Stubborn Distributivity, Multiparticipant Nouns and the Count/Mass Distinction[*]

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1.   Introduction

There are predicates that I call "stubbornly distributive" based on what happens when they are combined with plural count noun phrases. I will use these stubbornly distributive predicates to identify and analyze a certain subset of mass nouns which I call "multi-participant nouns". *Traffic* and *rubble* are multi-participant nouns but *furniture* and *luggage* turn out not to be. Importantly, 'typical' mass nouns like *water* are multi-participant nouns.

        The proposed analysis of multi-participant nouns will rely on the hypothesis that nouns, like verbs and adjectives, are event predicates. *Boy* is true of an event whose sole participant is a boy. In this framework, the meaning of a noun determines which events are in its extension. Whether or not a given event is in its extension can depend on: (a) the nature of the participants in the event, (b) the number of participants and (c) relations among participants. By allowing (a) to be just one component of the meaning of a noun, it becomes easier to imagine a semantic basis for the mass/count distinction with the following character. On the one hand, facts about the referents of a noun phrase **influence** the categorization of the head nouns: properties of water and of dogs, surely are relevant to the status of the nouns *water* and *dog*. On the other hand, properties of referents don't **determine** the status of the head, for as has often been observed, co-referential noun phrases can differ in the mass/count status of their head nouns.

2. Stubborn Distributivity

2.1 Plurals and Events

Below I will explain what I mean by "stubborn". "Distributivity" has to do with the distributive-collective ambiguity felt in examples like (1) below:

(1) The boxes are heavy.

On the collective reading, this sentence can be used to report the total weight of the boxes. On the distributive reading, it is a report of the weights of the individual boxes. In a situation where there are a lot of small boxes, (1) could be true on the collective reading and false on the distributive reading.

This ambiguity has been analyzed in different ways. For reasons that will eventually become clear, I will embrace an understanding of this ambiguity that originates in a 1989 NELS paper by Higginbotham and Schein. It is developed within a framework in which a verb is a predicate of events and its arguments describe participants in the event described by the verb. The key idea about distributivity is that it has to do with **event participation**. A collective reading is one in which multiple individuals participate in the same role, while a distributive reading involves quantification over events in each of which a single individual participates in a given role. The two readings of the sentence in (1) above are given in (2) and (3) below:

(2) There is a *heavy*-event **e**: every box participates in **e**. COLLECTIVE

(3) For every box, **b**, there is a *heavy*-event **e**:
     b participates in **e**. DISTRIBUTIVE

The distributive-collective ambiguity is an ambiguity about how to read a particular argument or argument position. A verb with two arguments may have one read collectively and the other distributively. For example, the sentence in (4) has a reading in which the subject is collective but the object is distributive.

(4) Jack and Jill enlarged their kitchen and their dining room.

On that reading, for each room there is an event of enlarging with two agent participants, Jack and Jill. Because the distributive collective ambiguity has to do with particular argument places, above I said that collective readings involve multiple participants in *the same role* while distributive readings have one participant in a given role. Since discussion here will be limited to intransitive predicates, henceforth I'll simply refer to multi-participant events (collective) and single participant events (distributive).

I use the term "event" because Higginbotham and Schein did, but I don't like it. I take these so-called events to be ways that we parse our surroundings. If I am looking at my TV set, I may see a screen filled with different colored dots – an event with many

participants. Looking at the very same TV set, I may see a dog running – an event with a single participant. These two events differ at the very least in numbers of participants but they are events or parses of the same underlying reality. It is this very general notion of 'event' that allows us to think of an adjective like *heavy* as being a predicate of events. Given that we have this general conception, I recommend that we complete the picture by taking all lexical predicates, including nouns, to be predicates of events. In other words, instead of thinking of *boy* as true of an *x* just in case *x* is a boy, we should think of *boy* as true of an event just in case its sole participant is a boy.

With this amendment, we need to revise how arguments and predicates are combined semantically. Since both describe events, the connection has to be in terms of statements relating the participants in the events described by both. Here are the two readings of sentence (1):

(5)   There is a set of *box* events B: COLLECTIVE
                 there is a *heavy* event, **e′**
                 the participants in the B events are all and only the participants in **e′**

(6)   There is a set of *box* events, B.   DISTRIBUTIVE
                 For every event **e** in B:
                  there is a *heavy* event, **e′**
                  the participants in **e** are all and only the participants in **e′**

Here is a summary of the key features of this theory:

(7)   Features of Plurals and Events Theory

    ❑   distributive/collective ambiguity has to do with number of event participants.
    ❑   nouns are event predicates
    ❑   DP-argument events are connected to the main predicate event with statements about shared participants.

