Pluractionality and dependent indefinites

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February 16, 2018

Abstract

Cross-linguistically, inflection on verbs and nouns can indicate that a plurality of events or individuals is distributed with respect to another plurality. In these verbal domain, these have been called *pluractionals*; in the nominal domain, they have been called *dependent indefinites* or *distributive numerals*. This paper discusses recent semantic approaches to the cross-domain parallels between the two phenomena. After establishing some formal and typological background, we introduce a number of recent compositional challenges that have been introduced by these patterns.

1 Introduction

In natural language, there are many ways to introduce pluralities. Perhaps the simplest way is through morphological marking—for example, changing singular *zebra* to plural *zebras*. In other constructions, however, a plurality may be generated through more complex means, through an interaction with another plural. In (1), for example, '*one book*' is morphologically singular, and yet we infer that there are a plurality of books, one per girl. As it turns out, many languages have a way of indicating this kind of dependent plurality. In languages as diverse as Hungarian, Telugu, and Kaqchikel Mayan, it is possible to communicate this dependency by reduplicating a numeral: *one-one*, *two-two*, *three-three*, and so on. The Kaqchikel sentence in (2) means that there are three tortillas per person. In the literature, these inflected numerals have been variously called dependent indefinites or distributive numerals (Farkas 1997; Gil 1982).

(1) The girls read <u>one book</u> each.

(2) Xeqatij <u>ox-ox</u> wäy
we-eat three-three tortilla
'We ate three tortillas each.' (Kaqchikel, Henderson 2014)

Many languages of the world also provide a grammatical way to encode *pluractionality*, that is, a plurality of events. This might be one thing happening again and again, or many things happening at the same time. For example, in Upriver Halkomelem, the verb *yáleq'* is the pluractional form of the verb meaning 'to fall'. The sentence in (3) can be used to describe a situation where many trees fell down at the same time, or where the same tree fell down multiple times, but not one in which one tree fell down one time. English has no directly analogous verbal morphology, but analogous judgments come from the pluralization of event-denoting nouns: the plural noun *parties* may describe the (possibly simultaneous) action of multiple groups, or the repetitive action of a single group.

(3) <u>yáleq'</u> -et -es te theqát
fall.pl -tr. -3S det. tree
'He/they felled the tree(s).' (Upriver Halkomelem, Thompson 2009)

Dependent indefinites and pluractional verbs pertain to different syntactic categories and different semantic domains: dependent indefinites modify noun phrases to indicate a plurality of individuals; pluractional morphemes modify verb phrases to indicate a plurality of events. However, despite these differences of domain, the two phenomena share a number of formal and typological semantic properties.

Compositionally, in both cases, the semantic contribution is that of a plurality 'filter'; that is, they check that there is a plurality, but don't create one (§4). This is formally different from pluralizing operators like English *each* or plural *-s*, which sum atomic objects into plural objects. In §5, we will see that this property goes hand-in-hand with another property that is interesting from a compositional perspective: namely, the behavior of dependent indefinites and pluractional marking depends on the presence of a plurality elsewhere in the sentence. We discuss in particular the case of licensing by distributive operators. The formal properties of pluractionals turn out to be parallel to another rich domain of semantic research—namely, the adjectives *same* and *different*; in §6, we give an overview of the questions raised by these parallel properties. Finally, in §7, we turn to cases of 'event-internal' pluractionals, which show distinct semantic behavior from canonical cases of pluractionality.

2 Typological properties

2.1 Morphophonological properties

Sapir (1921) observes that reduplication has a 'self-evident symbolism': plurality of form is an iconic way to express plurality of meaning. It is perhaps thus not surprising that reduplication is a common way to create pluractionals and dependent indefinites cross-linguistically. In (2), the dependent indefinite was created by reduplicating the numeral; in (4), pluractional verbs are created by reduplicating part of the verbal stem.

(4) a. kiraa 'call' → <u>kir</u>kiraa 'keep on calling'/'call many people'
b. táakàa 'step on' → <u>tát</u>tàakáa 'trample'
c. káɗàa 'beat (a drum)' → <u>káʀ</u>kàɗáa 'drum for a long time or in many places'

(Hausa, Newman 2012)

Wood (2007) makes this some what more precise in a geographically balanced survey of 43 languages (36 with grammaticalized pluractionality). Although non-reduplicative affixes comprised the majority of pluractionality markers (55/83), a sizeable minority of 18 were formed with some kind of reduplication. Conversely, Bybee et al. (1994) show that iterativity is the most common meaning expressed by verb reduplication.

