Pure Event Semantics

Roger Schwarzschild

MIT

October 25, 2022

Abstract

This paper offers a compositional semantics whose central premise is that nouns are one-place predicates of eventualities, just like verbs and adjectives. It includes:

- an analysis of the mass-count distinction in terms of the kind of state a noun denotes, doing justice to parallels between mass nouns and count plurals in combination with quantifiers and differences between mass nouns and count plurals in combination with reciprocals and stubbornly distributive adjectives.
- meanings for number features that function properly in Martí(2020)'s analysis of numeral noun constructions and in frankenduals, as well as in mass nouns (lexical plurals, mass neuters)
- an explanation for why lexical plurals (*suds, scissors*) are non-count and why they trigger plural semantic agreement. Crucial use is made of Sense Insertion in which features and roots are paired with meanings parallel to Vocabulary Insertion for phonological exponents.
- an hypothesis about the crosslinguistic use of diminutives to derive count nouns from mass nouns.
- an hypothesis about why dualia tantum are rare (Corbett 2019)
- an analysis of 'overcounting' and 'overmeasuring' in terms of quantification over states.
- an explanation for why intersective modifiers need to be in a relative clause or other predicative structure (Cinque 2010).

1 Introduction

1.1 Pure Event Semantics

In a neo-Davidsonian semantics, a verb is understood to be a one-place predicate of events or of states. Adjectives are often understood this way as well, but, with the exception of nominalizations, nouns rarely are. With thematic role predicates providing the connective tissue, neo-Davidsonian renditions of English sentences look like this:

(1) Jones buttered the toast.
($\exists e$) (**butter**(e) & **agent**(e,j) & **theme**(e,t))

(2) A window is open.
($\exists x$) (**window**(x) & ($\exists s$) (**open**(s) & **hold**(s,x)))

(3) Hunters occupied Addaura cave.

($\exists X$) (**hunters**(X) & ($\exists s$) (**occupied**(s) & **hold**(s,X) & **theme**(s,a)))

My goal here is to explore the viability and the desirability of a **pure event semantics** in which nouns, like verbs and adjectives, are one-place eventuality predicates. In §2, I lay the foundation for a pure event semantics. After that, I discuss empirical phenomena whose analysis benefits from a pure event semantic perspective. These phenomena and their analysis will be previewed in the remainder of this introduction.

1.2 Preview

With a focus on nouns, our main topics will be grammatical number (singular/plural/dual), noun meanings, especially the division between mass and count nouns[1], nominal quantification (*every horse*) and adjectival modification (*calm shepherd*). I will not be discussing nominalization, so unless otherwise noted, I use 'noun' to mean simple noun, one without argument structure, and I take nouns to be one-place predicates of states.

1.2.1 Mass, count and grammatical number

Mass nouns pattern in many ways like plural count nouns (Lasersohn 2011), leading many to conclude that mass nouns have the same kind of denotation as plural count nouns (Bacon 1973, Bale & Barner 2009, Burge 1977, Chierchia 1998, Gillon 1992, Landman 2020, Laycock 1972, Mufwene 1980). However, there are also ways in which mass nouns behave like singular count nouns, the most obvious being their use in grammatically singular noun phrases (*the soap*). Pure event semantics affords a way to make sense of the similarities of mass nouns and count plurals without identifying the two. Numerical distinctions can be made on two levels. States can be viewed from the inside in terms of the number of entities of which the state holds and they can be viewed from the outside in terms of the number of states involved. *The tree*, being count singular, would denote a single state while *the trees*, being count plural, would denote a set of states. This is a difference in the number of states denoted. The mass-count distinction is correlated with numbers of entities of which states hold. If every possible state in a noun's extension is a state that holds of a single entity, then it is count noun. These ideas form the basis for discussion in §§3-7.

Reciprocals are licenced by plural count noun phrases but not by singular count noun phrases. In §3, we use reciprocals to confirm that mass noun phrases denote singularities, just like singular count noun phrases.

The states that count nouns denote have single participants. That is their distinguishing feature. In §4, we find evidence of single participancy among adjectives as well. Single participant adjectives turn out to be useful tools for showing that there are multiparticipant states in the extensions of mass nouns (§4.2). Single participant adjectives also form the basis in §4.6 for a theory of why diminutives in various languages come to be morphemes that form count nouns out of mass nouns.

In §2.5, we offer an analysis of grammatical number features that draws on the two levels of numerical distinctions mentioned above. The analysis underwrites the

[1] I follow widely accepted usage of the term "mass" to be synonymous with "non-count" without ontological commitment.

claim that the plural feature in the mass noun *fumes* has the same meaning as the plural on the count noun *frogs*. This is the leading idea in §§5-7.

In §5 we explain why the plural feature present on *fumes* and other 'lexical plurals' *entails* that they are mass nouns.

In §6.2, we argue that bipartites (*scissors, pliers*) do not represent a mismatch between morphological and semantic number, which is why they trigger plural agreement even where semantic agreement is expected (Wechsler 2011). In §6.3, the focus turns to bipartites in languages that mark the dual. Corbett (2019) challenges theories of lexical plurals like ours with the observation that bipartites rarely occur as dualia tantum (nouns that occur only with dual number). We respond to that challenge by combining our analysis of lexical plurals (§5) with the analysis of duals composed (as in Hopi) of a 'singular' and a 'plural' morpheme (Noyer 1992, Harbour 2014). We show that in fact duale tantum status would not, as Corbett's challenge supposes, correlate with bipartite semantics.

In §7, our attention turns to three languages in which pluralization is intimately entwined with gender. In some cases, these 'gender plurals' are mass nouns and in other cases count nouns. The mass nature of lexical plurals stems from a close interaction between the root of the noun and the plural feature. Where the plural feature is located determines count-mass status. Paying close attention to the syntactic details in Kramer (2015)'s analysis of gender polarity in Somali then leads us to an explanation of why in that language gender plurals are count while in Asturian and Arbëresh they are mass (Manzini 2020, Manzini & Savoia 2017).

1.2.2 Quantification

The sentence

(4) Four thousand ships passed through the lock last year. (Krifka 1990)

may be judged true even if less than 4000 ships exist, as long as there were 4000 instances last year of a ship passing through the lock. Kratzer (2002:Ch4,p36-37) writes:

> If the noun **ship** has a state argument that can refer to temporal stages of individual ships, we understand why we are allowed to count ship stages when evaluating the truth of (4).

In §8, I will adopt the idea that state arguments explain 'overcounting' and expand on it by showing that the states that are counted need not correspond to stages of individuals. I will argue that nominal quantifiers always quantify over states. Default pragmatic restrictions can limit the domain of quantification to states that are in one-to-one correspondence with objects or individuals. In those cases, quantification over objects or individuals becomes a viable way to model natural language quantification. In §8.4, I'll adapt current ideas about measuring constructions to a pure event semantics and discuss how overmeasuring comes about.

1.2.3 Modification

In §9, attention is turned to adnominal modification by intersective adjectives (e.g. *healthy*) and by non-intersective, subsective adjectives (e.g. *skillful*). The generalization

in (5) below comes out of cross linguistic study of the distribution of intersective and non-intersective adnominal modifiers (Cinque 2010).

(5) Non-intersective interpretations are the result of direct combination of the adjective with the noun, while intersective interpretations require first building a predicative structure around the adjective.

By carrying out our analysis of modification in a framework in which nouns and adjectives are both one-place predicates of states, we'll gain an understanding of why that generalization holds.

1.2.4 Discourse

Discourse coherence is a relevant topic but unfortunately not one that we will cover. Coherence relations hold between eventuality descriptions. Stativity is a key feature in delineating these relations (Altshuler 2021). These relations are often mapped intersententially but they apply intrasententially as well (Hobbs 2010, Sasaki and Altshuler 2022). The contrast in (i-ii) is a simple example suggesting that nouns as state predicates enter into coherence relations:

(i) #He married his widow in 1960.
(ii) He met his wife in 1960.

As Anscombe (1979) observes, the train of cause and effect is a feature not present in (i), but it is present in (ii). More specifically, in (ii) the meeting event led to the wife state, but in (i) the marrying event didn't lead to the widow state, even though it was a prerequisite for it.

2 The framework

2.1 Semantics of plurals

Following Scha (1981), I adopt a semantics in which plural definite DPs denote non-singleton sets[2] and singular definite DPs denote singleton sets. Given our working assumption about noun meanings, those will be sets of states. Our universe therefore contains states and sets of states.

(6) Variables

s, s′ are variables over states.

S, S′ are variables over sets of states.

A non-singleton set of states will be called a **plurality**.
A set containing just one state will be called a **singularity**.

I will identify a singleton set with its members (Winter & Scha 2015:§3.1.1), so that:

[2] This approach would be classified as singularist and specifically mereological, with subset serving as the part-whole relation. Florio & Nicolas (2021) discuss criticisms of mereological approaches. "After comparing the mereological approach with plural logic," they "conclude that the former remains a viable and well-motivated framework for the analysis of plurals."

(7) $(\forall s)\ \{s\} = s$

(8) $(\forall S)(\forall s)\ (S = \{s\} \rightarrow S = s)$

It follows that any state is a singularity.

Identifying singletons with their members makes the implementation go a bit smoother, but it does take getting used to, so I will occasionally include a REMINDER of this identification.

2.2 Stative predications

The sentence

(9) A window is open.

reports on a connection between a *window* state and an *open* state. Following Ramchand (2005), I'll refer to the entities of whom a state holds as **participants**. The interstate relation invoked in (9) is that of shared participation, as indicated in the gloss in (10):

(10) A window is open.
'The participant in a window state is the participant in an open state'

Shared participation among states is a notion familiar from discussions of secondary predication. Note the double reference to the dress in Maienborn (2019:67)'s paraphrase of (11) connecting *wet* and *on the clothesline*:

(11) The dress was wet on the clothesline.

"there was a state of the dress being on the clothesline, and this state is temporally included in an accompanying state of the dress being wet"

Temporal inclusion is a necessary part of secondary predication (Rothstein 2004:§3.3), but it is not a necessary part of predication in general (Tonhauser 2021), and so it wasn't included in the gloss of (10) and it won't be included in subsequent glosses.

Returning to (10), *A window is open* involves the sharing of a participant between two states. The examples to follow describe participant sharing among several states.

(12) The molecules are in equilibrium.

'The participants in the molecule states are all and only the participants in a state of equilibrium'

The state of equilibrium is a **multiparticipant state**. And, by contrast, the state of openness referred to in (10) above is a **single-participant state**. In (12) above, *The molecules* picks out a plurality of states and the participants across that plurality are said

to be shared with the participants in a multiparticipant equilibrium state. Next, consider (13) in which two non-singleton sets of states are said to share participants:

(13) The molecules are small.

'The participants in the molecule states are all and only the participants in a set of small states.'

To cover all these possibilities, we introduce a symbol for participant sharing:

(14) The 'same participants' symbol: $\ominus$

'$\ominus$' stands for a relation among sets of states that holds between S and S' when the participants in the states in S are all and only the participants in the states in S'.

With this symbol we can abbreviate our glosses:

(15) a. A window is open.
b. $\exists s\, \exists s'$ s is a window state, s′ is an open state, $(s \ominus s')$

(16) a. Some molecules are in equilibrium.
b. $\exists S\, \exists s'$ S is a set of molecule states, s′ is an equilibrium state, $(S \ominus s')$

(17) a. Some molecules are small.
b. $\exists S\, \exists S'$ S is a set of molecule states, S' is a set of small states, $(S \ominus S')$

REMINDER *s, s′* pick out states, which are singleton sets. The definition in (14) connects sets of states. Since *s, s′* are singleton sets, the definition covers $(s \ominus s')$ and $(S \ominus s')$ in (15)-(16).

2.3 Thematic Roles

The same-participant relation can be associated with a silent lexical item θ_{HOLD} (Williams 2015:§9.10) interpreted as in (18)

(18) $[\![\theta_{\text{Hold}}]\!] = \lambda P\, \lambda S\, (\exists S')\, [P(S') \,\&\, (S \ominus S')]$

Composition can then proceed as follows[3]:

$[\![\theta_{\text{Hold}}\ \textit{open}]\!] = \lambda S\, (\exists S')\, [\textbf{open}(S') \,\&\, (S \ominus S')]$

$[\![\textit{a window}]\!] = \lambda P\, (\exists S)(\textbf{window}(S) \,\&\, P(S))$

[3] The format for quantification and conjunction in the metalanguage gives:

$(\exists S)\ (\textbf{window}(S) \,\&\, P(S))$

Parentheses will be dropped, or replaced by brackets to improve readability.

$(\exists s)(\textbf{window}(s) \,\&\, (\exists s')\,[\textbf{open}(s') \,\&\, (s \ominus s')])$

Although discussion will be limited to simple stative clauses for the most part, I should indicate how participation might enter into eventive clauses. Thematic relations describe states that event participants are in during the course of the event. While Adar washes the car, he is in an agent state and the car is in a patient state. As the window breaks, it is in a patient or theme state. With a syntax for (19)a as in (19)b, and the interpretations in (20)-(21), we generate the meaning in (22).

(19) a. A window broke.

b. [a window]$_i$ λ_i [$\exists_e$ [θ_{PATIENT} t_i] break]

(20) $[\![\theta_{\text{PATIENT}}]\!]$ = $\lambda s\, \lambda e$ $(\exists! s')$ [s' is a patient state of e & $(s \ominus s')$]

(21) $[\![\lambda_i$ [$\exists_e$ [θ_{PATIENT} t_i] break$]\!]$ =

$\lambda s\, (\exists e)\, (\exists! s')$ [s' is a patient state of e & $(s \ominus s')$ & **break**(e)]

(22) $(\exists s)$[**window**(s) & $(\exists e)(\exists! s')$ [s' is a patient state of e & $(s \ominus s')$ & **break**(e)]

'There is an event of breaking, its patient state shares all and only participants with a window state'

2.4 Multiparticipant states

Above it was pointed out that the state of equilibrium is a multiparticipant state. Multiparticipant states will play an important role in our discussion of noun meanings, so I'd like to mention some relevant properties. A multiparticipant state has at least two participants and some multiparticipant states could have an infinite number of participants[4]. One can perceive a state without knowing much about the participants except that they're in that state. Often, a scene may be composed of participants in various states, some multiparticipant and some single participant. Consider a starry sky on a dark night. There's a multiparticipant state manifested in points of light across the sky. The participants may be associated with those points, and we may perceive that, without knowing much more about the participants. In the same scene, there are also countless single participant states, one for each point of light. Finally, there is a single participant state whose sole participant is the sum of all the stars, the constellation. In a given scene, some states may be perceived, others not. Some may be salient, others not. In recurring scenes, various factors might encourage the creation of names for some states and not others. That is how I understand the important literature that seeks an ontological basis for noun categories (Gardelle 2016, Goddard 2010, Grimm 2018, Lauwers 2021, Wisniewski 2010, among others)

Using the technical resources introduced above we can define a metalanguage predicate for multiparticipation:

[4] Like when you have an infinite number of photons in a cloud of them.

(23) **multiparticipant**(S) $\stackrel{\text{def}}{=}$ $(\exists S_1)(\exists S_2)$ ($\neg(S_1 \ominus S_2)$ & $((S_1 \cup S_2) \ominus S)$)

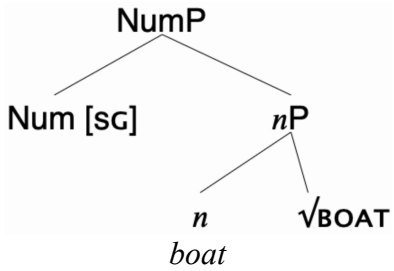
Assuming that any state has at least one participant, '$\neg(S_1 \ominus S_2)$' insures that between them, S_1 and S_2 have at least two participants. In that case, $((S_1 \cup S_2) \ominus S)$ insures that S has at least two participants.

There at least two ways S, a set of one or more states, could be multiparticipant. S could be a singleton set. In that case, it would have to contain a state that has many participants, such as a state of equilibrium. Another possibility is that S consists of several states, all of which have a single participant, but together they involve many participants. **multiparticipant**(S) will be true in that case as well.

2.5 Definite singular and plural noun phrases[5]

To frame our discussion of the syntax and semantics of noun phrases, we begin with the structure in (24) below, a Number Phrase (NumP) whose head includes a number feature, the feature SG found on singular nouns. The head of NumP is combined with the noun *boat* composed of the root $\sqrt{\text{BOAT}}$ and a nominalizing head *n*:[6]

(24)



The interpretation of the structure in (24) results from the combination of the root meaning and the meaning for the number feature, to be discussed shortly. The *n* makes no contribution. The root meaning is given in (25):

(25) $[\![\sqrt{\text{BOAT}}]\!] = \lambda s.\ s$ is a *boat* state

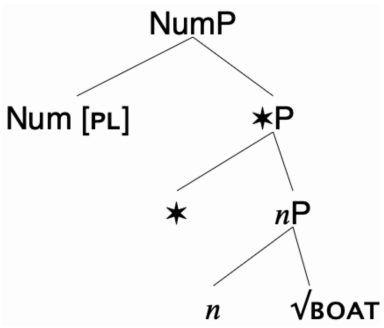
According to (25), any element in the extension of $\sqrt{\text{BOAT}}$ is a singularity (single state or, equivalently, singleton set of states). To produce a noun phrase with pluralities in its

[5] This section presupposes ideas prevalent in contemporary syntactic and morphological theory. Wiltschko (2021) surveys syntactic analyses of number marking. Number Phrase and little *n* are covered there in sections 8.3 and 8.4.1 respectively. The approach to morphosyntactic concepts (features, roots, exponence, Vocabulary Insertion) is chiefly that of Distributive Morphology (DM). Introductions to DM include Bobaljik (2017), Kramer (2015:§§1.2.2,1.2.3) and McGinnis-Archibald (2016). Roots in DM are the subject of Harley (2014). Roots are syntactic objects. I follow the custom of naming them with a '√' symbol followed by an English word that glosses their meaning. On syntactic features generally see Corbett (2012), Svenonius (2019).

[6] *n* is silent in this case. In other nouns it is pronounced: *marri-age, perform-ance, refus-al, confus-ion*. *n* is a categorizing head (Embick 2015:180). Other categorizing heads include *v* found in the verb *dark-en* and *a* found in the adjective *glob-al* (Embick 2015:46). I assume that *n* has no meaning in this case, but in §7 we'll see an *n* that does.

extension, we require in addition to the ingredients in (25), a '⋆', which is an operator that optionally attaches to *n*P.

