, the indefinite returns the same witness for each restrictor entity. That is, dependent indefinites are not narrow scope indefinites, but covarying indefinites for which narrow scope is a possible, but not guaranteed route to covariation.

We capture the ungrammaticality of a dependent indefinite without a quantificational clausemate due to the fact that, by default, other existential quantifiers contribute evaluation singularities. In particular, the existential closure of the event argument introduces a variable that is evaluation singular. Without a quantificational clausemate (or a pluractional, as we will see), a theta dependency linking the event and dependent indefinite always fails to hold. Consider again the sentence in (467) and the translation of its VP in (467-468).

(466) **X-e'-in-q'etej* *ox-ox* *ak'wal-a'.*
COM-A3p-E1s-hug three-RED child-PL
DESIRED READING: 'I hugged groups of three children.'

As a dependent indefinite, *oxox* contributes the cardinality constraint in the restrictor of the existential quantifier over individuals. It requires the variable x to store an evaluation plurality.

(467) $\exists x[\overbrace{x > 1} \wedge \mathbf{three}(x) \wedge \text{CHILD}(x)](\exists e(e = 1 \wedge \text{HUG}(e) \wedge \mathbf{th}(e, x)))$

(468) $[x] \wedge \overbrace{x > 1} \wedge \mathbf{three}(x) \wedge \text{CHILD}(x) \wedge [e] \wedge e = 1 \wedge \text{HUG}(e) \wedge \mathbf{th}(e, x)$

If x were evaluation singular, as with a plain indefinite, every $h \in H$ would store the same sum of three children in x. Therefore a θ-role function can hold between e and x.

(469)

H	$\ldots$	e	x
h_1	$\ldots$	hug_1	$three.children_1$
h_2	$\ldots$	hug_1	$three.children_1$
h_3	$\ldots$	hug_1	$three.children_1$

The situation is completely different with (467-468), as we see graphically below.

(470)

H	$\ldots$	e	x
h_1	$\ldots$	hug_1	$three.children_1$
h_2	$\ldots$	hug_1	$three.children_2$
h_3	$\ldots$	hug_1	$three.children_3$

Here e is still evaluation singular—every $h \in H$ assigns e to the same event. But now the reduplicated numeral requires that at least two $h \in H$ disagree on their assignments to x because it is evaluation plural. Now no exhaustive θ-role function can hold between e and x because there can be no functional dependency between e and x. This is the case even if e is domain plural, for instance, under the cumulative reading of *take three tortillas*. Unless there is something generating a evaluation plurality, like a nominal or adverbial quantifier, sentences with singular subjects and reduplicated numerals are predicted to be ungrammatical. In the next section, we see that distributive pluractionality can license dependent indefinites because it, too, contributes a evaluation plurality of events.

6.2.3 Distributive pluractionality

We are now able to finally finish the analysis of distributive pluractional and do so in a way that accounts for the fact that distributive pluractionality licenses dependent indefinites. The following sentences exemplify this fact. Without the pluractional, these examples would be ungrammatical.[4]

(471) *X-e'-in-piskoli-**la'*** *ju-jun* *wäy.*
COM-A3s-E1s-flip-**la'** a-RED tortilla
'I kept flipping tortillas one by one.'

(472) *X-e'-in-tun-**ula'*** *ka-ka* *su't.*
COM-A3p-E1s-flip-**la'** two-two napkins
'I folded the napkins in twos.'

(473) *X-e'-in-q'ete-**la'*** *ox-ox* *ak'wal-a'.*
COM-A3p-E1s-hug-**la'** three-RED child-PL
'I hugged the children in groups of three.'

Building such an analysis is not just important for understanding how dependent indefinites are licensed, but it also provides an important argument that different pluractionals can introduce different types of pluralities. The reason is that the other pluractional operators we have seen cannot license dependent indefinites. For instance, examples (474-475) show that dependent indefinites are bad with singular subjects and event-internal pluractional. Examples (476-477) show the same fact with the event-external pluractional *–löj*.

(474) *#X-e'-in-chap-**acha'*** *ox-ox* *ak'wal-a'.*
COM-A3p-E1s-handle-**la'** three-RED child-PL
READING SOUGHT: 'I kept poking groups of three children many times.'

(475) *#X-e'-in-tz'et-**etz'a'*** *ox-ox* *ak'wal-a'.*
COM-A3p-E1s-see-**la'** three-RED child-PL
READING SOUGHT: 'I kept glancing at groups of three students.'

[4]This is not entirely true. Example (471) would be fine, but on a different reading. The indefinite *jujun* acts as a dependent indefinite, as we have seen, but it can also have a meaning similar to unstressed 'plural some', i.e., *I bought some tomatoes*. The other reduplicated indefinites are not ambiguous in this way. To account for this reading we could say that *jujun* is either evaluation plural or domain plural, while the other reduplicated indefinite are always both evaluation plural and domain plural.

(476) *#X-e'-ok-**löj*** *ox-ox* *ak'wal-a'.*
COM-A3p-enter-**löj** three-RED child-PL
READING SOUGHT: 'Children kept coming in in groups of three.'

(477) *#Ox-ox* *x-e-käm-**löj**.*
three-RED COM-A3p-enter-**löj** three-RED child-PL
READING SOUGHT: 'They died in threes.'

These facts suggest that the pluractional distributivity suffix *–la'* is different than these other pluractionals. I propose that it is because they introduce evaluation pluralities like bona fide distributive quantifiers. I now translate the account of pluractional distributivity developed before into the dynamic framework where it introduces evaluation pluralities of events.

Recall that I proposed that the pluractional morphology signals a special theta dependency that distributes to atoms.[5] That is, each atomic event in the big event must get mapped to an atomic individual in the big participant by relevant role. To get this effect in the new account, I propose that the pluractional does this by introducing two variables to store the maximal set of atoms of both the event and individual arguments, and then asserting that a thematic dependency holds between these two new variables. Using $\mathbf{Max}^x$, which we have seen before (defined in (460)), and a domain-level cardinality test, the theme θ-role of pluractional predicate is translated as in (479).[6]

(478) $\mathbf{Atoms}(x) = \{y : \mathbf{atom}(y) \wedge y \leq \bigoplus G(x)\}$
Returns the set of atomic parts of those entities stored in x across G.

[5]I say 'signals' because we treat pluractional predicates syncategorematically for expository simplicity. A compositional account of the pluractional morpheme is possible if it is treated as a θ-role modifier. That is, we represent θ-roles in the syntax and allow *–la'* to compose with them directly (before composing with the verb). I show how this can be done in the appendix 6.4.

[6]$\mathbf{Max}^{\{x,y\}}(\phi)$ is like $\mathbf{Max}^x(\phi) = \mathbf{Max}^{\{x\}}(\phi)$, but selectively targets every variable in $\{x_1, ..., x_n\}$.

(479) Pluractional Distributivity (to be given in final form in 502)
$\mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Atoms}(e) \wedge x' \in \mathbf{Atoms}(x)) \wedge \mathbf{th}(e') = x'$

a. $\mathbf{Max}^{\{e',x'\}}($

b. $e' > n \wedge$

c. $e' \in \mathbf{Atoms}(e) \wedge x' \in \mathbf{Atoms}(x)) \wedge$

d. $\mathbf{th}(e') = x'$

The formula in (479) is broken up for perspicuity. It starts in (479a) by introducing a variable over events and a variable over individuals and then maximizes over them. That is, we store in each of them the maximal set of entities that satisfies the rest of the formula. Example (479b) gives the plurality condition requiring the cardinality of the set of events stored in e' to exceed some contextual standard n. The third conjunct, (479c), ensures that e' and x' store all of the atomic parts of the big event and big participant respectively. Finally, the last conjunct in (479d) establishes a thematic dependency between the maximal set of atomic events and atomic individuals.

The analysis in example (479) captures both the pluractionality and theta-based distributivity characteristic of *–la'*. To show this, we compare pluractional/non-pluractional minimal pairs. Examples (481-482) give the bottom-line truth conditions for the VP in (480), which is not pluractional. The matrix in (483) provides a representative set of output assignments satisfying (481-482).

(480)

X-e'-in-q'etej	*oxi'*	*ak'wal-a'.*
COM-A3p-E1s-hug	three	child-PL

'I hugged three children.'

(481) $\exists x[x = 1 \wedge \mathbf{three}(x) \wedge \text{CHILD}(x)](\exists e(e = 1 \wedge (\text{HUG}(e) \wedge \mathbf{th}(e) = x)$

(482) $[x] \wedge x = 1 \wedge \mathbf{three}(x) \wedge \text{CHILD}(x) \wedge [e] \wedge e = 1 \wedge \text{HUG}(e) \wedge \mathbf{th}(e) = x$

(483)

H	$\ldots$	e	x
h_1	$\ldots$	hug_7	$three.children_4$
h_2	$\ldots$	hug_7	$three.children_4$
h_3	$\ldots$	hug_7	$three.children_4$

We introduce an evaluation singularity in x and require that it store a plural individual composed of three atomic children. Similarly, we introduce an evaluation singularity in e and require that e and x stand in the *theme* relation and that there be a function between them.

Examples (485-486) alter the bottom-line truth conditions of (481-482), taking into account the discussion of the pluractional, shown in (484). Note that the only difference is that the theta dependency in (485-486) is replaced by that contributed by *–la'*.

(484) *X-e'-in-q'ete-**la'*** *oxi'* *ak'wal-a'.*
COM-A3p-E1s-hug-**PLRC** three child-PL
'I hugged three children individually.'

(485) $\exists x[x = 1 \wedge \textbf{three}(x) \wedge \text{CHILD}(x)](\exists e(e = 1 \wedge \text{HUG}(e) \wedge \textbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \textbf{Atoms}(e) \wedge x' \in \textbf{Atoms}(x)) \wedge \textbf{th}(e') = x')$

(486) $[x] \wedge x = 1 \wedge \textbf{three}(x) \wedge \text{CHILD}(x) \wedge [e] \wedge e = 1 \wedge \text{HUG}(e) \wedge \textbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \textbf{Atoms}(e) \wedge x' \in \textbf{Atoms}(x)) \wedge \textbf{th}(e') = x'$

(487)

H	$\ldots$	e	x	e'	x'
h_1	$\ldots$	hug_7	$three.children_4$	hug_1	$child_2$
h_2	$\ldots$	hug_7	$three.children_4$	hug_2	$child_3$
h_3	$\ldots$	hug_7	$three.children_4$	hug_3	$child_9$
$\ldots$	$\ldots$	$\ldots$	$\ldots$	$\ldots$	$\ldots$

Focusing on the contribution of *–la'* in the second line of (486), we break the hugging event e into its atomic parts and store it in e'. The cardinality constraint requires that there be more than n such atoms stored by various functions in the current context, that is, 485-486) contribute a evaluation plurality of events — it is *evaluation pluractional*. In the same way, the pluractional breaks up the plural individual consisting of the three children and stores each atomic child in x'. Finally, the pluractional requires there be a function between e' and x', that is, they stand in the theme relation.

Importantly, the account correctly predicts the distributive entailments of (484). Group hugs are ruled out because the variables e' and x' can only store atoms and in virtue of being a function, the theta dependency cannot map the same atomic event to two different atomic individuals. Moreover, since nothing requires the function to be an injection, we correctly predict that the pluractional, while distributive, should be grammatical with singular themes. In this case, we get repetition with the same theme because each pluractional subevent is mapped to the same participant.

It should now be clear why pluractional distributivity licenses dependent indefinites. The reason is that its interpretation results in output contexts that look a lot like a distributive quantifier over events taking scope over an indefinite quantifier over individuals. Recall that the pluractional works by storing the atoms of a domain plural event in a evaluation plurality, and then requiring a theta dependency to hold between them and a variable storing the atomic parts of an argument. Since the pluractional generates distributive dependencies by creating a evaluation plurality of events, it is able to compose with reduplicated numerals which do the same in the individual domain. To compare the result to the discussion of universal quantification, consider the following example.

(488) *X-e'-in-piskoli-**la'*** *ju-jun* *wäy.*
COM-A3p-E1s-flip-PLRC a-RED tortilla
'I kept flipping tortillas one by one.'
FALSE if there is only one flipping event or if I keep flipping the same tortilla.

Examples (489-490) combine the analysis of pluractional distributivity and reduplicated numerals, while the following matrix illustrates a typical set of output assignments.

(489) $\exists x[\overbrace{x > 1} \wedge \mathbf{atom}(x) \wedge \text{TORTILLA}(x)](\exists e(e = 1 \wedge \text{FLIP}(e) \wedge$
$\mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Atoms}(e) \wedge x' \in \mathbf{Atoms}(x)) \wedge \mathbf{th}(e') = x'))$

(490) $[x] \wedge \overbrace{x > 1} \wedge \mathbf{atom}(x) \wedge \text{TORTILLA}(x) \wedge [e] \wedge e = 1 \wedge \text{FLIP}(e) \wedge$
$\mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Atoms}(e) \wedge x' \in \mathbf{Atoms}(x)) \wedge \mathbf{th}(e') = x'$

(491)

H	...	e	x	e'	x'
h_1	...	$flip_1$	$tortilla_4$	$flip_2$	$tortilla_4$
h_2	...	$flip_1$	$tortilla_7$	$flip_3$	$tortilla_7$
h_3	...	$flip_1$	$tortilla_3$	$flip_4$	$tortilla_3$

The first line in (489-490) gives the contribution of the reduplicated numerals, specifically a evaluation plurality of atomic tortillas. The pluractional alters the usual theta dependency in the second line, as before. It introduces an event variable e' and stores in it a evaluation plurality of atomic events from the event satisfying the verbal predicate. Simultaneously, it stores the atomic members of $G(x)$, here just atomic tortillas in x'. Finally, it asserts that there is a dependency between these two new variables and that it satisfies the theme relation. The crucial contribution of the pluractional is the variable e' storing a evaluation plurality of events. Unlike the main event variable e, this new variable can stand in a theta dependency with the variable storing a evaluation plurality of individuals introduced by the reduplicated numeral. What allows the dependent indefinite to introduce a evaluation plurality is that the pluractional introduces a evaluation plurality of events as well. As we have seen, it does so in order to establish distributive dependencies between an event and an individual.

