Gather/numerous as a mass/count opposition

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Abstract

Predicates like *gather* and *be numerous* have both been described as 'collective predicates,' since they predicate something of a plurality. The two classes of predicates differ, however, with respect to plural quantifiers (e.g. *all*), which are grammatical with *gather*-type predicates but ungrammatical with *numerous*-type predicates. Here, I link the *gather/numerous* opposition to mereological properties that are familiar from the domains of telicity and mass/count. I address problems of undergeneration and overgeneration with recent technical innovations: first, I weaken the property of divisibility to Champollion's (2015) property of Stratified Reference; second, I introduce assumptions on the mereological structure of measurement events. Each of these theoretical moves is motivated by empirical parallels across the three semantic domains.

1 Introduction

1.1 Overview

Predicates like *gather* and *be numerous* have both been described as 'collective predicates.' Broadly speaking, collective predicates are predicates that work perfectly well with plural arguments, but are ungrammatical with atomic individuals, as evidenced in the contrast between (a) and (b) in the examples below.

(1) a. The students gathered.
b. * Marco gathered.

(2) a. The students are numerous.
b. * Marco is numerous.

However, not all collective predicates behave the same. In particular, there are two classes of predicates that differ in their grammaticality with plural quantifiers, such as *all*, *most*, and *several* (Kroch 1974, Dowty 1987, Winter 2001, Champollion 2010). I follow Champollion (2010) in calling these classes *gather*-type predicates and *numerous*-type predicates. The contrast is shown in (3) and (4); the former are perfectly grammatical, but the latter are as bizarre as (2b), seeming to suggest that each student is somehow particulate.

(3) *Gather*-type predicates
a. All the students gathered.
b. Most of the students gathered.
c. Several students gathered.

(4) *Numerous*-type predicates
a. * All the students are numerous.
b. * Most of the students are numerous.
c. * Several students are numerous.

The table in (5) provides examples of predicates in each class, taken largely from the references above.

(5)

Gather-type predicates		*Numerous*-type predicates	
gather	*hold hands*	*be numerous*	*suffice to defeat the army*
be similar	*fit together*	*be a group of ten*	*return a verdict of 'not guilty'*
meet	*be consistent* (axioms)	*form a pyramid*	*be inconsistent* (axioms)
disperse	*disagree*	*be a group of* < 10	*be denser in the middle of the forest*

Several authors (Winter 2001, p.224; Dobrovie-Sorin 2014; Champollion 2015) have discussed the intuition that the *gather*/*numerous* distinction is connected to the mereological divide familiar from mass/count and atelic/telic distinctions. The basic observation is that *numerous*-type predicates generally involve an emergent property of a group. For example, to 'be a group of ten' depends on the number of individuals in the whole group; to 'return a verdict of not guilty' depends a legal property that holds only of the jury as a whole; to 'be inconsistent' depends on the logical properties of the set as a whole. In contrast, *gather*-type predicates allow 'distributive sub-entailments' (Dowty 1987). For example, in a 'gathering' event, each individual went to the same place as someone else; in a 'fitting together' event, each puzzle piece connects with some other piece. In this paper, I argue that these intuitions are essentially correct. Specifically, I contend that the *gather*/*numerous* distinction is analogous to the mass/count distinction in the nominal domain and the atelic/telic distinction in the temporal domain.

(6)

	nouns	**verbs** *(w.r.t time)*	**verbs** *(w.r.t. participants)*
mass	mud	sleep	gather
count	puppy	wake up	be numerous

Yet, the devil is in the details: it turns out that classical formulations of monotonicity (as either divisiveness or cumulativity) both overgenerate and undergenerate the class of *gather*-type predicates; as a consequence, no account to date has provided a successful diagnostic based on independently observed semantic properties of the two kinds of predicates. In this paper, I provide such a diagnostic, inspired by divisiveness, but repairing its problems with two innovations. First, in the spirit of Champollion (2015), I argue that *gather*-type predicates have Stratified Reference, a weakening of divisiveness. Second, I argue that the relevant diagnostic is sensitive to mereological properties of events, not of individuals; assumptions about the mereology of events derive the fact that predicates involving measurement are systematically ungrammatical with *all*, regardless of their possible-world entailments. The resulting diagnostic does strictly better at classifying predicates than the classical notion of divisiveness.

Finally, I turn to the observation from Brisson (2003) that the grammaticality of *all* seems to be sensitive to the lexical aspect of the predicate. I argue that these facts, though real, are a red herring, due to an ambiguity of *all* that confounds grammaticality judgments. This is supported by new empirical data: I show that the adjective *same* has the same semantic restrictions as *all*, but without the *aktionsart* confound. The logical distinction that hold for states with *all* thus holds for both states and activities for *same*.

It bears noting that these three theoretical decisions are largely independent, so that each one can be argued for on its own terms, or can be replaced in a modular way by a competing analysis. On the other hand, the deeper thesis of this paper can be construed in a completely theory-neutral way. In particular, although classical diagnostics face certain puzzles in the categorization of *gather*-type predicates, we will observe that these puzzles are exactly analogous to puzzles faced in the categorization of mass nouns and atelic predicates. Regardless of specific mechanics, I take these empirical parallels to be strong motivation for the unified, domain-general analysis exemplified in (6).

1.2 Monotonicity and beyond

For both nouns and verbs, it has long been observed that language categorizes semantic concepts depending on their mereological structure. Nouns, for example, can be characterized as either *mass* or *count*, evidenced empirically by whether they can be pluralized and what determiners can be used to quantify them (as in (7)). With respect to temporal properties, verbs can be categorized as either *atelic* or *telic*, evidenced empirically by whether modification is possible with *for*- or *in*-adverbials (as in (8)).

(7) a. too much mud (mass)
b. too many puppies (count)

(8) a. sleep for an hour (atelic)
b. wake up in an hour (telic)

Formally, both of these properties can be characterized by a logical property that relates the whole of an object or event to its parts. For nouns, the most relevant starting point will be Cheng's (1973) characterization in terms of divisiveness: if x has a mass-noun property N, then every subpart of x also has property N. To a first approximation, if x is mud, then every subpart of x is also mud. The analysis of verbal aspect zeroes in on the same logical generalization. Vendler (1957) offers a mereological characterization of atelicity that is formalized by Bennet and Partee (1972) as the 'subinterval property': if an atelic predicate holds over an interval I, then it also holds over every subinterval of I. To a first approximation, if an individual slept for an hour, then they slept for every minute of that hour.

Famously, Quine (1960) observes that this characterization of mass nouns runs into the 'minimal-parts problem': *water* is a mass noun, but a single hydrogen atom in a water molecule is itself no longer water. Dowty (1979) observes a similar problem for the characterization of atelicity: *waltz* is an atelic verb, but waltzing requires at least three steps. Anticipating that the proposal in §2 will alleviate the minimal-parts problem in a more general form, let us provide a temporary patch in terms of *bounded* divisiveness, that states that a property holds of all *sufficiently large* subparts.