(26)



boats

The workings of the ⋆ operator are illustrated in (27). The meaning of the operator is given in (28), where I've defined the sum generating operator of Link (1983:(57)) for an algebra of sets:

(27) Illustrating the Effect of the Star Operator

$P(\{s_1\})$ & $P(\{s_2\}) \rightarrow$ $^\star P(\{s_1, s_2\})$, $^\star P(\{s_1\})$, $^\star P(\{s_2\})$

$Q(\{s_1, s_2\})$ & $Q(\{s_3\}) \rightarrow$ $^\star Q(\{s_1, s_2, s_3\})$, $^\star Q(\{s_1, s_2\})$, $^\star Q(\{s_3\})$

(28) Star Operator Defined: Closure under Set Union

$[\![^\star]\!] = \lambda P\, \lambda s\ \exists \mathscr{A}\ \mathscr{A} \neq \varnothing$ & $\mathscr{A} \subseteq \{s' \mid P(s')\}$ & $s = \cup \mathscr{A}$

Using the meanings in (25) and (28) we arrive at the equation in (29):

(29) $[\![^\star\ [_{\text{nP}}\ n\ \sqrt{\text{BOAT}}\ ]\ ]\!] = \lambda s.$ s is a set of one or more *boat* states

Number features, like the other elements in the structures above, have phonological exponents and meanings. The phonological exponents are given by the rules of Vocabulary Insertion in (30) below. SG and ⋆ have zero exponents (Trommer 2012). *–z* is the *elsewhere* exponent for plurals (it devoices in *boats*), there are other exponents of PL that are found with specific roots (e.g. *oxen, loci, memoranda*).[7]

[7] Syntactic structures like (26) are used to indicate hierarchical relations. I have adhered here to the custom in much of the syntactic and the semantic literature whereby hierarchically higher nodes are to the left of lower ones (at least for head initial languages). In (26), for example, PL is higher and therefore to the left of $\sqrt{\text{BOAT}}$. In the morphology literature one often finds the opposite order in the syntactic structures and I will draw some structures that way when the focus is realization. One way or another, the pieces eventually need to be linearized, so that, for example, the exponent of PL ends up to the right of the exponent for $\sqrt{\text{BOAT}}$. One possibility is that the morphemes undergo head movement giving us the string $\sqrt{\text{BOAT}}\ n\ ^\star$ PL. The Vocabulary Insertion Rules are written with that option in mind. This will be important in §5 where we find Vocabulary Insertion Rules that specify a context for the rule to apply.

(30) Vocabulary Insertion Rules

$\sqrt{\text{BOAT}}$	⇔	boat
n	⇔	∅
⋆	⇔	∅
SG	⇔	∅
PL	⇔	-z

The feature SG has a meaning given below in two equivalent statements:

(31) $[\![[\text{SG}]]\!] = \lambda P\, \lambda s.\ P(s)$
$[\![[\text{SG}]]\!] = \lambda P\, \lambda S.\ P(S)$ & S is a singularity

Given this meaning, we have the equivalences below[8]:

(32) a. $[\![[\text{SG}]\ n\ \sqrt{\text{BOAT}}]\!] = [\![\sqrt{\text{BOAT}}]\!]$

b. $[\![[\text{SG}]\ ⋆\ n\ \sqrt{\text{BOAT}}]\!] = [\![\sqrt{\text{BOAT}}]\!]$

The plural feature has the effect of restricting interpretation to pluralities. This is accomplished with the meaning in (33). As things develop and we cover more data, the motivation for interpreting the plural feature in this particular way will become clear:

(33) $[\![[\text{PL}]]\!] = \lambda P\, \lambda S\ (P(S)$ & **multiparticipant**$(S))$

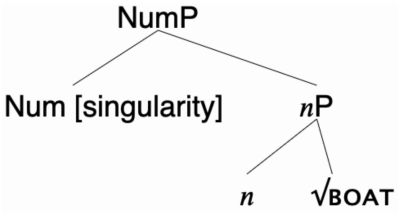
The metalanguage predicate **multiparticipant** was defined in (23) above. As explained there, in order for a set of one or more *boat* states to involve multiple participants, it would have to be a plurality of *boat* states, giving us:

(34) $[\![[\text{PL}]\ ⋆\ n\ \sqrt{\text{BOAT}}\ ]\!] = \lambda S.\ S$ is a plurality of *boat* states

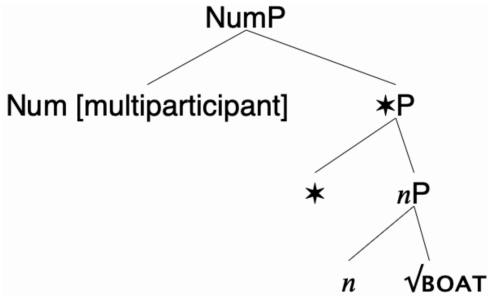
Up to now, I have named the number features with the labels that are used when glossing singular and plural noun phrases. Now that meanings have been assigned to the features, we also have the option of giving the features semantic names. [SG] can be referred to as [singularity] and [PL] as [multiparticipant]:

[8] The equation in b. is relevant for understanding how a singular noun phrase antecedent can licence ellipsis of a plural noun phrase. That equation allows them to have identical structures, up to number features (Bassi 2021).

(35)



boat



boats

The feature underlying a plural gloss in one language may have a different meaning from the feature underlying a plural gloss in another language. In §6.3, we'll briefly discuss languages where PL and SG are associated with different meanings than the ones introduced here. At that point, it will be important to have semantic names for number features.

With singular and plural noun phrases in hand, we now turn to definite descriptions. We will introduce a pure event implementation of Sharvy (1980)'s idea that "the primary use of 'the' is … to indicate totality; implication of uniqueness is a side effect". The meaning is spelled out in (37) below with some explanation below that. Given the grammatical framework, I give the meaning for the feature [DEF] whose exponent is *the*.

(36) [DEF] ⇔ *the*

(37) ⟦[DEF]⟧ is a function defined for P *iff* $(\exists s)\,[P(s)\ \&\ (s \ominus \cup\{s' \mid P(s')\})]$

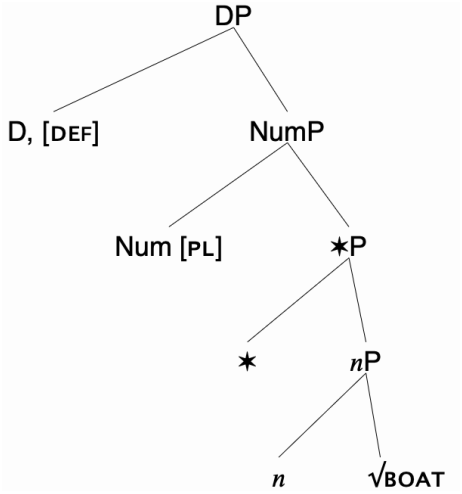
If ⟦[DEF]⟧ is defined for P, then:

$[\![[\text{DEF}]]\!]\,(P) = \lambda Q\,(\exists s)\,[P(s)\ \&\ (s \ominus \cup\{s' \mid P(s')\})\ \&\ Q(s)]$

$\cup\{s' \mid P(s')\}$ is a set of states. If P holds of a given plurality of states, then each state in that plurality is in $\cup\{s' \mid P(s')\}$. Likewise, if P holds of a given singularity, a singleton set of states, then the state in that singularity is in $\cup\{s' \mid P(s')\}$. In short, $\cup\{s' \mid P(s')\}$ is the set of all states that go into making up the sets in the extension of P.
$(s \ominus \cup\{s' \mid P(s')\})$ says that the participants of s are all and only the participants of the various states that go into making up the sets in the extension of P.

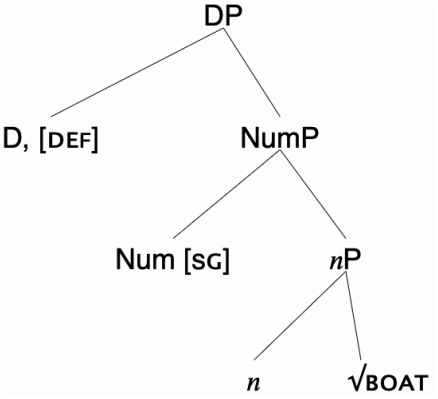
One can get a sense of how this works, by considering situations in which the definedness condition is not met, rendering one of the structures below meaningless.

(38)



the boats

(39)



the boat

Suppose there is just one boat. In that case, there will be no multiparticipant pluralities in the extension of [* *n* $\sqrt{\text{BOAT}}$]. That, in turn, means $[[\text{PL}]\ ^\star n\ \sqrt{\text{BOAT}}]$ is not true of anything, and so the first conjunct of the definedness condition will not be met in *the boats*. If there is just one boat, no meaning is defined for *the boats*.

Suppose there are many boats. Given our meanings for [SG] and for $\sqrt{\text{BOAT}}$, if $[[\text{SG}]\ n\ \sqrt{\text{BOAT}}]$ is true of something, it is a single participant state. That means no state in its extension could hold of all the participants in all the boat states. The second conjunct of the definedness condition will not be met in *the boat*. If there are many boats, no meaning is defined for *the boat*.

I made two assumptions in giving the meaning repeated below for $\sqrt{\text{BOAT}}$:

(40) $[\![\sqrt{\text{BOAT}}]\!] = \lambda s.\ s$ is a *boat* state

The first assumption is spelled out in (41):[9]

(41) Roots are Singularity-Only

Any element in the extension of a noun root is a state.

The second assumption had to do with the nature of the states of which $\sqrt{\text{BOAT}}$ is true. Given intuitions about what it means to be a boat, I assumed that any state in the extension of $\sqrt{\text{BOAT}}$ has a single participant. This is true of the actual extension of $\sqrt{\text{BOAT}}$ as well as of possible extensions $\sqrt{\text{BOAT}}$ could have at different indices of evaluation. That makes $\sqrt{\text{BOAT}}$ a 'single participant predicate' as defined in (42) below.

(42) Definition: single participant predicate

A *single participant predicate* has a non-empty extension at some index of evaluation and where its extension is nonempty, every element in its extension is a set of one or more single participant states.

[9] By 'noun root', I mean a root that can be combined with an *n*.

While any noun root is singularity-only, per (41), not every noun root is single participant. Consider the noun *snow*. It supports a kind of cumulative reference. If I know there is snow on the left half of the roof and I know there is snow on the right half of the roof, I can talk about what's on the roof using the phrase *the snow on the roof*. *The snow on the roof* denotes a state whose participants are all and only the participants of the states denoted by *the snow on the left half* and *the snow on the right half*. *snow* is **participant cumulative** in the sense defined below[10]:

(43) Definition: Participant cumulative

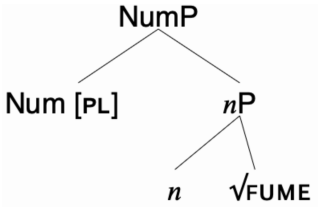
A predicate of states is *participant cumulative* if for any two states s and s' in its extension, there is a state in its extension that has all and only the participants of s and s'.

P is *participant cumulative iff*

$$(\forall s)(\forall s')\,[(P(s)\ \&\ P(s')) \rightarrow (\exists s'')\,[(\{s,\ s'\} \ominus s'')\ \&\ P(s'')]]$$

A single participant noun like *boat* could not be participant cumulative. As soon as $\sqrt{\text{BOAT}}$ is true of two states that do not share participants, participant cumulativity would require it to hold of a state with multiple participants, but $\sqrt{\text{BOAT}}$ is true only of single participant states. Conversely, a noun like *snow* that **is** participant cumulative will in general have multiparticipant states in its extension. Roots that are participant cumulative are therefore compatible with the feature [PL]. In §5, we'll discuss the noun *fumes* with syntax as depicted below:

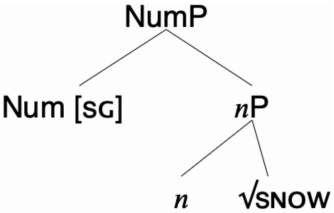
(44)



fumes

Of course, given that $\sqrt{\text{SNOW}}$, like any root, has only singularities in its extension, it can safely be combined with a singular number feature to produce an expression with a non-empty extension:

(45)



snow

[10] In §4.3, I will say how and why participant cumulativity differs from cumulative reference as conceived by Quine.

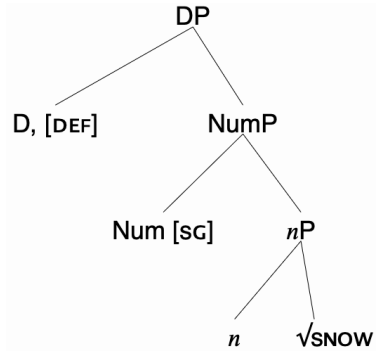
Elements of the extension of *snow* and *fumes* fit the definition of **multiparticipant** in §2.4. Elements of the extension of the plural *boats* also fit the definition of **multiparticipant** in §2.4. No element in the extension of *boat* fits the definition of **multiparticipant**. *A lot of* combines with *boats* and *snow* but not with singular *boat*:

(46) A lot of snow fell on the root.
(47) A lot of boats were in the harbor.
(48) **?**Alot of boat was in the harbor.

So we may say that *a lot of* combines only with a predicate that has multiparticipant elements in its extension.

Participant cumulativity casts its shadow on the interpretation of definite descriptions as well. Consider the structure in (49) below. The extension of the NumP consists of singleton sets of states, or equivalently states, in the extension of $\sqrt{\text{SNOW}}$. The definedness condition for [DEF], repeated in (50) below, rsequires the existence of a state whose participants are all and only the participants of all the states in the extension of $\sqrt{\text{SNOW}}$. Assuming there is some snow, that condition will be met because $\sqrt{\text{SNOW}}$ is participant cumulative.

(49)



the snow

(50) $[\![[\text{DEF}]]\!]$ is a function defined for P *iff* $(\exists s)\,[P(s)\ \&\ (s \ominus \cup\{s' \mid P(s')\})]$

If $[\![[\text{DEF}]]\!]$ is defined for P, then:

$[\![[\text{DEF}]]\!](P) = \lambda Q\,(\exists s)\,[P(s)\ \&\ (s \ominus \cup\{s' \mid P(s')\})\ \&\ Q(s)]$

By way of summary, we list the kinds of entities a speaker may refer to with a definite description:

(51) Referents of definite descriptions

the boat single participant state

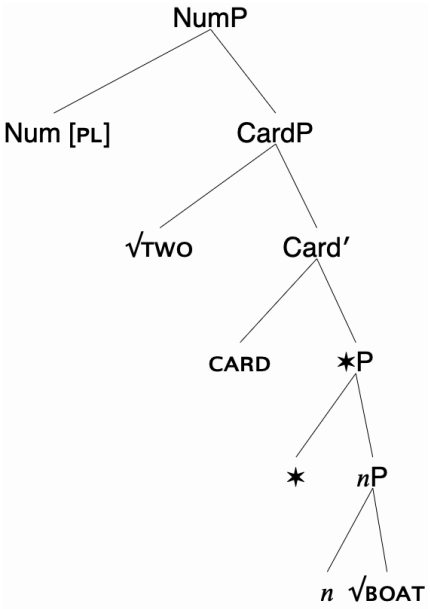
the boats	plurality of single participant states
the snow	multiparticipant state
the fumes	multiparticipant state

2.6 Numeral noun constructions

The number features we've introduced are pure event adaptations of the features defined in Harbour (2014). Recent support for Harbour's proposal has come from Martí (2020a)'s account of cross linguistic differences in number marking in numeral-noun combinations. In this section, I will discuss numeral-noun constructions in English. In §6.3, I'll briefly discuss Martí's account of Turkish, a language in which the noun is always singular when in combination with a numeral.

Martí's proposal draws on the syntax of Scontras (2014) in which number features (SG, PL) combine with a phrase, here labeled CardP, headed by a cardinality operator CARD and with a numeral as its specifier:

(52)



two boats

Except for the ⋆ operator and some node relabeling, the structure in (52) above reproduces Martí (2020a:16, (31)). To interpret this structure, we'll need a meaning for CARD and for $\sqrt{\text{TWO}}$. In (53) below, I've adapted Martí (2020a:(28))'s meaning to a pure event semantics in which, as we'll discuss in §8, all counting and measuring is counting and measuring of states:

(53) $[\![\text{CARD}]\!] = \lambda P\, \lambda n\, \lambda S\, (P(S)\ \&\ |S| = n)$

Using (53) along with the meanings in (54) and (55), we compute the meaning of *two boats*:

(54) ⟦PL⟧ = λ*P* λ*S* (*P*(*S*) & **multiparticipant**(*S*))

(55) $[\![\sqrt{\text{TWO}}]\!] = 2$

(56) $[\![\star\ n\ \sqrt{\text{BOAT}}\ ]\!]$ = λ*S*. *S* is a set of one or more *boat* states

(57) $[\![\text{CARD}\ \star\ n\ \sqrt{\text{BOAT}}\ ]\!]$ = λ*n*. λ*S*. *S* is a set of one or more *boat* states & |*S*| = *n*

(58) $[\![\sqrt{\text{TWO}}\ \text{CARD}\ \star\ n\ \sqrt{\text{BOAT}}\ ]\!]$ = λ*S*. *S* is a set of one or more *boat* states & |*S*| = 2

(59) $[\![\sqrt{\text{TWO}}\ \text{CARD}\ \star\ n\ \sqrt{\text{BOAT}}\ ]\!]$ = λ*S*. *S* is a set of two *boat* states

(60) $[\![\text{PL}\ \sqrt{\text{TWO}}\ \text{CARD}\ \star\ n\ \sqrt{\text{BOAT}}\ ]\!]$ =
λ*S*. *S* is a set of two *boat* states with distinct participants.

As (60) illustrates, the meaning for PL is compatible with the meaning in (59) for the CardP *two boat*. Compare the meaning for SG[11]:

(61) ⟦SG⟧ = λ*P* λ*S* (*P*(*S*) & *S* is a singularity)

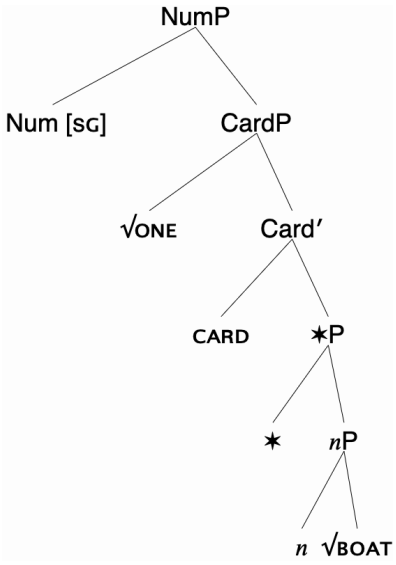
If SG replaced PL in the structure in (52), the result would be a predicate true of nothing, regardless of what boats there may be. Correspondingly, SG is compatible with *one boat* as in the structure in (64) below, but PL would not be[12].

(62) $[\![\sqrt{\text{ONE}}\ \text{CARD}\ \star\ n\ \sqrt{\text{BOAT}}\ ]\!]$ = λ*S*. *S* is a set of one or more *boat* states & |*S*| = 1

(63) $[\![\sqrt{\text{ONE}}\ \text{CARD}\ \star\ n\ \sqrt{\text{BOAT}}\ ]\!]$ = λ*s*. *s* is a *boat* state.

[11] REMINDER A singularity is a singleton set of states, which is a state.
[12] I've included the ⋆ operator to show the work that the numeral *one* does and to maintain contact with Martí's discussion. The ⋆ could be omitted without affecting the outcome.

(64)



one boat

The net result is that *one* N requires singular marking and *two* N requires plural marking if they are to have non-empty extensions.

Unlike the parameterized determiner of Hackl (2000:82), existential quantification is not encoded in the meaning of CARD. With Martí, I assume there's a quantifier higher up in the structure that takes care of this.

2.7 The Mass-Count Distinction

Numerals readily combine with the noun *boat* but not with the noun *snow.* I'll attribute the difference between *boat* and *snow* to a requirement imposed by CARD:

(65) CARD combines only with single participant predicates.

(42) Definition: single participant predicate

A *single participant predicate* has a non-empty extension at some index of evaluation and where its extension is non-empty, every element in its extension is a set of one or more single participant states.

A noun that felicitously combines with a numeral is a **count noun**. It follows from the requirement imposed by CARD that a count noun is a single participant predicate. A noun that does not combine felicitously with numerals is called a non-count noun, or, for historical reasons, a **mass noun**. *snow* is a mass noun. *snow* has extensions that include multiparticipant states so the condition in (65) blocks it from combining with a numeral. *snow* is participant cumulative and this appears to generally be the case with mass nouns. Participant cumulativity is detected through cumulative inferences and by the fact that felicitous use of the definite requires only existence. To take an example to be discussed in the next section, *luggage* is a mass noun (#*one luggage*, #*two luggage*(*s*)). It admits cumulative inference – if there's luggage above and luggage below, we can refer to it all with *the luggage.* Given that *luggage* is participant cumulative, it must have

multiparticipant states in some of its extensions and that would explain why it is a mass noun.