The careful reader will notice a certain problem with our account once we move to dependent numerals greater than one. Note that the evaluation plurality introduced by *jujun* 'one one' is made up of domain atoms. Thus, when the pluractional takes the atoms stored in variable *jujun* introduces, it is equivalent to taking the elements that make up the evaluation plurality. This is different with reduplicated numerals *kaka* 'two two', *oxox* 'three three', etc. With these items, each individual stored across G is non-atomic. The denotation of the pluractional thus predicts that the following sentences should have the same readings as with *jujun*, since we take out all of the atomic parts of each individual constituting the evaluation plurality. Not surprisingly, this is not the case.

(492) *X-e'-in-q'ete-**la'*** *ox-ox* *ak'wal-a'.*
COM-A3p-E1s-hug-PLRC three-RED child-PL
READING SOUGHT: '#I hugged the children individually.'

The fact that we do not distribute down to the atomic parts of domain pluralities composing the evaluation plurality shines through in the comment a speaker gave me for example (493)

(493) *X-e'-in-tij-**la'*** *ox-ox* *wäy.*
COM-A3p-E1s-hug-PLRC three-RED tortilla
'I kept eating the tortillas in groups of three'
SPEAKER COMMENT: It's really like you have a stacks of three tortillas
and you keep putting them in your mouth like that.

There seem to be two options to fix this. First, we could have dependent indefinites denote groups of the specified cardinality. Thus, *oxox* 'three three' would contribute a evaluation plurality of groups with three members. Since groups are atomic, the pluractional connects atomic events with atomic individuals (here groups of three tortillas), and the problem is solved. There are two reasons, though, to disprefer this approach. First, we would have to give *jujun* 'one one' a different denotation because it does not make sense to have a group of one. In this work we have assumed groups are atoms mapped to pluralities under a membership function (or atoms spatiotemporally imposed on a plurality). The second reason is that we then have to separate even further the denotation of plain and reduplicated indefinites. Ideally, they would be as semantically similar as possible. Finally, collective readings are not mandated by reduplicated indefinites when there is no pluractional, as example (494) shows.

(494) Suppose each of us eats three tortilla over the course of a meal:

X-e-qa-tij	*ox-ox*	*wäy.*
COM-A3p-E1s-hug-PLRC	three-RED	tortilla

'We each ate three tortillas.'

These facts suggest that we should locate the effect in the denotation of the pluractional. What I propose is that the pluractional does not break up the event and the individual into a plurality of atoms, but a plurality of relevant parts, which I define below. The function $\mathbf{Parts}(x)$ returns the set of individuals stored in x if that variable is evaluation plural, else it returns the atomic parts of the particular individual stored in $g(x)$ for all g in G. If both of those fail and the single individual in $G(x)$ is itself atomic, then **Parts** returns the salient material parts of an individual, defined in example (496).

(495) $\mathbf{Parts}(x) = \begin{cases} G(x) & \text{if } x > 1 \\ \mathbf{Atoms}(x) & \text{if } \neg\mathbf{atom}(\bigoplus G(x)) \\ \mathbf{M\text{-}Parts}(x) & \end{cases}$

(496) $\mathbf{M\text{-}parts}(x) = P$, where:[7]

a. $\forall y \in P[y \leq_m \bigoplus G(x)]$

b. $\bigoplus P = \bigoplus G(x)$

c. The elements of P are salient in the context.

What **Parts** does is look at a discourse referent and return the coarsest grained plurality possible given what that discourse referent stores. If that discourse referent is evaluation plural, then the pluractional distributes atomic events over that plurality via the verb's **th**eme theta-role, as in example (497), repeated from above. If that discourse referent is evaluation singular, but stores a domain plurality, then the pluractional distributive atomic events over the atoms of that plurality, as in (498).

(497) *X-e'-in-tij-**la'*** *ox-ox* *wäy.*
COM-A3p-E1s-hug-PLRC three-RED tortilla
'I kept eating the tortillas in groups of three'
SPEAKER COMMENT: It's really like you have a stacks of three tortillas and you keep putting them in your mouth like that.

(498) *X-e'-in-q'ete-**la'*** *ri* *ak'wal-a'.*
COM-A3p-E1s-hug-**PLRC** the child-PL
'I hugged the children individually.'

Finally, we can understand a puzzle that arose earlier. If the internal argument is both evaluation singular and domain singular, speakers infer that the pluractional subevents are dis-

[7] Here $\leq_m$ is the 'material part' relation defined in Link 1998. Link assumes a domain of matter in addition to the domain of individuals. Furthermore, there is a structure preserving homomorphism h mapping the domain of individuals to the domain of matter allowing us to define an operator $\leq_m$ such that $h(x) \leq h(y)$ iff $x \leq_m y$. The reason for the final clause is to ensure that P is unique.

tributed over parts of the atomic individual. This was hinted at in examples like (499), repeated from (372), but the contrast between (500-501) shows that this effect is most likely an entailment.

(499) *X-Ø-u-k'ut-**ula'*** *ri* *po't* *ch-w-e'.*
COM-A3s-E3s-show-**PLRC** the blouse P-E1s-DAT
'She showed me blouse repeatedly.'
SPEAKER COMMENT: She showed me all the various designs in the weaving

(500) Suppose I touch a bottle many times in the same place.
*X-Ø-in-chap-**ala'*** *ri* *botella.*
COM-A3s-E1s-handle-**PLRC** the bottle
'I touched the bottle repeatedly.'

(501) Suppose I touch a bottle many times all over.
*#X-Ø-in-chap-**ala'*** *ri* *botella.*
COM-A3s-E1s-handle-**PLRC** the bottle
'I touched the bottle repeatedly (all over).'

If the distributive pluractional tries to coerce a plurality out of any individual you give it, we correctly predict that even when we have singular objects, it is better to pair up atomic events with parts of the patient. The fact that using a notion of coarsest parthood allows us to keep a uniform denotation of *jujun* 'one one' and *kaka* 'two two', as well as predicting the entailments in (500-501), motivates incorporating **Parts** into our analysis of pluractional distributivity. Example (502) does just this, which we take as our final word on distributive pluractionality.

(502) Contribution of –*la'* (Final)
$\mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Parts}(e) \wedge x' \in \mathbf{Parts}(x)) \wedge \mathbf{th}(e') = x'$

6.2.4 Summary discussion

To summarize, this section introduced dependent indefinites in Kaqchikel and showed how extending analyses of similar items in other language to Kaqchikel will run into trouble. The core problem is that these previous approaches require dependent indefinites to take narrow scope to be licensed. The prediction is that anywhere a dependent indefinite can appear, a narrow scope plain indefinite can also appear, but this is not the case. Pluractional distributivity is not scope-taking, but it can license dependent indefinites.

The idea is that dependent indefinites impose constraints on sets of output assignments, not constraints on scope-taking. What unifies pluractionals and distributive quantifiers is that their interpretation generates output sets of assignments with similar structure, even though their LFs are very different. In particular, they both produce evaluation pluralities of events. While this analysis is able to resolve the scope puzzle and account for the fact that dependent indefinites are licensed by distributivity pluractionality and bona fide distributive quantifiers, the analysis has a variety of additional advantages.

First, we know that crosslinguistically dependent indefinites are licensed in the scope of both quantifiers over individuals and quantifiers over events, but not all dependent indefinites can covary with respect to quantifiers over worlds. In fact, only the Russian *nibud*-indefinites are able to do this, and they are different from the two other classes of dependent indefinites in a variety of ways. While previous accounts of Kaqchikel-type dependent indefinites have no explanation for the fact that they can generally covary with respect to events and individuals, but not worlds, this account does. Recall that dependent indefinites are ungrammatical when there is nothing to covary with, not because there is nothing to covary with, but because we cannot establish a thematic dependency between the event variable and the variable contributed by the dependent indefinite if the former is not evaluation plural. Quantifiers over individuals license dependent indefinites because they generate evaluation pluralities of events as a side effect. If theta-role functions are world-bound (which we want so that events need not have the same participants in every world), then we correctly predict that quantifiers over worlds should not license dependent indefinites. Furthermore, the theta-based account of dependent indefinite presented here correctly predicts that there should be no languages with dependent indefinites that can be licensed by quantifiers over individuals, but not events.

While my account makes sense of dependent indefinites that have medium-strength licensing requirements, it can be extended to other classes of dependent indefinites.[8] We saw that the primary difference between dependent indefinites in Telugu and dependent indefinites in Kaqchikel is that the former do not need a licensor. Balusu (2006) takes this as evidence that the dependent indefinites themselves contribute a universal quantifier and an event partition (in addition to their cardinality condition). My analysis gives dependent indefinites a much simpler denotation that is minimally different than plain indefinites, repeated below. Moreover, it allows for a compositional treatment of dependent indefinites.

(503) one $\rightsquigarrow \exists x[x = 1 \wedge \mathbf{atom}(x) \wedge \phi](\psi)$

[8] While the analysis can be extended to Telugu, I don't think the it should be extended to Russian-style *nibud'*-indefinites. The fact that *nibud'*-indefinites can be licensed by quantifiers over worlds suggests that their licensing requirement is not theta-based. Assuming Yanovich (2005) is correct, I would predict that if Russian had Kaqchikel-style pluractionality, it would not license *nibud'*-indefinites.

(504) $\text{one}_{dependent} \rightsquigarrow \exists x[\overbrace{x > 1} \wedge \mathbf{atom}(x) \wedge \phi](\psi)$

In light of these advantages, it would be nice to be able to extend the analysis to Telugu. One way to do this is to say that in Telugu, unlike in Kaqchikel, Hungarian, or Romanian, existential closure of the event argument is similarly ambiguous between an evaluation singular and a evaluation plural reading. That is:

(505) $\lambda V_{\epsilon t} \exists e[e = 1 \wedge V(e)]$

(506) $\lambda V_{\epsilon t} \exists e[e > 1 \wedge V(e)]$

When the existential closure in (506) is chosen, the so called spatial-key and temporal-key readings of Telugu dependent indefinites would be generated. One piece of evidence in favor is this analysis concerns the behavior of dependent indefinites in the scope of a universal quantifier in Telugu. Balusu (2006) gives two readings for example (507, repeated from 411).

(507) Balusu 2006, ex. 13

Prati	*pillavaaDu*	*renDu*	*renDu*	*kootu-lu-ni*	*cuus-ee-Du.*
every	kid	two	two	monkey-PL-ACC	see-Past-3PSg

a. 'Every kid saw two monkeys.'

b. 'Every kid saw two monkeys in each location'

Once the universal quantifier takes scope over the dependent indefinite, it should already be licensed. That beings said, if existential closure is ambiguous in Telugu between (505-506), then we correctly predict that we can get the doubly licensed reading in (507b) where each kid participated in a plurality of events of seeing 2 monkeys (namely 2 monkeys in each location for each kid). Crucially, languages like Kaqchikel do not have the reading in (507b), suggesting they do not have free access evaluation plural existential closure.

There is further evidence for existential closure like that in (506). If reduplicated preverbs in Hungarian introduce evaluation plural existential event closure, we immediately predict that they should licensed dependent indefinites, but not be scope-taking. The following examples illustrates the account. The important point is that e and x can stand in a thematic relationship in (509) because both variables store evaluation pluralities.

(508) *Az éjszaka folyamán* ***egy-egy*** *gyerek* ***fel-fel****-ébredt.*
the night during **a-RED** child **PART-PART**-woke
'During the night, a (different) child kept waking up.'
SPEAKER COMMENT: Different children woke up and
there were multiple wakings.

(509) $\exists x[\overbrace{x > 1} \wedge \mathbf{atom}(x) \wedge \text{CHILD}(x)]$
$(\exists e[x > 1 \wedge \text{WAKE}(e) \wedge \text{AT.NIGHT}(e) \wedge \mathbf{ag}(e) = x])$

There is no problem if we do not have a dependent indefinite, as in (510). We just get repetition where the same individual child stored in x participates in a evaluation plurality of events stored in e.

(510) Brasoveanu & Farkas 2011, ex. 77
Az éjszaka folyamán egy gyerek ***fel-fel****-ébredt.*
the night during a child **PART-PART**-woke
'During the night, a child kept waking up.'
FALSE if there is only one waking event

(511) $\exists x[x = 1 \wedge \mathbf{atom}(x) \wedge \text{CHILD}(x)]$
$(\exists e[x > 1 \wedge \text{WAKE}(e) \wedge \text{AT.NIGHT}(e) \wedge ag(e) = x])$

I think that this is promising result.

A last advantage of this analysis is that we end up with an elegant picture of plurality in the determiner domain. Indefinites introduce variables that, in addition to being either domain singular or domain plural, can also be either evaluation singular or evaluation plural.