In sign language, too, reduplication is used to indicate plurality, including the marking of pluractional verbs and dependent indefinites (Fischer 1973; Klima and Bellugi 1979; Wilbur 2009; Kuhn and Aristodemo 2017; Kuhn 2017). Several factors distinguish the morphological patterns in sign language from those in spoken language. First, whereas spoken language reduplication is typically limited to a single reduplicant, in sign language, a word may be repeated several times; often, the form of reduplication (punctuated vs. unpunctuated) communicates exact or relative number (Coppola et al. 2013). Second, in the nominal domain, plural objects are associated with areas of space in the horizontal plane. In many sign languages, verbs and numerals can thus indicate distribution via reduplicated movement across an area of space.

2.2 Dimensions of distribution

In the case of verbal pluractionality, a plurality of events is distributed in some way—this plurality has been called the *distributive share*. With dependent indefinites, the distributive share (i.e., what is distributed) is the plurality of individuals associated with the noun phrase. In both cases, however, there may be a choice regarding what the plurality is distributed across. For example, in the example in (3), the plurality of events may be distributed across participants (i.e. different trees falling down), or across times (i.e. one tree falling down repeatedly). The object with respect to which the plurality is distributed has been called the *distributive key*. Distribution across participants is the participant key reading, and distribution across times is the temporal key reading.[1] In some cases, distribution is also allowed over regions of space, or contextually salient groupings.

One of the strong generalizations emerging from typological work on pluractionals is that a particular morpheme in a given language may specify what is allowed as the distributive key (Cusic 1981; Lasersohn 1995). While the Halkomelem example in (3) is underspecified, allowing distribution across participants or time, in the related language Squamish, the pluractional made by reduplicating verb *xwet*, 'jump,' specifies distribution across time; the sentence cannot be used to describe a single occasion on which each individual jumped.

(5) chet xwet-xwit-im
1S.PL RED-jump-INTR
'We are jumping.' (Squamish, Bar-El 2002)

[1]Calling these 'readings' suggests actual ambiguity between the two readings, but this is not uniformly agreed upon. For example, Kuhn (2017) argues that at least for dependent indefinites in American Sign Language, different readings arise via different co-indexations, but Cable (2014) proposes an analysis for dependent indefinites in Tlingit in which a single interpretation is underspecified with respect to its distributive key. For convenience, the different verifying situations will be called 'readings,' but the term is meant neutrally.

A single language may have pluractional morphemes that specify different distributive keys. For example, in French Sign Language, *-rep* (exact repetition) requires distribution across time, and *-alt* (alternating hands) requires distribution across participants (Kuhn and Aristodemo 2017).

(6) ONE PERSON FORGET-rep ONE WORD.
'One person forgot one word repeatedly.'

(7) ONE PERSON FORGET-alt SEVERAL WORDS.
'One person forgot several words.' (LSF, Kuhn and Aristodemo 2017)

In fact, the range of meanings that are generated by pluractional inflection goes beyond the strictly distributive; in some languages, the same set of suffixes that mark distribution can also be used to mark a variety of related interpretations, like increased effort or excessive action, such as Dyirbal *balbalgan* 'hit too much', compared to *balgan* 'hit' (Dixon 1972). See Cusic (1981) for an exhaustive typology of pluractional meanings.

For dependent indefinites, a similar situations holds. For dependent indefinites in Telugu (Balusu 2005), Tlingit (Cable 2014), and Kaqchikel (Henderson 2014), the distributive key may be participants or space-time segments. In Hungarian, the dependent existential *egy-egy*, 'one-one' allows the same choices, but dependent numerals greater than one like *két-két*, 'two-two,' only allow the participant key reading (Farkas 2015).

(8) Minden gyerek hozott {egy-egy/két-két} könyvet.
Every child brought {one-one/two-two} book.
'Each child brought {one book/two books}.'

(9) A politikus mindig megtapsolt {egy-egy/*két-két} ellenzéki hozzászólást.
The politician always applauded {one-one/*two-two} opposition comment.
'Always, the politician applauded an opposition comment.' (Hungarian, Farkas 2015)

A related point of variation is whether or not this distributive key may be implicitly inferred (Henderson 2014). In Kaqchikel and Hungarian, dependent indefinites require their distributive key to appear overtly in the sentence; in Telugu and Tlingit, the distributive key may be inferred from context, provided that this results in a 'cognitively natural' partition (Cable 2014). Thus, the Telugu sentence in (10) allows an implicitly-inferred temporal-key reading, while the Kaqchikel sentence in (11), without an overt licensor, is ungrammatical.