Turning to collective predicates, a useful starting point is the observation by Winter (2001) that *gather*-type predicates are often associated with 2-bounded divisiveness. In the definition below, and subsequently through the paper, $\preceq$ indicates mereological parthood ($x \preceq y$ is read 'x is part of y'), $|\cdot|$ measures set cardinality, $\leq$ compares two numerical values (standard 'less than or equal to'), and ε is a contextually-determined small numerical value.

(9) A predicate P has ε-bounded divisiveness iff
$\forall x[P(x) \quad \rightarrow \quad \forall y[(|y| \geq \varepsilon \wedge y \preceq x) \rightarrow P(y)]]$
'If P holds of x, then P holds of all sufficiently large parts of x.'

Take *gather* as a representative instance of a *gather*-type predicate. Bounded divisiveness states that, for any plurality x, if x gathered, then any sufficiently large subplurality of x gathered. As in the nominal and temporal domains, the use of bounded monotonicity avoids an instance of the minimal-parts problem: just as a single atom cannot be water, a single person cannot gather.

Figure 1 illustrates what it means for a predicate to have divisiveness over the participants. Figure 1(a) provides one instance of a gathering event: all the dots are going to the same location. Figures 1(b) – (d) show three subevents of (a) generated by taking subsets of the dots; each of these is also a gathering event. More generally, any subplurality of at least two or three dots will be the participants of a gathering subevent.

At a first pass, divisiveness seems to do quite well as a diagnostic of *gather*-type predicates. Figure 1 gave an example with *gather*. The predicate *be similar* has the same property: if the members of some set are similar, then the members of any non-singleton subset are necessarily similar. In fact, this observation is not new: Winter (2001) very briefly considers (then dismisses) 2-bounded divisiveness as a possible diagnostic

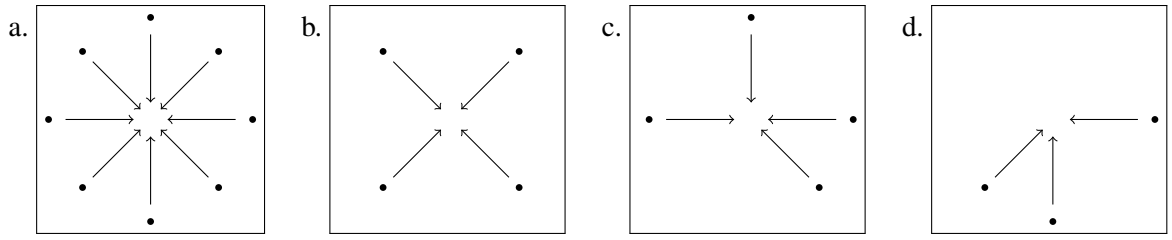

Figure 1: Four gathering events; (b) – (d) are subevents of (a).

for *gather*-type predicates.[1] But, as promising as this diagnoistic seems with *gather* and *be similar*, it turns out that n-bounded divisiveness faces problems of at least two kinds. First is a problem of undergeneration: divisiveness incorrectly rejects some predicates from the *gather* class, including *hold hands*, *fit together*, and *disagree*. Second is a problem of overgeneration: divisiveness incorrectly admits some predicates to the *gather* class, including *be a group of less than ten*.

Here, I will argue that these problems are not reason to give up hope; I will provide two amendments to divisiveness that will rescue the prospect of using a denotation-based diagnostic. Furthermore, I will maintain the congruence between mass nouns, atelic verbs, and *gather*-type predicates: tellingly, the puzzles that are faced in the participant domain are versions of the same puzzles from the nominal and temporal domains. As we will see, though, the semantic properties of collective predicates will be more variegated than that of mass/count and telicity, providing us a laboratory to test between more fine-grained theories of mass/count.

2 The 'tricky-parts' problem and Stratified Reference

2.1 The 'tricky-parts' problem

The first puzzle that we will address is a problem of undergeneration: there is a set of predicates that are incorrectly rejected from the *gather* class. The basic observation is that certain collective predicates are grammatical with *all* but are technically not divisive, despite still intuitively having 'distributive sub-entailments.' *Hold hands* and *fit together* are two such predicates, grammatical with *all* as in (10).

(10) a. All the students held hands.
b. All the puzzle pieces fit together.

The pictures in Figures 2 and 3 illustrate the problem. In Figure 2(a), a plurality of six children are holding hands. In Figure 2(b), the three selected individuals form a subplurality of the students, but they are not holding hands. Divisiveness states that every subplurality must have the property of holding hands; this is not the case, so *hold hands* does not have divisiveness. An analogous situation holds for *fit together*, as seen in Figure 3: the puzzle pieces in (a) fit together, but the members of the subplurality in (b) do not. Thus, *fit together* is likewise not divisive.

In fact, *hold hands* is not n-bounded divisive for any n. To see this, consider a circle of $2n$ students holding hands. The set consisting of every other student in the circle is a subset of n students, and yet the

[1]The actual sentence that Winter provides as a counterexample is "Exactly five girls drank together a whole glass of beer." I personally find the placement of *together* in this sentence to be quite unnatural, so I am hesitant to use it as strong counter-evidence. Nevertheless, I think that more natural examples make a similar point: the most parallel examples will be discussed in §4.2.

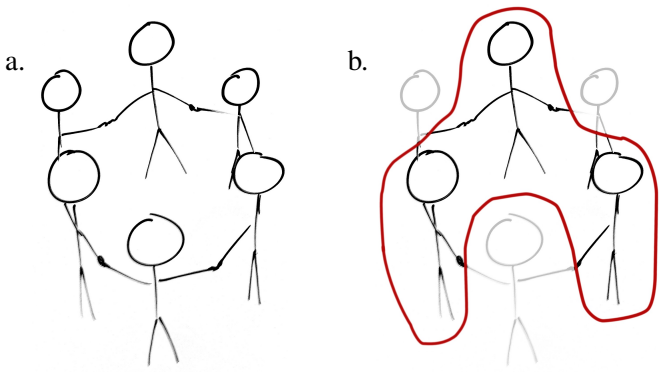

Figure 2: *Hold hands*

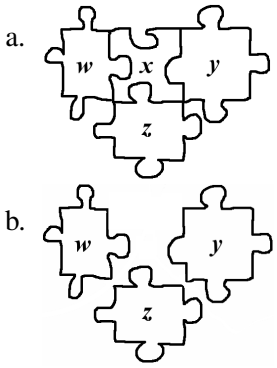

Figure 3: *Fit together*

predicate *hold hands* does not hold of it. Thus, what we have is not an instance of the minimal-parts problem, since arbitrarily large subparts may still not have the relevant property. The same state of affairs holds for *fit together*. Thus, for both of these predicates, what we seem to have is instead a 'tricky-parts' problem: intuitively, the subpluralities that provide a counterexample to divisiveness are constructed in 'tricky' ways, built by considering unnatural or non-contiguous subparts.