The idea of connecting predicates and their arguments with statements about relations among events is motivated and explored in detail in Schein(1993,in-prep).

2.2   Stubborn Distributivity

There are predicates that for some unknown reason allow for distributive readings but not for collective readings. *large* is an example of such a predicate. Sentence (8) below has a distributive reading according to which each of the boxes is large.

(8)   The boxes are large.

(8) lacks a collective reading. It could not be used to describe a situation in which there are many little boxes, even if the collection itself is large. To describe such a

situation one can replace the plural with a noun phrase headed by a group noun as in (9) below.

(9)   The pile of boxes is large.

Another method for getting at the missing collective reading of (8) is to paraphrase the predicate *large*. If something is large, then it is fair to say that it takes up a lot of space. Replacing *large* in (8) with *take up a lot of space* we get:

(10)   The boxes take up a lot of space.

Like (8), (10) has a distributive reading but it also has a collective reading. It seems like (8) should have that collective reading too. But it doesn't. *large* stubbornly refuses to allow that reading and so I call it a **stubbornly distributive predicate**. *big* and *small* are also stubbornly distributive as are *round* and *long*. In the b. examples in (11) and (12) below, I've used the paraphrase method to bring out the missing collective reading of the a. examples:

(11)   a. The boxes are round.   DISTRIBUTIVE-ONLY
        b. The boxes form a sphere.   HAS MISSING READING OF a.

(12)   a. The phone calls were long.   DISTRIBUTIVE-ONLY
        b. The phone calls took up a lot of time.   HAS MISSING READING OF a.

The stubbornly distributive predicates discussed here are adjectives of size, shape and duration. But there are other types of adjectives that are stubbornly distributive and some verbs are stubbornly distributive as well.

According to the theory summarized in (7) above, distributive readings of intransitive predicates are readings in which there are single participant events, while collective readings involve multiple participant events. Within the context of that theory, stubbornly distributivity can be described as in (13) below:

(13)   *A stubbornly distributive predicate is a predicate that applies only to single participant events.*

To see how this rules out collective readings, let us reconsider *the boxes are large* from (8). Following (5)-(6) above, the two potential readings come out as:

(14)   There is a set of *box* events B: COLLECTIVE
            there is a *large* event, e'
            the participants in the B events are all and only the participants in e'

(15)   There is a set of *box* events, B.   DISTRIBUTIVE
            For every event e in B:
             there is a *large* event, e'

the participants in **e** are all and only the participants in **e′**

The collective reading in (14) describes a *large* event with multiple participants, something that (13) says is impossible.

The situation described in (13) is to some extent expected. A predicate like *meet* or *gather* applies to events whose participants are human beings. But among those events, it will apply only to multi-participant events. So, we should expect to find predicates that apply only to single participant events. What still remains a mystery is why *big* for example should be such a predicate.

3. Multi-participant Nouns

There is a class of mass nouns that do not combine felicitously with stubbornly distributive predicates, as the following examples illustrate:

(16)   **?**The wine is big.
(17)   **?**The snow is round.
(18)   **?**The cocaine was long.
(19)   **?**The traffic is large.

Just as in the plural-count case, for each of these examples there is a plausible, though absent, collective reading in which a totality is described. And we can use the same methods we used earlier to get at the missing readings. In (20) below I've put my finger on the missing collective reading of (17) by using a group noun. In (21), I use the paraphrase method to describe the missing collective reading of (16).

(20)   The pile of snow is round.
(21)   The wine takes up a lot of space.

The analysis given in the previous section for plurals can be used to make sense of the data in (16)-(19). Recall that with definite plurals, there were two different procedures for combining the subject DP with the main predicate. One procedure collects together the participants of several events and this procedure fails with stubbornly distributive predicates. The other procedure quantifies over events, and pairs 'noun participants' with 'adjective-participants' for each event quantified over. This procedure works because each noun-event has only a single participant. The infelicity of examples (16)-(19) shows that neither procedure works with these nouns. In particular, we can conclude that even if we limit ourselves to individual 'noun-events' we are still left with too many participants. This leads to the hypothesis that the head nouns in (16)-(19) are *multi-participant nouns,* defined as follows:

(22)   *A multi-participant noun is noun that applies only to multi-participant events.*

Adopting this hypothesis and applying our earlier analyses of distributive readings to (19), we get:

(23)   There is a set of *traffic* events, T.
                For every event **e** in T:
                 there is a *large* event, **e′**
                 the participants in **e** are all and only the participants in **e′**

Being a stubbornly distributive predicate, *large* applies only to events with single participants. Therefore, **e′** in (23) has to have only one participant. Since *traffic* is a multi-participant noun, any of the **e**'s in (23) contains more than one participant. There could be no sharing of participants between **e** and **e′**.