Bale (2017) alerts us to a danger that comes with the analysis of the mass count distinction in terms of extensions. Noun phrases such as *non-toxic poison, snow that is not snow, square circle* and *boat that is not a boat* all have empty extensions at every index, yet the first two do not combine with numerals and the latter two do. The definition for single participant predicate in (42) above addresses half of this problem by requiring non-empty extension at some index. *Snow that is not snow* is not single participant, so it correctly cannot combine with numerals. That leaves us with expressions like *five square circles* or *one boat that is not a boat.* My intuitions waver here. As soon as I judge these grammatical, I find that I am reinterpreting the modifiers in some way that allows them to describe elements in the extensions of *circles* and *boat* respectively.

We will have a lot more to say about mass nouns in the coming sections. For that reason, I'd like to clarify my position on two topics that will not play much of a role in our subsequent discussion but which are major topics in the study of the mass nouns. They are countability classes and coercion.

There are various semantic and syntactic diagnostics that have been associated with the mass count distinction. The most well-known of these turn on the ability to combine with various quantifiers (*much* versus *many, every, each* and *either*). Allan (1980) and more recently Grimm and Wahlang (2021) have shown that, taken together, the various diagnostics do not yield a binary distinction but rather lead to 10 or more categories they refer to as **countability classes**. Some of these diagnostics will come up in our discussion, however, the basic mass/count distinction will remain the ability or inability to combine with numerals.

When mass nouns are used to refer to kinds, as in (66) below, or when mass nouns are used to refer to standardized portions as in (67) below, they function as count nouns. In these cases, the noun is said to have undergone **coercion**.

(66) We sell three *wines* and two *cheeses* that you won't find anywhere else.
(67) There are three *spaces* left. Grab a *beer* and come join me!

One can find several ideas about the nature of the coercion process in Kiss et al. (2021a). Gillon (2012:715) catalogues a few other types of coercion including a source reading (*a fear I have*). Not all mass nouns are amenable to coercion (#*John expressed a nonsense* Moravcsik 1970, *#every significance, #many precisions*).

Finally, our meaning for CARD repeated below operates on extensions.

(68) $[\![\text{CARD}]\!] = \lambda P\, \lambda n\, \lambda S\, (P(S)\ \&\ |S| = n)$

I will refrain from incorporating the single participant requirement in (65) in the meaning of CARD. That would involve intensionalizing the semantics, which is otherwise unnecessary for the phenomena we'll be discussing

2.8 Summary of what has been introduced

Below is a list of key properties of the system laid out in this section.

- A noun root is a predicate of states[13].

- The ⋆ operator may attach to *n*P. It closes an extension under set union thereby adding pluralities.

- English has two number features: [SG] and [PL]

  When [SG] applies, any element in the resulting extension is a state.

  When [PL] applies, any element in the resulting extension is a multiparticipant state or a plurality.

  [PL] has *–z* among its phonological exponents.

- A [DEF] feature realized as *the* may attach to a NumP. The result has a meaning only if the NumP's extension contains an element whose participants are all and only the participants of all the elements in the extension of the NumP.

- Numerals enter a noun phrase by combining with an operator dubbed CARD. CARD requires its sister to be a single participant predicate.

  □ A noun with only single participant states in its extension is a count noun.
  □ A mass noun can have multiparticipant states in its extension.

- Count plural definites denote pluralities, singular mass definites and singular count definites denote singularities.

2.9 Aspects of the number features

In this subsection, I draw attention to properties of the number features introduced above and relate them to previous work. The theory is not advanced here in any way.

The features [multiparticipant] and [singularity] were defined in (31) and (33). They were modeled on features in Harbour (2011, 2014)'s general theory of number[14].

A feature is **restricting** if its meaning combines with a predicate extension to yield a new extension that is a subset of the input. This contrasts with a system in which features are gatekeepers (Cooper 1983). If the meaning of the expression attached to a gatekeeping feature is of the right kind, it gets passed up, otherwise the result is

---

[13] REMINDER Since a singularity is a set whose only member is a state and since singleton sets are identified with their members, it follows that

- A noun root is a predicate of singularities.

[14] "Empirically, the theory yields a characterization of all numbers attested crosslinguistically, a combinatorial explanation of Greenberg-style implications affecting their cooccurrence, a natural account of morphological compositionality, and insight into their diachronic sources and trajectories." Harbour 2014. There is more on the background to Harbour's features in §6.3.

undefined. Our features are restricting. As a result of that and of the way the features are defined, the plural feature gives rise to predicates true exclusively of pluralities. This has consequences for several issues currently at the center of research on plurals, including homogeneity, maximality and markedness. Martí(2020b) discusses homogeneity in connection with restrictive features.[15]

Two restrictive features are **complementary**, if the extensions they produce could never have a common element. Harbour's features for plural and singular in English are complementary. The features I've defined are complementary *when attached to count nouns*. The extension of plural *boats* is composed of pluralities, while the extension of singular *boat* is composed of singularities. Our features are not complementary in the realm of mass nouns[16].

Our use of number features in mass noun phrases has terminological consequences. Harbour and others use the semantic label [+atomic] for the feature found on singular nouns. 'atomic' would be appropriate here as well, if understood in its algebraic sense: Let $\mathbb{S}$ be the set of all states and let $\wp(\mathbb{S})$ be the set of all subsets of $\mathbb{S}$. The sextuple $\langle \wp(\mathbb{S}), \cap, \cup, ', \varnothing, \mathbb{S} \rangle$ is a Boolean algebra. The atoms of that algebra are the singleton sets, the singularities. So 'atom' and 'singularity' converge. I've avoided the term 'atomic' because it is prone to interpretation in the material sense. When authors refer to 'atomic entities' or 'atomic individuals' it is often not clear to me if they intend entities that have no proper parts. This danger becomes acute when mass nouns are part of the discussion, especially since in much of the literature mass nouns are defined and categorized in terms of material parthood or in terms of relations defined on material parthood such as material sum. I suspect that Martí's analysis of number in Turkish would not extend easily to the mass noun phrases in Turkish to be discussed in §5.7, but in any case, deciding that would requiring resolving this ambiguity about atomicity.

I refer to [multiparticipant] and [singularity] as features. They can also be thought of as values of the feature Number. Using an attribute-value notation, we have [Number: *multiparticipant*] and [Number: *singularity*]. I will employ this notation in §7.2. Number is a binary feature; it has has two values. When features are binary, a question arises about whether to trade in a binary feature for a unary feature, by elminating one of the values and letting its work be done by the absence of a feature. Authors who argue in favor of binarity include Kramer(2015:112) for Animacy, Despić & Murray (2018) for Person and for Gender and Harbour (2011), Kouneli (2020), Landau (2016:1010), and Wiltschko (2008:649, fn18) for Number.

---

[15] Here are some hints/reminders for current plural semantics jargon.
• (i) *The pot has no lids* is odd compared with (ii) *The supply house currently has no lids.* This difference is unsurprising assuming that *lids* is true of two or more lids and that a pot generally has one lid, while a supply house would normally stock many. What is unexpected is that (ii) is false if the supply house has just one lid. This effect is known as homogeneity (Križ & Spector 2021, Bar-Lev 2021). • *The windows on the bus were open* – does that mean all of them were open or would it be true if just some of them were? That's a question of maximality. • Can *Every student brought his books* be asserted truthfully when some students brought just one book and others more than one? If yes, then plurals pass the quantification test (Sauerland 2008) for being unmarked, meaning the plural is inclusive, it may be true of pluralities but also singularities.

[16] Number features do not appear on mass nouns at all in Harbour (2014). He is of the opinion that the locus of number features, Num, "is not present for mass nouns, which lack a foundational atomic stratum".

There is a final aspect of the features [multiparticipant] and [singularity] that is significant and that could not be shared by predecessors. These features operate on two levels. [singularity] is defined from the perspective of states: one state, not many. [multiparticipant] is defined from the perspective of participants: many, not one. When we expand our feature inventory in §6.3, we'll come across this same bifurcation.

3 Reciprocals and other plurality seekers. Multiparticipation ≠ plurality-denoting

The system detailed above follows the spirit of previous authors who say that mass nouns are plural. However, unlike previous authors, our semantics is rich enough for mass noun phrases to involve multiplicity within states and yet still be singular. In this section, we find evidence that definite mass noun phrases denote singularities. We do that using reciprocals. This conclusion proves problematic for previous mass-as-plural accounts. The discussion will include singular mass definites (*the information*) as well as plural mass definites (*the directions to the stadium*). Here I show that plural mass definites denote singularities. An explanation for why that is will come in §5.

The key fact about reciprocals of interest here is that they require an antecedent that denotes a plurality:

(69) a. The messages contradicted each other.
b. #The message contradicted each other.

Definite mass noun phrases denote singularities so they pattern with singular count nouns. They too are unable to licence reciprocals[17], as noted in Acquaviva 2008:87

(70) #The information contradicted each other.

(71) #The directions to the stadium contradicted each other.

A conjunction of two singular count noun phrases can licence a reciprocal:

(72) The first message and the second message contradicted each other.

and the same goes for mass noun phrases:

(73) The information in the wiki and the additional information contradicted each other.
(74) The directions you gave me and the directions Ella gave me contradicted each other.

Likewise, two mass noun phrases or two count singular noun phrases can split-antecede a pronoun that licenses a reciprocal[18]:

---

[17] The incompatibility of plural mass definites with reciprocals and other plurality seekers is observed in Acquaviva 2008:87, who in turn points to Wierzbicka 1988:499-562 for more examples from several languages.

[18] Example (76) is modeled on Gillon (1992:(34)), who was making a point about split antecedence and mass nouns. I added the reciprocal. Note, plural marking on the pronoun is not sufficient by itself to licence a reciprocal. A plurality denotation is needed:

(i) [The younger girl]$_i$ said they$_i$ hurt themselves/themself/#*each other*.

(75) The cow told the chicken that they should entertain each other.
(76) The livestock told the poultry that they should entertain each other.

Plurality denoting phrases can also be conjoined and when they are, they give rise to readings that are unavailable with conjoined singularity denoting phrases. Gillon (1992:629) points out that (77) has a reading in which the predicate distributes over the conjuncts. It can be read as "the drapes resemble each other and the carpets resemble each other." By contrast, the predicate cannot distribute over the conjuncts in (78) or in (79).

(77) The drapes and the carpets resemble each other.
(78) The drapery and the carpeting resemble each other.
(79) The curtain and the carpet resemble each other.

The facts in (77)-(78) are discussed in Chierchia (1998:89), Rothstein (2010:379-384) and in Landman (2020:§6.5) where they are labeled "Gillon's Problem". In those accounts, mass noun phrase referents are pluralities, leading one to expect mass nouns to pattern with plural count nouns in combination with reciprocals. As we've shown, the facts are otherwise. In §4.4, we'll briefly return to this data and we'll take a look at the kind of solution proposed for this problem in those works.

I end this section with two notes on the data reviewed here. Given the meaning for the definite article proposed in (37), the noun phrase conjunctions in the examples above could be interpreted using a higher type *and*[19] as in (80):

(80) $[\![and]\!] = \lambda\mathcal{Q}_1\,\lambda\mathcal{Q}_2\,\lambda P.\,\mathcal{Q}_1(\lambda s\,\mathcal{Q}_2(\lambda s'.P(s \cup s')))$

In that case, the meaning of the reciprocal verb phrase applies to a plurality in (73)-(74), just as it does in (69)a.

As demonstrated here, reciprocals are a tool for detecting pluralities. Other plurality-seeking expressions include *one-by-one* (Brasoveanu and Henderson 2009), *one another, one after the other*, *both, neither*, floated and adnominal *each* (Champollion 2016). For the most part, their antecedent cannot be an unconjoined definite mass noun phrases.

4 Single participant adjectives

Single participancy is a significant semantic property of predicates. It distinguishes count nouns from mass nouns. In this section, we'll demonstrate that some adjectives have that property as well. Once identified, single participant adjectives will prove useful in a number of ways. These include providing evidence corroborating the idea that mass

(ii) The directions to the stadium were printed on the ticket, but they contradicted #*each other*.

[19] Noun phrase conjunctions could be interpreted that way, but see Hirsch 2017 and Schein 2017 for arguments that they aren't interpreted that way.

nouns are multiparticipant (§4.2) and shedding light on a well-known but unexplained use of diminutives in the formation of count nouns from mass nouns (§4.6).

4.1 Single participancy in the grammar of adjectives

The ⋆ operator was introduced earlier with the definition below:

(81) $[\![{}^{\star}]\!] = \lambda P_{st}\, \lambda s\ \exists \mathscr{A}\ \mathscr{A} \neq \varnothing\ \&\ \mathscr{A} \subseteq \{s' \mid P(s')\}\ \&\ s = \cup \mathscr{A}$

'${}^{\star}P$ is true of the union of any set of sets in P'.

EXAMPLES: $P(\{s_1\})\ \&\ P(\{s_2\}) \rightarrow {}^{\star}P(\{s_1, s_2\}),\ {}^{\star}P(\{s_1\}),\ {}^{\star}P(\{s_2\})$

$Q(\{s_1, s_2\})\ \&\ Q(\{s_3\}) \rightarrow {}^{\star}Q(\{s_1, s_2, s_3\}),\ {}^{\star}Q(\{s_1, s_2\}),\ {}^{\star}Q(\{s_3\})$

The ⋆ is an operator that optionally attaches to an *n*P to produce a noun phrase with pluralities in its extension. Without it, we wouldn't get pluralities, given our assumption that roots are singularity-only[20]. We'll now extend the use of the ⋆ to adjectives (*a*P) with similar reasoning.

Compare the sentence in (82) to the formula in (83):

(82) The actors were blond.

(83) $(\exists s)\ s \in [\![{}^{\star}\sqrt{\text{ACTOR}}]\!]\ \&\ (\exists s')\ s' \in [\![\sqrt{\text{BLOND}}]\!]\ \&\ (s \ominus s')$

(82) is read distributively. If (82) is true and Jack was one of the actors, it follows that Jack is blond. This is not captured by (83). Keeping to our assumption that roots are singularity-only, (83) represents a single blond state, s', in which all the actors participate. This would require an unavailable collective reading of (82). Intuitively, a blond state holds of a single individual:

(84) $[\![\sqrt{\text{BLOND}}]\!] = \lambda s.$ *s* is a state that holds of an individual when they have blond hair.

The distributivity intuited in (82) is correctly captured by the formula in (85) along with (84):

(85) $(\exists s)\ s \in [\![{}^{\star}\sqrt{\text{ACTOR}}]\!]\ \&\ (\exists s')\ s' \in [\![{}^{\star}\sqrt{\text{BLOND}}]\!]\ \&\ (s \ominus s')$

(85) requires each *actor* state to have the same participant as one of the *blond* states in the plurality of *blond* states in s'. Spelling out the silent ⋆ operators and the thematic role head, the sentence in (82) becomes:

(86) [The ⋆actors] were [θ_{Hold} ⋆blond].

[20] REMINDER An element in the extension of a root is a singularity or equivalently, a state.

While *blond* admits only a distributive reading, there are many predicates that can be understood distributively or collectively. *light* as used in (87) below is one such predicate.

(87) The ducks are light enough to carry.

The sentence in (87) could be used to report on the total weight of a box of rubber ducks. In that case, it entails the formula in (88) below where a single light state is populated with all the ducks. It is a multiparticipant state whose existence is entailed on the collective reading. Another possibility is that the collective weight of the ducks makes them impossible to carry, but the sentence in (87) is truthfully asserted with the intention of reporting on the weight of each individual duck. In that case, (88) is false, but (89) is true because there is a set of single participant light states whose participants are all and only the participants in the duck states.

(88) $\exists s\, s \in [\![{}^{\star}\sqrt{\text{DUCK}}]\!] \;\&\; \exists s'\, s' \in [\![\sqrt{\text{LIGHT}}]\!] \;\&\; (s \ominus s')$

(89) $\exists s\, s \in [\![{}^{\star}\sqrt{\text{DUCK}}]\!] \;\&\; \exists s'\, s' \in [\![{}^{\star}\sqrt{\text{LIGHT}}]\!] \;\&\; (s \ominus s')$

The collective reading is captured in (87) without the silent * operator, while the distributive reading would require a silent * operator on the adjectival phrase *light enough to carry.*

Many predicates admit collective readings, often like *light* in addition to distributive readings. Collective readings are easy to identify with predicates of measure and shape. *The boxes take up a lot of space* is most naturally read collectively. There is a multiparticipant state and each of the boxes is a participant in it. *The ducks form a line*/*sphere*/*cube*/*circle* describe a shape formed out of all the ducks. *Those phone calls cost me $400 / took a long time* can report on the time or the cost of a phone session. Given the ease with which these predicates are read collectively, it comes as a surprise that the adjectives in the sentences below do not readily admit collective readings:

(90) The boxes are large.
(91) The ducks are long.
(92) The phone calls were long.
(93) The butterflies were spherical.

Upon entering the butterfly conservatory, we behold a perfectly spherical cloud of butterflies. We cannot relate this experience with (93). A long session of brief phone calls will not make (92) true. A long line of ducks crossing the lake will not make (91) true. And a large pile of tiny boxes will not verify (90).

The extension of *take up a lot of space* includes single participant states. These it shares with *large*, hence the synonymy of *The boat is large* and *The boat takes up a lot of space.* The extension of *take up a lot of space* also includes multiparticipant states and these it does **not** share with *large.* In (94), I include the restriction to single participant states in the meaning of the adjective:

(94) $[\![\sqrt{\text{LARGE}}]\!]$ = λ*s*. *s* is a single participant state. The participant in that state takes up a lot of space.

Given this restriction, there must be silent ⋆ operators in (90)-(93) spelled out here for (90):

(95) The ⋆boxes are [θ_{Hold} ⋆ large].

Because they defy expectations and refuse to allow collective readings, I call these adjectives **stubbornly distributive**.

4.2 Stubbornly distributive predicates as mass noun probes

In (95) above, the plural subject introduces a plurality and the participants across that plurality are distributed, each to its own *large* state. There is, of course, another way to introduce multiple participants, using mass nouns, and in that case again we find distributivity (Joosten 2010:§3.4, Rothstein 2010:360). (96) below may report on several *large* states, one for each participant in the furniture state.

(96) The furniture is [θ_{Hold} ⋆large].

It's worth emphasizing here that the distribution is over participants in a single state introduced by the subject, unlike in (95). With plurality seekers, we show that *the furniture* denotes a singularity:

(97) #The furniture is touching *each other*.

(98) #The furniture rusted *one by one* over the course of the summer.

Here are some more descriptions of distribution over the participants in a multiparticipant state:

(99) The mail in this box is square and small.
(100) The luggage she brought was big.
(101) The equipment will be too large to fit inside this room. Allan (1980:566)
(102) That genetically engineered popcorn was square!
(103) This spaghetti is too long.
(104) The fruit was perfectly round.

Mass noun phrases predictably give rise to distributive readings when they combine felicitously with stubbornly distributive predicates. But not all mass noun phrases do combine felicitously with such predicates:

(105) ?The snow in my yard is big.
(106) ?The oil on the floor is square.
(107) ?The time we spent in the museum was too long.

(108) ?The information he gave us was small.