As it turns out, this situation is exactly analogous to a problem in the nominal domain posed by heterogenous mass nouns like *succotash* or *fruitcake* (e.g., Taylor 1977). Succotash is a prepared food that consists of a mixture of beans and corn; however, any subpart (however large) consisting of only beans does not qualify, itself, as succotash. Thus, *succotash* does not have bounded divisiveness, despite the fact that it behaves as a mass noun (e.g., *too much succotash*). Again, a 'tricky' subpart (e.g. the discontinuous subpart with no corn) provides a counterexample to bounded divisiveness.

2.2 Stratified Reference

Formally, the tricky-parts problem arises because there is a universal quantifier in the definition of divisiveness that is necessarily sensitive to even these irrelevant subparts. The definition in (9) states that if a predicate P holds of x, then P holds of *all* sufficiently large parts of x. To solve the undergeneration problem for *gather*-type predicates, we will thus adopt the solution that Champollion (2015) proposes for analogous problems in other domains: we will change the troublesome universal quantifier to an existential.

Champollion's (2015) proposal, called Stratified Reference (SR), can be formulated in a number of equivalent ways; here, I will do so in terms of covers, to highlight the relation between divisiveness and Stratified Reference. Given a set of entities S, let $\bigoplus S$ ('the sum of S') be the smallest individual y such that $x \preceq y$ for all $x \in S$. A *cover* of x is a set of (possibly overlapping) entities whose sum is x.[2]

(11) X is a cover of x if $\bigoplus X = x$.

Restating divisiveness in terms of covers, we say that a predicate P has divisiveness if, for every plurality in P, *every* cover of sufficiently large subpluralities has cells that are also in P. In constrast, a predicate P

[2]Technically, this is the definition of a 'tightly-fitting' cover; more commonly, a cover of x is defined to be a set of plural entities whose sum *contains* x. At the risk of abusing terminology, I will nevertheless use the term 'cover' to refer to the concept defined in (11), which will map more easily onto the logical translation of divisiveness and Stratified Reference. Further discussion about the linguistic use of tightly-fitting covers versus loosely-fitting covers appears in Schwarzschild (1996), Lasersohn (1995), and Brisson (2003).

has Stratified Reference if, for every plurality in P, there is *some* cover of sufficiently small subpluralities with cells that are also in P.[3] These definitions are provided formally in (12) and (13). Note that (12) is equivalent to (9).[4]

(12) Div(P) iff $\forall x[P(x) \rightarrow \boxed{\forall X_{\langle e,t\rangle}} [(\bigoplus X = x \wedge \forall y \in X.|y| \geq \varepsilon) \rightarrow (\forall y \in X.P(y))]]$

(13) SR(P) iff $\forall x[P(x) \rightarrow \boxed{\exists X_{\langle e,t\rangle}} [(\bigoplus X = x \wedge \forall y \in X.|y| \leq \varepsilon) \wedge (\forall y \in X.P(y))]]$

Following Champollion (2015), I will make one final change to this definition: instead of defining Stratified Reference as a property of *individual* predicates, I will redefine it as a property of *event* predicates. Following a large body of work in event semantics (e.g., Davidson 1967, Carlson 1984), verbs are taken to denote sets of events. Events are ontological primitives, small packets of information about the world. Terminologically, I construe 'event' broadly, synonymous to the 'eventualities' of Bach (1986), including both action-based events (e.g. the event of someone eating lunch) and things traditionally called 'states' (e.g. the event of a group being numerous). Events are related to their arguments via thematic role functions; thus if e is an event in which Edith ate lunch, then agent(e) = Edith and runtime(e) might be the interval from 12:00 to 1:00pm. Events, like individuals, have mereological structure. Following Krifka (1989), we assume cumulativity of thematic roles: for any thematic role θ and events e, e', $\theta(e \oplus e') = \theta(e) \oplus \theta(e')$.

Notably, moving to event semantics provides a clean way to unify our observations across domains: a single, parameterized definition can be used to characterized the mass/count, atelic/telic, and *gather*/*numerous* oppositions. Formally, this requires only one small change: we need to change the cardinality operator $|\cdot|$ to an abstracted measure function (here, μ) that can measure an event along any specified dimension. For Stratified Reference over participants (as for collective predicates), we let $\mu(e) = |\text{agent}(e)|$. For Stratified Reference over time (as for telicity), we let $\mu(e)$ measure the runtime of e.

(14) An event predicate P has Stratified Reference iff
$\forall e[P(e) \rightarrow \exists E_{\langle v,t\rangle}[\bigoplus E = e \wedge \forall e' \in E[\mu(e') \leq \varepsilon \wedge P(e')]]]$
'For every event in P, there is a cover of sufficiently small subevents that are also in P.'
(cf. Champollion 2015, (20))

For the collective predicates in coming examples, this definition can innocently be thought of as a condition on event participants, as in the definition in (13). However, this change will eventually become crucial in §3, where we will show that the two definitions are not quite synonymous: the definition in (14), which places a mereological condition on the events themselves, is a strictly stronger definition than the one in (13). We will leverage this difference empirically to account for a problem of overgeneration.

2.3 Examples

To confirm that Stratified Reference has the desired effect, we will work through several examples: we will show that *hold hands* and *fit together* are now correctly categorized as *gather*-type predicates, but that the

[3]The observant reader might notice a second difference between these two definitions that relates to the epsilon condition: in divisiveness, the parts must be 'sufficiently large'; in Stratified Reference, the parts must be 'sufficiently small'. The reason for this is directly related to the force of the quantifier: in the former case, the epsilon condition removes the threat of guaranteed falsity that would arise from considering singleton sets in the definition. In the latter case, the epsilon condition removes the threat of considering only the trivial cover consisting of only the set itself. More discussion of the epsilon condition can be found in Champollion (2010).

[4]Proof: **(9) → (12):** Take any tightly fitting cover X of x with sufficiently large cells. Take any element $y \in X$. X is tightly fitting, so $y \leq x$. By (9), P holds of y. Choice of y is arbitrary, so P holds of each cell in X. **(12) → (9):** Take any sufficiently large part y of x. There is a cover of x consisting of y and $x - y$. By (12), P holds of each cell, so P holds of y. □

weakening of the condition seems to avoid accidentally admitting any new *numerous*-type predicates (though an absolute proof of this fact is impossible without a comprehensive list of every single *numerous*-type predicate). Two pairs of examples will provide a nice minimal case study: *be consistent* vs. *be inconsistent*, and *agree* vs. *disagree*. The former pair acts differently with respect to *all*; the latter two do not. We will find that these contrasts come automatically from the new diagnostic of Stratified Reference. Additionally, these examples will allow us to probe the definition of Stratified Reference in a way not possible when only examining the nominal and temporal domains.