(10) Raamu renDu-renDu kootuluni cuuseeDu
Ram two-two monkeys saw
'Ram saw two monkeys at each time/location.' (Telugu, Balusu 2005)

(11) * Xe'inchäp ox-ox wäy.
I-handle three-three tortilla
'I took three tortillas each.' (Kaqchikel, Henderson 2014)

Although similar patterns hold for both pluractionals and dependent indefinites, it is interesting to note a few differences in these typologies. First, pluractionals sometimes allow a broader range of meanings, including intensification or culmination, mentioned above. Second, there is variation

with respect to the 'default' distributive key. For dependent indefinites, a temporal key reading may or may not be available, but it seems that a participant key reading always is. For pluractional verbs, a participant key reading may or may not exist, but if it does, it is very likely that a temporal key reading does, too. The one counterexample to this tendency of which I am aware is the pluractional marker *-alt* in French Sign Language, which only has a participant key reading. (And here, it is notable that other iconic properties are introduced with the use of two hands; see Lepic et al. 2016.)

3 Formal background

Theories of pluractionality generally assume a semantic ontology that includes events (Davidson 1967; Parsons 1990). Events are taken to be minimal parts of the world. For example, there is an event in which John kisses Bill—no other information about the world is included in this event. Verbs denote sets of events. In the neo-Davidsonian tradition, verbal arguments are related to events by thematic-role arguments. Thus '*Erin coughed*,' is given the logical form '$\exists e.\text{cough}(e) \wedge \text{agent}(e) = \text{erin}$,' i.e., there is a coughing event that has Erin as its agent.

We will assume that both individuals and events show mereological structure—that is, part-whole struture (Link 1983; Krifka 1998). Following standard conventions, '$\preceq$' defines a partial order; $x \preceq y$ means that x is part of y. For example, Ann is part of the plurality containing Ann, Ben, and Cat. An object is *atomic* if it contains no proper subparts. We define $x \oplus y$ (the sum of x and y) as the smallest object z such that $x \preceq z$ and $y \preceq z$. Note that if x and y are type α, $x \oplus y$ is also type α. $\bigoplus P$ is the sum of all objects in a non-empty set P.

The star-operator, defined in (12), returns the algebraic closure of a set with respect to sum formation. A standard analysis of plural nouns assumes that the plural suffix /-s/ denotes the star operator. So, if $[\![\text{kid}]\!] = \{a, b, c\}$, then $[\![\text{kids}]\!] = {}^*[\![\text{kid}]\!] = \{a, b, c, a \oplus b, a \oplus c, b \oplus c, a \oplus b \oplus c\}$.

(12) $^*P = \{x | \exists P' \subseteq P[x = \bigoplus P']\}$
'$^*P$ is the set of all objects that can be made by summing non-empty subsets of P.'

In the verbal domain, unmarked verbs can denote plural events. For example, the sentence in (13) entails a plurality of blooming events, one per flower. The sentence in (14) allows a cumulative reading in which three invitations were issued. These observations have led to the common assumption that lexical predicates are pluralized with the star operator, either inherently (Krifka 1992; Kratzer 2008) or by a silent operator. After pluralization, *bloom* denotes the set of all singular or plural blooming events.

(13) The flowers bloomed.

(14) Two girls invited three boys.

Additionally, there are overt pluralizing operators, relatives of the star operator, that may pluralize a predicate at other points in the derivation. For example, English floated *each* is a pluralizing operator that sums events in the denotation of its complement (see, e.g. Champollion 2015, building on Link 1987 *i.a.*). In (15), the denotation of '*read one book*,' only contains events that involve a single atomic book. But, since *each* sums events in the denotation of its complement—including

ones with different themes, the sentence in (15) admits events in which multiple books were read. These plural events may be further modified by higher adverbial phrases, as in (16) (Taylor 1985; Davies 1991; Brasoveanu and Henderson 2009).

(15) The boys each recited one poem.

(16) One by one, each boy recited a poem.