	Domain Singular	Domain Plural
evaluation singular	jun *one*	oxi' *three*
evaluation plural	jujun *one one*	oxox *three three*

Figure 6.1: Typology of indefinite plurality

Moreover, it is well know that reduplication is iconically associated with plurality (Gil, 1993, 2011). It is fitting then that dependent indefinites, which are often reduplicated indefinites, should have their primary contribution be a plurality, even if a distinguished subtype of plurality (see (Brasoveanu & Farkas, 2011) for a similar idea).

6.3 Conclusions

I made an extended argument in Part II of the dissertation for the need to recognize a new type of pluractionality that we have not encountered before, namely evaluation pluractionality. In formalisms that make use of sets of assignments, we can distinguish variables that are mapped to a plurality of entities under that set of assignments, regardless of whether these individuals are singular or plural entities in the domain. While the previous chapter was concerned with domain pluractionality, I have shown that the pluractional distributivity operator *-la'* introduces an event variable that is evaluation plural. In particular, it fills that variable with the atomic parts of the event given by existential closure. The suffix is distributive because it then forces each of those atomic events to stand in a thematic relation with a subpart of the verb's internal argument.

Though the analysis captured all of the core properties of *-la'*, the primary argument for an analysis in terms of evaluation plurality came from its interaction with dependent indefinites. I showed that Kaqchikel dependent indefinites, like dependent indefinites crosslinguistically, require covariation to be licensed. Crucially, both distributive pluractionality and bona fide distributive quantifiers license dependent indefinites, though only the latter are scope-taking. Since previous analyses closely tie the covariation dependent indefinites require to the incremental update scope-taking operators provide, the fact that such indefinites are licensed by distributive pluractionality is, at first pass, surprising. I showed that the puzzle can be resolved if dependent indefinites must covary with a evaluation plurality in a set set of output assignments. Then, if both distributive quantifiers and dependent indefinites introduce evaluation pluralities, we correctly predict that both license the appearance of dependent indefinites.

The primary result is a new analysis of dependent indefinites, but the implications for a theory of pluractionality are just as important. Distributivity is one of the core properties of quantificational operators in natural language. The fact that pluractionality can sometimes be distributive raises an important question about the connection between pluractionality and quantification. This chapter provides an answer to that question. Distributive pluractionals are not quantificational operators, but they have similar effects. That is, *-la'* is not a scope-taking operator that incrementally updates a variable assignment with respect to a variable it binds, but when we look at the output of interpreting a bona fide quantifier and *-la'*, we see something very similar. Both operators generate a plurality entities and distributive dependencies between those entities an another set of entities. With distributive quantifiers, the plurality corresponds to its set of restrictor entities, while the distributive dependencies hold between those entities and any individuals contributed by indefinites in its scope. With distributive pluractionality, the plurality is a evaluation plurality of events, while the distributive dependencies hold between those events and the individuals that are in the image a theta-role function with those events in its domain.

In the next chapter I continue with these themes of distributivity and pluractionality. The main difference is that it focuses on English and its so-called pluractionality adverbials, namely *one by one*, *piece by piece*, *dog after dog*. We are primarily interested in the ways such adverbials are similar and different to the derivational pluractionality we see in languages like Kaqchikel.

6.4 Going compositional

The heart of the analysis of pluractional distributivity, beyond its evaluation pluractionality, is that it structures the way the theme theta-role maps an event to its participants. We can give *-la'* a compositional treatment if it composes with a its theta-role first, and then its verb. In this way, *-la'* behaves like one of the type-shifting operators in (54-55) that allows a verb to compose with its thematic role.[9]

(512) Composing *-la'*
$\lambda\Theta_{\epsilon e}\lambda V_{\epsilon t}\lambda x\lambda e[V(e) \wedge \mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Parts}(e)$
$\wedge\, x' \in \mathbf{Parts}(x)) \wedge \Theta(e') = x']$

With the denotation of *-la'* in hand we can see how it composes with a verb and a depen-

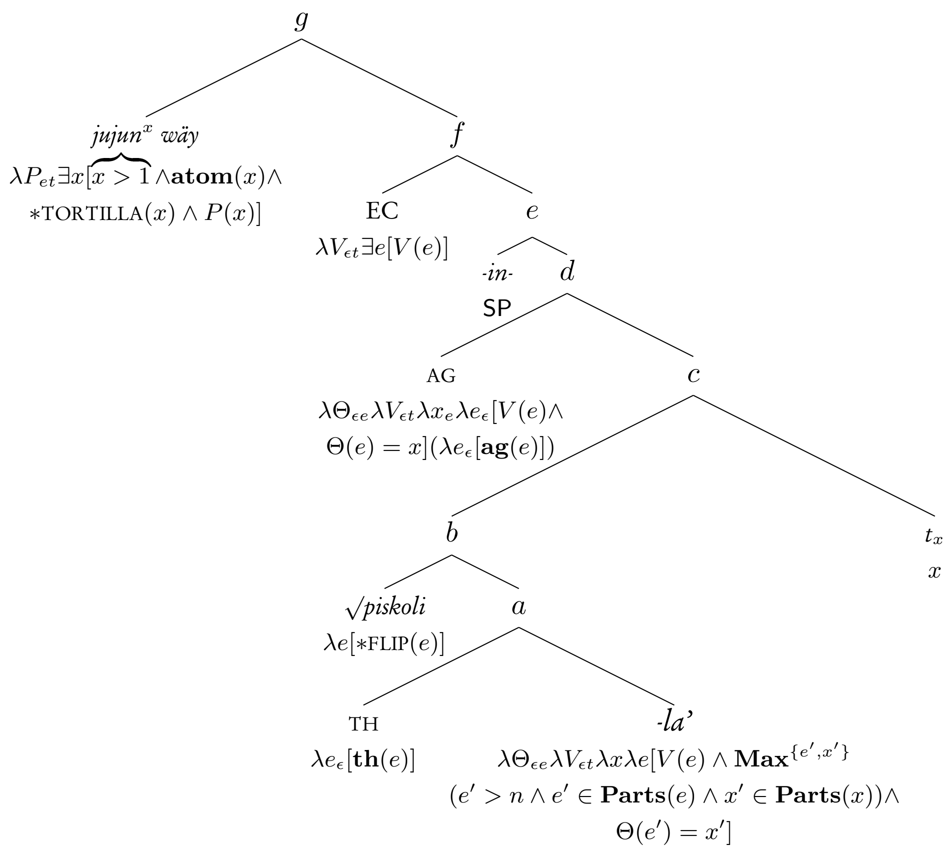
[9]We can easily force *-la'* to compose with $\mathbf{th}$ by adding a condition $\Theta = \mathbf{th}$, though we will not represent this in the following formulas.

dent indefinite internal argument. The tree in (514) gives the compositional translation of (513). The result is in (515g), which is just an abbreviation for the explicitly dynamic truth conditions in (516) that we have seen before in (490).

(513) *X-e'-in-piskoli-**la'*** *ju-jun* *wäy.*
COM-A3p-E1s-flip-PLRC a-RED tortilla
'I kept flipping tortillas one by one.'
FALSE if there is only one flipping event or if I keep flipping the same tortilla.

Note that I assume that quantifiers, including indefinites, move leaving a trace of type e. This is necessary for universal quantifiers, which must scope over existential closure if they are to license dependent indefinites. It is not necessary for indefinites to move, but it makes the composition cleaner.

(514) *Xe'inpiskolila' jujun wäy.* 'I kept flipping tortillas one by one'.



(515) a. $\lambda V_{\epsilon t} \lambda x \lambda e[V(e) \wedge \mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Parts}(e) \wedge x' \in \mathbf{Parts}(x)) \wedge \mathbf{th}(e') = x']$

b. $\lambda x \lambda e[*\text{FLIP}(e) \wedge \mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Parts}(e) \wedge x' \in \mathbf{Parts}(x)) \wedge \mathbf{th}(e') = x']$

c. $\lambda e[*\text{FLIP}(e) \wedge \mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Parts}(e) \wedge x' \in \mathbf{Parts}(x)) \wedge \mathbf{th}(e') = x']$

d. $\lambda e[*\text{FLIP}(e) \wedge \mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Parts}(e) \wedge x' \in \mathbf{Parts}(x)) \wedge \mathbf{th}(e') = x' \wedge \mathbf{ag}(e) = y]$

e. $\lambda e[*\text{FLIP}(e) \wedge \mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Parts}(e) \wedge x' \in \mathbf{Parts}(x)) \wedge \mathbf{th}(e') = x' \wedge \mathbf{ag}(e) = \mathsf{SP}]$

f. $\exists e[*\text{FLIP}(e) \wedge \mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Parts}(e) \wedge x' \in \mathbf{Parts}(x)) \wedge \mathbf{th}(e') = x' \wedge \mathbf{ag}(e) = \mathsf{SP}]$

g. via Quantifying-In[10]
$\exists x[\overbrace{x > 1} \wedge \mathbf{atom}(x) \wedge *\text{TORTILLA}(x) \wedge \exists e[*\text{FLIP}(e) \wedge \mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Parts}(e) \wedge x' \in \mathbf{Parts}(x)) \wedge \mathbf{th}(e') = x' \wedge \mathbf{ag}(e) = \mathsf{SP}]]$

(516) $[x] \wedge \overbrace{x > 1} \wedge \mathbf{atom}(x) \wedge *\text{TORTILLA}(x) \wedge [e] \wedge e = 1 \wedge *\text{FLIP}(e) \wedge \mathbf{Max}^{\{e',x'\}}(e' > n \wedge e' \in \mathbf{Atoms}(e) \wedge x' \in \mathbf{Atoms}(x)) \wedge \mathbf{th}(e') = x' \wedge \mathbf{ag}(e) = \mathsf{SP}$

[10] Which says that if $[\![\text{DP}^v]\!] = \alpha$ and $[\![\text{B}]\!] = \beta$ and DP^v and B are daughter of C, then $[\![\text{C}]\!] = \alpha(\lambda v[\beta])$, if well formed

Part III

Plural Events and Degrees

Chapter 7

English Pluractional Adverbials

7.1 Introduction

Verbs of variable telicity have played a central role in the understanding of the semantics of aspect and aspectual composition. At the heart of this literature are the INCREMENTAL THEME verbs, whose telicity is intimately wrapped up with object reference, as (517) shows. Very broadly, a verb phrase headed by one of these predicates is telic just in case its internal argument makes reference to a bounded quantity of stuff.

(517) a. John ate a tuna sandwich in 10 minutes / #for ten minutes.
b. John ate tuna #in 10 minutes / for ten minutes.
c. Mary built a house in three weeks / #for three weeks.
d. Mary built houses #in three weeks / for three weeks.

While incremental theme verbs are the prototypical verbs of variable telicity, the literature now recognizes at least two more subtypes: (i) the CHANGE OF STATE verbs in (518), and (ii) the DIRECTED MOTION verbs in (519).

(518) a. The crack widened for 30 sec / #in 30 sec.
b. The crack widened 10 inches #for 30 sec / in 30 sec.
c. The stalactite lengthened for a million years / #in a million years.
d. The stalactite lengthened to the floor #for a million years / in a million years.

(519) a. John walked for an hour / #in an hour.
b. John walked to the store #for an hour / in an hour.
c. The plane ascended for 5 minutes / #in 5 minutes.
d. The plane ascended 1000m #for 5 minutes / in 5 minutes.

Change of state and directed motion verbs present a challenge for classic analyses of incremental theme verbs because they do not entail that an argument's mereological constitution changes over the course of an event. For example, the seminal work of Krifka 1989, 1992 accounts for the contrasts in (517) by positing a special thematic role GRADUAL PATIENT, which requires a homomorphism between the subprocesses of a verb's event argument and the subparts of its internal argument. It should be clear that this type of account does not immediately extend to examples like (518-519). For example, the verb *ascend* does not relate the parts of an ascending object with the parts of an ascending event. While a Krifka-type account can be extended to account for change of state and directed motion verbs (Ramchand, 1997), a different strand of research aims, not to extend an analysis of incremental theme verbs to the other two classes, but to subsume all three under a more general theory of scalar change (Hay et al., 1999; Kennedy & Levin, 2008; Kennedy, in press). The idea is that all three classes of verbs describe how an individual changes over the course of an event along a particular dimension. For incremental theme verbs, the dimension is mereological constitution or extent. For directed motion verbs, it is an abstract path, and for change of state verbs, it is the particular scalar dimension encoded by the predicate itself.

Against this backdrop we take up the question of the adverbials in (520) and their semantic contribution, which previous authors have identified with pluractionality in languages like Kaqchikel (Beck & von Stechow, 2007; Brasoveanu & Henderson, 2009).

(520) a. John ate the cake **piece by piece**.
b. They searched the neighborhood **house by house**
c. The students left **one by one**.

This chapter argues that the modifiers in (520), hereafter X-BY-X adverbials, are degree-based pluractionals. In particular, I show that previous approaches, whether focused on plurality or distributivity, create predicates with an analog of Krifka's "gradual patient" property. Just as with Krifka's account of incremental theme verbs, these previous accounts miss generalizations when considering the interaction of X-BY-X adverbials with other verbs of scalar change. To fix these problems the account I propose puts scales first. The function of X-BY-X adverbials is to fix the unit of scalar change. For instance, the spatial extent of the cake in (520a) will, in the words of Tenny 1994, "measure out" the eating event in piece increments. In this way, X-BY-X adverbials come to behave like the pluractional derivations discussed in previous chapters. They generate predicates of plural events by structuring the way a predicate's event argument is related to a functionally related domain, here the domain of degrees.