Since Stratified Reference is a strict weakening of divisiveness, the change from a universal quantifier to an existential quantifier does not exclude any predicates from the *gather* class that were previously admitted. Thus, *gather* and *be similar* automatically have Stratified Reference; for example, any gathering event can be decomposed into (i.e. is the sum of) small gathering events involving overlapping groups of two or three individuals. As we saw before, *hold hands* and *fit together* do not have divisiveness; nevertheless, they do have Stratified Reference. Any holding-hands event can be decomposed into small holding-hands events (overlapping pairs of adjacent people); any fitting-together event can be decomposed into small fitting-together events (overlapping pairs of adjacent pieces). Figure 4 makes this concrete by returning to the example from Figure 3: the same configuration of puzzle pieces that provided a counterexample to divisiveness does not provide a counterexample to Stratified Reference: the fitting-together event containing puzzle pieces w, x, y, and z can be divided into one fitting-together event containing w and x, one containing x and y, and one containing y and z. These small subevents comprise a cover of the larger event. More generally, any fitting-together event can be decomposed in a similar way: by the lexical semantics, if some plurality fits together, then each atomic part fits together with another atomic part; a cover can be constructed by taking cells containing every such pair.

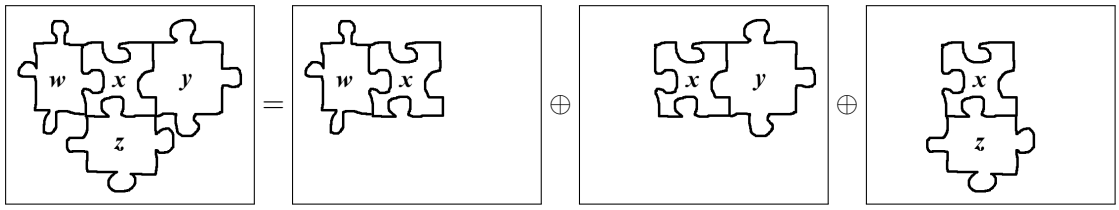

Figure 4: A fitting-together event decomposed into a cover of small fitting-together events.

In contrast, the *numerous*-type predicates discussed before do not have Stratified Reference. For example, *be numerous* can clearly not be divided into a cover of small *numerous*-subevents, since the participants in any subevent which is sufficiently small will by definition not be numerous. Likewise, *return a verdict of not guilty* does not have Stratified Reference, because any event with only a subset of the participants cannot be (by legal definition) an event of returning a verdict. The reader can confirm that Stratified Reference gets similarly correct results for *gather*-type predicates *meet*, *disperse*, *disagree*, and for *numerous*-type predicates *be a group of ten*, *form a pyramid*, *suffice to defeat the army*, *elect the president*, among others.

A clean (novel) minimal pair is found in the contrast between *consistent* and *inconsistent*, and the parallel contrast (p.c. Benjamin Spector) between *compatible and incompatible*. In both cases, the former is compatible with *all*, but the latter, derived by the simple addition of a negative morpheme, is not. (Note: I am only concerned with the 'internal' reading of these predicates—'be compatible *with each other*'—as opposed to the 'external' reading that compares each member of the set to a contextually salient individual.)

(15) a. All the axioms are consistent.
b. * All the axioms are inconsistent.

(16) a. All the computer programs are compatible. (p.c. Benjamin Spector)
b. * All the computer programs are incompatiable.

It turns out that this prediction follows immediately from the definition of Stratified Reference. By definition, if a set of axioms is consistent, then any subset is also consistent. (Otherwise, the inconsistency of the part would yield inconsistency of the whole.) Thus, for any 'consistent' event, it is perfectly easy to find a cover of small 'consistent' subevents. In an 'inconsistent' event, on the other hand, inconsistency may emerge from the set as a whole. For instance, consider a set of axioms that consists of the following five inequalities: $\{a > b,\ b > c,\ c > d,\ d > e,\ e > a\}$. In this example, it turns out that any strict subset is consistent; inconsistency arises only when all five are considered together. It is therefore not possible to find a cover of small 'inconsistent' subevents. An analogous situation holds for *compatible* and *incompatible*.

Given the contrast observed for *consistent*/*inconsistent* and *compatible*/*incompatiable*, it is striking that *agree* and *disagree* do not show such a contrast—both are grammatical with *all* (despite the fact that they, too, are "opposites"). Nevertheless, it turns out that Stratified Reference makes exactly the right predictions.

(17) a. All the students agreed (about what book to read).
b. All the students disagreed (about what book to read).

The situation can be explained based a fundamental difference between inconsistency and disagreement: while inconsistency is a situation that may be contingent on the presence of every single part (as in the scenario above), disagreement entails that there is always a difference of opinions that can be instantiated by a single pair of individuals. For any disagreeing event, then, we can construct a cover by including both of these opinions in each cell. Disagreement thus arises from properties of an event's subparts in a way that inconsistency does not.

2.4 Divisiveness vs. cumulativity

Up to this point, we have characterized the cross-domain count/mass distinction with respect to variants of divisiveness, which are stated with respect to the parts of events or individuals. However, another logical property commonly associated with the count/mass distinction is that of *cumulativity*, defined in (18), which is stated with respect to the sums of events or individuals (Quine 1960).[5]

(18) A predicate P has cumulativity iff
$\forall P[(P(x) \wedge P(y)) \rightarrow P(x \oplus y)]$
'If P holds of x and y then P holds of $x \oplus y$.'

In the nominal and temporal domains, divisiveness and cumulativity are often confounded; for example, while it is true that any (sufficiently large) part of water is water, it is also true that any sum of water and water is also water. For this reason, much work in the literature has looked for arguments—such as the minimal-parts problem—to provide support for one definition over the other. Deal (2017) proposes another possible state of affairs, in which the grammar is sensitive to both logical properties, but each is tracked by a distinct set linguistic phenomena. For example, she argues that English *furniture* is cumulative but not divisive, which is why it patterns like canonical mass nouns with respect to quantifiers (e.g. *too much furniture*), but patterns with canonical count nouns with respect to stubbornly distributive adjectives (e.g.

[5]Quine's primary motivation to use cumulativity instead of divisiveness is that it does not face the minimal-parts problem; as we have seen, this problem is also alleviated with Stratified Reference, a variant of divisiveness.

small furniture, *small apple(s)* vs. **small mud*). Turning to *gather*-type collective predicates, we can ask an exactly analogous question: does the *gather/numerous* opposition track a variant of divisiveness (such as Stratified Reference), or does it track cumulativity? Strikingly, for this domain, unlike for count/mass and telicity, there are a number of predicates that have Stratified Reference but not cumulativity. These predicates nevertheless pattern as *gather*-type predicates, thus showing that a variant of divisiveness is indeed the relevant logical property.

The predicate *be similar* provides a simple starting point. If plurality x consists of large Australian athletes and plurality y consists of small Icelandic librarians, the atoms of x can be characterized as 'similar,' and the atoms of y can be characterized as 'similar,' but the atoms of $x \oplus y$ cannot. At this point, we might be tempted to patch this solution with a revision of cumulativity, stating that P only holds of sums of *overlapping* individuals in P. Given that *be similar* is a transitive property, the property in (19) will hold for *be similar*, with the overlap acting as the bridge between the two sets. (Here, $x \circ y$ iff $\exists z[z \preceq x \wedge z \preceq y]$.)