The idea that *traffic* is a multi-participant noun, as defined in (22), is fairly intuitive. The participants in traffic events are vehicles or pedestrians in transit and, at least in normal cases when that noun is applied, more than one of these participants is present. As Susan Schweitzer pointed out to me, *lumber, timber, clutter, debris* and *rubble* are other nouns for which the label 'multi-participant' seems appropriate. Like *traffic*, they do not combine with stubbornly distributive predicates and it seems plausible that they describe events with multiple participants – planks or boards in the case of *lumber*, broken bits of rock or masonry in the case of *rubble*. But what should we say about nouns like *snow* or *wine*? To evaluate the claim that they are multi-participant nouns we need to decide what the participants are in events described by nouns of this type. Cartwright(1970) and Burge(1977) are representative of the positions generally taken on this question. Cartwright introduces the technical term 'quantity' and she illustrates its use in connection with the noun *coffee*. She writes: "Suppose now that I have before me a cup filled with coffee. My claim is that there is a non-empty set, *Q*, of quantities of coffee, each of which contains some of the coffee in my cup and one of which contains all of it." In at least normal cases, any time you have a quantity of coffee present, you have several quantities present. If we understand the quantities of coffee to be the participants in an event described as *coffee,* then *coffee* is multi-participant and likewise for *snow* and *wine*. Burge elaborates a view according to which nouns like *water* and *lemonade* are like pluralized count nouns; they apply to 'aggregates', Burge's term for what I would call pluralities. The aggregates have molecules as their member-components. As Burge explains, *lemonade* aggregates are composed of at least three kinds of molecules: water, sucrose and citric-acid. If we take these components to be the participants in any event described by *lemonade*, then it is a multi-participant noun.

Let us now summarize our results. We know something about stubbornly distributive predicates because of what happens when they come in contact with plural count noun phrases. In the context of a theory in which the distributive-collective ambiguity has to do with event participation, stubbornly distributive predicates are analyzed as predicates of single participant events. They do not admit collective readings because such readings describe events with multiple participants. Stubbornly distributive predicates do not combine with certain mass nouns. In the context of a theory where nouns are event predicates, these nouns are analyzable as "multi-participant nouns". A multi-participant noun applies only to multi-participant events and hence cannot be combined at all with a stubbornly distributive predicate. Our understanding of this

pattern of data relies on two theoretical assumptions. First, that the distributive/collective ambiguity concerns event participation and secondly, that nouns, like verbs and adjectives, are event predicates. In section 6, I try to show why I found it hard to understand this pattern of data in a semantic framework for the study of plurals and mass nouns where these assumptions are not made.

4. The Count-Mass Distinction

Here are some of the standard diagnostics for the count-mass distinction. Count nouns are found directly combined with numerals, the indefinite article, *every* and *few*. A given count noun may occur in the singular and in the plural. A singular count noun generally cannot occur in argument position without a determiner (see Carlson 2006 for exceptions). Mass nouns are found in combination with *much,* combine in the singular with *a lot of* and have none of the properties just listed for count nouns. Once the categories of count and mass are grammatically defined, one can proceed to ask (a) whether there is a categorization of meanings that corresponds to the grammatical categorization of forms, (b) whether that correspondence leads to a meaningful explanation of the diagnostics and finally (c) whether there are psychological or physical properties of referents that, in conjunction with the proposed semantic categorization, explain patterns of lexicalization. The question in (b) involves asking, for example, whether incompatibility with a numeral follows in an interesting way from the meaning of a noun. The question in (c) involves asking, for example, whether there is something about water that determines the type of semantics the noun *water* has. It is a bit difficult to see the difference between (a) and (c), given standard ways of thinking about the mass-count distinction. To appreciate the difference between (a) and (c), it is helpful to recall the TV scene discussed earlier. The dots event differs from the dog event in ways that will be reflected in the descriptions used. They are different meanings that will correspond to different forms. But one could also ask what properties of the TV scene might lead to one to a preference for one type of description over the other. This type of situation is familiar from the aspect literature. One and the same scene maybe construed as a state (*was running*), as a process (*ran*) and as an accomplishment (*ran to the store*). When looking at verbs, one may notice that a scene of some prototypical kind favors lexicalization in one particular aspectual class, with languages possibly differing on the favored class. In the remainder of this section, I will take some steps towards addressing the questions in (a-c) in the context of the discussion in the previous two sections.