The chapter is structured as follows. Section 7.2 presents the basic data and previous analyses of X-BY-X adverbials. It shows how these analyses, while different, are closely related to the notion of gradual patient in the work of Krifka 1989, 1992. Section 7.3 then presents a series of new generalizations that are problematic for previous approaches and which support an analysis of X-BY-X adverbials that makes reference to scales. The analysis of these new generalizations comes in section 7.4, while section 7.5 concludes.

7.2 Basic data and previous approaches

There are two different X-BY-X constructions, which are distinguished morphologically. The first substitutes a numeral for the variable X, while the second substitutes a common noun.

(521) a. The students left one by one.
b. John killed ants two by two.

(522) a. Susan ate the cake piece by piece.
b. Bill climbed the ladder rung by rung.

Previous authors show that these two subtypes of the X-BY-X construction have different distributional properties (Brasoveanu & Henderson, 2009), but all previous accounts of X-BY-X adverbials aim to give the two subtypes a minimally different semantics, where one is an extension of the other (Beck & von Stechow, 2007; Brasoveanu & Henderson, 2009). One place where the two previous treatments of X-BY-X adverbials differ concerns which subtype is taken as basic. Therefore, in introducing the basic facts about the X-BY-X construction, I rely on Brasoveanu & Henderson 2009 for NUM-BY-NUM adverbials and Beck & von Stechow 2007 for N-BY-N adverbials.

7.2.1 Num-by-Num

Brasoveanu & Henderson 2009 are primarily focused on the distributive entailments generated by NUM-BY-NUM adverbials, especially *one by one*. In particular, the goal is to compare these adverbials to more familiar distributive operators. In service of this goal, Brasoveanu & Henderson (2009) present three generalizations about the distribution of NUM-BY-NUM adverbials: (i) NUM-BY-NUM needs a nominal target, (ii) the target must be semantically plural, and (iii) the target must be local—basically clausemates with the adverbial.

Types of Nominal Targets:

NUM-BY-NUM adverbials target nominals in a wide variety of argument and adjunct positions.[1]

(523) Subjects:

a. One by one, 63 North Koreans stepped through the heavily fortified border zone.

b. The sucker holes closed, one by one.

(524) Direct objects

a. One by one, he eliminates the contestants.

b. I brought him my singers one by one.

(525) Prepositional phrases:

a. Joe came back for the boxes, one by one.

b. He waved forked fluorescent scanners over the vials one by one to catch anything in the solutions that didn't register chemically.

c. He was followed, one by one, by his companions.

While there are very few constraints on the syntactic function of nominals NUM-BY-NUM can target, a target is necessary. In a corpus of over 1000 examples of sentences with *one by*

[1] All of the examples here come from Brasoveanu & Henderson 2009. Importantly, all of their examples, unless otherwise noted, come from Corpus of Contemporary American English (COCA, `www.americancorpus.org`) – a large, balanced corpus of 385 million (M) words that includes 20M words each year from 1990-2008, divided among spoken, fiction, popular magazines, newspapers and academic texts (78.8M, 74.9M, 80.7M, 76.3M and 76.2M, respectively). There are 2774 tokens of *one by one* in COCA, i.e., approx. 7 tokens per 1M words (spoken 4/M, fiction 19.7/M, magazines 6.1/M, newspapers 4.3/M, academic 2.1/M)

one culled from COCA, Brasoveanu & Henderson 2009 only found one counterexample to the generalization that NUM-BY-NUM adverbials need a plural nominal target.

(526) [Inside an old factory building in Cambridge, Mass., a remarkable machine with the improbable name Zeus is hard at work. Flexing its two robotic arms, the computer-driven device reaches again and again into a storage area the size of a toddler's crib, where thousands of individual samples of genetic material sit in tiny wells etched into plastic plates, each one identified by a unique bar code.]
One by one, Zeus searches for a particular code, dips into the corresponding well with a fine, quill-like probe and picks up a minuscule droplet of liquid DNA.

(527) [Compare with:] Sample by sample, Zeus searches for a particular code.

While attested, it is quite clear that even (526) is quite degraded. This is made particularly clear by the contrast with (527), which has an N BY N adverbial. In fact, Brasoveanu & Henderson (2009) show that it is a general property of N BY N adverbials that they do not need a plural nominal target, or even a clear nominal target at all like (527).

(528) I tore the house down { ✓brick by brick / *one by one }.

(529) The city ordered the demolition to be done { ✓brick by brick / *one by one }.

(530) The houses were not earthquake-proof, so the city ordered the demolition of the neighborhood { ✓house by house / *one by one }.

(531) John gathered stones for the new path and patiently built it { ✓stone by stone / *one by one }.

The contrast between NUM-BY-NUM and N-BY-N adverbials in terms of the nominal targets leads Brasoveanu & Henderson (2009) to argue that a unified account of X-BY-X adverbials is not possible. Section 7.2.1 argues for a partial unification, where both subtypes of X-BY-X adverbials need access to a scale along which incremental change is taking place. The difference is that N-BY-N adverbials must use the measure introduced by the verb, while NUM-BY-NUM brings along its own measure in the form of cardinality.

Plurality of the Nominal Target

In addition to needing a nominal target, NUM-BY-NUM adverbials require their target to be semantically, though not morphologically, plural. The following examples show that *one by one* is grammatical with a variety of morphologically singular nominal targets that have plural semantics.

(532) Group-denoting nouns:

a. His party gradually peeled off, one by one, on the approaches.

b. One by one that baffled, costumed crew slunk away into the shadows.

c. She said good-bye to her staff one by one.

(533) Conjoined NPs:

a. Jan dredged from a Safeway bag, one by one, a can of baby corn cobs, a tin of Norwegian sardines, and a glass jar crammed with tiny white cocktail onions.

b. In the next hour, a manager, a lawyer and three publicists will, one by one, approach Ms. Paltrow's table.

(534) Quantifiers headed by *every* / *each*:

a. One by one, every student present began to applaud.

b. Papa isn't saying anything and Mama is just looking at everyone, one by one, around and around, like she's waiting.

c. One by one, Pepe debunks every conceivable component of Don Inocencio's ideological convictions.

d. The provost called each man in the company one by one to be interviewed.

e. One by one each tells his story of life around the King of Kings.

(535) Pseudo-partitives:

a. A squad of unknown terrorists walked one by one into several subway stations during the peak of rush hour Friday afternoon.

b. A big crowd of students stood in front of the door, waiting to be called in, one by one.

c. One by one, he dropped on the table a series of snapshots he had taken.

(536) Partitives, including partitives based on *most* / *each*:

a. Linguini watches – stunned – as, one by one, the rest of the staff exits.

b. Then, one by one, at several-minute intervals, each of us sets out on a solitary walk.

Locality of the nominal target

Finally, Brasoveanu & Henderson (2009) show that the NUM-BY-NUM adverbials must be clausemates with the nominals they target (where "clausemate" has to be more carefully defined to deal with causatives and focus-background domains). Their arguments come from two sources. First, the intuitions are clear that *one by one* cannot target a nominal outside of tensed clause embedded in an adjunct.[2]

(537) a. When, **one by one**, *their units* were ACTIVATED, Mr. Lozano slowly realized that if war in the Persian Gulf came his family could be wiped out.

b. ***One by one**, when their units were activated, Mr. Lozano slowly realized that if war in the Persian Gulf came his family could be wiped out.

c. *When their units were activated, Mr. Lozano slowly realized that if war in the Persian Gulf came **one by one**, his family could be wiped out.

d. When their units were activated, Mr. Lozano slowly realized that if war in the Persian Gulf came, *his family* could be WIPED OUT **one by one**.

[2] In the following examples, the target of *one by one* is italicized, while the verbal predicate it modifies *one by one* is given in small caps.

(538) a. If *the students* ARRIVE **one by one**, tell them to come back when I can examine them.

b. If the students arrive, TELL *them* **one by one** to come back when I can examine them.

c. If the students arrive, tell them to *PRO* COME BACK **one by one** when I can examine them.

d. If the students arrive, tell them to come back when I can EXAMINE *them* **one by one**.

The second argument for the clause-boundedness of NUM-BY-NUM modification is that it can operate over conjoined predicates just in case it syntactically scopes over both conjuncts. Examples provided in (539) and (540) present the relevant contrasts.

(539) a. Over those busy decades, as **one by one** *our nestlings* FLEDGED and TOOK WING ... (✓fledge one by one)

b. Over those busy decades, as *our nestlings* fledged and **one by one** TOOK WING ... (*fledge one by one)

(540) a. It was sad that **one by one** *our nestlings* FLEDGED and TOOK WING. (✓take wing one by one)

b. It was sad that **one by one** *our nestlings* FLEDGED and that they took wing. (*take wing one by one)

To summarize, Brasoveanu & Henderson 2009 proposes that the distribution of NUM-BY-NUM adverbials can be characterized by three generalizations: (i) they must have access to a nominal target, (ii) the nominal target must be semantically plural, and (iii) the target must a clausemate with the NUM-BY-NUM adverbial, where clausemate means something like argument or adjunct to the same verbal predicate the NUM-BY-NUM adverbial modifies.

The analysis in Brasoveanu & Henderson 2009

On the syntactic side, Brasoveanu & Henderson 2009 assumes that arguments and adjuncts, when introduced, pass on a theta-role index that percolates up and down some local subtree. Furthermore, NUM-BY-NUM is indexed by the theta-role it targets and this index can only be drawn from those that are on the tree *one by one* modifies. They argue that his kind of system can capture the constrained flexibility of NUM-BY-NUM modification.

On the semantic side, a NUM-BY-NUM adverbial like *one by one* has a translation like (541) below.

(541) *one by one*$_\theta$ $\rightsquigarrow \lambda\mathbf{E}_{\epsilon t}.\lambda\mathbf{e}_\epsilon.\mathbf{E}(\mathbf{e}) \wedge$
$\mathbf{linear.order}(\{\mathbf{e}' \leq \mathbf{e} : \mathbf{atom}(\mathbf{e}')\}) \wedge$
$|\{\theta(\mathbf{e}') : \mathbf{e}' \leq \mathbf{e} \wedge \mathbf{atom}(\mathbf{e}')\}| > 1 \wedge$
$\forall \mathbf{e}' \leq \mathbf{e}(\mathbf{atom}(\mathbf{e}') \rightarrow \mathbf{atom}(\theta(\mathbf{e}')))$

We can see here that an NUM-BY-NUM adverbial requires that the event argument be a plural event and the indexing theta-role must map that event to a plural individual. The event's parts must be temporally sequenced and each atomic part must be mapped by the indexing theta-role to an individual of the cardinality given by NUM, in this case, *one* or equivalently, by the predicate **atom**. The translation for sentence like (542) is provided in (543) below and a picture of the resulting interpretation is shown in (544).

(542) The$^{\mathbf{ag}}$ boys recited 'The Raven'$^{\mathbf{th}}$ one by one$_{\mathbf{ag}}$.

(543) $\exists \mathbf{e}_\epsilon(\text{RECITE}(\mathbf{e}) \wedge \mathbf{th}(\mathbf{e}) = \text{THE-RAVEN} \wedge$
$\mathbf{ag}(\mathbf{e}) = \sigma x.{}^{*}\text{BOY}(x) \wedge \mathbf{runtime}(\mathbf{e}) \prec \mathbf{t}_{now} \wedge$
$\mathbf{linear.order}(\{\mathbf{e}' \leq \mathbf{e} : \mathbf{atom}(\mathbf{e}')\}) \wedge$
$|\{\mathbf{ag}(\mathbf{e}') : \mathbf{e}' \leq \mathbf{e} \wedge \mathbf{atom}(\mathbf{e}')\}| > 1 \wedge$
$\forall \mathbf{e}' \leq \mathbf{e}(\mathbf{atom}(\mathbf{e}') \rightarrow \mathbf{atom}(\mathbf{ag}(\mathbf{e}'))))$

(544)
$$\begin{array}{lcccccc} \mathbf{e} & = & \mathbf{e}_1 & \oplus & \mathbf{e}_2 & \oplus & \dots \\ & & \mathbf{atom}(\mathbf{e}_1) & & \mathbf{atom}(\mathbf{e}_2) & & \dots \\ & & \mathbf{runtime}(\mathbf{e}_1) & \prec & \mathbf{runtime}(\mathbf{e}_2) & \prec & \dots \\ the.boys & = & boy_1 & \oplus & boy_2 & \oplus & \dots \\ & & \mathbf{atom}(boy_1) & & \mathbf{atom}(boy_2) & & \dots \\ & & \mathbf{ag}(\mathbf{e}_1) = boy_1 & & \mathbf{ag}(\mathbf{e}_2) = boy_2 & & \dots \end{array}$$

The formula in (543) is true just in case there is an event $\mathbf{e}$ of reciting 'The Raven', which has at least two atomic parts that are linearly ordered by time, and which are mapped by $\mathbf{ag}$ to two different parts of the sum of some contextually salient boys.

While Brasoveanu & Henderson (2009) discuss N-BY-N adverbials, they do not provide an analysis of them. A minimal extension of their account, though, would treat them like in (545).