4 Pluractionals as plurality filters

Pluractional verbs and dependent indefinites share compositional properties that distinguish them from pluralizing operators like English *each*. Empirically, the effect of this can be observed in two related properties. First, pluractionals cannot induce variation in a plain indefinite. Second, pluractionals and dependent indefinites can appear redundantly in a sentence without compounding the distributive effect. Analytically, we can characterize these properties by saying that pluractionals are plurality *filters*, not pluralizing operators. That is, given a set of singular and plural objects, filters restrict a set to only the plural objects, but they do not add any new elements to the set. This is in contrast to pluralizing operators, which sum objects together to make new pluralities. The definition in (17) sketches a very simple definition for pluractional morphemes; here, $|e|$ returns the number of atomic parts of e; additional conjuncts can specify the meaning further, such as adding restrictions on how the subevents are distributed.

(17) $[\![\text{-PLURACT}]\!] = \lambda V e.\ V(e)\ \wedge\ |e| > 1\ \wedge\ \ldots$
'Given a predicate V, return the set of non-atomic V-ing events.'
(cf. Lasersohn 1995; Kuhn and Aristodemo 2017)

4.1 No variation of plain indefinites

As seen in (15), distributive operators like *each* can induce variation in a plain indefinite. Across a variety of languages, a number of authors have observed that pluractional morphemes do not have this ability (see Yu 2003 for Chechen, van Geenhoven 2004 for West Greenlandic, Laca 2006 for Spanish, Henderson 2014 for Kaqchikel, Kuhn and Aristodemo 2017 for French Sign Language). The French Sign Language pair in (18) illustrates the contrast between distributive operators and pluractional markers in this respect. In (18a), the distributive operator EVERY-DAY can scope over the indefinite 'ONE WORD' allowing the words to vary day by day. In contrast, although the pluractional morpheme *-rep* may also indicate an event recurring over time, these events must involve the same word on each occasion. This contrast is particularly notable with what Cabredo Hofherr and Laca (2012) call 'once-only' predicates—denoting events that can only happen a single time to an individual. In Chechen, for example, *lilxira* is the pluractional form of the verb 'explode'; the sentence in (19) can only be used to describe the unlikely scenario in which the same bomb exploded multiple times.

(18) a. EVERY-DAY JEAN ONE WORD FORGET. ✓many words ✓one word
'Every day, Jean forgot one word.'

b. JEAN ONE WORD FORGET-rep. *many words ✓one word
'Jean forgot one word repeatedly.' (LSF, Kuhn and Aristodemo 2017)

(19) Bomba lilxira
bomb.SG explode.PLR
'A/the bomb exploded repeatedly.' (Chechen, Wood 2007)

Analytically, this can be understood if pluractional markers are plurality *filters*. The constituent 'ONE WORD FORGET' in LSF denotes the set of singular or plural events involving a single word; the pluractional marker *-rep* filters out only those plural events distributed over time. Notably, this returns a subset of the original set, so these events, too, involve only a single word.

4.2 Innocent redundancy

A related property of pluractionals is that they can appear redundantly in a sentence without multiplying distributivity. Sentence (20) provides an example from Kaqchikel; here, the sentence includes both the pluractional marker *-ala'* and a dependent indefinite *ju-jun*, 'one-one.' The two pluractionality markers reside peaceably in the same sentence; both the events and books vary with respect to a single distributive key—times or locations.

(20) Xinkan-ala' ju-jun wuj.
search-LA' one-one book
'I looked for a book on each occasion.' (Kaqchikel, Henderson 2014)

Similarly, multiple dependent indefinites may occur together without compounding distributive force. The Korean sentence in (21), where *ssik* marks two dependent indefinites, allows a reading in which men and boxes are both distributed with respect to the same event-based distributive key.

(21) Namca twu-myeng-ssik-i sangca sey-kay-ssik-ul wunpanhayssta
man two-Cl-Dist-Nom box three-Cl-Dist-Acc carried
'Two men carried three boxes on each occasion.' (Korean, Oh 2006)

This behavior contrasts with distributive operators, which obligatorily introduce their own distributive force. The result is that, when multiple distributive operators are present in a sentence, there are multiple levels of distribution. For example, in (22a), if there are n professors and m classes, then there are $n \times m$ nominations. Even in (22b), where the two distributive operators specify the same distributive key, each operator contributes a new level of distributivity, resulting in $n \times n$ nominations.

(22) a. The professors each nominated one student per class.
b. The professors each nominated one student per professor.

Again, the difference in behavior can be explained by the operator-filter distinction. Pluralizing operators sum events together, so nesting multiple operators will compound the effect, by summing together events that have already been pluralized. On the other hand, plurality filters contribute intersective meanings, so can further refine the attributes of a plural event, but the repeated specification of pluractionality is innocently redundant.