In section 3, I defined a class of nouns in terms of the number of participants in an event in the domain of application of the noun. In the chart below I've expanded that type of classification to include two other possible noun classes:

(24)   Semantic classification of nouns

NAME OF CLASS	RESTRICTION ON DOMAIN OF APPLICATION	EXAMPLE
Multi-participant	only multi-participant events	*wine, traffic*
Single participant	only single participant events	*box, boy*
Mixed participation	multi- and single participant events	

Below I will discuss nouns that exemplify the last semantic class. But first, I will offer a proposal about how the semantic classes in (24) are related to the grammatical categories 'count' and 'mass'.

(25)   *Single participant nouns are count nouns, all the rest are mass nouns.*

It follows from (25) that with count nouns, there is a reliable one-to-one correspondence between events and participants. In that case, counting events is tantamount to counting participants. This could serve as the basis for some of the distributional differences mentioned above in conjunction with the following idea. The lexical vocabulary offers event predicates and so the semantics for functional elements must be put in event terms. But the functional elements, numerical determiners and count-quantifiers, may ultimately be interested in counting and quantifying participants: objects in the world, not ways of parsing it. With count nouns and only with count nouns, the events can serve as proxies for their participants. This fact may also play a role in number marking. Count nouns occur in the singular and the plural. And for count nouns, the choice of number marking has semantic consequences. In contrast, a given mass noun will occur (as a mass noun) in the singular or in the plural (eg *proceeds, shavings, belongings, dregs, guts*) but not both. And there is no consistent semantic import to the number marking on a mass noun. Suppose we take number marking to reflect the number of events in the extension of the noun that are in play, so that singular number marking always means 'one event'. In the case of count nouns, it ultimately matters how many events there are, since they serve as proxies for participants. But for mass nouns it doesn't matter.

There are well-known distributional similarities between plural count noun phrases and mass noun phrases. Both can found in combination with *most* and *all* (*most water, most waterways, *most water-boy*) and like mass nouns, plural count nouns freely occur determinerlessly. Here again a focus on the tension between interest in participants and the need for event talk offers a way to understand why these two groups of nouns pattern alike. In sections 2 and 3, we saw two different ways that one can associate multiple participants with a single role in a verbal predicate. One option is to use a plural count noun phrase. In that case, you have several events and, one way or the other, the semantics places all the participants in these events in the role in question. The other option is to use a mass noun which allows several participants in a single event. If the

diagnostic contexts somehow demand multiple participant role filling, count-plural or mass will do, but singular-count will not.

It is often said that a noun cannot be a count noun, if, whenever it describes some thing, it also describes parts of that thing. If something is water, then every visible part of it is water and so *water* has to be a mass noun. I doubt this principle is correct, but let's suppose it is. I'd like to sketch out by example how the lexicon would come to be characterized by this principle. Imagine a body of water and imagine a set of concentric circles, each one marking out an event in the extension of *water*. Let's start with the counter to fact assumption that *water* is a single participant noun. Take the innermost circle. The water inside it satisfies whatever criteria there are for being a participant in a water event. The same holds for every circle up to the outermost one. But now, let's fix on the outermost circle. The water that fills the innermost circle is inside the outermost circle and as we just said, that water satisfies the criteria for a being a participant in a *water* event. Whatsmore, there is no salient basis for excluding that water as one of the participants in the outermost event. Whatever the criteria are, they don't say anything about amount, extent or shape. Contrast *lake, puddle* and *ice-cube* which apply to events with watery participants, but which impose other criteria on participation in their events. If we now take the water occupying the innermost circle to be a participant in the outermost event then it has at least two participants. The same reasoning applies for the water that fills all the intermediate circles. So the outermost circle must have multiple participants.