The states introduced by these mass noun phrases somehow make them incompatible arguments for a stubbornly distributive predicate. This conclusion is sharpened by using pronouns whose antecedents are headed by mass nouns:

(109) #You would not believe [how much gasoline]$_i$ spilled on the floor. We had to use a vacuum cleaner to remove it$_i$, because **it**$_i$ was so big.

While the connection to distributivity was not made until recently, previous authors were aware of the distinction between nouns that do and do not combine with stubbornly distributive predicates.[21] McCawley (1979:170) refers to nouns that resist the combination **hard-core**, others call them 'prototypical' or 'canonical' and many of them are described as 'substance nouns'. Nouns like *furniture* and *equipment* that happily combine with stubbornly distributive predicates are called 'anomalous mass terms' (Grandy 1975), 'fake mass nouns' (Chierchia 1998), 'count mass nouns' (Doetjes1997, Smith 2016), 'object mass nouns' (Barner and Snedeker 2005), 'aggregate nouns' (Joosten 2010), 'naturally atomic mass nouns' (Rothstein 2010), 'neat mass nouns' (Landman 2020), 'cognitively count mass nouns' (Chierchia 2021), and sometimes they're called '*furniture* nouns'. Many of these names reflect preconceived notions about what the semantics of a mass noun should be. Nouns that have those meanings are legitimate. Those that don't have those meanings are specially labeled. In a similar fashion, stubbornly distributive predicates were labeled as such because of their unexpected, single participant nature.

It is hard to say what exactly goes wrong when hardcore mass nouns are combined with stubbornly distributive predicates. I speculate that it is related to the intuitions about division often cited in discussions of mass nouns, as when it is pointed out that whenever we observe a portion of water, we are in the presence of many portions of water that make it up. Let us suppose then that if a *water* state has a portion of water as one of its participants, then any watery parts of that portion are also participants in the state. More specifically:

(110) If *x* is a participant in a *water* state *s*, and *y* is part of *x* and *y* is in a *water* state, then *y* is a participant in *s*.

If (110) is correct, then *That water is round* could never be true, for while it may be that the puddle I'm pointing to is round, various portions of water making up the puddle are not. But since *round* is a stubbornly distributive predicate, it would have to have a state for each water participant. For *That water is small* to be true would require a comparison class that could serve both for the puddle I'm pointing to and for all its watery parts, no matter how small. That may not be possible. It may also be that some of

[21] Stubbornly distributive predication induces a division between hardcore mass nouns on one side and count nouns and non-hardcore mass nouns on the other side. This division comes under the heading of 'dimensionality' in Zhang (2012) who tracks its role in the use of classifiers in Mandarin. Bale & Gillon (2020) explore this further in Mandarin as well as West Armenian under the heading of atomicity. (I have not read Zhang, N. N. (2013) *Classifier Structures in Mandarin Chinese*. Berlin: Mouton de Gruyter.)

those portions are not "spatially delimited" (Truswell 2009:530) or not "well-delineated" (Bunt 1985:208) making them ineligible for participation in the kinds of states that *small* describes. All this may be compounded by a vagueness affecting the relation between states and their participants. As (110) says, whether or not a given y is in the state s that x is in, depends on whether or not y is itself in a *water* state. But the question of whether y is in a *water* state may be murky, especially as we get to smaller and smaller parts of x. It could be that there is a *water* state s' but it's not settled whether s' holds of y or not. Chierchia (2010, 2017, 2021) associates mass nouns with vague properties, and this too could be a factor.

4.3 Stubbornly distributive predicates and participant cumulativity

Whatever the reason is, the inability of stubbornly distributive predicates to combine with hardcore mass nouns has made them useful tools for probing for mass meaning. Gil (1996) uses them to show that the collective nouns of Maltese can have hard-core mass interpretations as well as count plural interpretations, making them truly multiparticipant nouns. I'd like to use this diagnostic to draw an important distinction between 'participant cumulativity' whose definition is repeated in (111) below and Quine's famous definition of cumulative reference given in (112):

(111) Definition: Participant cumulative

> A predicate of states is *participant cumulative* if for any two states s and s' in its extension, there is a state in its extension that has all and only the participants of s and s'.
>
> P is *participant cumulative iff*
>
> $$(\forall s)(\forall s')\,[(P(s)\ \&\ P(s')) \rightarrow (\exists s'')\,((\{s, s'\} \ominus s'')\ \&\ P(s''))]$$

(112) Cumulative reference (Quine 1960)

> So-called *mass* terms like 'water', 'footwear', and 'red' have the semantical property of referring cumulatively: any sum of parts which are water is water.

Cumulative reference makes use of material summation. Participant cumulativity does not. I make a distinction between one state that has many participants and a second state that has a single participant composed of the many participants in the first state. *glue* applies to states with multiple participants. It is a mass noun, in fact, a hardcore mass noun: #*The glue on the table is big*. Contrast that with *blob of glue* which is a count noun phrase and which therefore happily combines with a stubbornly distributive predicate: *That blob of glue is big*. *glue* describes multiparticipant states. The single participant in a *blob of glue* state is presumably the material sum of participants in a *glue* state.

Participant cumulativity is a property of hard-core and soft-core mass nouns. Stubbornly distributive predicates allow us to see that it would be a mistake to assume closure under material sum in our definition of participant cumulativity. *The furniture is* ⋆*small* may accurately describe the contents of a room wherein there are many, many small chairs and small tables. The material sum of those chairs and tables is large: *The furniture collection is large*. But the collection is not a participant of the *furniture* state.

So *The furniture is *small* correctly says that each participant in the *furniture* state is in a *small* state.

4.4 Gillon's Problem and stubbornly distributive predicates

In §3, the data in (113)-(115) was taken to show that with respect to readings of reciprocals, mass noun phrases pattern with singular count noun phrases and not with plural count noun phrases.

(113) The drapes and the carpets resemble each other.
(114) The drapery and the carpeting resemble each other.
(115) The curtain and the carpet resemble each other.

This is a challenge for accounts in which the mass-as-plural intuition leads one to conclude that mass noun phrases have the same kind of denotation as plural count noun phrases. In response, proponents of this view have invoked a silent operator that combines with a mass noun or noun phrase and produces a count noun phrase (Chierchia 1998:75,89, Rothstein 2010:383, Landman 2020:§6.5). It functions like *blob* in *blob of glue.* But if such an operator is present in a language, then there should be no problem combining a noun phrase of any sort with stubbornly distributive predicates. In fact, that is how Deal describes Nez Perce and it forms part of her motivation for proposing a silent atomization piece in the syntax of Nez Perce (Deal 2017:146-7). But in English stubbornly distributive predicates do not freely combine with all nouns from which we can conclude that there is no silent mass-to-count operator in English.

4.5 On the source of stubborn distributivity

In our proposed meaning for $\sqrt{\text{LARGE}}$ repeated in (116) below, we stipulate that it holds only of single participant states.

(116) $[\![\sqrt{\text{LARGE}}]\!] = \lambda s.$ *s* is a single participant state. The participant in that state takes up a lot of space.

That stipulation is motivated by the stubborn distributivity of *large*. The rationale for the remainder of the meaning is most clearly seen by letting *large* takes as its subject a concrete, singular count noun phrase. In that case, distributivity doesn't enter in and we may paraphrase *large* as 'takes up a lot of space':

(117) The boat is large.
'the boat takes up a lot of space'

Other stubbornly distributive predicates would be similarly handled:

(118) $[\![\sqrt{\text{ROUND}}]\!] = \lambda s.$ *s* is a single participant state. The participant in that state has the form of a circle

(119) $[\![\sqrt{\text{SMALL}}]\!] = \lambda s.$ *s* is a single participant state. The participant in that state takes up a very little space.

(120) The boat is small.
'the boat takes up takes up very little space'

Constructing meanings in this way, with a single participant stipulation, invites the conjecture that some languages may have words we would want to translate as *large, small* or *round* but which happen not to be stubbornly distributive. The expectation is heightened when one considers that cross linguistic variation with respect to single participancy is well established in nouns. To test the aforementioned conjecture, we ought to establish some identifying properties of a near synonym of *large* that lacks the single participant stipulation. To start, it would function just like *large* when predicated of singular count nouns. That would lead to a gloss as 'large'. With plural count nouns, it would engender ambiguity, just like the English *take up a lot of space.* Perhaps the most telling identifier would come from combination with mass nouns, especially hardcore mass nouns. These are infelicitous with *large* but they are felicitous with *take up a lot of space*.

With these hallmarks in mind, one can find hints in the literature of the expected variation. Kouneli (2020) describes several ways to distinguish mass nouns and count nouns in Kipsigis. These include the inability of stubbornly distributive predicates to combine with hardcore mass nouns. *Múgûl* 'round' can take as subject a noun phrase glossed as 'the ball' but not subjects glossed as 'the rain' or 'the water'. This contrasts with the adjective *oo* which "is interpreted as 'big' when it modifies a singular count noun, but as 'a lot' when it modifies a singular mass noun". Kouneli also reports (pc) that the quantifier *tyaan* means 'how big' in combination with singular count nouns and 'how much' in combination with mass nouns (compare: *how much space does the boat / the water take up*?). When the quantifier *tyaan* combines with plural count nouns, it is ambiguous between 'how big' and 'how many' (*tyaan* is found in examples (33-34) of Kouneli 2020). Nevins and Coelho da Silva (2020) examined the behavior of mass nouns and count nouns in Maxakalí. Nouns in Maxakalí are not marked for number, however there are suppletive verbs, where one root is used when the internal argument is count singular and a different root is used when the internal argument is count plural. Interestingly, mass nouns always require the plural root. Coming around to our immediate concerns, the words *xeka* and *kutĩynãg* are glossed as 'big' and 'small' respectively when they modify *yip* 'car' (p281). These words can modify *ãxok* 'sugar' and when they do, they are glossed as 'much' and 'a little'. One more example concerns diminutives, which will be the subject of §4.6. Wiltschko (2006) discusses diminutive marking in Halkomelem that takes the form of reduplication. From *steqíw* 'horse', you get *stitiqíw* 'small horse'. This diminutive marking may occur on a substance-denoting noun, and when it does, it is glossed as 'little bit of'. In all three of the cases cited, we find size adjectives combined felicitously with substance nouns to indicate large or small amounts. There is, in fact, a taste of this in English in the prenominal uses of *little* to mean small amount (*there's little interest in the proposal, a little sugar*).

There is in addition to the crosslinguistic variation, some tantalizing evidence from acquisition of the stipulative nature of single participation. Syrett (2015) reports on children as young as 3 demonstrating robust awareness of the stubborn distributivity of *big, square* and *round* but not of *tall.*

In contrast to what has been assumed here so far, Schein (2017:§12.1.1) claims that, given the right syntactic context[22], a stubbornly distributive predicate can in fact receive a collective interpretation, however, the conditions for obtaining this interpretation are not present in simple predications like the ones considered here. According to Schein, the stativity of *be large* has the effect of requiring that the measurement be replicable across various conditions but size and shape predicates describe properties that are not preserved for a group of objects, for example, when members of the group are scattered. This normally makes a collective reading impossible. Scontras & Goodman (2017) employ similar reasoning. For them, having a stable configuration is a prerequisite for a collective reading. They show how this requirement can be understood as the product of the speaker-hearer effort to converge on a standard of measurement (see also Glass 2018a,b on the rule of measurement). Scontras & Goodman also report on a series of experiments demonstrating the availability of collective readings of stubbornly distributive predicates and the dependence on a perceived stability. If this is correct, then much of what was said above about kinds of mass nouns and about participant cumulativity would still hold, but the explanation would be more involved. A more serious rethinking would be necessary for the just discussed cross linguistic variation and for the etymology of diminutives to be discussed next.

4.6 Diminutives and Single participancy

Having identified single participancy as a grammatically significant property specified in the meaning of roots for some adjectives and nouns, we are in a position to address an open question to do with the use of diminutive affixes attached to the roots of mass nouns. Diminutives are affixes that can be used productively with a meaning glossed as 'little':

(121) *Dutch* (De Belder 2011:183)

Ik heb de hond-**je**-s geaaid.
I have the dog-DIM-PL petted
'I have petted the *little* dogs.'

(122) *Italian* (Dressler and Barbaresi 1994:17)

Potrei aver - ne una fett-**in**a?
Could I have of it a slice-DIM?
'Could I have a *little* piece of it, please?'

(123) *German* (Dressler and Barbaresi 1994: 389)

Es trägt ein weißseidenes Jäck-**chen**
he wears a white-silken jacket-DIM
'He wears a white-silken *little* jacket'

[22] Schein's examples include (p618):
a. A **long** 10,000 popsicle sticks were lined up end to end and called art.
b. I sat through a **long** five skits.
c. Many a **long** five skits are performed without intermission.

Across languages, diminutives are used to express an array of additional meanings including affection, approximation, intensification, imitation, and female gender (Jurafsky 1996:533). Jurafsky (1996) proposes a central sense for diminutives together with a small set of meaning relations linking to extensions beyond the central one. Dressler and Barbaresi (1994, 2001) offer an alternative view which attributes a much greater role to pragmatics and is a cornerstone of their theory of morphopragmatics. Among the possible interpretations discussed in these and related works, there is one that is of interest here and that is not adequately treated by these authors. Examples of this use are given below. In each case, a mass noun root combines with a diminutive and a count noun results.

(124) Mass-to-count diminutives

DUTCH	*tarwe*	'wheat'	*tarwetje*	'wheat loaf'	Jurafsky 1996
DUTCH	*zout*	'salt'	*zoutje*	'salt cracker'	Borer 2005
GERMAN	*Brot*	'bread'	*Brötchen*	'bread roll'	Wiltschko 2006
GERMAN	*Schlaf*	'sleep'	*Schläfchen*	'nap'	Wiltschko 2006
GERMAN	*Staub*	'dust'	*Stäubchen*	'dust particle'	Dressler & Barbaresi 1994
ITALIAN	*crema*	'cream'	*cremino*	'creme praline'	Acquaviva 2015
ITALIAN	*pan*	'bread'	*panino*	'sandwich'	De Belder et al. 2014
ITALIAN	*latte*	'milk'	*lattino*	'milk bottle for a baby'	Dressler & Barbaresi 1994
ITALIAN	*vento*	'wind'	*venticello*	'breeze'	Dressler & Barbaresi 1994

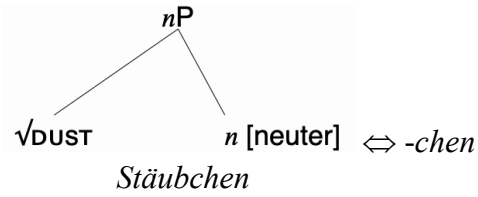
Dressler and Barbaresi (1994:126) seem to suggest that examples like the ones above involve coercion of the mass noun stem, so that the diminutive attaches to a count noun (see also Borer 2005:92 and Fortin 2011:129). This seems problematic as a general account. To begin with, coercion is not triggered by modification by adjectives meaning 'small'. As Wiltschko (2006) points out, *Schläfchen* 'nap' is ok, but **kleiner Schlaf* small.M.SG sleep is not. And then there are mass nouns that are resistant to coercion no matter the trigger, but still, a count diminutive can be formed with them. *Stäubchen* 'speck of dust' is possible but *Staub* 'dust', like its English translation, does not easily coerce. Finally, mass-to-count diminutives do not as a rule have the kinds of meanings one expects from coercion (standard portion or subkind). Turning to Jurafsky (1996), he discusses mass-to-count diminutives and he attests to their cross linguistic robustness with the examples below. But in the end, he leaves us with no explanation for how this use of the diminutive comes about.

(125) Mass-to-count Diminutives (Jurafsky 1996:555)

BAULE	*ajwe*	'rice'	*ajweba*	'rice kernel'
OJIBWA	*goon*	'snow'	*goonens*	'snowflake'
EWE	*sukli*	'sugar'	*sukli-ví*	'piece of sugar'
CANTONESE	*tong*^{21}	'sugar'	*tong*^{35}	'piece of candy'

Meanwhile, another part of the literature is concerned with the syntactic structures that are associated with different diminutive meanings (Wiltschko 2006, Wiltschko and Steriopolo 2007, Ott 2011, De Belder, Faust, and Lampitelli 2014, De Belder (2011), Kramer 2015:§10.3). Building on Wiltschko and Steriopolo and De Belder et al, Kramer proposes that diminutive noun structures vary along two dimensions: the position within the noun phrase where the diminutive merges and whether or not gender is projected from the diminutive affix. Mass-to-count diminutive affixes are attached to the root (De Belder et al) and they project their gender (Acquaviva 2015:1180-81)[23]. In Kramer (2015), a root-attached, projecting diminutive affix is a little *n*. *Stäubchen* 'dust particle' is a neuter noun formed from the same root as the masculine noun *Staub* 'dust'. The diminutive heads the *n*P as illustrated below:

(126)



Wiltschko (2006) likens the diminutive *-chen* in structures like (126) to a light noun that is the head of a compound[24]. Wiltschko's analogy serves as a clue to the process through which mass-to-count diminutive affixes come about.

One of the mechanisms of semantic change that Jurafsky considers is generalization which he defines as follows (see also Traugott 2006):

(127) Generalization or Bleaching (Jurafsky 1996:544)

A new sense is created from an old one by abstracting away specific features of meaning. The new meaning is more general and less informative than the old one.

---

[23] Acquaviva compares two diminutives formed from the Italian mass noun *crema* (fem). There is the diminutive *cremina* which is feminine like *crema* and is a mass noun. That contrasts with the diminutive *cremino* which is masculine and is a count noun. Cremina is cream made by whisking together sugar and a little bit of coffee. A cremino consists of one or more layers of cream enclosed between two layers of chocolate.

[24] Wiltschko notes that nouns show final devoicing before a diminutive suffix. Dressler & Barbaresi (1994:110) likewise point to devoicing concluding that it is "as if the diminutive suffix were a transparent second part of a compound. Ott (2011:§3.2.3) argues that there is no evidence for the phonological independence of the diminutive morpheme, or for a similarity between diminutive-formation and compounding. He concludes that German *-chen* is a cohering affix. Raffelsiefen (in press:§§2.1,2.3) presents evidence that diminutive *-chen* is in fact non-cohering.

Jurafsky(1996:§4.3) discusses instances of generalization in which the resulting sense has completely left the original source domain of size. Suppose we follow this scheme, beginning with (128), modeled on the meaning assigned to $\sqrt{\text{LARGE}}$ in (94) above:

(128) Basic meaning for diminutive.