5 Licensing by distributive operators

Participant key readings must be licensed by the presence of a plural elsewhere in the sentence. Sentence (11) provided a minimal contrast with (2); when all other arguments in the sentence are singular, the dependent indefinite makes the sentence ungrammatical.

Surprisingly, however, these distributive forms may also be licensed by distributive operators like English *each* (or Kaqchikel *chikijujunal*), that distribute down to atomic individuals. As has been observed by a number of authors (notably Henderson 2014; Kuhn 2017), this poses a compositional puzzle, since the 'unpackaged' version of (23), 'X hugged one-one dog, Y hugged one-one dog, and so on,' would be ungrammatical, just like (11).

(23) Chikijujunal ri tijoxela' xkiq'etej ju-jun tz'i'.
each the students hugged one-one dog
'Each of the students hugged a dog.' (Kaqchikel, Henderson 2014)

For dependent indefinites, this licensing puzzle has been well-documented, including for Hungarian (Farkas 1997), Telugu (Balusu 2005), Korean (Oh 2006), Tlingit (Cable 2014), Kaqchikel (Henderson 2014), and American Sign Language (Kuhn 2017). For pluractional marking on verbs, the property has been less well documented, but has been reported for both participant key and temporal key distribution in French Sign Language (Kuhn and Aristodemo 2017).

(24) a. BOY EACH FORGET-alt BRING CAMERA.
'Each boy forgot to bring a camera.'
b. EVERY-DAY ONE BOOK JEAN GIVE-1-rep.
'Every day, Jean gave me one book.' (LSF, Kuhn and Aristodemo 2017)

This puzzle opens two attractive but opposing avenues for analysis, both of which have been represented in the literature. On a 'syntax-heavy' analysis, the pattern exemplified in (23) and (24) is viewed as a kind of 'distributive concord.' Similar to standard analyses of negative concord (Zeijlstra, 2004), what appears as pluractional marking on the numeral or verb is the expression of a semantically uninterpreted feature, with a syntactic constraint that requires it to appear in the scope of a higher (interpreted) distributivity operator. This point of view has been most clearly articulated by Oh (2006) and Kimmelman (2015).

On a 'semantic-heavy' analysis, lexical denotations are set up as in §4, but a mechanism of scope-taking allows the pluractional morpheme to be interpreted at a higher structural position than the distributive operator. The effect is one of innocent redundancy, as described above: first, the distributive operator pluralizes a predicate, resulting in a set of plural events; the pluractional morpheme then applies as a filter on this set, possibly removing nothing from the already pluralized event predicate. This point of view has been advocated for by Henderson (2014), Kuhn and Aristodemo (2017), and Kuhn (2017).

One central difference regarding these two analyses is a matter of scope: on the concord analysis, the pluractional morpheme necessarily takes scope *below* the distributive operator; on the scopal analysis, the pluractional morpheme necessarily takes scope *above* it. This fact has been used to disentangle the two hypotheses.

5.1 Licensing by pluractionals

Empirically, there is a difference between plain indefinites and dependent indefinites: the latter marks the noun as the distributive share, so there must be variation of the indefinite with respect to some distributive key. Under the concord hypothesis, this difference is posited to arise not from a difference in the semantics of the two forms—both have the existential meaning of a plain indefinite—but on the restrictions about where they can occur: dependent indefinites must appear under a distributive operator; plain indefinites may or may not.

Henderson (2014) argues against this hypothesis by looking at the interaction of pluractionals and dependent indefinites in Kaqchikel. Namely, as shown in (20), dependent indefinites in Kaqchikel can be licensed by a pluractional verb. However, similarly to pluractionals in other languages, pluractional verbs in Kaqchikel cannot induce variation in a plain indefinite (cf. §4). This is thus a syntactic environment in which both plain and dependent indefinites can occur, but have different meanings. The absence of variation in plain indefinites provides evidence that the dependent indefinite is appearing *without* the presence of a higher distributive operator.

5.2 Iconicity and scope in LSF

In LSF, Kuhn and Aristodemo (2017) show that pluractional markers display iconicity: the rate at which a verb is reduplicated indicates the relative rate at which the event happened. Formally, this can easily be incorporated into the definition. An iconic predicate describes a set of events by reference to the phonetic form Φ; it is thus of the correct type, $\langle v, t\rangle$, to be added as a modifier to the pluractional morpheme, as in (25).