(19) A predicate P has 'cumulativity 2.0' iff
$\forall P[(P(x) \wedge P(y) \wedge x \circ y) \rightarrow P(x \oplus y)]$
'If P holds of x and y and x overlaps with y then P holds of $x \oplus y$.'

However, these revisions come at a cost, and worse, don't address the problem in its full generality. First, we lose the connection to the other domains: notably, observe that count nouns like *puppy* also trivially satisfy (19) since distinct atomic individuals will have no overlap; it is thus not possible to use a single definition of cumulativity to characterize the three domains. Moreover, the patch in (18) addresses only a corner of a problem that appears in a more general form elsewhere. Specifically, the predicates *consistent* and *inconsistent* provide clear cases where divisiveness and cumulativity are dissociated. *Consistent* has divisiveness and Stratified Reference but not cumulativity; *inconsistent* has cumulativity, but neither divisiveness nor Stratified Reference. The reasons for this are exactly what we saw before: two internally-consistent sets of axioms may nevertheless interact to yield inconsistency of the whole; on the flip side, adding anything to an inconsistent set of axioms will trivially yield another inconsistent set. The fact that *consistent* patterns with *gather* and *inconsistent* with *numerous* thus conclusively shows that it is some variant of divisiveness, not cumulativity, that is at play with collective predicates. Collective predicates, with a more complex lexical semantics than that of nouns, thus offer a novel testing ground for theories of cumulativity and divisiveness.

2.5 A property of predicates, not events

Noun meanings do not occupy the entire semantic space with respect the logical properties associated with count/mass. Specifically, as we have seen, the definition of Stratified Reference (like those of divisiveness and cumulativity) states that a certain property holds of *all* elements of the predicate denotation. For example, *all* instances of 'water' can be divided into subparts that are also 'water.' Consequently, in order for a predicate to fail to have Stratified Reference, it should suffice for a single individual in its denotation to fail to be divisible into subparts for which the predicate holds. But, in fact, count nouns tend to have a stronger property (Krifka 1989): they typically denote predicates such that *no* individual in their denotation is divisible into subparts for which the predicate holds. No bicycle can be divided into small parts that are bicycles; no poodle can be divided into small parts that are poodles.[6] This constraint on noun meanings is reminiscent of Gärdenfors (2014) claim that word meanings are 'convex'; for example, there is no single word that means 'bicycle or water,' since this would consist of two disjoint regions of semantic space.

[6]Some potential counterexamples exist. For example, each step of a direct proof can itself be viewed as the proof of a simple fact. A photomosaic is an picture that is created by tiling many small pictures. *Proof* and *picture* are nevertheless count nouns.

Collective predicates do not have this semantic gap. Notably, there are some instances of *be inconsistent* for which one *can* find a cover of sufficiently small inconsistent events. Consider, for example, the following set of equalities: $\{a = 1, a = 2, a = 3, a = 4, a = 5\}$. Here, any subset of at least two equalities is inconsistent; thus, it is perfectly easy to find a cover of sufficiently small inconsistent events (any cover with non-singleton cells will work). Nevertheless, in such a scenario, it is still ungrammatical to say '*All the equalities are inconsistent.*' This is predicted on the present analysis: in order for a predicate P to have Stratified Reference, it must be the case that every event in P can be divided into small subevents in P. The fact that some 'inconsistent' events cannot be divided into 'inconsistent' subevents (such as the one described in §2.3), is sufficient for the predicate to not have Stratified Reference.

There are several ramifications of these observations, supporting design choices that we have made so far. First, these facts confirm the idea that Stratified Reference is a property of predicates (i.e. sets of events), and not a property of the events themselves. Second, the fact that predicates like *inconsistent* pattern with *numerous*-type predicates supports the position that a single logical property characterizes *gather*-type predicates, and that *numerous*-type predicates are negatively defined, as an 'elsewhere condition.' The variegated semantic properties of collective predicates remove a gap in the semantic space that confounds these questions in the nominal domain.

3 Grounded Stratified Reference

3.1 A problem with measurement predicates

In Section §2, we resolved a problem of undergeneration by shifting from divisiveness to Stratified Reference. In the present section, we address a problem of overgeneration: without any further assumptions, divisiveness and Stratified Reference both incorrectly predict that *all* will be grammatical with certain predicates having to do with measurement. The problem for Stratified Reference can be illustrated with the predicates *be a group of less than ten* and *be denser in the middle of the forest*.

(20) a. * All the students are a group of less than ten.
b. * All the trees are denser in the middle of the forest.

Stratified Reference says that any event in P can be divided into a cover of subevents which are also in P. But this seems to get the wrong prediction for the predicates in (20): any plurality that satisfies the predicate *be a group of less than ten* can be divided into a cover of small subpluralities; clearly each of these subpluralities will also satisfy the predicate *be a group of less than ten*. A similar problem holds for *be denser in the middle of the forest* (provided that the epsilon condition admits large enough subpluralities for density to be well defined). For any plurality of trees that is denser in the middle of the forest, let each cell in the cover be a uniform sampling of these trees; this sampling will also be denser in the middle. Both of these predicates thus appear to satisfy Stratified Reference, yet are ungrammatical in sentences with *all*.

An even more striking demonstration of this problem is brought out by certain 'tautological' predicates like *'be a group of more than four or less than five'* and *'be a group of at least two'* (adapted from related examples in Higginbotham 1994 and Lønning 1987).

(21) a. * All the students are a group of more than four or less than five.
b. * All the students are a group of at least two.

Critically, both of these predicates denote properties that hold of every single non-singleton plurality. Thus, for any plurality, it will trivially be the case that the predicate will hold of all subpluralities. In fact, what

these sentences conclusively show is even stronger: there is *no* diagnostic that can successfully characterize *gather*-type predicates based on only the possible-world entailments of the sentences they appear in.

Just as with the 'tricky parts' problem, an exactly analogous problem holds in other domains—specifically, in the atelic/telic distinction. Here, (22a) is constructed to be analogous to (20a); (22b) is constructed to be analogous to (21b). The basic observation is that the predicates *ate less than fifty raisins* and *drank some quantity of beer* are telic (evidenced by their ungrammaticality with *for*-adverbials), despite the fact that they have the properties of divisiveness and Stratified Reference, when these properties are stated in terms of the entailments of the sentences.

(22) a. * John ate less than fifty raisins for twenty minutes.
b. * John drank some quantity of beer for twenty minutes.