$[\![\text{DIMINUTIVE}]\!]^c = \lambda s.$ *s* is a single participant state that holds of an individual when its size is below the standard in *c.*

And now suppose that all reference to size is abstracted away:

(129) Hypothetical meaning for diminutive after generalization/bleaching

$[\![\text{DIMINUTIVE}]\!] = \lambda s.$ *s* is a single participant state

The result is a pure single participant predicate. It has roughly the meaning of *entity.* If this diminutive functions like the head of a compound noun, that noun will be a count noun. If we now return to the examples of mass-to-count diminutives, we find the same kinds of relations between the head and non-head as have been catalogued for noun noun compounds. I illustrate this with the examples listed in (124) and (125) above drawing on compound examples and discussion in Jackendoff (2010:§13.5.3). In (130), the non-head describes the star ingredient in the food described by the diminutive or compound noun:

(130) Non-head describes the star ingredient of the whole

Diminutives: *tarwetje* 'wheat loaf', *zoutje* 'salt cracker', *cremino* 'crème praline', *panino* 'sandwich'

Noun noun compounds: *cherry pie, gingerbread, cinnamon bun, cheesecake, noodle soup, dill pickle, jelly roll*

In the examples in (131), the non-head describes the material making up what is described by the diminutive or compound noun:

(131) Non-head describes material making up the whole

Diminutive: *Brötchen* 'bread roll' *Stäubchen* 'dust particle' *Schläfchen* 'nap', *venticello* 'breeze', *ajweba* 'rice kernel', *goonens* 'snowflake', *sukli-ví* 'piece of sugar', *tong*[35] 'piece of candy'

Noun-noun compound: *snowball, fireball, rubber band, tinfoil, inkblot, corkboard, wood chip, sugar cube, dungheap, bearskin rug, ice sculpture, bloodstain*

Finally, *lattino* 'baby bottle' describes a container for what is described by the non-head (milk), just like in *coffee cup, photo album, soapdish,* and *fishtank.* The meaning of a compound is constrained, but not fully determined, by the meaning of its components along with a small set of relations that may hold between the components (Jackendoff

2010:§§13.4-13.7) and the head principle which says the compound usually denotes a particular subtype of the type denoted by the head. The same applies to mass-to-count diminutives. In that case, the head principle merely requires that the diminutive noun be a predicate of single participant states.[25]

5 Lexical Plurals

5.1 Introduction

Across a variety of languages, plural-only meanings and forms are often linked with mass noun interpretations. Lauwers (2021) writes:

> "Lexical plural is an umbrella term for items that are always plural (cf. pluralia tantum), at least for a particular sense.
> …despite their plural forms, these items are [−count], or more precisely, they exhibit count deficiency, as shown for instance by their incompatibility with cardinal numbers (**three oats*)."

In this section, we explore the link between the restriction to plural form and mass noun interpretation.

5.1.1 A note on syntactic structures

In this section, because there will be a focus on the realization of number morphemes, right headed structures will be drawn. This way PL occurs to the right of the stem in the structure as it does in the pronunciation. Categorizing *n* heads will initially be omitted to simplify the presentation. They will be reintroduced at the end. I also leave off the categorizing feature 'Num', writing 'PL' instead of 'Num [PL]'.

5.2 Contextual Allosemy

5.2.1 Why lexical plurals are mass nouns

The nouns *arms, brains, directions, effects, funds* and *guts* all have at least two senses, on one they pattern as mass nouns and on the other as count. These nouns occur in pairs of sentences below, the first of which is conducive to the interpretation associated with mass grammar and the second to the interpretation associated with count grammar.

(132) To win the war, they need **more arms** and ammunition. MASS
A sea star can lose **one or more arms** and grow new ones. COUNT

(133) The next phase needs **more brains** and less muscle. MASS
Axial resections were obtained in **two brains**. COUNT

(134) Download this map for **more directions** to St. Luke's, including where to park.

[25] Note, 'compound semantics' with a bleached diminutive explains the mass-to-count diminutive, but it is not limited to cases in which the root is mass.

MASS
It radiates power in **one or more directions**. COUNT

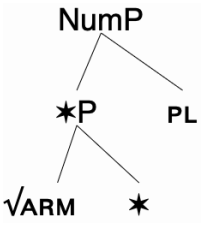
(135) They have **no personal effects**, no furniture, no money, no relations. MASS
Policy measures have had **several effects**. COUNT

(136) **More funds** will be available for renewables in the future. MASS
Several funds have been set up to promote adaptation measures. COUNT

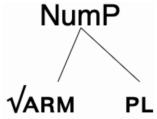
(137) The new administration has **more guts** than its predecessor. MASS
Guts of larvae were investigated by culturing **seven individual guts**. COUNT

The syntax associated with the two meanings of *arms* is given below:

(138)



arms 'shoulder to wrist appendages'



arms 'weaponry'

The structure on the left in (138) contains a ⋆ operator, as expected for a count plural. In the structure on the right there is no ⋆ operator. The plural is felicitous without the ⋆ because on the mass noun 'weaponry' interpretation the extension of $\sqrt{\text{ARM}}$ contains multiparticipant states. This is an example of a mass plural (McCawley 1979, Ojeda 2005). The structure on the right does not by itself capture the fact that the mass interpretation of $\sqrt{\text{ARM}}$ is only available in the presence of the plural. We have here a case of *syntactically conditioned polysemy*[26] better known as **contextual allosemy** (Marantz 2013:97, §6.3, McGinnis-Archibald 2016:§3.2, Wood 2021:§§1.3.1, 6.1). After explaining what contextual allosemy is, I will propose rules that encode the dependency of the mass interpretation on the presence of PL.

The plural morpheme in English has several allomorphs. The choice of the allomorph is conditioned by the stem to which the plural is attached: *ox**en***, *bat**s***, *addend**a***. This conditioning is referred to as **contextual allomorphy**. An example of contextual allomorphy somewhat closer to our concerns comes from Moskal (2015)'s discussion of nominal suppletion, in which the form of a nominal root is different in the singular and plural, as in these Ket examples:

(139) Nominal suppletion in Ket (Moskal 2015 based on Werner 1997)

SINGULAR	PLURAL	
diˑlˀ	kʌˀt	'child'

[26] I take the polysemy in (132)-(137) to be *irregular*, that is, not given by some general rule like 'container for content' or 'author for works'. On the regular-irregular distinction and for a guide to past and present thinking on polysemy, see Vicente & Falkum (2017). For discussion of regular polysemy and the mass-count distinction, see Kiss, Pelletier, and Husić (2021).

oˑksʼ	aʔq	‘tree’
kɛʔt	dɛʔ-ŋ	‘man’

The rules in (140) below associate exponents with the root in Ket glossed as ‘child’. The rules are applied with an elsewhere logic, whereby a more specific rule preempts a less specific one. So, if PL is present in the structure, the first rule is applied and otherwise the second is applied.

(140) Vocabulary Insertion rules (Moskal 2015)

$\sqrt{\text{CHILD}} \Leftrightarrow$ kʌʔt / _____ PL

$\sqrt{\text{CHILD}} \Leftrightarrow$ dɨˑlʼ

Summarizing, nominal suppletion is modeled in (140) as contextual allomorphy in which the plural feature conditions the choice of allomorph.

Contextual allosemy is the semantic analogue of contextual allomorphy. It is captured by rules that state context sensitive pairings of semantic values with elements of syntax. I’ll call these ‘sense insertion rules’ and formulate them in a manner similar to that of the vocabulary insertion rules, following Harley (2014) and others[27]. The rules for the root in the noun *arms* are given below:

(141) Sense Insertion rules for $\sqrt{\text{ARM}}$

$\sqrt{\text{ARM}} \Leftrightarrow$ λ*s*. *s* is a state whose participants are weapons. / _____ PL

$\sqrt{\text{ARM}} \Leftrightarrow$ λ*s*. the sole participant of *s* is an appendage from shoulder to wrist.

Terminals and possibly other nodes are paired with meanings in keeping with sense insertion rules. After that, compositional rules of interpretation apply beginning with the rule in (142):

(142) If α is a pair whose second element is a meaning *m,* then ⟦α⟧= *m*.

In addition to (142), we have familiar rules such as the one below for function argument application:

(143) If α is has two daughters, β and γ, then if ⟦β⟧(⟦γ⟧) is defined, ⟦α⟧ = ⟦β⟧(⟦γ⟧) and if ⟦γ⟧(⟦β⟧) is defined, ⟦α⟧ = ⟦γ⟧(⟦β⟧).

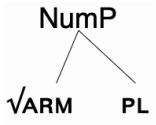
The equation in (144)a below should now be understood as describing the outcome of applying the context-free sense insertion rule in (144)b and then applying the rule in (142).

[27] I used the term ‘sense’ because that’s common in the literature on polysemy.

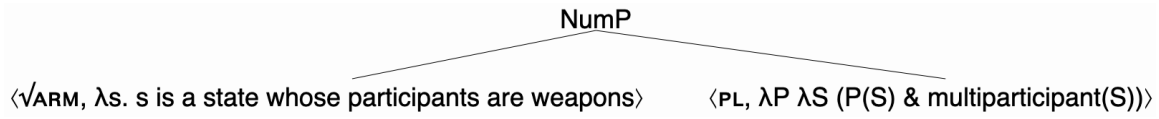
(144) a. ⟦PL⟧ = λ*P* λ*S* (*P*(*S*) & **multiparticipant**(*S*))

b. PL ⇔ λ*P* λ*S* (*P*(*S*) & **multiparticipant**(*S*))

Summarizing then, in the structure below:



the root will be paired with a meaning in keeping with the first rule in (141), PL will be paired with a meaning in keeping with (144)b,



and the two meanings combine by function argument application, given the rules of interpretation in (142) and (143). The result is the meaning associated with NumP.

⟦NumP⟧ = λs. s is a state whose participants are weapons & multiparticipant(*s*)

With the addition of the sense insertion rules in (141), we now capture the fact that on its mass interpretation, *arms* must be plural.

The sense insertion rules in (141) encode the dependency between mass-meaning and plural-only form, but they don't give any insight into why there should be such a connection. For that, we turn to the **block**ing of nominal suppletion. Serbo-Croatian and other Slavic languages show number driven suppletion for the root glossed as 'man'. However, in those languages, the diminutive can come between the root and the plural morpheme. In that case, suppletion is blocked:

(145) Nominal suppletion in Serbo-Croatian (Moskal 2015:371)

SINGULAR	PLURAL	
čovek	ljud-i	'man'
čoveč-ić	*ljud-ić-i	'man-DIM'

The context condition in the rule in (146) below requires the root to combine directly with the plural feature. Nothing may intervene.

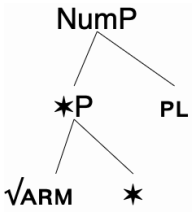
(146) $\sqrt{\text{MAN}}$ ⇔ ljud / _____ PL

Assuming that strict adjacency is a property of contexts for all insertion rules, or at least for rules in which the target is a root (Adger et al 2003 cited in Moskal & Smith 2016:300), we conclude that a rule of the form:

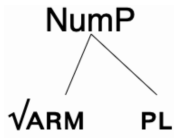
(147) $\sqrt{\alpha}$ ⇔ *meaning* / ____PL

requires for its application, a syntax in which the root combines **directly** with the PL feature. But now, consider the consequences. If the extension of a root is restricted to single participant states, then when it combines with the plural, which requires multiparticipant states, the result would always be an empty extension. This would not make for a very good vocabulary item. It follows then that when the meaning of a root is limited to plural contexts, like $\sqrt{\text{ARM}}$ 'weaponry' or $\sqrt{\text{BRAIN}}$ 'intelligence', that meaning cannot be the kind of meaning you find with singular count nouns. We have arrived at the link between mass-meaning and plural-only form. To illustrate, consider our earlier structures:

(148)



arms 'shoulder to wrist appendages'

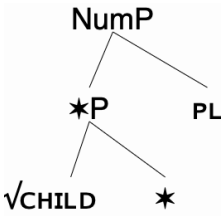


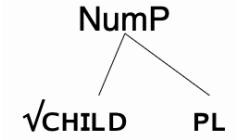
arms 'weaponry'

A plural-conditioned root meaning could not be inserted in the structure on the left. The PL condition is not met there because the ⋆ operator intervenes. A plural-conditioned root meaning could only be inserted in the structure on the right, and that structure entails that the plural-conditioned meaning contains multiparticipant states.

This cannot be the whole story, for if we stop here, we seem to make the wrong prediction for Serbo-Croatian *ljudi* 'men, people' and for the plural nouns of Ket in (139) above. Those are count plurals (Georg 2007:102, 182, Kazakevich 2002:line 3) and yet their exponence is conditioned by PL. Being a plural count noun, *kʌʔt* 'children' would have to have the structure on the left in (149) below, but given that its phonological exponence is governed by the rule repeated in (150) below, it would presumably have to have the structure on the right in which the root and the conditioning PL are adjacent.

(149) Syntactic structures for *kʌʔt* 'children'





(150) $\sqrt{\text{CHILD}} \Leftrightarrow$ kʌʔt / _____ PL

To see our way out of this paradox, we take note of Moskal's discussion of suppletion in Lezgian, which is triggered by oblique case:

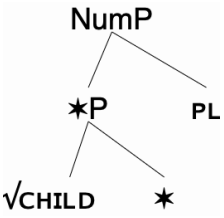
(151) Case triggered nominal suppletion in Lezgian (Moskal 2015:372 based on Haspelmath 1993, p.c.)

	SINGULAR	PLURAL	
ABS	jad	jat-ar	'water'
OBL	c-i	jat-ar-i	

Looking at the singular, we note that a different phonological exponent is used for the oblique. This doesn't happen in the plural. In the plural, *jat-ar-i* 'water-PL-OBL', number intervenes between the root and case features. Number interferes with suppletion for the plural but not for the singular. The plural has a phonological exponent but the singular does not. In this and other cases (see recently Paparounas 2021), intervening elements interfere with adjacency but only if they are associated with a phonological exponent or with a meaning, with the choice depending on the kind of insertion rule at issue (Marantz 2013). McGinnis-Archibald (2016:414-415) reviews Marantz's discussion of stative participles in Greek and concludes "contextual allomorphy requires phonological adjacency, while contextual allosemy requires semantic adjacency." Applying this to the data of interest here, the vocabulary insertion rule in (152) applies in the structure in (153). Since the ⋆ operator has no phonological exponent (Sauerland 2003) it does not intervene.

(152) $\sqrt{\text{CHILD}} \Leftrightarrow$ kʌʔt / _____ PL

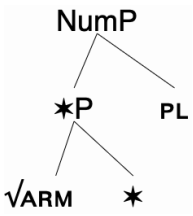
(153) Syntactic structure for *kʌʔt* 'children'



By contrast, the ⋆ operator is associated with a meaning and so the rule in (154) could not apply in the structure in (155).

(154) $\sqrt{\text{ARM}} \Leftrightarrow$ λ*s*. *s* is a state whose participants are weapons. / _____ PL

(155)



arms 'shoulder to wrist appendages'

5.2.2 Summary

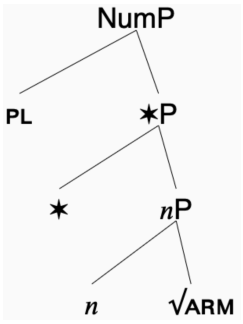
The link between plural-only meaning and mass interpretation is this: in order to have a meaning that is conditioned to appear in the context of a plural feature, the root must be adjacent to the plural feature. Nothing meaningful may intervene. In particular, the ⋆ operator may not intervene. But if the root combines directly with the plural feature, PL, the root's extension cannot be limited to single participant states, for that would give rise to a necessarily null extension. Count nouns extensions are limited to single participant states(§2.7). It follows then that if a root meaning is conditioned by the presence of PL, it must be a mass noun.

The ⋆ operator interferes with rules of allosemy because it has a meaning. But it has no phonological exponent, so it doesn't interfere with rules of allomorphy. That's why it is possible to find nominal suppletion triggered by number in count nouns, as in the Ket and Serbo-Croatian examples discussed in Moskal (2015).[28]

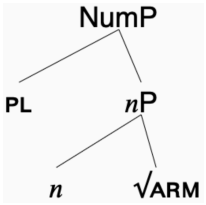
5.2.3 Categorizing heads

In order to simplify the presentation, categorizing *n* heads were omitted to this point. I assume that in the nouns discussed here the heads have neither phonological form nor meaning, so they do not interfere with either kind of insertion rule. Below, I've added them back in and reversed the order for those of us accustomed to hierarchical structures with right branching display:

(156)



arms 'shoulder to wrist appendages'



arms 'weaponry'

PL is 'semantically adjacent' to $\sqrt{\text{ARM}}$ in the structure on the right, but not in the structure on the left, where ⋆ intervenes.

5.3 Pluralia tantum

At the heart of our analysis of lexical plurals is a sense insertion rule that associates a root with a mass meaning. The rule is conditioned by a plural feature and we linked this conditioning with the non-count nature of the meaning. We began our discussion with nouns that have mass senses only in the plural but that can occur in the singular and the plural with a count sense (*arms, brains, directions, funds, guts*). Sense insertion rules may

[28] For more on locality conditions, see section 4.1 of Gousakova and Bobaljik (2020)'s handbook article on allomorphy and vocabulary insertion. Semantic adjacency as a requirement for contextual allosemy is a central theme of Wood 2021's study of nominalization in Icelandic. The locality of allomorphy is discussed in section 6.1 of that work.

also explain the behavior of nouns like *fumes* that only occur in the plural, so-called *pluralia tantum*. English has *gobs* of pluralia tantum. The examples below are among those discussed in Acquaviva (2008) and Ojeda (2005):

(157) *arrears, dregs, dues, fumes, furnishings, oats, proceeds, remains, suds, valuables, winnings*

Following a suggestion in Arregi & Nevins (2014:fn5), I propose that there is a sense insertion rule for $\sqrt{\text{FUME}}$ that is conditioned by the plural, like the first line of (158) below, but that there is no rule akin to the second line of (158). In that case, [$_{\text{NumP}}$ PL *n* $\sqrt{\text{FUME}}$], pronounced *fumes,* receives an interpretation but [$_{\text{NumP}}$ SG *n* $\sqrt{\text{FUME}}$], pronounced *fume*, does not receive an interpretation, moreover the interpretation *fumes* receives makes it a mass noun.

(158) Sense Insertion rules for $\sqrt{\text{ARM}}$

$\sqrt{\text{ARM}}$ ⇔ λ*s*. *s* is a state whose participants are weapons. / _____ PL

$\sqrt{\text{ARM}}$ ⇔ λ*s*. the sole participant of *s* is an appendage from shoulder to wrist.

On this proposal, *fumes* is a plurale tantum noun because it only gets a meaning in a plural context. Given our discussion of allomorphy and allosemy, we may expect to find nouns that are plurale tantum because they only get a pronunciation in a plural context. In that case, the noun could be a count noun since a ⋆ would not intervene with a PL condition in a phonological insertion rule. Trommer (2012:346) writes: "a conceivable analysis for the fact that German *Elter-n*, 'parents' doesn't have a singular form (but contains the regular plural suffix -*n*) is to assume that the lexicon of German provides the allomorph for this lexeme in the context of the plural morpheme, but no default Vocabulary item which would be adequate for a non-plural context." This idea is implemented in the following Vocabulary Insertion rules:

(159) $\sqrt{\text{ELTER}}$ ⇔ Elter /___ PL

PL ⇔ -n

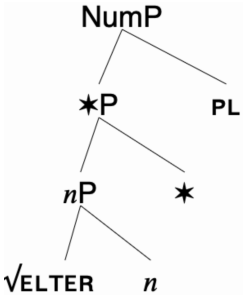
and we add to that a Sense Insertion rule:

(160) $\sqrt{\text{ELTER}}$ ⇔ λ*s*. *s* is a single participant state of someone who has a child.

On this account, $\sqrt{\text{ELTER}}$ has exactly the same meaning as $\sqrt{\text{PARENT}}$ but unlike $\sqrt{\text{PARENT}}$, $\sqrt{\text{ELTER}}$ is never realized without the plural. In that case, $\sqrt{\text{ELTER}}$ has a count noun[29]

[29] Here's an example of its use with numerals:
(i) In Mexiko wurde das erste Kind weltweit geboren, das Erbmaterial von zwei Müttern hat, also **drei genetische Eltern**.
'In Mexico, the first child in the world was born, with genetic material from two mothers, i.e. **three genetic parents**.'
br.de/nachrichten/wissen/drei-eltern-und-ein-baby

meaning and we get the structure below. The ⋆ does not interfere with the rule in (159) because ⋆ has no phonological exponent.



Eltern 'parents'

5.4 Mass count diagnostics

As noted earlier, nouns with plural-conditioned sense insertion are called mass plurals. Their status as mass nouns is established by their inability to combine with numerals:

(161) Why did they give us #two directions to the stadium?