(25) $[\![\text{-alt/-rep}]\!] = \lambda V e.\quad \underbrace{V(e) \wedge |e| > 1 \wedge ...}_{\text{Logical component}} \quad \wedge \quad \underbrace{\textbf{Icon}^{\Phi}(e)}_{\text{Iconic component}}$

'/-alt/ and /-rep/ give the set of non-atomic V-ing events (with other specified logical properties), which are distributed temporally in the manner shown'

Iconicity provides another way to resolve the theoretical question regarding the hierarchical position of the pluractional morpheme. Kuhn and Aristodemo (2017) show that the iconic meaning of the pluractional marker in ASL and LSF can be interpreted locally or interpreted globally: for example, an accelerating inflection can indicate the rate at which each individual performed an event, or it can indicate the overall rate at which events were performed by members of a plural licensor. Critically, they show that the level at which the iconic condition is evaluated is exactly the structural position at which the grammatical condition is evaluated. In particular, in the case of distributive operators, a slow movement of /-alt/ under EACH must denote an event which happens slowly *from a global perspective*, indicating that the pluractional morpheme is evaluated at a high structural position.

5.3 How to take scope

If pluractional morphemes and dependent indefinites are evaluated as though at a higher structural position, by what semantic process does this scope-taking occur? Kuhn (2017) argues that, at

least for dependent indefinites, the process is exactly the same as standard quantifier scope (i.e. quantifier raising or equivalent). In particular, quantifiers are known to be sensitive to scope-islands out of which they cannot take scope. Kuhn (2017) shows that these scope islands are also sufficient to block the licensing of dependent indefinites, such as the *if*-clause in (27). This is as expected if dependent indefinites need to scope high in order to access the plurality introduced by a distributive operator.

(26) Minden professzor két-két diákról mondta, hogy meglepné ha ⟨diplomát szereznének⟩.
every professor two-two students-of said that surprised if diploma receive
'Every professor said of two students that he would be surprised if they graduated.'

(27) * Minden professzor azt mondta, hogy meglepné, ha ⟨két-két diák diplomát szerezne⟩.
every professor DEM said that surprised if two-two student diploma receive
'Every professor said that he would be surprised if two students graduated.'

(Hungarian, Kuhn 2017)

The situation is slightly more complex; Kuhn (2017) shows that dependent indefinites display a kind of split-scope behavior. In particular, in (28), the dependent indefinite is licensed by the distributive operator 'every director,' but the same distributive operator binds a pronoun in the restrictor of the dependent indefinite. The restrictor of the DP must thus scope low, while the plurality condition of the DP scopes high. Charlow (to appear) shows that this behavior fits into a larger class of phenomena in which a cardinality filter is evaluated separately from an associated existential quantifier. See also Henderson (2014) for an analysis in terms of 'postsuppositions.'

(28) Minden rendező benevezte két-két filmjét.
every director entered two-two his-films
'Every director entered two of his films.' (Hungarian, Kuhn 2017)

For the case of pluractional verbs, the situation is less clear, since quantifier raising is not an operation generally assumed for verbal affixes. In the verbal domain, there has also been sparser documentation of licensing by distributive operators, making the empirical landscape less clear. The appropriate semantic mechanism to explain the verbal facts will perhaps emerge as more fieldwork uncovers the extent of the pattern across spoken and sign languages.

6 Quantification over functions and dynamic semantics

Recent literature on dependent indefinites has converged with an existing body of literature on the adjectives *same* and *different*. In both domains, compositional challenges have motivated enrichments to the semantics, including new ways of taking scope (Barker 2007) or plurality-based theories of dynamic semantics (Brasoveanu and Farkas 2011; Henderson 2014; Kuhn 2017). The complexity of these theories prevents us from a thorough comparison, but the rest of this section outlines the empirical parallels, and sketches the compositional issues involved.

6.1 Empirical parallels with *same* and *different*

The adjective *same* is known to be ambiguous between an 'external' and an 'internal' reading. On the external reading, sentence (29) compares the dogs to another individual in context ('My pet rabbit licked a cat....'); on the internal reading, it compares the dogs to each other. Critically, the internal reading of (29a) is only licensed by the presence of a plural elsewhere in the sentence. Out of the blue, the sentence in (29b) is ungrammatical; we are left asking, 'As who?'

(29) a. All the dogs licked the same cat.
b. * Fido licked the same cat.