This story depends on water events reliably having this divisional character. By contrast, the Pope's crown may itself be constructed of crowns (Wiggins 1980), but since crown-events don't reliably have participants, parts of which satisfy criteria for participation in crown events, we don't expect *crown* to be lexicalized as a multi-participant noun. What about speakers of English who believe that any portion of water has constituents, molecules, no proper part of which is water? This belief concerns criteria for being a participant in a *water* event. If we take the molecules themselves to be potential participants in *water* events, then the current theory predicts that it should be odd to refer to a single water molecule on my sleeve as *the water on my sleeve*. The problem would arise because although we have a potential participant in a *water* event, we don't have enough of them to constitute a *water* event. The oddness should at least be on a par with referring to a lone car on the highway as *the traffic on the highway*. With *water* we have the added problem that not many of us encounter single molecules of water.

It should be emphasized that this is supposed to be an account of why a certain type of meaning is likely to lexicalize as a multi-participant noun, a species of mass noun. It is not a definition of "mass noun". The definition of "mass noun" was given already in (25) above. The account is also not intended as a general picture of how mass noun lexicalization works. It leaves open, for example, that the reason why *water* is a mass noun may be different than the reasons why *traffic, evidence* or *ignorance* are mass nouns.

This brings us to the empty cell in the chart in (24) above in the row labeled "mixed participation". Since these nouns apply to events with multiple participants, they have all the trappings of mass nouns, as expected given (25). On the other hand, since they can also apply to events with single participants they can combine felicitously with stubbornly distributive predicates. The head nouns of the subjects of the following examples are all included in this class:

(26)   The **furniture** in that nightclub is round.
(27)   The **mail** in that bin is square and small.
(28)   The **luggage** she brought was big.
(29)   The **equipment** will be too large to fit inside this room[1].

Discussions of the semantic basis of the mass-count distinction usually consider two types of inferences, one to do with division and the other to do with cumulativity (see for example Bunt 1985, Krifka 2007). The present approach allows these two inferences to operate at different levels. Division was discussed above in connection with the noun *water*. It has to do with the fact that criteria for participation in *water* events do not distinguish something that satisfies the criteria from any of its parts. Cumulativity applies on the level of events, as I will now explain with the aid of the following example of a <u>valid</u> cumulative inference.

(30)   If Jack spilled sour milk on the carpet and Jill spilled sour milk on the chair, it follows that the milk that Jack and Jill spilled was sour.

Switching to a count noun we can generate an example of an <u>invalid</u> cumulative inference. Borrowing an example suggested by Barbara Partee (Krifka 1989 fn5), we have:

(31)   If Jack wrote a sequence of primes on his paper and Jill wrote a sequence of primes on her paper, it does not follow that the sequence that Jack and Jill wrote consisted of prime numbers.

Sequence is a count noun and so it can only apply to events with a single participant. But there is no single sequence that Jack and Jill wrote. By contrast, since *milk* is a mass noun, it can pick out an event with two participants, the one from Jack's spilling and the one from Jill's. The difference between these two examples has to do with the numerosity of participants in the events described. It is not tied in any direct way to criteria for being milk or being a sequence. The difference between the two levels is especially clear if we compare count nouns like *chair, table* or *couch* with the mass noun *furniture*. Anything that satisfies the criteria for participation in a *chair* event will also satisfy criteria for participation in a *furniture* event. They do not differ on this score. But *chair* is a single participant noun so it will not support a cumulative inference, while *furniture* will. Returning to (31), one can indeed form a new sequence by putting two

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[1] From Allan (1980:566)

sequences together. If cumulativity had to do with criteria for participation, *sequence* might indeed be expected to validate such inferences.

Quine(1960:section 21)'s discussion of the adjective *spherical* is interesting in light of the foregoing discussion. Quine allowed that some adjectives could be treated like mass terms, but that adjectives like *spherical* "are not cumulative in reference, not mass terms". From the current perspective, we can understand Quine's "cumulative in reference" to be a fact about participation criteria defined in terms of an intuitive notion of 'sum'. A noun or adjective is cumulative in reference if its participation criteria are satisfied by any sum of parts each of which satisfies the participation criteria. The 'sum' of two red objects is red but if we 'sum' two spherical objects the result is presumably not spherical, hence *spherical* is not cumulative in reference. Quine suggested that count adjectives can't be modifiers of mass nouns, hence the infelicity of **spherical water*.[2] Burge(1972) replied to this suggestion by observing that *cylindrically shaped* and *foot-shaped* do combine with mass nouns, even though neither adjective is cumulative in reference.   The stalemate can be broken if we advance from the level of participation criteria to the level of events. *Spherical* is a stubbornly distributive predicate hence it can only hold of single participant events. Count nouns also apply only to single participant nouns. So, in a sense, Quine was right, *spherical* could be characterized as a 'count adjective'. But this is a fact about number of event participants in a *spherical* event and, as we've seen, it is possible to have a different predicate such as *shaped like a ball* which has similar participation criteria but that allows multiple participants. Such a predicate would not be a 'count predicate'. So Burge's objection goes away. Burge had a different kind of objection to Quine's 'count adjectives' that I think is valid. If we take 'count' to be a grammatical category, as I have, then it simply doesn't apply to adjectives as it relies on facts about cooccurrence with determiners and behavior in argument position.[3]