More evidence comes from their inability to combine with reciprocals, unless conjoined, as seen in these examples from §3.

(162) #The directions to the stadium contradicted each other.
(163) The directions you gave me and the directions she gave me contradicted each other.

Some of the mass plurals are hardcore mass nouns and so they resist combination with stubbornly distributive predicates (§4.2):

(164) #The fumes were big.

Combination with *much* versus *many* tends to correlate with being mass versus count (*much work, many jobs*). As noted in §2.7, this and other such correlations hold to a greater or lesser degree. Mass plurals present a point at which the correlation breaks down. Jespersen (1961/65:§5.28) observed that "with regard to plural mass-names there is some difficulty in expressing quantity, as *many* cannot well be used because it implies countability, and *much* presupposes the sg number; thus *a great quantity* or similar expressions must be resorted to." Gillon (1992:613) reports that his informants found both *many* and *much* awkward with plural mass nouns, while his own intuitions vary, with *much brains* versus *many effects.* An explanation for this behavior might come with a better understanding of *much* and *many*. Bacon (1973), Smith (2016), Wellwood (2014), and Bale & Gillon (2020) develop the idea that the choice of *much* vs. *many* is determined by the number feature on the quantified noun, though the data above from Gillon (1992) challenges that idea. In addition, we may discover grammatically relevant distinctions among kinds of multiparticipant states, as we did in our discussion of differences in felicity in combinations with stubbornly distributive predicates (§4.2).

5.5 Mass plurals vs. mass singulars

Nouns whose extensions are restricted to single participant states are count nouns. Mass noun extensions are not so restricted (§2.7). Mass noun extensions include multiparticipant states. But this does not preclude their also having single participant states in their extension. This may not be possible for hardcore/canonical mass nouns, if they are divisive, as suggested earlier (§4.2). But it is possible for fake/aggregate/object mass nouns as many have observed (e.g. Joosten 2010:38, fn22, Leisi 1971:32 cited in Mihatsch 2015:1185 and Martí 2020a:§4.2.2). Križ (2017:§2.3) writes "Certainly my *luggage* can be a single suitcase, today's *mail* can be a single letter, and a cardinal's *jewelry* may consist in a single ring…. It is quite possible, for example, to point at a single table and utter *This is furniture*." With plural mass nouns, the plural morpheme removes the possibility of having single participant states making for the contrast between singular and plural mass nouns pointed out in Gardelle (2016:364) and described in Križ (2017)'s remarks regarding "*clothes, belongings, possessions, goods, movables, valuables,* and *eatables*, which refer to collections of well-individuated objects." He writes "it is simply not possible to use pluralia tantum of this kind to refer to a single object…one cannot hold up a single shirt and say *#These are clothes.* or *#This is clothes.*"

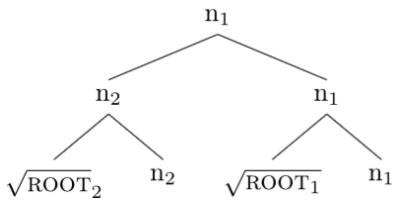
5.6 Compounds and other contexts

Harðarson (2021) is a study of conditions for allomorphy and allosemy in compounds. One part of a compound structure may condition allomorphy or allosemy in another. He cites the example of "compound intensifiers in Icelandic (e.g., Indriðason 2016). The stem *eitur* typically receives the meaning 'poison/venom', (165)a., whereas in certain adjectival compounds it serves as an intensifier, (165)b,c."

(165) *Icelandic*

a. eitur#slanga	b. eitur#hress	c.eitur#fljótur
poison#snake	poison#chipper	poison#quick
'venomous snake'	'very chipper'	'very fast'

Harðarson concludes from this that in the structure below, $\sqrt{\text{ROOT}}_2$ is sensitive to the category of the element that n_2 attaches to.



If this is right, then there must be sense insertion rules whose contexts are met only in compounds. This has consequences for the proposal above about pluralia tantum. It was claimed that root $\sqrt{\text{FUME}}$ cannot appear without the plural, because it would not get associated with a meaning. But that conclusion should be qualified. We might expect to

find speakers forming compounds with $\sqrt{\text{FUME}}$ without a plural. The following were gleaned from the web:

(166) fume cabinet, fume hood, fume extractor, fume buildup, fume condensation

We also find it without a plural in verbs, presumably conditioned there by the presence of a little *v*.

(167) They *fumed* about the World Bank's funding of destructive infrastructure.

5.7 Optionally plural mass nouns

We have explained why *arms* has a mass interpretation only in the plural but curiously we have no explanation for why *milk* or *evidence* have a mass interpretation only in the singular. Plural features are compatible with mass roots, so why don't they optionally combine with $\sqrt{\text{MILK}}$? One thought might be that the mass meaning of $\sqrt{\text{MILK}}$ is conditioned on the presence of a singular feature, just as the mass meaning of $\sqrt{\text{ARM}}$ is conditioned on the presence of plural feature. This hypothesis runs into problems with nouns like *fire, rock* or *rope* plausibly formed from roots that have both a count and a mass meaning. The mass uses of these words only occur in the singular so we should suppose that the mass meaning is conditioned on the presence of a singular feature. The count uses of those words occur in the singular and the plural so they would go by an elsewhere rule. The combination might look like this:

(168) a. $\sqrt{\text{ROCK}} \Leftrightarrow \lambda s.\ s$ is a solid mineral state. / _____ SG

b. $\sqrt{\text{ROCK}} \Leftrightarrow \lambda s.\ s$ is a state whose participant is a mass of hard mineral material

But now, by elsewhere logic, any structure with SG in it will be interpreted by the more specific rule (168)a, making it impossible to have a singular, count use of $\sqrt{\text{ROCK}}$.

If we venture outside English, we find languages in which singular mass nouns do have acceptable plural mass counterparts (Alexiadou 2011, 2021, Corbett 2000:§7.3, Ember 1905, Gesenius et al. 1909:§124, Gillon 2015, Haspelmath 1993:§7.2.1, Sharifan & Lotfi 2003, Tsoulas 2006, 2009, Wiese 2012:§4.2.2.3). These languages are a diverse group including Biblical Hebrew, Greek, Innu-aiman, Lezgian (exemplified in (151) above), Persian and Turkish[30]. These languages confirm our expectation that mass nouns

[30] As we'll see in §6.3, nouns in Turkish are always singular in combination with numerals. So to establish that there are plural mass nouns, one needs to look to partitives which allow plural count nouns. The quantifier in a partitive formed on plural mass nouns can be the mass indefinite quantifier *biraz*, as in (i) below, but it cannot be a numeral or the count indefinite quantifier *bazı*.

(i) *Turkish*

viski-**ler**-den	biraz-ın-ı	iç-di-m.
whiskey-PL-ABL	some-3SG-ACC	drink-PAST-1SG

'I drank some of the generous amount of whiskey.'

This example and others were supplied by İsa Bayırlı along with insightful comments about the phenomenon. I am truly grateful for his help and his good cheer. I also wish to thank Sabine Iatridou for discussion of this phenomenon in Greek.

can be pluralized as mass nouns, but they are problematic in other ways. Speakers allow the plural with some roots but not with others (Alexiadou, Kouneli) and the interpretation of pluralized mass nouns is more than what one would expect from the combination of a plural feature and a mass root. According to some, pluralized mass nouns can convey abundance (Tsoulas, Alexiadou), according to others disorder and dispersion (Kouneli 2019, Erbach 2019:415, Sharifan & Lotfi), disdain (Tsiakmakis et al. 2021) and intensity (Ember, Gesenius). There is a small analytical literature (Chierchia 2021, Erbach 2019, Kouneli 2019, Renans et al. 2018) which assigns different meanings to number features in English and Greek and/or deduces abundance as a scalar implicature. But this may not be a strictly plural-mass phenomenon. Wiese (2012:62-3) discusses a parallel effect with an optional singular indicating small amount. Ember (1905) identifies intensive plurals on count nouns (The Biblical "rivers of Babylon" may refer to the (once) mighty Euphrates River.). Several of the special uses of the plural in Corbett (2000:§7.3) also involve count nouns.

The generalization seems to be that plural features are permitted on mass nouns only when they result in a meaning not achievable with the singular either because the root doesn't get a mass meaning without the plural or because the plural contributes 'added' content only in the presence of a mass noun root.

6 Bipartites

Bipartites (e.g. *pliers, pants*) are a species of mass plurals that call for special treatment. Klockmann (2021:315) calls them "more canonical pluralia tantum nouns" and for good reason. Pluralia tantum are routinely presented as evidence on issues along the border between syntax and semantics and in most cases, the examples cited are bipartites. **Mixed agreement** is such case. Authors who write about mixed agreement tend to view bipartites as 'semantically singular'. The data does not confirm this judgement, as we'll show in §6.2. We will also attempt to explain the 'semantically singular' intuition. Then in §6.3, we take up a typological challenge to the idea that number marking is meaningful in mass plurals. Corbett (2000, 2019) questions why languages that have dual number do not seem to use it for bipartites. We'll explain why that might be. Section 6.3 is lengthy as it requires some introduction to current thinking about the semantics of dual marking.

6.1 Bipartites defined

'Bipartite' is a term used by Payne and Huddleston (2002) for "words denoting objects made up of two like parts". Below are a few of their 39 examples:

(169) Bipartite nouns
scissors, eyeglasses, pants, pliers, binoculars, tweezers

Payne and Huddleston comment that the bipartite structure of the objects "motivates the construction with *pair*, and the plural form of the noun." The required plural and the observation about like parts inform the following sense insertion rule:

(170) $\sqrt{\text{SCISSOR}} \Leftrightarrow \lambda s.\ s$ is a *scissors* state. / _____ PL

The participants in a *scissors* state are two blades pivoted so that the sharpened edges slide against each other when the handles opposite to the pivot are closed[31].

6.2 Mixed Agreement

Important insight into the nature of agreement has come from expressions that show mixed or hybrid agreement (Wechsler 2015, Landau 2016:§2 a.o.). Polite plural pronouns are a well-studied example of this. The French second person plural pronoun *vous* has an honorific or polite use with a single addressee or with multiple addressees. In (171) below, the agreement on the verb is uniformly plural but the number marking on the adjective reflects the reference of the pronoun:

(171) *French* (Wechsler 2011:1000)

a. Vous êtes loyal.
you.PL be.2.PL loyal.M.**SG**
'You (singular, formal, male) are loyal.'

b. Vous êtes loyaux.
you.PL be.2.PL loyal.**PL**
'You (plural) are loyal.'

The pattern of number marking on the predicative adjectives in (171) is referred to as 'semantic agreement'. The contrasting agreement on the verb versus on the adjective in (171)a is an instance of mixed agreement. The subject pronoun in (171)a agrees with a plural verb and yet it has singular reference. This represents a kind of syntax-semantics mismatch. Pluralia tantum in general and bipartites in particular are routinely thought to represent a similar mismatch[32]. This leads to the expectation that *ces ciseaux* 'these scissors' will give rise to mixed agreement. But that is not what one finds:

(172) *French* (Wechsler 2011:1016)

Ces ciseaux sont géniaux! / *génial!
these.PL scissors (M.PL) are.PL brilliant.M.**PL** / *brilliant.M.**SG**

'These scissors are cool!'

Wechsler (2011:1016) reports that mixed agreement has been documented for a variety of languages[33] and "in all of these mixed agreement languages, polite plural pronouns

[31] This wording is from a Wikipedia entry. This meaning will do for now, but it should be modified to make it participant cumulative.

[32] For example, in a paper on nouns with non-canonical number properties, Corbett (2019) writes "on the obvious reading of *These scissors are blunt* it denotes a single entity, so that its semantics is out of step with its syntax and morphology".

[33] "The mixed agreement pattern was documented for Czech, French, Italian, Romanian, Icelandic, and Modern Greek by Comrie (1975: 410). Greville Corbett investigated this issue for all the Slavonic languages, and found this mixed agreement pattern to be favored in Macedonian, Bulgarian, Czech, Slovak, Upper Sorbian, Ukrainian, Belorussian, and Russian (long form adjectives) (Corbett 1983:56ff., 2000:193–194, 2006:230–232)." Wechsler (2011:1001-2)

trigger plural on a verb but semantic agreement on an adjective, while plurale tantum common nouns trigger plural on both."

The Hebrew plural-only noun *be'alim* 'owner(s)' is another expression for which syntax and semantics are mismatched (Landau 2016, Gesenius et al. 1909:§124.1, Ember 1905:230), and so they provide another point of comparison with bipartites. When referring to a single owner, *ha-be'alim* can trigger mixed agreement (173) or singular agreement (174). Bipartites and other pluralia tantum always trigger plural agreement.

(173) *Hebrew* (Landau 2016:985)

ha-be'al-im	ha-xadaš-im	hexlit	al picul.
the-owner-PL	the-new-**PL**	decided.3**SG**	on de-merger

'The new owner decided on demerger.'

(174) *Hebrew* (Landau 2016:984)

ha-be'al-im	ha-kodem	maxar et	ha-makom.
the-owner-PL	the-previous-**SG**	sold.3**SG** ACC	the-place

'The previous owner sold the place.'

(175) *Hebrew*[34]

ha-ofan-ay-im	ha-xadaš-im	nimca-im	ba-martef
the-wheel-TWO-PL	the-new-PL	found.3PL	in.the-basement

'The new bicycle is in the basement'

The agreement profile for bipartites supports the view developed here according to which they are semantically plural. Researchers who think otherwise appear to be guided by intuitions expressed with singular count nouns. Bale (2021:252) supports his claim that the plural on *scissors* is semantically vacuous by pointing to the fact that

The scissors that Mary bought are in the closet.

is an acceptable description of a situation where Mary only bought one ***item*** (see Baggio & Trigg 2019 for similar reasoning, see also reference to 'a single entity' in footnote 32). Wechsler (2011:1016) has a particularly illuminating version of this type of theorizing (see also Wechsler & Hahm 2011:253-4). He concludes from the fact that the predicate nominal in (176) below is singular, that *scissors* is not semantically plural.

(176) These scissors are an important tool. (Wechsler 2011:fn14)

The argument relies on the assumption that predicate nominals typically show the "semantically justified number form" and specifically, that the subject of a singular

[34] Bipartites in Hebrew include the affix *-ay* 'TWO' identified by Ritter (1995:415) as part of the plural-dual affix *-áyim*.

predicate nominal could not be semantically plural. That assumption is incorrect and it's instructive to consider where it goes wrong. Consider the following examples:

(177) His ear **tufts** are **a tool** for sending signals to other lynx.

(178) The report **cards** are **a tool** designed to meet the needs of healthcare consumers.

(179) The **rules** of procedure are the **tool** set up by the council to ensure the daily functioning of the network.

(180) The **computers** were **a gift** from my boss.

(181) The **raft** he mentioned was just five **logs** that were connected with vines.

The first three examples have plurality denoting subjects combined with singular predicate nominals. In the fourth example, the subject is singular and the predicate plural. According to (180), the plurality referred to there by *the computers* bears an intimate relationship to a singularity introduced with *a gift.* Let us say their referents are **entangled**. Pluralities and singularities that would make the other sentences true are likewise entangled. Entanglement between the *scissors* state and a *tool* state would make (176) true and similarly for assertions which purport to identify a *scissors* state with *entity, object* or *item* states. Below is a rudimentary definition of entanglement sufficient for our purposes:

(182) A set of one or more states S is **entangled** with a single participant state *s* if the participant in *s* is the mereological sum of the participants in the states in S.

In (180), *a gift* describes a state that is entangled with the set of states denoted by *the computers*. In (176), *an important tool* describes a state that is entangled with the state denoted by *the scissors*. We would not deny that *the computers* is semantically plural based on (180). And, as the agreement facts show, we should not deny that *the scissors* is semantically plural based on (176).

With the notion of entanglement in hand, we can elaborate on the link drawn by Payne and Huddleston between bipartites and *pair*:

(183) $\sqrt{\text{PAIR}} \Leftrightarrow \lambda P\, \lambda s.\ s$ is a single participant state & $(\exists S)$ ($P(S)$ & S has two participants & S and s are entangled)

With that meaning, we form *pair of pants*, a count noun phrase that will allow us to indirectly count the states in the extension of *pants*. Above we saw that a state can be entangled with another state or with a plurality of states. In *pair of pants*, the S that witnesses the existential is a singularity, a single state. In *pair of shoes* it is a plurality:

(184) $[\![\textit{pair of}^{\star}\textit{shoes}]\!] = \lambda s.\ s$ is a single participant state & $(\exists S)$ ($[\![\text{PL}^{\star}\sqrt{\text{SHOE}}]\!](S)$ & S has two participants & S and s are entangled)

Since *shoe* states are single participant, in order to satisfy the existential conjunct of (184), the witness for S must be a set of two shoe states. This contrasts with *pair of scissors* in which a single scissor state can supply two participants. This difference is

reminiscent of the way the plural feature works. There too, with single participant nouns like *shoe* multiple states are needed, while with multiparticipant nouns a single state will do.[35]

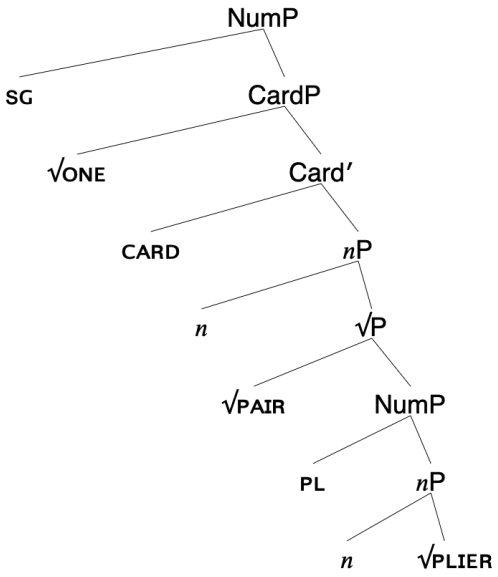
6.2.1 Count noun bipartites

In their discussion of bipartites, Payne and Huddleston report uncertainty and variation among speakers regarding the combination of bipartites with numerals and with some quantifiers. In the linguistics literature, some authors assert that a particular bipartite is a count noun and others assert that it isn't. In online forums, such as Wordreference.com, self-identified native speakers profess uncertainty in some cases and make conflicting claims in others. The examples below are representative of count noun bipartites, available for some speakers.

(185) A tweezers was used.
(186) Two scissors were used.
(187) One pliers was enough.

It could be that speakers have a null version of *pair* that selects for certain roots and that only occurs in the presence of CARD. The structure for the subject of (187) would then be as in (188):

(188)



one pliers

[35] This discussion was inspired by Wągiel (2015, 2017)'s questioning why *pair of scissors* denotes one object, while *pair of shoes* denotes two objects.

6.3 Dualia tantum

Corbett (2000) observed that while pluralia tantum are found in many languages, one rarely comes across a **duale tantum,** that is, a noun that occurs only with dual number. Corbett (2019) writes:

> "Linguists who stress the motivation of apparent irregularities sometimes point to bipartites, like *trousers*, as being motivated pluralia tantum. We might ask, then, what might happen to such nouns in a language with a dual. If 'two-ness' is the motivating factor, we might expect such nouns to occur as dualia tantum. Yet what we often find (in the relatively few instances where there are data) is that the usual suspects turn up, as pluralia tantum."