(545) $N\,by\,N_\theta \rightsquigarrow \lambda \mathbf{E}_{\epsilon t}.\lambda \mathbf{e}_\epsilon.\mathbf{E}(\mathbf{e}) \wedge$
$\mathbf{linear.order}(\{\mathbf{e}' \leq \mathbf{e} : \mathbf{atom}(\mathbf{e}')\}) \wedge$
$|\{\theta(\mathbf{e}') : \mathbf{e}' \leq \mathbf{e} \wedge \mathbf{atom}(\mathbf{e}')\}| > 1 \wedge$
$\forall \mathbf{e}' \leq \mathbf{e}(\mathbf{atom}(\mathbf{e}') \rightarrow \overset{\rightsquigarrow}{N}(\theta(\mathbf{e}')))$

The resulting translation for sentence (546) is provided in (547) below. The plural event $\mathbf{e}$ of eating is broken into atomic subevents $\mathbf{e}'$ that satisfy three properties: (*i*) the subevents are temporally sequenced, (*ii*) they involve more than one entity as their theme and (*iii*) each and every one of their themes is a piece. That each such piece is actually a piece of cake follows from the fact that the macro-event $\mathbf{e}$ has the cake as its theme.

(546) John ate the$^{\mathbf{th}}$ cake piece by piece$_{\mathbf{th}}$.

(547) $\exists \mathbf{e}_\epsilon(\text{EAT}(\mathbf{e}) \wedge \mathbf{th}(\mathbf{e}) = \sigma x.\text{CAKE}(x) \wedge \mathbf{ag}(\mathbf{e}) = \text{JOHN} \wedge \mathbf{runtime}(\mathbf{e}) \prec \mathbf{t}_{now} \wedge$
$\mathbf{linear.order}(\{\mathbf{e}' \leq \mathbf{e} : \mathbf{atom}(\mathbf{e}')\}) \wedge$
$|\{\mathbf{th}(\mathbf{e}') : \mathbf{e}' \leq \mathbf{e} \wedge \mathbf{atom}(\mathbf{e}')\}| > 1 \wedge$
$\forall \mathbf{e}' \leq \mathbf{e}(\mathbf{atom}(\mathbf{e}') \rightarrow \text{PIECE}(\mathbf{th}(\mathbf{e}'))))$

This analysis, of course, ignores the important fact that N-BY-N adverbials, but not NUM-BY-NUM adverbials, are grammatical without an overt nominal target. Since Brasoveanu & Henderson 2009 are committed to the idea that X-BY-X modification is mediated by theta-role functions, they would have to say that these cases involve oblique roles that need not be licensed by overt syntactic material, like MANNER, TEMPORAL, or LOCATIVE roles. (Though accessing these roles would somehow have to be banned under NUM-BY-NUM modification.) The exact implementation is not so important because in section 7.3 I present data that is independently troublesome for the account in Brasoveanu & Henderson 2009. It is important to lay out a tentative extension to N-BY-N adverbials, though, in order to see how it would deal with the relevant data.

7.2.2 N-by-N

Beck & von Stechow (2007) treat the N-BY-N construction as basic and use its analysis as the basis for the account of a variety of pluractionality adverbials. Unlike Brasoveanu & Henderson 2009, they are not primarily interested in distributivity, but in how verb phrases come to denote predicates of pluralities, especially under modification by adverbials like those in (548).

(548) a. John ate the cake **piece by piece**.
b. She went through the book **page by page**.
c. Bill climbed the ladder **rung by rung**.

Beck & von Stechow 2007 do not provide any generalizations about the distribution of pluractional adverbials not in Brasoveanu & Henderson 2009. Their primary aim is to generate the bottom line truth conditions of sentences like (548a), which they give as (549).

(549) (548a) is true of an event e iff the relevant division of the cake is into pieces, and each piece was eaten by John in a relevant subevent of e, and each relevant subevent of e is an eating of one of the pieces by John.

To generate the intuitively correct truth conditions in (549), Beck & von Stechow (2007) take the term "pluractionality" at face value and introduce syntactically-covert pluralization operators, defined basically as in (550) below (see Beck & von Stechow 2007, pg. 234, ex. 66)).[3]

(550) $PL \rightsquigarrow \lambda Cov.\lambda R_{e(\epsilon t)}.\lambda x_e.\lambda \mathbf{e}_\epsilon.$
$PARTITION(Cov, \mathbf{e} \oplus x) \wedge [{}^{**}\lambda y_e.\lambda \mathbf{e}'_\epsilon.Cov(\mathbf{e}') \wedge Cov(y) \wedge R(y)(\mathbf{e}')](x)(\mathbf{e})$

The operator PL applies to a cover, a relation R between individuals and events of type $e(\epsilon t)$, a plural individual x and a plural event $\mathbf{e}$ and requires: (*i*) the cover to be a partition of (the sum of) the plural event and the plural individual and (*ii*) each pair of subparts in the cover to satisfy the relation R. The operator ** is cumulative closure over relations: for any R of type $e(\epsilon t)$, ${}^{**}R$ is the smallest relation such that $R \subseteq {}^{**}R$ and, if $\langle x, \mathbf{e}\rangle, \langle y, \mathbf{e}'\rangle \in {}^{**}R$, then $\langle x \oplus y, \mathbf{e} \oplus \mathbf{e}'\rangle \in {}^{**}R$.

The contribution of pluractional adverbials is to further constrain the cover over individuals Cov that the pluralization operator PL requires. For example, the adverbial *piece by piece* requires each y that is a part of x (according to Cov) to be a piece (see (67c) and (70) in Beck & von Stechow 2007, pg. 234-235). The example in (551) below is assigned the logical

[3] In fact, the paper is built as an argument for the pervasiveness of cover-based, two place pluralization operators like (550) in natural language.

form (LF) in (552) and is compositionally interpreted as shown in (553) (see Beck & von Stechow 2007, pg. 234, ex. 67). To derive the intuitively-correct interpretation, the direct object *the cake* has to be QR-ed and, crucially, we need to assume that the λ-abstractor associated with the QR-ed direct object is syntactically independent from it. This is needed because the pluralization operator PL_{Cov} and the adverbial *piece by piece* have to be tucked between the QR-ed object and its associated λ-abstractor.

(551) John ate the cake piece by piece.

(552) [the cake]$_2$ [PL_{Cov} [piece by piece [$\lambda 2$ [John ate t_2]]]]

(553) $\exists \mathbf{e}(\mathbf{runtime}(\mathbf{e}) \prec \mathbf{t}_{now} \wedge PARTITION(Cov, \mathbf{e} \oplus \text{THE-CAKE}) \wedge$
$\langle \mathbf{e}, \text{THE-CAKE} \rangle \in {}^{**}\lambda y.\lambda \mathbf{e}'.Cov(y) \wedge Cov(\mathbf{e}') \wedge \text{PIECE}(y) \wedge \text{EAT}(\mathbf{e}', \text{JOHN}, y))$

Example (553) gives exactly those intuitively correct truth conditions in (549). The sentence is true just in case you can divide the eating event and the cake in to event-piece pairs, each of which is satisfies the eating relation with John as its agent.

The approach detailed above can also handle those cases where N-BY-N modification does not have a nominal target, though Beck & von Stechow (2007) do not seem to have noticed these examples. What they would have to say is that in the absence of a QR'ed nominal target, there is existential closure over the individual argument of the predicate *PARTITION*. (Though existential closure would somehow have to be banned under NUM-BY-NUM modification.) This type of treatment overgenerates because it is not generally possible to drop arguments in the presence of N-BY-N, but it should cover the attested cases.

While Beck & von Stechow (2007) do not discuss *one by one* explicitly, they indicate that it should be analyzed as *piece by piece* (see the discussion and examples on pp. 215-217). Thus, *one by one* presumably requires each individual in the cover to be atomic, and the example in (554) below is interpreted as shown in (556), based on the LF in (555).

(554) John ate the cakes one by one.

(555) [the cakes] [PL_{Cov} [one by one [$\lambda 2$ [John ate t_2]]]]

(556) $\exists \mathbf{e}(\mathbf{runtime}(\mathbf{e}) \prec \mathbf{t}_{now} \wedge PARTITION(Cov, \mathbf{e} \oplus \text{THE-CAKES}) \wedge$
$\langle \mathbf{e}, \text{THE-CAKES} \rangle \in {}^{**}\lambda y.\lambda \mathbf{e}'.Cov(y) \wedge Cov(\mathbf{e}') \wedge \mathbf{atom}(y) \wedge \text{EAT}(\mathbf{e}', \text{JOHN}, y))$

Ignoring the linear-ordering requirement, Beck & von Stechow (2007) would capture the intuitively-correct interpretation for examples like (554), just like Brasoveanu & Henderson 2009.

7.2.3 Recasting incrementality

At first blush, the analyses of Brasoveanu & Henderson 2009 and Beck & von Stechow 2007 look very different. In the former, X-BY-X adverbials encapsulate a theta-role function, while in the latter, they constrain a pluractionality operator. These same semantic differences lead to radically different syntax-semantics interfaces. In spite of these differences, I show here that the analyses have one deep similarity, namely they recast Krifka-style incrementality familiar from his work on verbs of variable telicity (Krifka, 1992, 1998). I then show that the connections between pluractional adverbials and verbs of incremental change are closer than previously acknowledged and that the data are troublesome for previous accounts. This sets the stage for the analysis in section 7.4.

Recall that the analysis of incremental theme verbs in Krifka 1992, 1998 has two parts—incrementality and quantization. Incrementality refers to the homomorphism between the denotation of a theme argument to the progress of an event. It allows one to know how much of an event has transpired by examining its patient. Quantization is a property of predicates whose members do not have proper parts also in the extension of the predicate. Combined with incrementality, quantization predicts telicity. The reason is that quantized predicates denote bounded entities, and those bounds determine an endpoint for an incremental verb. If an incremental verb's theme argument is not quantized then there is not enough information to determine, based on the theme's denotation alone, when the event culminates.

It should be clear that incrementality under this account is a necessary property of verbs showing variable telicity dependent on object reference. Krifka 1998 formalizes the critical property in the following way. A verb is incremental just in case it's theme-role satisfies, MAPPING TO SUBEVENTS, MAPPING TO SUBOBJECTS, UNIQUENESS OF EVENTS, and UNIQUENESS OF OBJECTS.

(557) Mapping to subevents:
$\forall x, y, e[\mathbf{th}(e) = x \wedge y \leq x \wedge \neg y = x \rightarrow \exists e'[e' \leq e \wedge \neg e = e' \wedge \mathbf{th}(e') = y]]$

'If y is a proper part of x and x is the theme of e, then there is an e' that is a proper part of e and y is its theme.'

(558) Mapping to subobjects:
$\forall x, e, e'[\mathbf{th}(e) = x \wedge e' \leq e \wedge \neg e = e' \rightarrow \exists y[y \leq x \wedge \neg y = x \wedge \mathbf{th}(e') = y]]$

'If e' is a proper part of e and x is the theme of e, then there is a theme of e' that is the proper part of x.'

(559) Uniqueness of events:
$\forall x, y, e[\mathbf{th}(e) = x \wedge y \leq x \rightarrow \exists! e'[e' \leq e \wedge \mathbf{th}(e') = y]]$

'If x is the theme of e and y is a part of x, then there is a unique part of e that has y as its theme.'

(560) Uniqueness of objects:
$\forall x, e, e'[\mathbf{th}(e) = x \wedge e' \leq e \rightarrow \exists! y[y \leq x \wedge \mathbf{th}(e') = y]]$

'If x is the theme of e and e' is its part, then there is a unique part of x that is its theme.'

Note that these four properties make reference to arbitrary parts of the event and theme arguments. What Brasoveanu & Henderson 2009 and Beck & von Stechow 2007 do is derive verbs that satisfy more restricted versions of these four properties. Take for instance, the sentence (561) and its analysis in (562-563).

(561) John ate the$^{\mathbf{th}}$ cake piece by piece$_{\mathbf{th}}$.

(562) Brasoveanu & Henderson 2009
$\exists \mathbf{e}_{\epsilon}(\text{EAT}(\mathbf{e}) \wedge \mathbf{th}(\mathbf{e}) = \sigma x.\text{CAKE}(x) \wedge \mathbf{ag}(\mathbf{e}) = \text{JOHN} \wedge \mathbf{runtime}(\mathbf{e}) \prec \mathbf{t}_{now} \wedge$
$\mathbf{linear}.\mathbf{order}(\{\mathbf{e}' \leq \mathbf{e} : \mathbf{atom}(\mathbf{e}')\}) \wedge$
$|\{\mathbf{th}(\mathbf{e}') : \mathbf{e}' \leq \mathbf{e} \wedge \mathbf{atom}(\mathbf{e}')\}| > 1 \wedge$
$\forall \mathbf{e}' \leq \mathbf{e}(\mathbf{atom}(\mathbf{e}') \rightarrow \text{PIECE}(\mathbf{th}(\mathbf{e}'))))$

(563) Beck & von Stechow 2007
$\exists \mathbf{e}(\mathbf{runtime}(\mathbf{e}) \prec \mathbf{t}_{now} \wedge PARTITION(Cov, \mathbf{e} \oplus \text{THE-CAKE}) \wedge$
$\langle \mathbf{e}, \text{THE-CAKE} \rangle \in {}^{**}\lambda y.\lambda \mathbf{e}'.Cov(y) \wedge Cov(\mathbf{e}') \wedge \text{PIECE}(y) \wedge \text{EAT}(\mathbf{e}', \text{JOHN}, y))$

Any theta-role satisfying (563) has to satisfying the following mapping principles.[4] Notice that instead of talking about arbitrary parts of the event and theme arguments, we talk about parts in partition of the contextually specified cover. Furthermore, the individual argument parts must satisfy the predicate PIECE.