Take an event in which John ate less than fifty raisins that has a runtime τ. Consider any subevent that transpires over a subinterval of τ. Necessarily, this will also be an event in which John ate less than fifty raisins. Thus, *ate less than fifty raisins* has (entailment-based) divisiveness and Stratified Reference. Similarly, any event in which John drank some quantity of beer can be divided into a cover of temporally small events, each of which contains the consumption of some quantity of beer. Thus, *drink some quantity of beer* also has (entailment-based) divisiveness and Stratified Reference.

To anticipate my proposal, the solution will lie in the fact that the definition of Stratified Reference in (14), following Champollion (2015), is technically not an entailment-based diagnostic: instead, it is defined using an event semantics, which provides more structure than a classic possible-worlds semantics. In our characterization of collective predicates so far, there has been no difference between saying that a predicate of *individuals* has Stratified Reference versus a predicate of *events* has Stratified Reference. Champollion proposes the latter, among other reasons, because it provides a clean way to unify generalizations across domains. Here, we will further leverage this choice to provide a solution for the empirical puzzle above. The definition of Stratified Reference will remain unrevised; we will just adopt certain new assumptions about the mereology of events.

3.2 Grounded Stratified Reference

From a general point of view, what unites all the above examples is the fact that the predicates denote something about the measurement or cardinality of a set. This seems to be a robust generalization: language treats all measure phrases exactly the same way with respect to *gather*/*numerous* categorization, regardless of whether they are of the form '*exactly* x,' '*less than* x,' or '*at least* x.' Intuitively, the measurement of a set is certainly something that arises by virtue of the group as a whole. The problem for the predicates in (20)–(22) is that divisiveness or Stratified Reference holds, but for the wrong reasons; the semantics of these predicates yields *accidental* satisfaction of the diagnostic properties.

To make this more concrete, let's consider the two sentences in (20). Observe that, in fact, any plurality, regardless of whether it satisfies the predicate itself, nevertheless can be divided into subpluralities that do. For *be a group of less than ten*, this is transparent: choose any cover with cells containing less than ten individuals. For *be denser in the middle of the forest*, this requires heavily overlapping cells in the cover, but the same thing is true: in each cell, include all the trees in the middle of the forest, plus one or two others on the outskirts. This strategy provides a way to find a cover of 'denser in the middle' cells, even for events that do not satisfy the predicate themselves. Ideally, then, we would like to formalize the intuition that a predicate holds of the sum *by virtue of* the fact that it holds for the parts. That is, there is more to an event than simply the individuals who participate in it. It turns out that this is exactly what we are given by event semantics, where sentences mean more than just the worlds in which they are true.

3.3 Stratified reference of participants vs. events

To ground our discussion, we start with a formal observation: namely, Stratified Reference stated in terms of events is strictly stronger than Stratified Reference in terms of individuals. The definitions in (23) and (24) repeat those of (13) and (14), with $|\text{agent}(e)|$ substituted for $\mu(e)$ in (24). Note also that (23) defines a property of individual predicates and that (24) defines a property of event predicates. To relate the two definitions, we therefore employ the following correspondence: for an event predicate P, we define the individual predicate θ_P as $\lambda x.\exists e[P(e) \wedge \text{agent}(e) = x]$.

(23) $\text{SR}_{\text{indiv}}(Q_{\langle e,t\rangle})$ iff $\forall x[Q(x) \rightarrow \exists X_{\langle e,t\rangle}[(\bigoplus X = x \wedge \forall y \in X[|y| \leq \varepsilon \wedge Q(y)]]]$

(24) $\text{SR}_{\text{event}}(P_{\langle v,t\rangle})$ iff $\forall e[P(e) \rightarrow \exists E_{\langle v,t\rangle}[(\bigoplus E = e \wedge \forall e' \in E[|\text{ag}(e')| \leq \varepsilon \wedge P(e')]]]$

We would like to show that $\text{SR}_{\text{event}}(P) \rightarrow \text{SR}_{\text{indiv}}(\theta_P)$, but that $\text{SR}_{\text{indiv}}(\theta_P) \nleftarrow \text{SR}_{\text{event}}(P)$. Going the first direction, we assume that P has Stratified Reference of events. Choose an arbitrary x in θ_P; by definition, this is the agent of some event e in P. By assumption, there is a cover E of e such that $P(e')$ for all e' in E. Let $X = \{\text{agent}(e') : e' \in E\}$, i.e., the set of individuals attained by mapping each cell in E to its agent. By definition, $\theta_P(y)$ holds for all y in X. By cumulativity of thematic roles, $\bigoplus X = x$. Choice of x was arbitrary, so this holds for all x in θ_P. Thus, θ_P has Stratified Reference of individuals.

To go the other direction, it suffices to observe that there exist events e_1, e_2, and e_3 such that $\text{agent}(e_1) \oplus \text{agent}(e_2) = \text{agent}(e_3)$ but $e_1 \oplus e_2 \neq e_3$. We can make this linguistically plausible with the *numerous*-type predicate *comprise a committee*. Assume that in e_1, Alicia and Mary make up the tenure committee; in e_2, Alicia and Talia make up the colloquium committee; in e_3, Alicia, Mary, and Talia make up the job search committee. The denotation of *comprise a committee* includes e_1, e_2, and e_3. The participants of e_3 are the sum of the participants in e_1 and e_2, but, since each commitee is independent, e_3 is not the sum of e_1 and e_2.

Figure 5 illustrates the situation with a graphical representation. Figure 5a represents an event instantiating definition (23); here, the plurality z, with $Q(z)$ witnessed by e_3, can be divided into sufficiently small parts x and y, with $Q(x)$ and $Q(y)$ witnessed by e_1 and e_2. Figure 5b represents an event instantiating definition (24); here, the event e_3 can be divided into e_1 and e_2, with $\text{ag}(e_1)$ and $\text{ag}(e_2)$ sufficiently small. By cumulativity of thematic roles, we also know that $\text{ag}(e_1) \oplus \text{ag}(e_2) = \text{ag}(e_3)$, so we can add the partial ordering on the left side of the diagram as well. In this form, the difference between the two definitions is clear: Figure 5a does not have the mereological structure between the events that is present in Figure 5b.

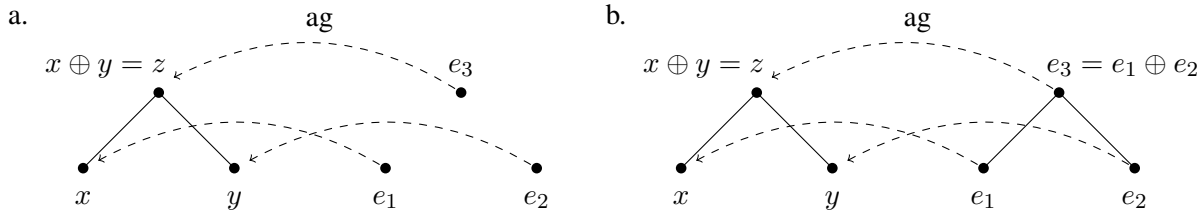

Figure 5: Graphical representations of the definitions in (23) and (24).