In order to address the dearth of dualia tantum, I begin by introducing two new number features [+minimal] and [–minimal]. Recognition of these features grew out of the study of pronominal systems in the world's languages (Conklin 1962, McKay 1981, Noyer 1992). Our interest in them stems from the fact that dual can be defined by combining [+minimal] and [multiparticipant]. I'll begin with meanings for [±minimal] as presented in Martí (2020a). Next, I'll adapt those meanings to a pure event semantics. I'll show how the dual can be constructed using [+minimal] and I'll very briefly discuss what motivated the idea that the dual is composite. Following that, I'll develop an analysis of dualia tantum that employs the new features and that follows the logic of our analysis of lexical plurals. The outcome is surprising. In fact, we should not expect bipartites to occur as dualia tantum.

Martí's meaning for our new features are given in (189) and (190) below[36] in the form of sense insertion rules:

(189) [+minimal] $\Leftrightarrow \lambda P.\ \lambda x.\ \ P(x) \ \&\ \neg\exists y\ P(y) \ \&\ y \sqsubset x$

(190) [–minimal] $\Leftrightarrow\ \lambda P.\ \lambda x.\ \ P(x) \ \&\ \exists y\ P(y) \ \&\ y \sqsubset x$

These meanings were crafted for a system in which count nouns denote pluralities and singularities that are ordered by a part-whole relation. *The boat* formed with [+minimal] will pick out singularities because singularities have no proper parts. *The boats* formed with [–minimal] will pick out pluralities since pluralities do have proper parts. In this section, since we are juggling two different systems for marking plural and singular, we cannot continue to use glossing labels for features ([SG],[PL]) and we must resort to the semantic labels [singularity], [multiparticipant], [+minimal] and [–minimal].

Readers unfamiliar with this literature may be curious to know where the idea for these new features came from. To satisfy that curiosity, if only tepidly, we take a brief look at pronominal affixes in Winnebago. The chart below is modeled on Nevins (2011:422)'s presentation of a similar paradigm in Ilokano.

---

[36] These features lead to so-called minimal–augmented number systems. In some of the literature they are [±minimal], elsewhere [±augmented], where [+minimal] = [–augmented] and [+augmented] = [–minimal]. The definitions closely follow the definitions in Harbour (2014).

(191) *Pronominal affixes for active verbs in Winnebago*

	[+minimal]		[−minimal]		
[+auth, +addr]	**hin-**	'I and you alone'	**hin-**	**-wi**	'I and you and others'
[+auth, −addr]	**ha-**	'I alone'	**ha-**	**-wi**	'I and others' (but not you)
[−auth, +addr]	**ra-**	'you alone'	**ra-**	**-wi**	'you and others' (but not I)
[−auth, −addr]	∅	'he, she, it'	**∅-**	**-ire**	'they'

Lipkind(1945:§29), Noyer(1992:178), Harbour(2011a:226)

The person features [+auth, +addr] apply to any set that includes the author, the addressee and possibly others. Then [±minimal] restrict the meaning further as in the glosses. [+auth, −addr] applies to any set that includes the author and excludes addressees. In a pure event semantics, pronouns would refer to sets of one or more states and the person features would make reference to the states individuals are in when they are author, addressee or neither. Pronouns are not our main focus here, so I will not pursue this further.

The features [±minimal] were discovered in the context of pronominal systems, but they have since been shown to play a role in other phenomena. It has been argued that the dual is a composite number, with the feature [–minimal] forming part of the amalgam (more on this below). These features also figure in Martí's theory of numeral noun constructions. In §2.6, we saw her analysis of number marking in numeral noun constructions in which singular is used with *one* and plural with higher numbers. If instead of [multiparticipant] and [singularity], the number features in a given language are [+minimal] for singular and [–minimal] for plural, then, as we'll soon see, in that language the singular is predicted with *one* as well as with higher numbers. Turkish is such a language.

(192) *Turkish* (Martí 2020a)
Ayşe kitap-**lar**-ı oku-du.
Ayşe book-PL-ACC read-PAST
'Ayşe read the books.'

(193) *Turkish* (Martí 2020a)
Bir {çocuk | *çocuk-**lar**}
one {boy | boy-PL
'one boy'

(194) *Turkish* (Martí 2020a)
Iki {çocuk | *çocuk-**lar**}
two {boy | boy-PL
'two boys'

We'd like now to adapt the meanings in (189)-(190) to a pure event semantics. Our adaptation will be guided by properties of the meanings we assigned to [singularity] and [multiparticipant]:

(195) [singularity] $\Leftrightarrow \lambda P.\ \lambda P\ \lambda s.\ (P(s)\ \&\ s$ is a singularity)

(196) [multiparticipant] $\Leftrightarrow \lambda P.\ \lambda s\ (P(s)\ \&\ \textbf{multiparticipant}(s))$

The meaning for [singularity] is state level. It requires s to be a singleton set of states. The meaning for [multiparticipant] is participant level. Likewise, we'll assign [+minimal] a state level meaning and [–minimal] a participant level meaning. Our adaptation for [+minimal] is in (197) below. Given our framework for pluralities and singularities, we've replaced 'proper part' with 'proper subset', returning in fact to the formulation in Noyer (1992:180). Our adaptation for [–minimal] is in (198) and it requires some explanation.

(197) [+minimal] $\Leftrightarrow \lambda P\ \lambda s.\ P(s)\ \&\ \neg\exists s'\ P(s')\ \&\ s' \sqsubset s$

(198) [–minimal] $\Leftrightarrow \lambda P\ \lambda s.\ P(s)\ \&\ \exists s'\ P(s')\ \&\ \neg(s' \ominus s)\ \&\ ((s \cup s') \ominus s))$

The final conjunct of (198) is repeated below:

(199) $\neg(s' \ominus s)\ \&\ ((s \cup s') \ominus s))$

The first conjunct of (199) says that s' and s do not have all the same participants. The second conjunct in (199) says that when one combines the two sets of states, s and s', the result is a set of states with all the same participants as s. In other words, the participants in s' are some but not all of the participants of s. It follows that s is not minimal in P from the participant perspective. It now follows that $[_{\text{NumP}}$ [–minimal] $\star\ \sqrt{\text{BOAT}}\ ]$ will be true only of pluralities.

The phrase $[_{\text{NumP}}$ [–minimal] $\sqrt{\text{TWO}}\ \star\ \sqrt{\text{BOAT}}\ ]$ will be true of nothing, since (199) could not be satisfied by an s and an s' both of which are a set of two boat states.[37] On the other hand, $[_{\text{NumP}}$ [+minimal] $\sqrt{\text{TWO}}\ \star\ \sqrt{\text{BOAT}}\ ]$ is true of any set of two boat states. Since [+minimal] is the singular feature and [–minimal] is the plural feature in Turkish, we get the pattern in (194).

We now have two sets of number features representing two different ways a language could make the distinction between singular and plural. The stage is set for Noyer (1992:180)'s discovery. A language could employ both sets of features and in that case the dual can be defined as a combination of the plural feature from one set and a singular feature from the other. Noyer cites the data in (200) from Hale (1997) as illustration:

[37] This assumes that when we count, we only count states with non-overlapping participants (§8.3).

(200) *Hopi* Noyer (1992:181)

a. Pam taaqa wari
that man run.PFV ‘That man ran’

b. Puma taaqa-t wari
those man run.PFV ‘Those two men ran’

c. Puma taʔtaq-t yùutu
those man run.PFV ‘Those men (plural) ran’

In (200)c, the noun is reduplicated indicating one kind of plural feature. In addition, it has a suffix *-t* indicating a second kind of plural feature. The form in (200)b has only the suffix, so it is ‘half plural’ and ‘half singular’. The forms of the verb and the determiner in (200)b also reflect a combination of singular and plural features (see Harbour 2020 for a fuller analysis of Hopi and other languages with duals constructed out of morphemes used for singular and plural). To see how the dual could result from combining two features, consider the calculation in (201)-(203)

(201) $[\![^{*} \sqrt{\text{MAN}}]\!] = \lambda S.\ S$ is a set of one or more *man* states

(202) [[multiparticipant] $^{*} \sqrt{\text{MAN}}]\!] = \lambda S.\ S$ is a set of two or more *man* states

(203) [[+minimal] [multiparticipant] $^{*} \sqrt{\text{MAN}}]\!] = \lambda S.\ S$ is a set of two *man* states

The step in (202) relies on the fact that it takes at least two *man*-states to get multiparticipation, assuming $\sqrt{\text{MAN}}$ is a single participant root. The last step in (203) relies on the fact that a set containing exactly two states has no proper subset that is a set of two or more states. Decomposing the dual in this way correctly predicts that if a language has a dual, it will also have a singular and a plural (Harbour 2011a).

With an analysis of dual in place, we can imagine what a duality tantum would look like. It would have to be a root whose meaning is assigned in the context of the features needed for duality. Here’s a hypothetical example:

(204) Sense Insertion for hypothetical duale tantum

$\sqrt{\text{TROUSER}} \Leftrightarrow \lambda s.\ s$ is ….. / _____[+minimal] [multiparticipant]

When [multiparticipant] combines with a root, the result can have a non-empty extension as long as the root is not single participant. This much we know from our discussion of lexical plurals. The combination [[multiparticipant]$\sqrt{\text{TROUSER}}$] will be a predicate true of single states, as it is built from a root and all roots are predicates of states. Since [[multiparticipant]$\sqrt{\text{TROUSER}}$]] is a predicate of states, singleton sets, and no singleton set can be a **proper** subset of another, it turns out that adding [+minimal] will have no effect on the final meaning.

(205) [+minimal] $\Leftrightarrow \lambda P\ \lambda S.\ P(S) \ \&\ \neg\exists S'\ P(S') \ \&\ S' \subset S$

(206) [[multiparticipant]$\sqrt{\text{TROUSER}}$]] ≡ [[+minimal] [multiparticipant]$\sqrt{\text{TROUSER}}$]]

The feature combination [+minimal] [multiparticipant] picks out dualities when in combination with starred count nouns, as in (203). It does not have that effect when combined with roots. So while a bipartite may occur as a duale tantum, we should not in general expect that. Plurale tantum status is as informative as duale tantum status and plurale tantum status can be achieved with fewer features.

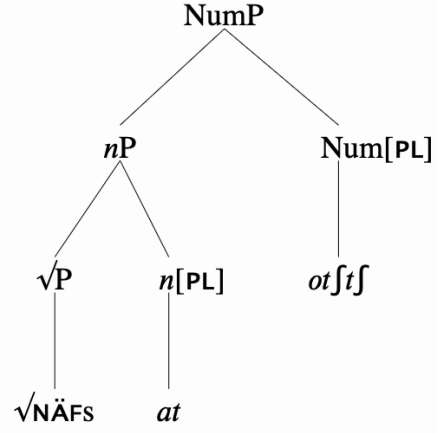
7 Number and Gender

7.1 Number features on the heads of nP and NumP

In the noun phrase structures considered to this point, number features are located on the head of NumP. The head of NumP is the typical syntactic location for plural inflection, however, there are diverse phenomena that point to the existence of structures in which there are number features on the nominalizing head *n* as well as on the head of NumP. I very briefly describe three recent studies.

Amharic has a regular plural suffix *–otʃtʃ* as well as a set of irregular pluralization strategies, including suffixation, partial reduplication and phonotactic changes. Regular and irregular pluralization can co-occur as in the structure below from Kramer (2015):

(207) *Amharic* Kramer (2015:43, 2016:544)



näfs-at-otʃtʃ 'souls'

Kramer develops a theory of gender assignment[38] that specifies the locus of gender features in the syntax as the nominalizing head *n*. In that context some of the evidence that irregular plural morphology is a realization of *n* comes from interactions between irregular plural morphology and gender. These interactions include plural affixes whose form varies with gender and gender suffixes that block irregular plural morphology (Kramer 2015:§3.3, 2016a).

Kiowa displays a phenomenon traditionally known as inverse agreement. Nouns agree for singular, plural and dual. Nouns with an inverse affix trigger a special form of agreement. The affixed form can be semantically singular, dual or plural. It all depends on the particular noun that is suffixed. In Harbour (2011b)'s analysis of this number system, there are number features on *n* (labeled 'Class' in Harbour 2011b:567), as well as

[38] See Kramer 2016b for critical review of research on syntactic gender features.

on NumP. Each *n*P has a feature-value combination. Often these values are in conflict with the values on the head of NumP. Inverse forms are the vocabularic reflex of such conflicts.

Finally, the nouns in Kipsigis are divided into two groups with some showing a marked plural and an unmarked singular and others showing a marked singular and an unmarked plural. Kouneli (2020) treats this classification of nouns in terms of features on *n* that interact with number features on the head of NumP to produce different realizations of number. Numerical classification systems, like gender, involve a sorting of nouns into classes that is reflected by agreement patterns on other elements such as adjectives, determiners and verbs. Kouneli (2020:§2.1) draws attention to this fact and other similarities between numerical classification systems and gender.

In the studies described above, there are number features on the heads of *n*P and NumP, but in all three cases the number features on *n* are uninterpretable. They make no contribution to the meaning of the noun phrase. One may wonder whether that is necessarily the case. Could there be a noun phrase with meaningful features in the heads of both *n* and NumP? Given the feature meanings proposed here that is indeed possible. As noted in §2.9, the features [singularity] and [multiparticipant] are complementary *when attached to count nouns*. The extension of plural *boats* is composed of pluralities, while the extension of singular *boat* is composed of singularities. But they are not complementary in the realm of mass nouns. In the next section, I'll suggest, following Manzini & Savoia (2017) and Manzini (2020), that mass nouns in Asturian and Arbëresh have an interpretable plural gender feature that appears alongside interpretable number features in NumP.

7.2 A plural gender

We begin with a sketch based on Carretero García (2017) of the 'neutro de materia'[39] in Asturian. Nouns in Asturian are classified in terms of gender, masculine and feminine. This manifests in theme vowels attached to the noun as well as in agreement with determiners, prenominal and postnominal adjectives, predicative adjectives, anaphoric pronouns and clitics, but not with verbs. Mass nouns trigger masculine/feminine agreement on determiners and prenominal adjectives, just like count nouns, but they trigger a different kind of agreement on postnominal adjectives, predicative adjectives, and pronouns, and some have a theme vowel peculiar to mass nouns. Some of this is illustrated in (208) below, where I've glossed the agreement marking using MN for mass neuter, following Carretero García (2017). *pelo* 'hair' is a masculine mass noun. It agrees for masculine with the determiner to its left. *ropa* 'clothing' is a feminine mass noun.

(208) *Asturian* García González (1985)

El	paisanu	viey**u**	de **la**	casa	blanc**a**
DEF.M.SG	peasant	old.M.SG	of DEF.F.SG	house	white.F.SG

[39] The terms 'neutro de materia' and 'mass neuter' refer at once to the semantic import of the relevant markings and to their ancestor, the Latin neuter.

lleva'**l**	pelo	cort**o**	y	**la**	ropa	bien	llimpi**o**.
have.PST.3SG= DEF.M.3SG	hair	short.MN	and	DEF.F.SG	clothing	well	clean.MN

'the old peasant in the white house has short hair and clean clothes'

(209) below illustrates mass agreement on a participle and lack of gender agreement on the copula verb.

(209) *Asturian* Carretero García (2017)

La	ropa	**ta**	tendí**o**
DEF.F.SG	clothing	be.PRES.3SG	hang.PASTPART.MN

'The clothing is hung.'

(210) below contrasts the agreement on prenominal and postnominal adjectives as well as showing mass agreement on a clitic pronoun:

(210) *Asturian* Carretero García (2017)

La	viey**a**	ropa
DEF.F.SG	old.F.SG	clothing

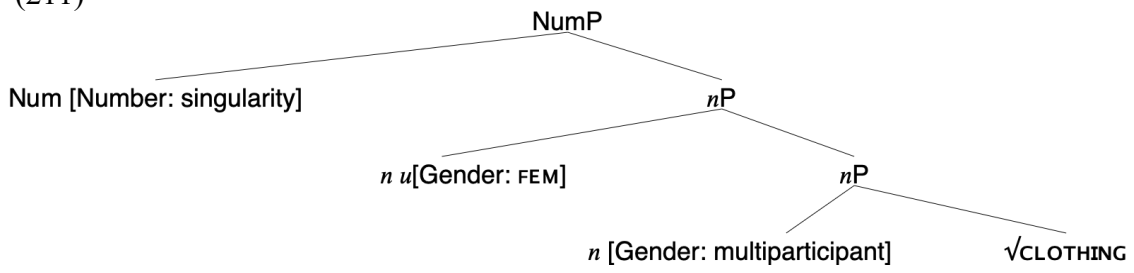
'The old clothing'

La	ropa	muy	viey**o**	pues	vende**lo**	
DEF.F.SG	clothing	very	old.MN	can.PRS.2SG	sell.INF=3.ACC.MN	

'The very old clothing, you can sell'

The targets for mass agreement (postnominal and predicative adjectives, pronouns, and participles) are targets for feminine/masculine agreement. This suggests that mass agreement is agreement triggered by a gender feature. This means that a noun in Asturian may have two gender features. At the same time, in line with Manzini and Savoia (2017)'s proposal, I take mass agreement to be triggered by a plural feature. To spell this out properly, we must recognize that features are pairings of attributes and values and we'll employ a notation that allows us to refer to the elements of those pairs. We write **[Number: multiparticipant]** for the plural feature on *boats* and for the Asturian mass noun *ropa* 'clothing' we have **[Gender: multiparticipant]**. In (209) above, the NumP containing *ropa* includes three features: [Number: singularity], [Gender: multiparticipant] and [Gender: feminine]. The presence of the Number feature is reflected on the copular verb, the presence of the feminine feature is reflected on the determiner and the presence of [Gender: multiparticipant] is reflected on the participle. Assuming that gender features are located on *n* and that stacked *n*'s allow for multiple gender features for the same noun phrase (Kramer 2015), we arrive at the following structure for the NumP *ropa*:

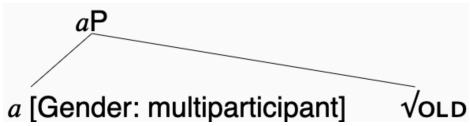
(211)



ropa 'clothing'

Kramer (2015:Ch.10) argues that when there are stacked *n*s, the highest one determines syntactic agreement. That would explain why in *La vieya ropa* 'the old clothes' in (210) above, the determiner and the prenominal adjective show feminine agreement. In the structure in (211) the '*u*' next to [Gender: FEM] indicates that that feature is uninterpreted, as opposed to [Gender: multiparticipant] which is interpreted. I assume that predicative adjectives including postnominal adjectives, pronouns and clitics participate in a kind of semantic agreement so that when there is an interpreted value of the appropriate attribute available, it controls agreement.[40] That is why in *la ropa muy vieyo* 'the very old clothes' in (210), the postnominal adjective does not show feminine agreement. Instead, the structure for *viey**o*** 'clean' has a categorizing *a* with a gender feature valued as multiparticipant:

(212)



*viey**o*** 'clean'

Summarizing, Asturian appears to have a feature that participates in gender agreement alongside masculine and feminine and that marks mass nouns. As a gender feature, it is located on *n*. As a marker of mass nouns, following the logic employed in our discussion of lexical plurals, we take the value of that feature to be multiparticipant and we take it to be adjacent to the root. Above the *n* carrying the multiparticipant feature, there is a second *n* whose gender feature has a feminine or masculine value. Because it is higher, that *n* controls syntactic agreement, while the lower *n* controls semantic agreement, because its feature is interpreted.