[4] We could provide a similar translation in the framework of Brasoveanu & Henderson 2009, but it is more complicated because the analysis assumes the existence of atomic events, while Krifka 1998 does not.

(564) PIECE-based mapping to subevents:
$\forall x, y, e[\mathbf{th}(e) = x \wedge y \in PARTITION(Cov, e \oplus x) \wedge \neg y = x \wedge \text{PIECE}(y) \rightarrow \exists e'[e' \in PARTITION(Cov, e \oplus x) \wedge \neg e = e' \wedge \mathbf{th}(e') = y]]$

'If y satisfies PIECE and is a contextually salient proper part of x, and x is the theme of e, then there is an e' that is a contextually salient proper part of e and y is its theme.'

(565) PIECE-based mapping to subobjects:
$\forall x, e, e'[\mathbf{th}(e) = x \wedge e' \in PARTITION(Cov, e \oplus x) \wedge \neg e = e' \rightarrow \exists y[y \in PARTITION(Cov, e \oplus x) \wedge \neg y = x \wedge \text{PIECE}(y) \wedge \mathbf{th}(e') = y]]$

'If e' is a contextually salient proper part of e and x is the theme of e, then there is a theme of e' that satisfies PIECE and is a contextually salient proper part of x.'

We could provide a similar translation of the uniqueness properties, but it should be clear how to do so. More important is to see that what the analyses in Brasoveanu & Henderson 2009 and Beck & von Stechow 2007 do is enforce a Krifka-style incremental relationship between the event and one of its arguments. Neither of the previous analyses recognize this relationship. The next section shows that, in doing so, they miss a series of generalizations about the distribution of pluractional adverbials. What I argue is that instead of recasting Krifka-style incrementality, N-BY-N adverbials elaborate on an incremental relationship provided by the verb. In the case of (561) it would be the relationship between the progress of the event and the extent of the cake provided by the incremental theme verb *eat*. The special properties of NUM-BY-NUM modification will fall out from the fact that measuring the progress of an event via the cardinality of one of its arguments is more freely available, but crucially dependent on an overt argument that is semantically plural.

7.3 Scales and X-by-X adverbials

We have seen how previous accounts of X-BY-X adverbials draw close, though unrecognized connections to the incrementality of incremental theme verbs. When we consider the wider class of scalar change verbs, of which incremental theme verbs are only a part, it will be clear that an account of X-BY-X modification based on part-whole relationships between events and (possibly covert) arguments is untenable. Instead, I argue that X-BY-X adverbials must make reference to scales within a theory of verbs of scalar change that includes incremental theme verbs as a subtype. For the moment I focus on N-BY-N adverbials, putting aside NUM-BY-NUM modification which behaves slightly differently. Once an analysis of N-BY-N adverbials has been developed in section 7.4, I show how to extend it to account for NUM-BY-NUM.

Given the formal connections revealed in the previous section, it is not surprising that the examples of N-BY-N modification discussed in depth in Beck & von Stechow 2007 and Brasoveanu & Henderson 2009 involve incremental theme verbs. The analyses are tailor made to handle these kinds of examples. But just like accounts that try to extend a Krifka-style account of incremental theme verbs to all verbs of variable telicity, previous accounts of N-BY-N modification run into problems with change of state and inherently directed motion verbs.

(566) Change of state verbs

a. The crack widened **inch by inch**.

b. I warmed the patient **degree by degree** until he was no longer in danger.

c. The turkey was fattened **pound by pound**.

d. The artist lightened the portrait **shade by shade** until she was pleased with the composition.

e. **Penny by penny** the price increased.

(567) Inherently directed motion verbs

a. The plane descended **meter by meter** until it reached a safe altitude.

b. **Step by step** John ascended the mountain.

c. **Block by block** the police approached the seized bank.

d. They lowered the basket **inch by inch**.

e. The interest rate was slowly raised **percentage point by percentage point**.

The problem these examples present is that the N-BY-N adverbials do not match up the parts of an event with the parts of an argument in the way that previous authors suppose. In (566d), no part of the portrait is a shade and in (567b), no part of John is a step. Instead, these examples show N-BY-N adverbials elaborating on the incremental change of an argument along a scale lexically associated with the verb.

We might want to try to extend one of the previous analyses by making reference to a degree argument, but this type of an approach faces serious hurdles. The problem with extending the analysis in Brasoveanu & Henderson 2009 is that there is no relevant theta-role mapping events to degrees on a scale. Moreover, we do not want elaborate on arbitrary degrees, but degrees that tell us something about how a particular individual changes over the course of an event. For example, we cannot interpret (566d) so that the artist is changing shades. This suggests that *shade by shade* has a nominal target, but instead of looking at parts of nominal target, we consider the degree of change that target undergoes during subparts of the event relative to a property scale.

Beck & von Stechow 2007 is not cast in terms of thematic relations, so in principle the pluractional operator and the N-BY-N adverbial could target the degree argument of a scalar predicate as in (568).

(568) The plane descended meter by meter.
$\exists \mathbf{e} \exists \mathbf{d}(\mathbf{runtime}(\mathbf{e}) \prec \mathbf{t}_{now} \wedge PARTITION(Cov, \mathbf{e} \oplus \mathbf{d}) \wedge$
$\langle \mathbf{e}, \mathbf{d} \rangle \in {}^{**}\lambda \mathbf{d}'.\lambda \mathbf{e}'.Cov(\mathbf{d}') \wedge Cov(\mathbf{e}') \wedge \text{METER}(\mathbf{d}') \wedge$
$\text{DESCEND}(\mathbf{e}', \text{THE-PLANE}, \mathbf{d}'))$

The problem with (568) is that it is cast in terms of parts and wholes. While we can treat degree scales as mereologies (Szabolcsi & Zwarts, 2003; Lassiter, 2010), the mereological sum operator, which is used above to define the $**$-operator and the contextually salient partition, is different than the degree sum operator that we need. In particular, $\oplus$ must be idempotent (i.e., $a \oplus a = a$). This means that if d is one meter and so is d', then their sum is just one meter. The result is that (568) is false unless the plane descended exactly one meter, which is clearly wrong. The problem is that the account in Beck & von Stechow 2007 is about parts, wholes and pluralities, where the data in (566-567) reveal a close connection between N BY N adverbials and scales.

The data in (566-567) show that N-BY-N adverbials can set the increment for a verb of scalar change, but they do not show that N-BY-N modification is dependent on verbs of scalar change. There are three arguments that this is the case, which is entirely unexpected based on previous accounts of pluractional adverbials. First, if N-BY-N adverbials must make reference to scales, then they should be ungrammatical with verbs of nonscalar change. As Levin & Rappaport Hovav (2010) discusses, verbs of nonscalar change come in two types and describe changes that cannot be characterized as an ordered set of degrees. The first type lack an ordering relation. The second are in some sense, too complex to isolate a scale of change. Both types of verbs resist modification by N-BY-N adverbials. In fact, it is hard for speakers to even think of potential N-BY-N adverbials to modify such predicates.

(569) Verbs of change without an order
  a. The ball floated #foot by foot/#gust by gust/#throw by throw/#day by day
  b. The top spun #inch by inch/#circle by cirle/#twist by twist
  c. The dancer whirled #step by step/#song by song/#minute by minute

(570) Verbs of complex changes
  a. John exercised #step by step/#machine by machine/#drill by drill/#gym by gym

b. Susan waved #hand by hand/#foot by foot

c. George shuddered #chill by chill/#extremity by extremity/#flurry by flurry

It isn't even possible to target the subparts of an individual with N-BY-N adverbials that modify predicates like these.

(571) a. #The ballerinas whirled dancer by dancer.

b. #The graduating seniors waved student by student.

c. #The platoon exercised soldier by soldier.

The treatment of N-BY-N adverbials under previous analyses do not predict this kind of infelicity. For example, Brasoveanu & Henderson 2009 would give (571a) the translation in (572), which is perfectly coherent. It is true if the ballerinas are the agent of a whirling event whose atomic parts are linearly ordered and have dancers as agents.

(572) $$\exists \mathbf{e}_{\epsilon}(\text{WHIRL}(\mathbf{e}) \wedge \mathbf{ag}(\mathbf{e}) = \sigma x. * \text{BALLERINAS}(x) \wedge \mathbf{runtime}(\mathbf{e}) \prec \mathbf{t}_{now} \wedge \\ \mathbf{linear.order}(\{\mathbf{e}' \leq \mathbf{e} : \mathbf{atom}(\mathbf{e}')\}) \wedge \\ |\{\mathbf{ag}(\mathbf{e}') : \mathbf{e}' \leq \mathbf{e} \wedge \mathbf{atom}(\mathbf{e}')\}| > 1 \wedge \\ \forall \mathbf{e}' \leq \mathbf{e}(\mathbf{atom}(\mathbf{e}') \rightarrow \text{DANCER}(\mathbf{ag}(\mathbf{e}'))))$$

Similarly, Beck & von Stechow 2007 would give (571b) the translation in (573), which is coherent. We merely partition the main event and the graduating seniors into parts where the event part is waving and the individual part is a student.

(573) $$\exists \mathbf{e} \exists \mathbf{d}(\mathbf{runtime}(\mathbf{e}) \prec \mathbf{t}_{now} \wedge PARTITION(Cov, \mathbf{e} \oplus \text{THE-SENIORS}) \wedge \\ \langle \mathbf{e}, \mathbf{x} \rangle \in {**}\lambda \mathbf{y}.\lambda \mathbf{e}'.Cov(\mathbf{y}) \wedge Cov(\mathbf{e}') \wedge \text{STUDENT}(\mathbf{y}) \wedge \text{WAVE}(\mathbf{e}', \mathbf{y}))$$

It is not hard to imagine a simple situation in which (573) is true. For example, at graduation where each senior stops and waves to the crowd as they cross the stage. The problem is that (571b) just cannot mean this. Previous accounts of N-BY-N modification do not account for facts like these, though a scalar treatment would. If N-BY-N adverbials are dependent on a scale provided by the verb phrase, then the infelicity of (569-571) would be predicted because these sentences contain verbs of nonscalar change.

Another argument that N-BY-N modification makes reference to scales comes from the effect of resultatives on their grammaticality. It is well known that nonscalar change verbs, many of which lexicalize a manner, start to behave like verbs of scalar change when modified by a resultative (Levin & Rappaport Hovav, 2010). The prediction is that N-BY-N modifiers should be grammatical only in the latter case. This is borne out.

(574) a. #Crumb by crumb, Bill licked the plate.
b. Crumb by crumb, Bill licked the plate clean.

(575) a. Erica wiped the table #smudge by smudge.
b. Erica wiped the table clean smudge by smudge.

(576) a. Lily pried the door #inch by inch.
b. Lily pried the door open inch by inch.

If resultatives transform pure manner verbs into verbs of scalar change, then the contrast be the (a) examples and the (b) examples in (574-576) can be attributed to the sensitivity of N-BY-N modification to scales.

The final argument, which has a similar form to the previous one, comes from verbs like *climb*. These verbs are ambiguous depending on their direct objects between a scalar, inherently directed motion interpretation and a manner interpretation. For example, climbing a ladder involves directed motion, while climbing on a jungle gym does not. Only the former interpretation allows N-BY-N modification, as (578) shows.

(577) a. John climbed the ladder.
b. John climbed the jungle gym.

(578) a. John climbed the ladder rung by rung.
b. John climbed the jungle gym #rung by rung/#bar by bar.

Once again, the data show that the availability of N-BY-N modification is correlated with verbs that have a scalar semantics. Given that previous analyses do not predict these effects, and in fact, have trouble capturing degree-based readings, we are led to pursue an account that puts scales first. This conclusion is only strengthened by the fact that there are already reasons to suspect a close connection between change of state verbs, inherently directed motion verbs, and incremental theme verbs. Moreover, we know from that literature that it is easier to start with verbs of the latter two classes and then fold in incremental theme verbs, than to extend classic accounts of incremental theme verbs to cover all cases of scalar change. In the next section we pursue this easier strategy in analyzing N-BY-N adverbials. While we depart from the previous pluractional or theta-role-based accounts, we show that the degree-based account increases the empirical coverage and retains insights from the previous analyses about distributivity and event plurality.

7.4 An analysis in increments

The account proceeds by first accounting for the behavior of N-BY-N adverbials with canonical verbs of scalar change like change of state and directed motion verbs. I then extend the analysis to incremental theme verbs, which are different in that they do not lexicalize a scale in the same way as verbs from the previous classes, instead using the extent of the theme as a scale. Finally, I show how to account for NUM-BY-NUM which are not dependent on verbs of scalar change at all. That being said, I argue for a degree-based analysis where NUM-BY-NUM are dependent on the cardinality of an argument, which is always available.

I assume the account of scalar change verbs in Kennedy & Levin 2008, which builds on work in Hay et al. 1999. The idea is that verbs of scalar change denote *measure of change* functions. They map individuals and events to a degree on a scale that is the difference between the degree associated with that individual at the end of the event and the degree associated with that individual at the start of the event. A sentence like (579) will have the truth conditions in (580).[5]

(579) It$_x$ widened.

(580) $\exists e[\text{WIDE}_\Delta(\mathbf{ag}(e))(e) \geq \mathbf{stnd}(\text{WIDE}_\Delta)]$

'There is an event e, and the degree x widens over the course of e is larger than the standard for widening.'

The formulas in (581-582) unpack the Δ-notation, making the denotation in (580) clearer.