There is one final property of the mass/count distinction which is important to keep in mind when assessing our key data to do with mass nouns and stubbornly distributive predicates.   It is possible for nouns to transition among the meaning categories in the table in (24) (for some discussion see Gillon 1999, Doetjes 1997:section

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[2] For a more extensive account of the modification facts, see Bunt(1979,1981, 1985:chapter 9).

[3] This is true for English. The meaning of the terms "mass" and "count" may well be different for languages in which nouns are marked for mass or count and where adjectives show agreement with respect to these features. In Asturian, for example, adjectives show differential agreement marking that is related in some way to the mass/count status of the noun they agree with. In the example below from García González (1985:32):

(i)   El paisanu viey**u** de la casa blanc**a** lleva'l   pelo cort**o** y   la ropa   bien llimp**io**.
        the peasant old   of the house white had-the hair short and the clothes well clean
        'the old peasant in the white house had short hair and clean clothes'

there are three different types of nominal agreement markers. Traditionally, the markers are described as 'feminine', 'masculine' and 'neutro de materia'. In (i), *pelo, corto* and *llimpio* all have the neutro de materia suffix '-*o*'. And whereas *pelo* is translated as *hair*, *pelu*, with the masculine suffix, might be translated as 'strand of hair'.

2.1.2). For example, the noun *sugar,* normally used as a multi-participant noun, is used as a mixed participant noun in the example below from Bunt(1985:213):

(32)   The sugar in these boxes is cubic.

        (32) is to be understood as uttered in a discourse "in which sugar takes the form of lumps". By adding the lump-criterion, we're able to exclude participants that would have otherwise been included by necessity in any sugar event and which ordinarily make it impossible to find a single-participant event as required by *cubic.* When a basic multi-participant noun like *water* is used with count grammar (*Bring me three waters for table 6*) a concomitant change in criteria of participation is entailed. Some additional criterion such as form must be added to distinguish portions of water thereby allowing for single participant events. It is important to keep in mind the facility with which these transitions occur when judging examples with stubbornly distributive predicates. The examples given earlier in (16)-(19) above relied upon the assumption that the nouns were used as multi-participant nouns. In fact nothing in the grammar guaranteed that, because the definite article is used with all three types of nouns. To prevent slippage into a count reading, we can make use of anaphora as in the following:

(33) $^?$[A lot of wine]$_i$ spilled on the floor. It$_i$ was so big we had to use a mop.

(34) $^?$Max poured out [a lot of cocaine]$_i$ but still it$_i$ wasn't long enough.

        Transitions from the multi-participant category to mixed participant and to single participant are brought about by adding contextually supplied participation criteria. There is a related phenomenon which I'll call "quantitative context dependence". The following pair shows the quantitative context dependence of the mass DP *some wood*:

(35)   There is some wood in my truck.

(36)   There is some wood in my eye.

        The amount of wood that would be required to verify (35) is presumably much smaller than the amount required for (36). The relevant contribution of context in these cases is a threshold quantity. These examples do not involve transitioning among categories and could arguably have to do with the meaning of the quantifier, *some* and not the noun.

        Alongside quantitative context dependence goes quantitative vagueness. In natural contexts for both (35) and (36), the threshold quantity will be vaguely specified. Chierchia(2008) takes quantitative vagueness to be a defining property of mass nouns and he offers a semantics for mass-determiners that in effect test for this property. In fact, some count nouns are subject to quantitative vagueness as well. How a high a disturbance in the landscape or on the surface of the water needs to be to count as a mountain or a wave will be resolved contextually, but only up to a point. Colloquial uses of these nouns will not pin things down to within a centimeter, for example. However,

there is an important difference in the consequences of the vagueness in the case of count nouns versus mass nouns. The vagueness for *mountain* will not affect the number of participants in an event. If the scene outside my kitchen window has a mountain it, the fact that a slightly lower rise would also count as a mountain, doesn't (on most accounts) entail that there are two mountains in that scene. By contrast, if the scene includes wood, then the vagueness of wood-criteria means that no scene could be positively held to be one with a single wood participant in it. This will have consequences for how wood is lexicalized, as outlined in the discussion of water circles above. So at least for this class of nouns, vagueness may well be the key to understanding their classification as mass nouns, as Chierchia argues.