At this point, the argument boils down to the following: measure predicates, like the example in Figure 5a, lack the requisite mereological structure to satisfy event-based Stratified Reference. We motivate this independently with a formal observation: mereological summation does not preserve measure summation, due to the possibility of 'counting twice' for overlapping entities.

3.4 The event mereology of measurement predicates

We start with an the assumption, anteceded by the work of Fine (2012, to appear), that the denotation of a measurement predicate is a set of events witnessing exact measurements. Fine (2012) argues a similar point for disjunction, following similar insights from inquisitive semantics (see Mascarenhas 2009, Groenendijk 2009, among others). Whereas conjunction ('p and q') is witnessed by the sum of two events ($e_1 \oplus e_2$ where e_1 witnesses p and e_2 witnesses q), there is no such thing as an 'indeterminate' event that directly witnesses disjunction ('p or q'); rather, the witnesses of disjunction are the collection of events that witness either the one or the other of the disjuncts. Building on this work, I assume that measurement predicates are parallel to disjunction, denoting a set of events that witness exact measurements. For example, *be a group of more than five* is witnessed by events in which there is a group of exactly six, ones in which there is a group of exactly seven, ones in which there is a group of exactly eight, and so on. There are no 'indeterminate' events that directly witness the presence of a group of uncertain cardinality.

Under this assumption, we can now understand why measurement predicates as a class have the behavior that they do under *all*. For concreteness, we consider the predicate *weigh less than 250 kilograms*. With definite plurals, this predicate is ambiguous between a distributive reading ('each individual weighs less than 250kg') and a collective reading ('their total weight is less than 250kg'). As expected (given that it is a measurement predicate), the collective reading disappears in sentences with *all*.

(25) All the boys weigh less than 250 kilograms. ✓distributive *collective

Like *be a group of less than ten*, the collective reading of *weigh less than 250 kilograms* has individual-based Stratified Reference. As seen in (26), if the predicate holds of an individual, then it necessarily also holds of small subpluralities that form a cover of the individual; of note, (26) entails (27a) and (27b).

(26) Craig, Aditya, and Angela weigh less than 250 kilograms.

(27) a. Craig and Aditya weigh less than 250 kilograms.
b. Aditya and Angela weigh less than 250 kilograms.

However, the event that witnesses sentence (26) is not the sum of the events that witness the sentences in (27). Under the current analysis, each of these sentences is true by virtue of an event that witnesses an exact measurement. For example, these might be the same events that witness the truth of the sentences in (28) and (29).

(28) Craig, Aditya, and Angela weigh exactly 210 kilograms.

(29) a. Craig and Aditya weigh exactly 140 kilograms.
b. Aditya and Angela weigh exactly 140 kilograms.

What should now be clear is that there is no parthood relation between an event witnessing '*weigh exactly 140 kilograms*' and an event witnessing '*weigh exactly 210 kilograms*.' If we sum the two events that witness the sentences in (29), we do not get an event that witnesses the sentence in (28); we get an event that witnesses the existence of two groups that each weigh 140 kilograms. Indeed, the sentences in (29) do not even entail the sentence in (28), if Aditya has a different weight from the other two. Ultimately, the problem arises from a property of measurement; if μ is an additive measure function, $\mu(x) + \mu(y) = \mu(x \oplus y)$ if but only if x and y do not overlap. Exact measurements of wholes cannot always be deduced from the

exact measurements of their parts, because measurement cares about 'counting twice,' but mereological summation does not.[7]

4 Collective predicates, *same*, and *aksionsart*

4.1 *Same*: another window into mereological structure of collective predicates

If indeed *gather* and *numerous* differ in their mereological structure, we may expect evidence of this to be found elsewhere besides just with plural quantifiers like *all*. Here, I argue that this is indeed the case; I show that the adjective *same*, which is licensed by the existence of a plurality of events (Carlson 1987, Barker 2007, Hardt et al. 2012, Hardt and Mikkelson 2013), differs in its behavior with *gather*- and *numerous*-class collective predicates. This falls out immediately from the analysis proposed here.

The basic observation, dating back to Carlson (1987), is that *same* requires the existence of two distinct events to compare. A convincing example with an 'external' use of *same* (i.e., getting its antecedent from a separate sentence), comes from Hardt et al. (2012); they observe that *same* is not grammatical in (30b), in which both sentences describe a single reading event.

(30) a. I read *War and Peace* on my last vacation, and I read it in a single sitting.
b. * I read *War and Peace* on my last vacation, and I read the same book in a single sitting.
(from Hardt et al. 2012)

Barker (2007) makes a similar point for sentences with 'internal' readings of *same*. He observes that (31) only admits the reading in which John's buying and Mary's selling are not part of the same exchange.

(31) John bought and Mary sold the same book. (from Barker 2007)
a. ✓'There were two events; one in which John bought the book and one in which Mary sold it.'
b. * 'There was one event in which Mary sold John a book.'

Thus, *same* compares events, and must be licensed by the existence of a plurality of distinct events.

Given this as background, we make the interesting new observation that *same* is sometimes grammatical with collective predicates, as in (32b).

(32) a. Jose, Ellen, Brigitta, and Francis gathered around the table.
b. Jose, Ellen, Brigitta, and Francis gathered around the same table.

Under an analysis in which *gather*-type predicates are treated as properties of (impure) atomic individuals (e.g. Champollion 2010), it is mysterious why these predicates license *same*, since then there is only a single event involved in the meaning of (32a). On the other hand, given the analysis that we have developed here for *gather* and *numerous* predicates, this follows immediately, since any *gather* event can be divided into a plurality of subevents that can be compared by *same*. On the other hand, *numerous* events are defined by the fact that they *cannot* be divided into small subevents. The analysis therefore predicts that *same* should only be grammatical with *gather*-type predicates. As seen in (33) and (34), this prediction is borne out.

(33) *Gather*-type predicates are grammatical with *same*

[7] Note that it was the same insensitivity to double-counting that allowed us to prove that any 'density' state can be divided into a cover of cells satisfying '*be denser in the middle*.'

a. Jose, Ellen, Brigitta, and Francis gathered in the same room.

b. The four of them collaborated on the same project.

c. These seven puzzle pieces can fit together at the same time.

d. One hundred children held hands in the same circle.

(34) *Numerous*-type predicates are ungrammatical with *same*

a. * Jose, Ellen, Brigitta, and Francis elected the same president.

b. * Those twelve jurors returned the same verdict.

c. * The trees surround the same lake.

d. * The six departmental representatives make up the same committee.

What is particularly striking about the examples in (34) is that the ungrammaticality has exactly the same flavor as the ungrammaticality of *numerous*-type predicates with *all*: there is a desire to interpret the sentence with atomic distributivity, even if, as in the case of (34c), this yields a bizarre interpretation. The compatibility of a collective predicate with *same* can thus serve as another window into the mereological properties of the predicate.