(581) Difference Function (Kennedy & Levin 2008, ex. 23)
For any measure function $\mathbf{m}$ from objects and times to degrees on a scale S, and for any $d \in S, \mathbf{m}^{\uparrow}_d$ is a function just like $\mathbf{m}$ except that:

a. its range is $\{d' \in S | d \leq d'\}$, and

b. for any x, t in the domain of $\mathbf{m}$, if $\mathbf{m}(x)(t) \leq d$ then $\mathbf{m}^{\uparrow}_d(x)(t) = d$.
'$m^{\uparrow}_d$ measures objects relative to a specified degree d'

(582) Measure of Change (Kennedy & Levin 2008, ex. 25)
For any measure function $\mathbf{m}, \mathbf{m}_\Delta = \lambda e[\mathbf{m}^{\uparrow}_{\mathbf{m}(\theta(e))(init(e))}(\theta(e))(fin(e))]$

[5] I have altered the account in Kennedy & Levin 2008 by allowing verbal measure functions, which are the only kind we consider here, to access their individual arguments through theta-role functions.

'Returns a degree representing the difference in the degree x has on the scale associated with $\mathbf{m}$ at the start and end of e'

Against this backdrop, I propose that N-by-N adverbials are eventive modifiers. Like the pluractionals we have encountered, they contribute a partition of the event argument's temporal trace. Where they are different is that the lexical content of the adverbial are measure nouns setting the unit for scalar change. Note that I follow Lønning 1987 in assuming that degrees are not numbers, but expressions like *inch*, *meter*, *pound*, etc. map degrees to numbers. Example (584) gives the truth conditions of example (583).

(583) It$_x$ widened inch by inch.

(584) $\exists e \exists \mathsf{P}[\text{WIDE}_{\Delta}(\mathbf{ag}(e))(e) \geq \mathbf{stnd}(\text{WIDE}_{\Delta}) \wedge \mathbf{ag}(e) = x \wedge \mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P} \exists e'[\tau(e') = t \wedge e' \leq e \wedge \mathbf{atom}(e') \wedge \text{INCH}(\text{WIDE}_{\Delta}(\mathbf{ag}(e'))(e')) = 1$
$\wedge\ \text{INCH}(\text{WIDE}_{\Delta}(\mathbf{ag}(e'))(e')) < \text{INCH}(\text{WIDE}_{\Delta}(\mathbf{ag}(e))(e))]]$

'There is a widening event e, and the degree x widens over the course of e is larger than the standard for widening. Moreover, there is a partition of $\tau(e)$ such that each element in the partition is a trace of an event e' in e of x widening an inch and x widens more over e than e'.'

The analysis captures the bottomline truth conditions of (583), while making connections to pluractionality as we have seen it in languages like Kaqchikel. First, as long as the trivial partition is ruled out, the temporal partition requires the pluractional subevents to be linearly ordered in time. This accounts for the incrementality of verb phrases modified by N-BY-N adverbials, as previous authors have noted. Second, the final clause requires that the degree of change over e be larger than the degree of change over any e'. This correctly makes (583) false in scenarios where the crack only widened one inch, and ensures that verb phrases modified by N-BY-N can only be satisfied my non-atomic events. Finally, just like pluractional morphology crosslinguistically, the analysis separates the type of plural reference involved from how the atoms that make up the plurality are defined. In my analysis, the relevant atomic events correspond to atomic units of change relative to lexical content of the N-BY-N adverbial. It is this fact that predicts that N-BY-N adverbials should only modify verbs of scalar change, including change of state and inherently directed motion verbs in addition to incremental theme verbs.

While the analysis immediately accounts for examples of change of state and inherently directed motion verbs like those in (585-586), where the N-BY-N adverbial is based on a canonical measure noun, the examples in (587) are not as clear.

(585) Change of state verbs

a. I warmed the patient **degree by degree** until he was no longer in danger.

b. The turkey was fattened **pound by pound**.

c. The artist lightened the portrait **shade by shade** until she was pleased with the composition.

d. **Penny by penny** the price increased.

(586) Inherently directed motion verbs

a. The plane descended **meter by meter** until it reached a safe altitude.

b. The intrest rate was slowly raised **percentage point by percentage point**.

c. They lowered the basked **inch by inch**.

(587) a. **Step by step** John ascended the mountain.

b. I climbed the ladder **rung by rung**.

While nominals like *step* and *rung* are not obviously measure nouns, looking more closely, they have a similar distribution to more canonical examples in the relevant contexts. Note in (588) that *step* and *rung* can take numeral modifiers with inherently directed motion verbs like canonical measure nouns. Non-scalar movement predicates like those in (589) reject, not just N-BY-N adverbials, but both classes nominal measures.

(588) a. John ascended 10 meters.
b. John ascended 10 steps.
c. Mary walked 2 feet.
d. Mary walked 3 steps.
e. ?Susan climbed the ladder 2 meters.
f. ?Susan climbed the ladder 2 rungs.
g. Erica moved down two feet.
h. Erica moved down two rungs.

(589) a. #John exercised 10 meters.
b. #John exercised 10 steps.
c. #Mary shuddered two feet.
d. #Mary shuddered three steps.
e. #Billy climbed on the jungle gym 2 metres
f. #Billy climbed on the jungle gym 2 rungs.

These examples show that nominals like *step* and *rung* are able to map degrees on certain scales to numerals, and can be treated in the N-BY-N construction the same way as measure nouns like *inch* and *meter*. The formula in (590) shows how we analyze inherently directed motion verbs and X-BY-X adverbials built on nominals like *step*.

(590) John ascended step by step.

$$\exists e \exists \mathsf{P}[\text{ASCEND}_{\Delta}(\mathbf{ag}(e))(e) \geq \mathbf{stnd}(\text{ASCEND}_{\Delta}) \wedge \mathbf{ag}(e) = \mathbf{J} \wedge \mathsf{Part}(\mathsf{P}, \tau(e)) \wedge \forall t \in \mathsf{P} \exists e'[\tau(e') = t \wedge e' \leq e \wedge \mathbf{atom}(e') \wedge \text{STEP}(\text{ASCEND}_{\Delta}(\mathbf{ag}(e'))(e')) = 1 \wedge \text{STEP}(\text{ASCEND}_{\Delta}(\mathbf{ag}(e'))(e')) < \text{STEP}(\text{ASCEND}_{\Delta}(\mathbf{ag}(e))(e))]]$$

'There is an ascending event e, and the degree John ascends over the course of e is larger than the standard for ascending. Moreover, there is a partition of $\tau(e)$ such that each element in the partition is a trace of an event e' in e of John ascending a step and the degree of ascending over the course of e is greater than the degree of ascending over the course of e''

The reason that examples like *#John exercised step by step* are odd has a simple explanation. In these examples, *step* is treated as a function from degrees to numbers, but predicates like *exercise*, *shudder*, *climb on*, etc. are not scalar change predicates, that is, they are not functions from individuals and events to degrees. Thus, they cannot be composed with a measure noun, which is required by *10 steps* or *step by step*. This is shown in (591), where ✗ illustrates the point where composition fails. The subformula $\text{EXERCISE}(e')$ does not denote something in the domain of STEP under its interpretation as a measure nominal.[6]

(591) #John exercised step by step.
$\exists e \exists \mathsf{P}[\text{EXERCISE}(e) \wedge \mathbf{ag}(e) = x \wedge \mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P} \exists e'[\tau(e') = t \wedge e' \leq e \wedge \mathbf{atom}(e') \wedge$
$\text{STEP}✗(\text{EXERCISE}(e')) = 1 \wedge \text{STEP}✗(\text{EXERCISE}(e')) < \text{STEP}✗(\text{EXERCISE}(e))]]$

While the analysis captures the distribution and interpretation of N-BY-N adverbials with change of state and inherently directed motion verbs, extending the analysis to incremental theme verbs is not straightforward. The problem is that there is good evidence that incremental theme verbs do not themselves lexicalize a scale, but use the extent of their internal argument as an extent scale (Levin & Rappaport Hovav, 2010). Kennedy (in press) makes this clear by having incremental objects receive their incremental interpretation via the Natural Unit (**NU**) function of Krifka 1989, 1992, which has been altered so it behaves like a measure of change. A VP like *eat ten dumplings* under Kennedy's account has the denotation in (592), following Kennedy in press, ex. 37.

(592) ⟦eat ten dumplings⟧ =
$\lambda e \exists x[*\text{EAT}(e) \wedge *\text{DUMPLING}(x) \wedge \mathbf{NU}_{\Delta}(\text{DUMPLING})(x)(e) = 10]$

[6] Note that we get similar effects, even with bona fide verbs of scalar change, when the measure nominal does not have in its domain the degrees in the range of the scalar predicate. For instance, we cannot say *#John slid down the embankment step by step*, just like we cannot say *#The price rose meter by meter*. These effects fall out naturally is measure nouns are only partial functions on the domain of degrees.

'The function mapping e to $\mathbb{T}$ just in case there are dumplings x such that x changes in dumpling-measure over e by degree 10.'

While I do not follow this route, it inspires my analysis. I am skeptical of the approach in (592) as an appropriate extension of Krifka 1989, 1992. In those works, the natural unit function is used to assign individuals their cardinality. In this light, (592) seems to say that the individual x changes cardinality over the course of e, which does not seem right. What we want to say is that the parts of x that participate in e over the course of e increases in cardinality relative to the natural unit. To formalize this notion, I borrow an idea from that same paper, inspired by Bochnak 2011. I propose that incremental theme verbs, in addition to the usual theta-roles, make use of a measure theme role that maps the subparts e' of an event e to the degree on some contextually specified scale that $\mathbf{th}(e')$ overlaps the material parts of $\mathbf{th}(e')$.

(593) $\forall e' \leq e[\mathbf{th}^{e}_{\mathbf{m}}(e') = \mathbf{max}(\mathbf{m}(\mathbf{th}_{\leq \mathbf{m}}(e)), \mathbf{m}(\mathbf{th}_{\leq \mathbf{m}}(e')))]$

'For all part e' of e, $\mathbf{th}^{e}_{\mathbf{m}}$ maps e' to the degree that $\mathbf{th}_{\leq m}(e')$ overlaps $\mathbf{th}_{\leq m}(e)$ on the scale associated with $\mathbf{m}$, where $\mathbf{th}_{\leq m}$ maps e to the material parts of $\mathbf{th}(e)$'

Thus, the VP *eat ten dumplings* can be given the denotation in (594). Here the measure theme is relativized to the measure $\mathbf{m}_{\text{DUMPLING}}$, which maps individuals to degrees on a scale ordering dumpling amounts. The natural unit function for dumplings, $\mathbf{NU}_{\text{DUMPLING}}$ then maps this degree to 10.

(594) $[\![\text{eat ten dumplings}]\!] = \lambda e \exists x[*\text{EAT}(e) \wedge *\text{DUMPLING}(x) \wedge \mathbf{th}(e) = x \wedge \mathbf{NU}_{\text{DUMPLING}}(\mathbf{th}^{e}_{\mathbf{m}_{\text{DUMPLING}}}(e)) = 10]$

If the theme argument is a bare plural, as in *eat dumplings*, the natural unit function need only map the measure degree to a numeral greater than 0.

(595) $[\![\text{eat dumplings}]\!] = \lambda e \exists x[*\text{EAT}(e) \wedge *\text{DUMPLING}(x) \wedge \mathbf{th}(e) = x \wedge$
$\mathbf{NU}_{\text{DUMPLING}}(\mathbf{th}^{e}_{\mathbf{m}_{\text{DUMPLING}}}(e)) > 0]$

Note that we correctly predict that (595) should be non-quantized and thus atelic, while (594) should be quantized and telic. No part of an e satisfying (594) can be mapped by $\mathbf{th}^{e}_{\mathbf{m}_{\text{DUMPLING}}}$ to a degree equal to 10, but arbitrary parts of an e satisfying (595) can satisfy that same predicate.

This type of account not only avoids the problems noted previously for an analysis like Kennedy in press, but it also allows an account of their interaction with N-BY-N adverbials. The idea is that even though $\mathbf{th}^{e}_{\mathbf{m}}$ will usually be relativized to a scale associated with the object's physical extent and fed into the object's natural unit function, it need not be. N-BY-N adverbials make use of this fact. An example like (596) gets the truth conditions in (597). The final line in (597) gives the contribution of the adverbial. Just like before, it needs to make use of a function from individuals to degrees, but it cannot use the verb, which is not a verb of scalar change. Instead, it pick up $\mathbf{th}^{e}_{\mathbf{m}_{\text{CAKE}}}$, which is. The adverbial then says that, instead of measuring those degrees of cake-amounts in terms of the natural unit of cakes, measure them by pieces. Each event corresponding to a τ in the partition must have as it's theme a piece of the cake.

(596) He$_{x}$ ate the cake piece by piece.

(597) $\exists e \exists \mathsf{P}[*\text{EAT}(e) \wedge \mathbf{ag}(e) = x \wedge \mathbf{th}(e) = \sigma x. * \text{CAKE}(y) \wedge$
$\mathbf{NU}_{\text{CAKE}}(\mathbf{th}^{e}_{\mathbf{m}_{\text{CAKE}}}(e)) = 1 \wedge \mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P} \exists e'[\tau(e') = t \wedge e' \leq e \wedge \mathbf{atom}(e') \wedge$

$\mathbf{NU}_{\text{PIECE}}(\mathbf{th}^{e}_{\mathbf{m}_{\text{CAKE}}}(e')) = 1 \wedge \mathbf{NU}_{\text{PIECE}}(\mathbf{th}^{e}_{\mathbf{m}_{\text{CAKE}}}(e')) < \mathbf{NU}_{\text{PIECE}}(\mathbf{th}^{e}_{\mathbf{m}_{\text{CAKE}}}(e))]]$

'There is an eating event with x as its agent and *the cake* as it's theme and over the course of e the amount of cake-stuff eaten corresponds to one cake. Furthermore, there is a partition of $\tau(e)$ such that each element in the partition is a trace of an atomic event e' in e of eating a piece-worth of the cake-stuff and the amount of cake eaten over the course of e is greater than that over the course of e'.'