5. Conclusions and Prospects

The central conclusions of this paper are as follows. Nouns are predicates of events. A noun meaning specifies the number of participants in the events it applies to and it specifies criteria for participation in those events. Within and across languages, it is possible to have two nouns that agree on criteria for participation but disagree on the numerical restrictions. The numerical restrictions lead to a tripartite division of nouns into single participant, multi-participant and mixed participation nouns. The count-mass distinction is a bipartite grammatical division which separates the single-participant nouns from the multi- and mixed participant nouns. The key evidence adduced here is compatibility with stubbornly distributive predicative adjectives. These adjectives apply to single participant events only. When combined with plural count noun phrases or with mixed participant mass noun phrases, they give rise to distributive readings but do not admit collective readings. They do not combine felicitously with noun phrases headed by multi-participant nouns.

If these conclusions are correct, there are at least two issues that need to be confronted. First, a more complete account must be given for how nominal arguments combine with predicates and in particular, we need an analysis of determiners that explains how they quantify over participants in the events picked out by the noun phrases they combine with. Along the way, the nature of these entities I've been calling events could be further clarified, especially as they relate to other semantic entities that have similar features such as situations (Kratzer 2008) and plural information states (Brasoveanu 2008, van den Berg 1996, Murray 2007). Secondly, we await a solution to the mystery of stubbornly distributive predicates; why are they stubbornly distributive? For those taking up this challenge, I'd like to add a cautionary note. In studying this lexical phenomenon it is important to probe the meanings of adjectives in predicative position. One issue is that attributive, non-restrictive contexts by themselves tend to enforce distributive readings (Schwarzschild 2006). *Heavy* is not a stubbornly distributive predicate but *twelve heavy bottles* quantifies over bottles, each of which is heavy. Whatsmore, pronominal adjectives are often subject to the vicissitudes of interpretation often noted in connection with compounds. *expensive wine* is wine, a standard portion of which costs a lot of money. A teaspoon of expensive wine may not be expensive at all.

6. Pluralities and Singularities

The analysis of mass nouns and plurals presented in the preceding pages analyzes the count-mass distinction and the distributive-collective ambiguity in terms of event participation. The purpose of this section is to confront the key data in (16)-(19) repeated below with theories that locate these distinctions elsewhere.

(16) **?** The wine is big.
(17) **?** The snow is round.
(18) **?** The cocaine was long.
(19) **?** The traffic is large.

Most work on the semantics of plurals locates the distributive/collective ambiguity in a distinction between two kinds of objects: singularities and pluralities. *Jack* refers to a singularity; *Jack and Jill* refers to a plurality. A plurality is composed of a set of singularities. A collective reading is one in which a predicate applies directly to a plurality. A distributive reading involves quantification over singularities with the distributively read predicate applying to each one[4]. The two readings of *The boxes are heavy* are given in (37) and (38):

(37) There is a plurality **p** consisting of all the boxes, **p** is in the extension of *heavy*.
      COLLECTIVE

(38) There is a plurality **p** consisting of all the boxes, every singularity that is part of **p** is in the extension of *heavy*.   DISTRIBUTIVE

The quantification over singularity parts in the distributive reading is usually attributed to the presence of a silent operator modeled on floated *each* and attached to the verb phrase.

If distributivity is associated with the application of a predicate to a singularity rather than a plurality, then stubborn distributivity should be analyzed as in (39) below:

(39) *A stubbornly distributive predicate is a predicate that only applies to singularities.*

Since *large* is stubbornly distributive, by (39), it would be impossible for it to apply to a plurality, hence *the boxes are large* has no collective reading, but it does have a distributive reading along the lines of (38). (39) also correctly predicts that the missing collective reading is restored in *the pile of boxes is large*. Since *pile* is count singular, *the pile of boxes* denotes a singularity.

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[4] I am ignoring intermediate distributivity (Schwarzschild 1996:Ch5, Beck and Sauerland 2000, Winter 2000).

The idea that predicates would be restricted just to singularities or just to pluralities is not new. *Meet* and *gather* are stock examples of plurality-only predicates and Schwarzschild(1994) and Gajewski(2005) discuss singularity only predicates like *blond-haired* or *born in America.* While it is a bit tricky to show that these predicates are singularity-only, the fact itself is not surprising. Being blond is, in normal circumstances, a property of individuals not of pluralities. The same intuitions do not hold for *large*, so why *large* should be singularity-only remains to be explained.