4.2 *Aksionsart* and collective predication

A few words should be given to the observation, based on insights from Taub (1989), that accomplishment predicates (i.e. those denoting an process that results in a change of state), are often exceptionally grammatical with *all*, regardless of whether they have Stratified Reference or not.

The puzzle is exemplified by (35), which has a collective reading in which all the boys collaborated on a single raft-building event. What is of relevance here is that it's not possible to divide the set of boys into small subsets that each built a raft; the emergence of a raft depends on the contributions of each member involved in its construction. It therefore apparently does not have Stratified Reference, so the analysis, as it stands, gets the wrong prediction. (Note also that this is an undergeneration problem, not an overgeneration problem, so mucking around with the mereology of events will be of no help here.)

(35) All the boys built a raft. ✓distributive ✓collective

Taub's generalization is that there is a systematic difference based on the *aksionsart* of the predicate in question: according to her, activities and accomplishments admit *all*, while states and achievements do not. The most compelling evidence for this generalization are minimal pairs like the the one in (36). Here, the verb *form* is ambiguous between a stative meaning and an accomplishment. Only the accomplishment meaning is available with *all*.

(36) a. * All the dots form a circle. (based on Krifka p.c. via Brisson 2003)

b. All the boys formed a big group.

This generalization seems to be accurate—but only to a point. Namely, as we have already seen, states can appear in both *gather* and *numerous* classes. Among the clearly stative *gather*-type predicates, for example, we have seen *be similar* and *be compatible*. The *consistent*/*inconsistent* contrast provides particularly clear evidence against this generalization, since the two predicates differ only in the presence of a single morpheme. The more accurate generalization, then, is that, whatever property determines the category of

collective predicates in general (e.g., Stratified Reference), something special happens with accomplishments that allows them to appear grammatically with *all*.

To lend credence to the claim that accomplishment predicates like *build a raft* do not in fact belong to the *gather*-class (despite their grammaticality with *all*), we observe that, unlike canonical *gather*-type predicates, collective readings of accomplishments like *build a raft* are ungrammatical with *same*. In contrast with the examples in (33), the sentences in (37) and (38) do not allow a collective reading. The sentences in (37) are admissible only under the distributive interpretation that each boy built his own raft. (In (37a), they must be the same *kind* of raft).

(37) a. (All) the boys built the same raft. ✓distributive * collective
b. (All) the boys built a raft at the same time. ✓distributive * collective
c. (All) the boys built a raft in the same room. ✓distributive * collective

(38) * The boys formed the same group.

It is beyond the scope of this paper to offer an analysis of the exceptionality of accomplishment verbs with *all*, but a likely possibility is the presence of ambiguity—either lexical ambiguity of *all* or structural ambiguity of quantified plural DPs. A second form of *all*, independent from the one discussed here, is sensitive to the predicate's *aksionsart* (such as in the analysis of Brisson 2003). This is consistent with the behavior of the adjective *same*; since *same* has an entirely different syntax from the quantifier *all*, it is predicted not to be subject to the same ambiguity as *all*. *Same* thus removes the *aksionsart* confound: the logical distinction that hold for states with *all* holds for both states and accomplishments for *same*.

5 Discussion

This paper began with the insight that *gather*-type collective predicates show a formal congruence to mass nouns and atelic predicates; we thus explored an analysis in terms of the classic notion of divisiveness, as proposed for the other two domains. Although at a first pass, divisiveness was a surprisingly good diagnostic for *gather*-type predicates, we observed that it was too strong in one way, and too weak in another. In Section 2, I addressed a problem of undergeneration (the 'tricky-parts problem'); I changed a universal to an existential, and moved from divisiveness to the weaker property of Stratified Reference. In Section 3, I addressed an overgeneration problem involving measurement; I showed that, if Stratified Reference holds of events instead of participants, then plausible assumptions about the mereology of events have the effect of systematically ruling out measurement predicates from the *gather*-class.

5.1 Why Stratified Reference?

Why are plural quantifiers sensitive to Stratified Reference? I'd like to suggest that Stratified Reference is a presupposition that exists to avoid triviality. Brisson (2003) posits that plural quantifiers like *all* quantify over the cells of a cover of the plural noun; thus, *all the dogs* means roughly 'each relevant subset of the dogs,' where subsets must be small and can be atomic. The sentences in (39) and (40) provide two new pieces of data to support this claim. In (39), we observe that (39a) can be true in a scenario in which there are two opposing opinions (*Harry Potter* vs. *The Hunger Games*), but (39b) requires a larger number of opinions (perhaps even down to pairwise disagreement). Thus, *all* has a maximizing effect not only on *which students* are involved in the disagreement, but also on *which subsets* of students are in disagreement.

(39) a. The students disagreed about what book to read.

b. All the students disagreed about what book to read.

Relatedly, in (40), we observe that the sentence can be true in a scenario in which the total set of students who hung out with someone is the same in both weeks, just with different groupings. In order to get these truth conditions, *none* must be able to quantify over subsets of students.

(40) None of the students who hung out last week hung out this week.

As is hopefully apparent from the formulation of Stratified Reference in this paper, there is a deep connection between quantification over covers and Stratified Reference. Namely, Stratified Reference guarantees the existence of a possible cover to quantify over. For *numerous*-type predicates, which involve an emergent property of the whole, there are events for which a sentence quantifying over a cover will be guaranteed to be false. The presupposition of Stratified Reference is therefore a grammaticalized way to avoid trivial falsity. (This connection between ungrammaticality and triviality has been explored further with the notion of L-analyticity and G-triviality in Gajewski 2002 and Chierchia 2013.)

A second theme that emerges here is the idea that natural language is insensitive to accidents. Both of the moves that I have made here have made the diagnostic more resilient to irrelevant edge cases. First, the move to Stratified Reference removed a universal quantifier that was accidentally considering 'tricky' ways of dividing up a plurality. Second, the move to event semantics ensured that the reason that a predicate holds of a sum is grounded in the reason it holds of its parts. Both of these theoretical moves, then, are formal ways to encode the idea that the ontology of natural language only cares about the big picture.

5.2 Cross-domain parallels

As indicated in the introduction, there are two general goals of this paper: the first consists of the technical solutions to various puzzles, including both the extension of Stratified Reference from Champollion (2015), and the novel use of the mereology of event semantics. The second goal has been to make a more general and theory-neutral point: whatever distinguishes *gather*-type predicates from *numerous*-type predicates, it is exactly the same property that distinguishes mass from count and atelic from telic. What I hope to have brought out throughout the paper is the observation that the puzzles that we face when distinguishing categories of collective predicates—regardless of whether one adopts the analysis here in whole or in part—are exactly those puzzles that we face when distinguishing mass from count and atelic from telic. Specifically, we saw direct analogues across several domains of (a) the minimal parts problem, (b) the tricky parts problem, and (c) the measurement problem. I thus take it as a desideratum of any theory of collective predicates to give an analysis explains the parallels to these other domains. Drawing on existing work on mass/count and telicity, that is exactly what I have done here.

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