The adjective *same* shows striking parallels with pluractionals and dependent indefinites. First, Hardt et al. (2012) and Hardt and Mikkelsen (2015) observe that sentences with *same* necessarily involve multiple events—that is, they are pluractional. The sentence in (30) cannot be used to describe a single event in which Mary sold John a book.

(30) John bought and Mary sold the same book. (Barker 2007)

On its internal reading, *same* also shows licensing patterns similar to the ones above. The contrast in (29) shows that the internal reading must be licensed by a plural licensor, but, just as for dependent indefinites and pluractionals, this licensor may be an operator that distributes down to atomic individuals, as in (31).

(31) Each student recited the same poem.

Finally, Kuhn (2017) shows that in American Sign Language, the adjectives *same* and *different* are morphologically unified with dependent indefinites. In each case, distributivity is marked by reduplication or movement across an area of space. Spatial co-indexation with another plural is used to specify the distributive key. Thus, in (32), the arc-movement of ONE or SAME over location 'a' (where the boys were indexed) yields a distributive reading for (32a), and an obligatory internal reading of (32b).

(32) a. ALL-a BOY READ ONE-arc-a BOOK.
'All the boys read one book.'
b. ALL-a BOY READ SAME-arc-a BOOK.
'All the boys read the same book.' (ASL, Kuhn 2017)

6.2 Compositional challenges

As we have seen, pluractional verbs entail that there is a plurality of events, distributed in some way; dependent indefinites likewise entail that there is a plurality of individuals. For dependent indefinites, however, something more is needed: additionally, there is a cardinality assertion—in (33), that there are two monkeys per kid. In order to state this assertion, the formal system needs to keep track of the kid-monkey association—the function mapping kids to the monkeys they saw.

(33) 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.' (Telugu, Balusu 2005)

A parallel compositional challenge presents itself in the domain of the adjectives *same* and *different*, on the internal reading. Famously, Keenan (1992) proved that the DP '*the same N*' cannot be analyzed as a generalized quantifier (type $\langle et, t\rangle$). Though the proof is somewhat complex, an essential observation again relates to the presence of a function: sentence (34) asserts something of the function mapping each student to the books they read—namely, that this is a constant function.

(34) Every student read the same books.

How is this function made available to the compositional system? Under a standard analysis of quantifier raising, the compositional system only gets access to one lambda abstraction at a time: a QRed '*the same book*' applies to a set of individuals: $\lambda y.x$ read y. On the other hand, Barker (2007) observes that if *same* takes scope at a position *in between* the licensor '*every boy*' and its lambda abstract, then '*the same book*' can apply to doubly abstracted '$\lambda xy.x$ read y,' to assert that it is constant. This is the structural configuration produced by Barker's system of 'parasitic' scope-taking.

Recent work on dependent indefinites has provided an alternative solution by employing new innovations in dynamic semantics (Henderson, 2014; Kuhn, 2017). In standard dynamic semantics (Groenendijk and Stokhof 1991), the logical system pays attention not only to truth conditions, but also to a set of discourse referents—the set of individuals that are passed through discourse and that can be referred to later. If I say that someone entered the room, this establishes a mental representation of an individual. In the mid 90s, a second wave of dynamic semantics emerged, in which the semantics represents not only individuals, but also functions (van den Berg 1996; Nouwen 2003; Brasoveanu 2006). For example, if someone mentions that each boy invited a girl, we represent not only the boys and the girls, but also the pairing between them. This mapping is available to anything that is dynamically evaluated after the closure of the distributive operator.

7 Event-internal pluractionality

Cusic (1981) and Wood (2007) highlight another parameter of variation: event-*external* or event-*internal* pluractionality. All forms discussed so far have been cases of event-external pluractionality: roughly speaking, we have a plurality of events of the same kind. Intuitively, event-internal pluractionals are atomic events that are nevertheless comprised of smaller parts. The English words *nibble*, *flutter*, *juggle*, *applaud* seem to have this property: a single juggling event is divided in time into many moments at which a throwing event happened.

Many languages of the world have morphemes that indicate this kind of event-internal pluractionality. The derivations in (35) provide examples from Syrian Arabic that illustrate.