In the context of (39), the incompatibility of some mass DPs with stubbornly distributive predicates ((16)-(19)) leads to the following conclusion. Contrary to what you find in Link(1983, see D.22,25), mass DPs do not denote singularities. If *the wine* were singularity denoting, then presumably the singularity-only predicate *large* would apply to it and **that wine is too big* would be synonymous with *that portion of wine is too big.* The incompatibility of mass DPs with stubbornly distributive predicates appears then to support the view that mass DPs are plurality denoting (Burge 1977, Chierchia 1998, Gillon 1992, Laycock 1972, Nicolas 2008, Zamparelli 1998). But there is a problem with that view as well. Recall that distributive readings depend on the presence of a distributivity operator which in general allows a singularity-only predicate to combine with a plurality denoting subject. In *the boxes are large* the distributivity operator negotiates between the main predicate and the subject, pulling the singularities out of the box-plurality and applying the meaning of *large* to each of them. If a mass DP were plurality denoting, the distributivity operator ought to be able to pull out its singularity parts and apply the meaning of a stubbornly distributive predicate to each of those singularities. There shouldn't be any incompatibility. This conclusion would be avoidable if one could argue that the silent distributivity operator, like *each*, is only present when there is plural agreement on the predicate it attaches to. In fact, we know that that is not the case. The evidence comes from nouns that describe collections, such as *furniture* and *mail*. DPs headed by these nouns combine felicitously with stubbornly distributive predicates, as in the following examples discussed above:

(40)   The furniture in that nightclub is round.
(41)   The mail in that bin is square and small.
(42)   The luggage she brought was big.

Despite the singular agreement on the main predicate, they work just like with plurals. They allow for distributive readings but not collective readings. Using our familiar methods, we can draw out the missing readings with group nouns and paraphrase:

(43)   That pile of luggage is big.   MISSING READING OF (42)
(44)   The luggage she brought takes up a lot of space. MISSING READING OF (42)
(45)   The furniture forms a circle.   MISSING READING OF (40)

Given our analysis of stubbornly distributive predicates in (39), we can conclude that these readings are missing because the subjects of (40)-(42) denote pluralities and stubbornly distributive predicates do not apply to pluralities. Instead what you get is a

distributive reading where the predicate holds of the singularities making up the plurality in question: tables and chairs in the case of (40), packages in (41), suitcases in (42). This reading requires the presence of a distributivity operator, hence we can conclude that the silent distributivity operator is present even with singular agreement on the verb phrase.

Let us take stock. From their behavior with count noun phrases, we concluded that stubbornly distributive predicates apply exclusively to singularities. That they don't combine felicitously with *the wine* or *the traffic* implies that these DPs are not singularity denoting. From their behavior with DPs headed by *furniture* or *luggage,* we know that a singular stubbornly distributive predicate can combine with a plurality denoting DP with the help of a distributivity operator that targets the singularities composing the plurality. That stubbornly distributive predicates don't combine felicitously with *the wine* or *the traffic* implies that these DPs are not plurality denoting either. And now we've run out of options. I do not see any easy way to explain the infelicities in (16)-(19) that builds on what we know about stubbornly distributive predicates from their behavior with count noun phrases.

The above investigation into the nature of the referents of mass DPs highlights an important issue concerning singularities and pluralities. The distinction does not have any physical or even perceptual basis. I cannot simply study the snow on my roof or reflect on how I think about it to decide whether or not it is a singularity or a plurality. When I ask you to notice the stars in the sky, I use a plural DP and hence I'm referring to a plurality. But the object I refer to is indistinguishable from what *the cluster of stars* refers to, even though the latter is a singularity. Burge(1977) tried to provide language external criteria for distinguishing between the referents of *the stars that make up the galactic cluster* (plurality) and *the galactic cluster* (singularity), but I don't think he was successful. Unlike with count DPs, grammar is no help in deciding the reference type for mass DPs and so the literature is split on this issue. Given the characterization of stubbornly distributive predicates in (39), one might have expected them to be of use in deciding the question. Instead they have led us to a dead end.

The account of mass nouns offered in previous sections of this paper agrees with those who take mass nouns to be plural in some sense. It parts ways with them in taking the intuition to be about event participation as opposed to the nature of the objects referred to.

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