Just like before we have to assume that the natural unit function $\mathbf{NU}_{\text{PIECE}}$ has in its domain those degrees that order the cake amounts. This seems natural and predicts why example (598) are infelicitous. It is parallel to cases like (591). The natural unit function $\mathbf{NU}_{\text{PIECE}}$ does not have the degrees returned by $\mathbf{m}_{ramen}$ in its domain, just like *step* under its interpretation as a measure noun, cannot measure degrees of exercising.

(598) #He ate the ramen piece by piece.

While the N-BY-N adverbials that target incremental theme verbs usually replace the natural unit function, they need not. Recall that $\mathbf{th}^{e}_{\mathbf{m}}$ gets its measure argument contextually in my account. It need not be something that maps individuals to degrees in the domain of of a natural unit function. This allows us to capture examples like (599).

(599) a. He ate the sub sandwich inch by inch.
b. Susan polished off a tall glass of whiskey ounce by ounce.

In these examples the N-BY-N adverbial still elaborates on the incremental relationship between parts of the event and parts of the internal argument, but the parts of the object are measured along a different scale. This type of example is easily accounted for under my analysis. The formula in (600) shows the truth conditions for (599a). Note that, as always, the adverbial provides the unit function. All that has changed is that measure theme measures in relativized to LENGTH.[7]

(600) $\exists e \exists \mathsf{P}[*\text{EAT}(e) \wedge \mathbf{ag}(e) = x \wedge \mathbf{th}(e) = \sigma x. * \text{SUB-SANDWICH}(y) \wedge$
$\mathbf{NU}_{\text{SUB-SANDWHICH}}(\mathbf{th}^{e}_{\mathbf{m}_{\text{SUB-SANDWICH}}}(e)) = 1 \wedge \mathsf{Part}(\mathsf{P}, \tau(e)) \wedge$
$\forall t \in \mathsf{P} \exists e'[\tau(e') = t \wedge e' \leq e \wedge \mathbf{atom}(e') \wedge$
$\text{INCH}(\mathbf{th}^{e}_{\text{LENGTH}}(e')) = 1 \wedge \text{INCH}(\mathbf{th}^{e}_{\text{LENGTH}}(e')) < \text{INCH}(\mathbf{th}^{e}_{\text{LENGTH}}(e))]]$

'There is an eating event with x as its agent and *the sub sandwich* as it's theme and over the course of e the amount of sub-stuff is eaten corresponds to one sandwich. Furthermore, there is a partition of $\tau(e)$ such that each element in the partition is a trace of an atomic event e' in e of eating a part of the sub measuring one inch long and the length of sub eaten over the course of e is greater than the length of sub eaten over e'.'

In accounting for examples like (599), we come full circle. This chapter started by showing that previous analyses of N-BY-N adverbials cannot account for the fact that the construction targets verbs of scalar change more widely, not just incremental theme verbs. But these examples show that we need a scalar account of N-BY-N in order capture all of the generalizations about even incremental theme verbs. Here N-BY-N does not only look at the part-whole structure of an event and its individual argument like previous analyses propose, but it then measures out the event in terms of how those parts are mapped to degrees on a scale like length or volume. It is this fact that unites examples like (599) with examples where N-BY-N targets a change of state or inherently directed motion verb, ignoring the part-whole structure the event's internal argument completely.

7.4.1 Extending the account to Num-by-Num

Almost immediately we see that NUM-BY-NUM cannot be treated in the same was as N-BY-N adverbials. The reason is that while the latter needs access to a measure function supplied

[7] We do not want to relativize the first instance of $\mathbf{th}^{e}_{\mathbf{m}}$ because we can say things like 'He ate 10 sub sandwiches inch by inch'.

by the verb, NUM-BY-NUM does not need the verb phrase it modifies to supply a measure. Note that NUM-BY-NUM is felicitous with verbs of non-scalar change, which are uniformly infelicitous with N-BY-N, shown in (601), repeated from (571).

(601) a. #The ballerinas whirled dancer by dancer.
b. #The graduating seniors waved student by student.
c. #The platoon exercised soldier by soldier.

(602) a. The ballerinas whirled one by one.
b. The graduating seniors waved one by one.
c. The platoon exercised one by one.

I propose that NUM-BY-NUM has this wider distribution because, in virtue of containing a numeral, it brings its own measure, namely cardinality.

(603) $\exists \mathbf{e}_{\epsilon}(*\text{WHIRL}(e) \wedge \mathbf{ag}(\mathbf{e}) = \sigma x. * \text{BALLERINAS}(x) \wedge$
$\wedge \mathsf{Part}(\mathsf{P}, \tau(e)) \wedge \forall t \in \mathsf{P} \exists e'[\tau(e') = t \wedge e' \leq e \wedge \mathbf{atom}(e') \wedge$
$\mathbf{CARD}(\mathbf{ag}(e')) = 1 \wedge \mathbf{CARD}(\mathbf{ag}(e')) < \mathbf{CARD}(\mathbf{ag}(e))]]$

'There is a whirling event e whose agent are the sum of contextually salient ballerinas and there is a partition of $\tau(e)$ such that each element in the partition corresponds to an atomic event e' in e whose agent is atomic. Moreover, the cardinality of the participants of e' is less than e.'

The formula in (603) shows that NUM-BY-NUM contributes a partition of the big event's temporal trace, just like other pluractionals and pluractional adverbials. Where it is different is that unlike N-BY-BY, it does not target measure provided by the verb phrase, but a theta-role function, in this $\mathbf{ag}$. It then requires each element in the partition correspond to an event in the main event that is mapped by the theta-role to an individual of the specified cardinality. The final condition ensures that the theta-role NUM-BY-NUM targets is semantically plural. Finally, the cardinality-based analysis captures one final difference between NUM-BY-NUM and

N-BY-N. When N-BY-B target an incremental theme verb, it elaborates on the verb's measure theme, which itself makes use of an individuals material parts. This predicts that N-BY-N should be grammatical with mass incremental themes, because mass entities have material parts. In contrast, mass individuals should not be able to be targeted by NUM-BY-NUM since **CARD** is not defined over mass nouns. Examples (604-605) show that this prediction is correct.

(604) a. John drank the wine sip by sip.
b. Bil ate the rice grain by grain.
c. George shoveled sand scoop by scoop.

(605) a. #John drank the wine one by one.
b. #Bil ate the rice two by two.
c. #George shoveled sand one by one.

7.5 Conclusion

This chapter has argued that pluractional adverbials in English instantiate a degree-based flavor pluractionality. Just like Kaqchikel, these pluractionals contribute a partition of the main event's temporal trace. Moreover, just like pluractionals we have seen, X-BY-X adverbials must define what individuals make up plural event at hand. In the case of N-BY-N adverbials, these events are defined relative to a measure function contributed by the verb phrase. The nominal content of the pluractional adverbial is treated as a measure noun, and the events that constitute the pluractional plurality are those that describe unit changes relative to the measure function and the measure noun. I show how this type of account improves over previous analyses of N-BY-N adverbials, like Brasoveanu & Henderson 2009; Beck & von Stechow 2007, which only account for their grammaticality with incremental theme verbs. The crucial insight is that incremental theme verbs are part of a wider class of verbs of scalar change, including change of state and inherently directed motion verbs. I then show that NUM-BY-NUM adverbials are very similar, but can modify verbs of non-scalar change because they bring their own measure, namely cardinality. While they can target more types of verbs, they do not necessarily have a wider distribution. The fact that NUM-BY-NUM needs plural count noun nominal targets follows from the fact that **CARD** is not defined for mass nouns.

Chapter 8

Conclusions and Future Research

If the treatment of pluractionality in the previous chapters is indicative of natural language verbal denotations more widely, then the varieties of plural event reference are just as rich as plural reference in the nominal domain. Where previous work has focused most intensely on evidence for the mass/count distinction in the verbal domain, I have shown that pluractional morphemes can derive event predicates exhibiting at least three different types of plural count reference. The first can be assimilated to the COUNT pluralities in the denotation of bare plurals. The second involves reference to GROUP entities like those in the denotation of nouns like *grove*. Finally, the last type makes reference to EVALUATION pluralities like those introduced when interpreting a quantifier. Crucially, all three types of plural event reference have counterparts in the nominal domain, showing that natural language recycles representations across categories. Thus, this dissertation calls for more work on the fine-grained subtypes of plural event reference and their counterparts in the nominal domain. There are promising places to look:

- I argued that *–Ca'* derives predicates of *grove*-type group events. It is an open question whether there are eventive predicates denoting groups similar to those in the denotation of canonical group nouns like *team* or *committee*. One candidate are collective predicates, specifically those like *gather*, which have distributive subentailments (Brisson, 2003; Dowty, 1987). Recall that one of the facts motiving the account of *–Ca'* was that, like *grove*-type groups, it is opaque to all forms of distributivity, including modifiers like *one by one*. In contrast, while collective predicates like *gather* are ungrammatical with quantificational distributors, they are grammatical with *one by one* (Brasoveanu & Henderson, 2009). We account for this fact if *gather* denotes groupified atoms of arriving events and, as we have shown, if *one by one* has the general ability to access the members of *committee*-type group individuals.

A second main result of the dissertation is that care must be taken to separate the kind of individuals a verbal predicate denotes from the way it comes to denote those entities. In every case this dissertation has examined, plural event reference comes about by the way operators link events to functionally related domains, either times, individuals, or degrees. There is a lot more work to be done in this area. For example, while Kaqchikel does not have purely spatially-based pluractionality, it is attested in other languages (e.g., Wood 2007). Another question is whether degree-based pluractionality is attested as verbal derivational morphology, not just adverbial modification like the English examples. There is at least one potential example in Kaqchikel that merits future work:

- Kaqchikel has a suffix *–Cöt* that canonically derives roots belonging to a distinguished class called *positional* in the Mayan literature.

(606) √ch'eq 'wet'

a. *At ch'eq-**ël**.*
A2s wet-**P.STAT**
'You're wet.'

b. *X-Ø-ch'eq-**ech'öt**.*
COM-A3s-wet-**Cöt**
'It kept getting a little wet.'

(607) √tzuy 'seated'

a. *At tzuy-**ül**.*
A2s sit-**P.STAT**
'You're seated.'

b. *X-Ø-tzuy-**utz'öt'**.*
COM-A3s-sit-**Cöt**
'He kept shifting in his seat.'

What these representative examples show is that –*Cöt* derives predicates of repeated events that satisfy the predicate in some diminutive way. I have argued in previous work that positional roots are special in that they uniformly have a degree argument (Henderson, 2012). Just as the pluractionals we have previously encountered pair events with small slices of a temporal interval or individual argument, we should be able to analyze –*Cöt* as pairing events with small slices of the scale on which the positional denotes. Even if the analysis does not immediately extend, the data suggest that derivational degree-based pluractionality exists.

Finally, while the dissertation tackles the compositional morphosemantics of pluractional derivation in Kaqchikel, most notably in the proposal that event-internal pluractionals compose before cumulative closure and thus more closely to the root than event-external pluractionals, there are many open questions about pluractional derivation and its effects on argument structure. Crosslinguistic investigations have shown that if a pluractional morpheme has a restricted distribution, it tends to target intransitive predicates, but when it does target transitive predicates, it is only when it generates some entailment about the internal argument (Wood, 2007). Kaqchikel exhibits this pattern where the event-external pluractional *–löj* can target an intransitive stem as is, but it cannot apply to a transitive stem. In contrast, the distributive pluractional *–la'* targets transitive verb stems, generating distributive entailments about the internal argument. Ideally, we would like the different syntactic requirements of these classes of pluractionals to be explained in terms of their semantic contribution. An important tool for explaining these patterns is to investigate the distribution of expressions with similar semantics in languages where pluractionality has been less grammaticalized:

- My own preliminary corpus work on English adverbials with pluractional-like semantics (e.g., *one by one*), that shows that these adverbials preferentially target intransitive subjects and transitive objects. Here we find a statistical generalization matching the categorical distribution of pluractional morphology in languages where this preference has been more grammaticalized, like the Kaqchikel distributive pluractional which only targets transitive objects and derived intransitive subjects. I intend to pursue this corpus work in order to provide a usage-based perspective that can supplement a formal account of this type of puzzle.
- While the pluractional suffixes in Kaqchikel are fairly productive, in many languages

only a small number of predicates have pluractional forms and very often these predicates require a plural absolutive argument. What needs explanation is that these languages tend to distinguish the same subset of verbs, including verbs of killing, verbs of movement, verbs of position, and verbs of handling (Mithun, 1988). It would be exciting to investigate both the lexical semantics and actual use of the relevant classes of predicates to build an account of this pattern. In particular, looking at English corpora to find the frequency of plural absolutive arguments with the relevant predicates, as well as the frequency of distributive and collective readings of those arguments, would allow us to test the hypothesis that pluractionality in these languages indicates marked readings of certain high-frequency verbs.

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