(35) a. safaʔ 'to clap, slap' → saffaʔ 'to applaud/clap in rhythm'
b. kasar 'to break in two' → kassar 'to break to pieces'
(Syrian Arabic, Cowell 1964)

Wood (2007) describes a range of properties that distinguishes event-internal pluractionality from event-external pluractionality. First, there are aksionsart restrictions that apply only to event-internal predicates: they appear on semelfactives and possibly achievements (as in (35a) and (35b), respectively), but do not appear on accomplishments. Second, event-internal pluractionals generally carry the requirements of multiplicity and density. Whereas event-external pluractionals seem to be felicitous with at least two repetitions of the event, event-internal pluractionals generally entail numerous sub-parts in quick succession. Third, a subclass of event-internal pluractionals carry the entailment that the series of repetitions share a common goal or result. Again, this can be seen in the examples above: in (35a), keeping rhythm is a goal that can be accomplished through a plurality of claps; in (35b), repetitive breaking yields a single result-state.

Event-internal pluractionals also differ from event-external pluractionals with respect to compositional properties. In particular, we saw above that event-external pluractionals may allow (or require) distribution across the members of a plural licensor—a different subevent associated with each participant. This is never possible with event-internal pluractionals. The pluractional in (35b), for example, must describe the breaking up of a single object, not multiple objects being broken a single time. Similarly, in (36), the Kaqchikel suffix glossed *Ca'* marks event-internal pluractionality. The sentence must mean that each individual glanced at the speaker several times; it cannot be used to describe a situation in which each person glanced at the speaker once.

(36) Xikitz'et-etz'a' ri winaqi'
look.at-Ca' the people
'The people kept glancing at me.' (Kaqchikel, Henderson 2017)

These observations suggest an analysis in which event-internal pluractionals are in fact *atomic*, but have a temporal/spatial trace that can be divided into small parts (Henderson 2017). The expression in (37) sketches the meaning of an event-internal pluractional marker. We let τ be a function that gives the temporal or spatial trace of an event—i.e., when and where it occured. The function 'fine-partition' returns a set of overlapping intervals that cover this area of space-time. Event-internal pluractionals entail that a given event occurred at each of these subintervals.

(37) $\lambda V e.\ |e| = 1\ \wedge\ \exists P[\text{fine-partition}(P, \tau(e)) \wedge \forall t \in P[\exists e'[t = \tau(e') \wedge V(e')]]]$
'Given a predicate V, return the set of atomic events whose temporal (or spatial) trace can be divided into small parts, each of which contains a V-ing event.'
(cf. Henderson 2017)

Notably, this definition differs from the one for event-external pluractionality in (17) in a critical way: the output of (17) is a set of plural events ($|e| > 1$); the output of (37) is a set of atomic events ($|e| = 1$). This has compositional consequences. Notably, when a plural individual is an argument of a plural event, a cumulative reading is allowed in which each atomic individual associates with a different subevent. For event-external pluractionals, this allows the participant-key reading. For event-internal pluractionals, all arguments of the plural individual must be associated with the same, atomic event.

In the nominal domain, Henderson (2017) observes that a similar state of affairs holds for what he calls 'swarms.' In English, the nouns *swarm*, *grove*, *bouquet* share properties with group-denoting nouns like *team* and *committee*, but critically differ with respect to others. In particular,

swarm-terms are also surprisingly compatible with stubbornly distributive predicates (as in (38)), and are incompatible with the adverb *one-by-one* (as in (39)). Henderson (2017) thus proposes that a swarm, like an event-internal pluractional, is an atomic individual, with a plurality of individuals distributed over its spatial trace.

(38) a. * {wide/circular} team
b. {wide/circular} grove
c. {wide/circular} table

(39) a. I greeted the team one by one.
b. * I chopped down the grove one by one.
c. * I cleaned the table one by one.

8 Conclusion

Despite pertaining to different domains of objects—events or individuals—pluractional verbs and dependent indefinites share a core collection of parallel semantic properties. In both cases, they mark an object as a distributive share, and may put restrictions on what can serve as a distributive key. Compositionally, both constructions act as a plurality filter; this means that they cannot induce variation in plain indefinites, and that multiple markers can appear redundantly in the same sentence. Pluractional constructions also raise a number of compositional questions. First, they may be licensed by operators that distribute down to atomic individuals. We provided evidence in favor of an analysis in which dependent indefinites and pluractional verbs take scope above these distributive licensors. Second, dependent indefinites, like the adjectives *same* and *different*, seem to need to require higher-order quantification. We discussed several recent innovations that allow functions to be made available to the compositional system. Finally, we discussed cases of event-internal pluractionality, where internal structure may nevertheless be predicated of atomic events.

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