According to this proposal, there is a feature found on mass nouns whose value is shared with a feature found on plural count nouns. Manzini and Savoia (2017) find

[40] The division into those elements that participate in semantic agreement and those that do not conforms to the Agreement Hierarchy of Corbett (2006). In that work syntactic agreement is agreement consistent with the form of the controller. Semantic agreement is agreement consistent with its meaning. As envisioned here, the distinction originates in a distinction among types of syntactic features, those that do or do not have interpreted values. More sophisticated versions of this idea can be found in Wechsler 2011, Landau 2016 and Smith 2017.

support for this conclusion[41] in varieties of Arbëresh (Italo-Albanian) in which mass agreement and count-plural agreement show the same exponence. To see an example of this, consider first copular sentences with count noun subjects:

(213) *Arbëresh as spoken in San Benedetto Ullano* (*Cosenza*) Baldi and Savoia (2018)

a.	a-i	burr	əʃt	i	ʎart
	DEM.DIST-M.SG	man	be.SG	linker.M.SG	tall.SG
	'that man is tall'				
b.	aj-ɔ	grua	əʃt	ɛ	ʎart
	DEM.DIST-F.SG	woman	be.SG	linker.F.SG	tall.SG
	'that woman is tall'				
c.	at-a	burr-a	jan	tə	ʎart-a
	DEM.DIST-PL	man.M.PL	be.PL	linker.PL	tall.PL
	'those men is tall'				

Comparing (213)a and (213)b., we note that the demonstrative and the linker agree in gender, while the copula and the predicative adjective do not participate in gender agreement. From (213)c, we learn the form of the plural demonstrative and the plural linker. Consider now what happens in a copular sentence with a mass noun subject:

(214) *Arbëresh as spoken in San Benedetto Ullano* (*Cosenza*) Baldi and Savoia (2018)

at-a	diaθ	əʃt	tə	mir
DEM.DIST-PL	cheese	be.SG	linker.PL	good.SG
'that cheese is good'				

The copula and the adjective are singular, due to agreement with [Number: singularity]. The demonstrative and the linker agree with [Gender: multiparticipant], which in this language has the same exponent as the feature [Number: multiparticipant] found on plural count nouns.

Returning to Asturian, there is one final point having to do with the exponence of the adjective marked with [Gender: multiparticipant] that must be mentioned. Above, we used the glossing label MN for 'mass neuter' however this exponent is found as well on predicative adjectives and other gender targets when the subject is a clause or an infinitive:

(215) *Asturian* Camblor Portilla and Wood Bowden (2005)

Fumar	ye	mal**o**
smoke.INF	be.PRS.3SG	bad.NEUT
'smoking is bad'		

[41] Manzini and Savoia do not employ a pure event semantics, so their meaning for the feature is different from what is assumed here.

(216) *Asturian* Camblor Portilla and Wood Bowden (2005)

Que fumes	peles	mañanes	ye	mal**o**
that smoke.SBJV.2SG	by=DEF.F.PL	morning.PL	be.PRS.3SG	bad.NEUT

'that you smoke in the mornings is bad'

Following Manzini and Savoia (2017) we treat the neuter as an "Elsewhere gender", with insertion rules like in (217):

(217) Vocabulary Insertion Rules

a, [Gender: masculine] ⇔ *-u*

a, [Gender: feminine] ⇔ *-a*

a ⇔ *-o*

An adjective with the feature [Gender: multiparticipant] will get the *-o* suffix. Such is the case with *viey**o*** 'clean' in (212). Assuming that clauses and infinitives have no gender features, then *malo* 'bad' in (215)-(216) has no gender features and therefore it too bears the *-o* suffix.[42]

I've spelled out this analysis using the idea of a number value for a gender feature. Corbett(2012:ch8) warns against such a move. A possible alternative to explore exploits the redundancy in our analysis that comes from the fact that gender features are always on *n.* Perhaps we could replace [Number: multiparticipant] and [Gender:multiparticipant] with bundles consisting of a categorial feature and a number feature: {Num, PL} and{*n,* PL}.

7.3 Gender polarity in Somali

In Asturian, we find an example of an interpreted plural feature that is located on *n* and therefore interacts with gender features. In this section, we'll see a different instantiation of this situation in Lecarme (2002)'s analysis of gender polarity in Somali, as presented and developed in Kramer (2015:§8.2). Comparison of the two languages will echo and reinforce the account in §5.2.1 of why lexical plurals are mass nouns.

"gender polarity" refers to gender reversals that come with a change in number, as in these examples:

(218) *Somali* Kramer (2015:147), Lecarme (2002)

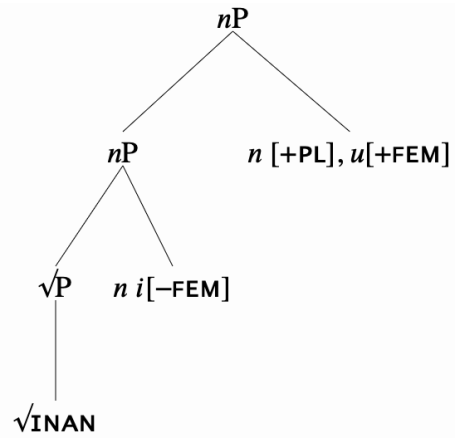
a. díbi 'bull (m.)'	b. dibí 'bulls (f.)'
c. náag 'woman (f.)'	d. naag-ó 'women (m.)'

This interplay of number and gender is a sign that plural features are carried by *n* along with gender features. But notice that unlike in Asturian, these are count plurals! It turns

[42] I recently discovered an empirically rich discussion and analysis of the Asturian neuter in Loporcaro (2018:Ch.5). I was encouraged to see that in the proposed analysis "each noun of the language is specified in the lexicon for two distinct gender features". But I haven't yet studied that work, so I don't know how it impinges on what I've said here.

out, as Kramer argues, that Somali has stacked *n*s as well, however in this case the plural feature is on the higher *n*. The word for 'son' is *ínan*. The feminine plural is *inammó*, formed by gemination of the final consonant and a suffix -ó (Kramer 2015:151). The structure from Kramer (2015:161,215) is given below:

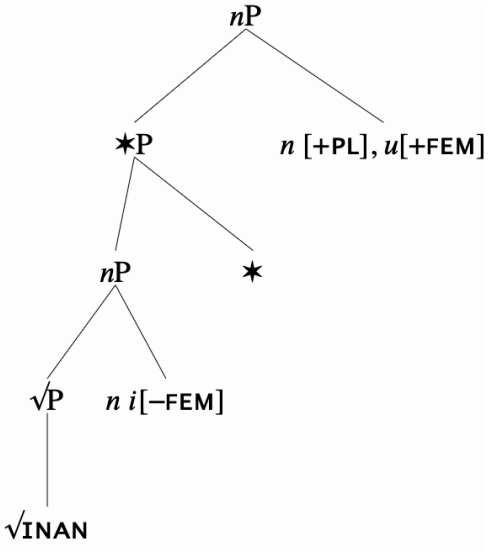
(219)



inammó 'sons (f.)'

The lower interpretable feature [−FEM] accounts for the interpretation as sons (not daughters). The uninterpretable [+FEM] feature controls agreement because it is higher. Recall now that ⋆ operators can attach to *n*P. Since 'sons' is a count noun, there can be and there must be a ⋆ operator below the plural feature:

(220)



inammó 'sons (f.)'

7.4 Summary

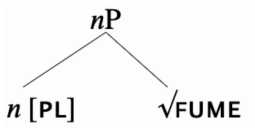
In this section, we saw two examples of a 'low plural', that is, a plural feature on *n*, the locus of gender. Both examples involved stacked *n*s. In Asturian, the plural was on the lower *n,* attached to the root. For that reason, it had no effect on agreement with attributive elements (determiner, prenominal adjectives), as they agree with the highest *n.* Since only mass roots can be multiparticipant, a root attached plural is only possible in a mass noun and so the Asturian low plural has been characterized as "mass gender". Since multiparticipant and singularity are simultaneously compatible with mass nouns, it is possible to have a high number feature on NumP in addition to the one on *n*. In Arbëresh, the high and low plural features have the same exponent. In Somali, the plural feature is on the higher of the stacked *n*s along with a ±FEM feature, and, being higher, that *n* controls agreement. Since the plural is on the higher *n,* the lower *n*P provides a site for a ⋆ operator to intervene between the plural feature and the root. For that reason, a low plural in Somali can be used to form plural count nouns as well as plural mass nouns.[43]

I should add that the reasoning about Asturian relied on the assumption that ⋆ operators attach to *n*P but not to the root. This parallels recent work by Wehbe (2022) showing that ⋆ operators may attach to *v*P but not below *v*.

7.5 Lexical plurals reconsidered

Acquaviva (2008:270)'s analysis of lexical plurals is depicted in (221) below.

(221)



fumes

This analysis shares two key properties with the contextual allosemy analysis in §5.2. First, even though *fumes* is "lexical", the plural in (221) is treated as an affix. In a reading study of native speakers of British English, Schlechtweg and Corbett (2021) found no durational difference between word-final fricatives in pluralia tantum and in count plurals. This contrasts with acoustical differences found in the pronunciation of affixal and non-affixal *s*. Second, (221) explains why lexical plurals are mass nouns, assuming our proposed meaning for PL. On this analysis, lexical plurals have the form of mass neuters in Asturian, but unlike mass neuter in Asturian and plurals in Somali, there is no interaction with gender to motivate an *n* locus for number. There is no evidence for number features in NumP alongside those in *n* of the kinds mentioned in §7.1 in connection with Amharic, Kiowa and Kipsigis and except for some bipartites (§6.2.1), we do not see evidence from agreement of a higher NumP with a different number feature, as suggested for Asturian and Arbëresh. *fumes* consistently triggers plural agreement DP

[43] Lecarme (2002:126) cites the plural mass nouns *biyó* (m) 'water' and *caanó* (m) 'milk'. These happen to be formed by a strategy of pluralization that doesn't involve gemination and that produces masculine nouns, unlike the example *inammó* 'sons (f.)' in the main text. Somali has several strategies for forming plurals, a fact that plays a role in making the case against locating the feature in NumP (Kramer 2015:§8.2.3).

internally and externally (***these/ #this*** *fumes* ***are*** */#**is*** *not toxic*, *so* ***they/#it*** *can be inhaled*). Finally, on this analysis, it would be possible to have a ⋆ operator attached to *n*P. If that were the case, then a definite DP formed from a lexical plural could denote a plurality. That's not possible on the analysis in §5.2-5.3, because a ⋆ on *n*P would come between Num and the root and interfere with the sense insertion rule. We saw in our discussion of reciprocals (§3) that mass definite DPs, plural or singular, denote singularities.

Acquaviva 2008 covers an expansive empirical terrain not traversed here. The analysis in (221) may serve for other cases (see also Alexiadou 2021), but it doesn't look right for English.

8 Quantification

8.1 Introduction

In this section, we'll see how quantification works in a pure event semantics. Along the way, I will point to contexts in which something is lost when one takes quantification to be over individuals instead of states. Nevertheless, a lot of theorizing by linguists and speakers operates on that assumption, so I will try to state the circumstances in which quantification over individuals is an adequate proxy for quantification over states. The discussion is divided up into 'logical quantifiers' (*every, some* and *no*), cardinality-based quantifiers and measurement-based quantifiers.

8.2 Simple universal and existential quantifiers

Adapting standard generalized quantifier meanings to a pure event semantics, we have:

(222) $[\![\textit{every}]\!] = \lambda P\, \lambda Q\, \forall s\, (P(s) \rightarrow Q(s))$

(223) $[\![\textit{some}]\!] = \lambda P\, \lambda Q\, \exists s\, (P(s)\ \&\ Q(s))$

(224) $[\![\textit{no}]\!] = \lambda P\, \lambda Q\, \neg\exists s\, (P(s)\ \&\ Q(s))$

With the meaning in (222), we can compute the meaning of (225) below. Adjacent to the stative predicate *rusty* in (225), there is a null thematic role head, θ_{HOLD}. The meaning of the combination is given in (226) and the meaning for (225) is in (227).

(225) Every nail was rusty.

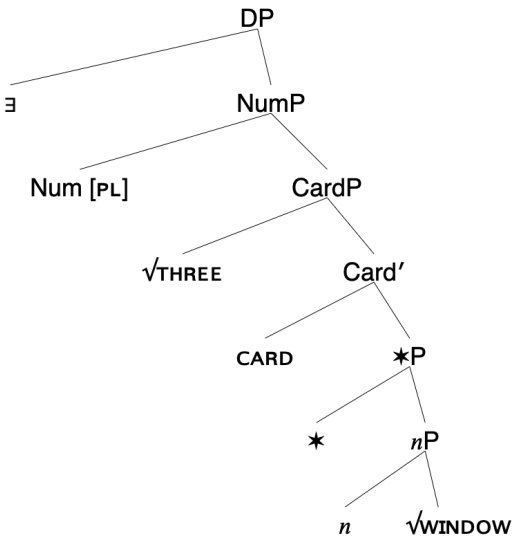
(226) θ_{HOLD} rusty $\rightsquigarrow \lambda s\ (\exists s')\ [\textbf{rusty}(s')\ \&\ (s \ominus s')]$

(227) $(\forall s)\ (\textbf{nail}(s) \rightarrow (\exists s')\ [\textbf{rusty}(s')\ \&\ (s \ominus s')])$

8.3 Cardinality quantifiers

Recalling the analysis of numeral noun constructions in §2.6, and assuming a null existential above the NumP we have the structure in (228) with the meaning in (229):

(228)



three windows

(229) $\lambda P\,(\exists S)\,(P(S)\ \&\ {}^{\star}\mathbf{window}(S)\ \&\ |S| = 3)$

If we now combine *three windows* with a starred adjectival predicate as in §4 we get the meaning in (231):

(230) Three windows are open.
(231) $\exists S\,({}^{\star}\mathbf{window}(S)\ \&\ |S| = 3\ \&\ (\exists S')\ {}^{\star}\mathbf{open}(S')\ \&\ (S \ominus S'))$

Suppose there are exactly two windows and they are open. A single window can be in different window states of varying duration. It is possible then to have a set S of three window-states, two of which have the same participant. Such a set would verify (231), incorrectly predicting that (230) is true. So, it must be the case that in using numeral noun constructions, we tend to abstract away from sets with states that share participants. Our default domain of quantification is as in (232):

(232) Default Domain

In a default context *c,* the domain of quantification $\mathrm{DOM_C}$ is such that:

$(\forall S)(\forall s)(\forall s')\ (S \in \mathrm{DOM_C}\ \&\ \{s, s'\} \subseteq S) \rightarrow\ \neg(s \ominus s')$

This constraint on the domain of quantification has the effect that when we employ numeral noun constructions, our counting of states amounts to the counting of participants in those states. This presents an opportunity to simplify in the interest of theorizing. Assuming default domains and limiting interest to count nouns, we can model natural language quantification in terms of quantification over objects or individuals. This is what standard generalized quantifier theory is from the perspective of a pure event semantics.

For an example of a non-default context, consider (233) below:

(233) During Smith's career, she has taught over 100 courses serving **over 2,058 students**.

If Jack was simultaneously enrolled in two of Smith's courses, there were two states of being a student in a Smith course and both figure in the reckoning reported in (233). Those two states have the same participant and yet they are both included in the domain. They both count towards the final tally of 2,058. In (234) below is another, well known, example in which the domain of quantification is understood to be non-default:

(234) Four thousand ships passed through the lock last year. (Krifka 1990)

In this case, the domain is limited to ship states that overlap an event of passing through the lock. If the Pinta passed through the lock twice last year, there are two ship states with the same participant, and because they overlap distinct events, they both figure in the reckoning reported in (234). Limiting the domain to states that temporally overlap events has the effect that when we employ numeral noun constructions, our counting of states amounts to the counting of event times. Krifka calls this an **event-related reading**.

Krifka's example challenges the modeling of nominal quantification in terms of quantification over objects or individuals. Some have responded to this challenge by limiting attention to count nouns in default contexts and in event-related contexts, and then modelling natural language quantification in terms of quantification over temporal parts of individuals (Musan 1995, Barker 1999, 2010, Gotham 2021)[44]. Temporal parts modeling but it won't cover the Smith example in (233), since there we counted two simultaneous Jack states and for any given time period, an individual has just one temporal part. Here are two more examples where the counting outstrips the number of person stages:

(235) At our last chess tournament, we had **30 players** who paid $10 per game, so that was $300. We didn't serve 30 meals, because some people played several games – a few people played two games at the same time.

(236) Antonia is doing a PhD in math and a PhD in Roman history. How do we count her when asked: *How many PhD candidates do we have here?* That will depend on the interrogator's purpose.

I assume that the choice of which states to count is constrained by context. In Krifka's ships example, the choice of what to count appears to be determined sentence internally. Schein (2017) points out that this is not necessarily the case, attributing the point to Moore (1994) who employs anaphora to make the point:

---

[44] Sider (2008:§1) explains what temporal parts are. Temporal parts of individuals, especially very short ones, are also called **stages**. Over time, one ship has many stages. Once quantification is taken to be over stages, a constraint like our default domain becomes relevant to cover 'object related' counting. Here's an example from Viebahn (2013):

(i) Basic constraint on quantifier domain restriction
The domain of any ordinary use of a quantifier contains at most one stage out of any maximal class of suitably counterpart-interrelated stages.

(237) Four thousand ships passed through the lock last year.
Two thousand of them were more than 50 meters long.

Moore (1994:586) remarks: "The discourse in (237) may be true even if there are only 3000 distinct ships that passed through the lock, and only 1000 distinct ships that are longer than 50 meters." In the second sentence, the quantification is over ship states that temporally coincide with lock passings – events not mentioned in that second sentence but salient in the context. Schein (2017:611) uses collective predicates to press the point further, as in this example with *stream*:

(238) Three hundred thousand elite Soviet troops streamed past the reviewing stand in 6 hours.

Schein elaborates: "In a Potemkin-village display of Soviet strength, the parade in (238) is a circle that turns back just out of sight of the reviewing stand. Still, the 300,000 counted in (238) are not 300,000 streams".

8.4 Measure quantifiers

Adjectives of quantity *many, much, few,* and *little* and their cross-linguistic counterparts provide the means for expressing quantification over degrees and amounts. This is illustrated in (239)-(242) below, with *most* understood to be the superlative of *much* and *more* the comparative of *much.*

(239) **Too much** cotton was produced this week.
(240) **That much** cotton was produced this week.
(241) **The most** cotton was produced this week.
(242) **More** cotton was produced this week.

Rett (2007, 2014, 2018), Solt (2009, 2015, 2018) and Coppock et al. (2020) analyze these and a variety of related constructions in a uniform way. In every case, the adjective of quantity is taken to be a gradable degree/amount quantifier whose scope at LF is a sentence with a free variable over degrees or amounts. In (239)-(242), the LF scope of the degree/amount quantifier would have the meaning of (243):

(243) *m* is the amount of cotton produced this week.

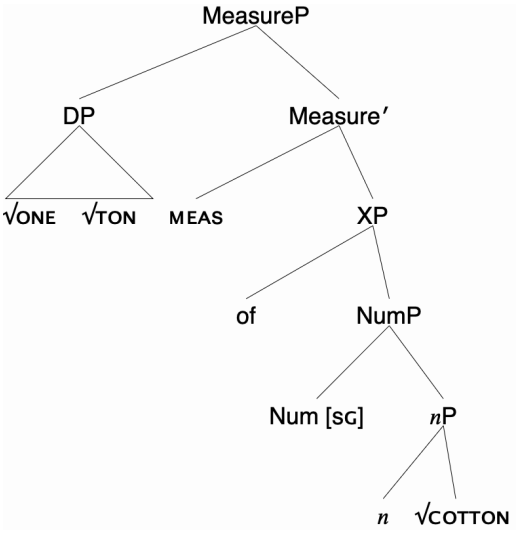
The quantification attributed to *too much* in (239) would add that *m* exceeds the upper limit on achieving a relevant goal. The quantification attributed to *that much* in (240) would add that *m* is a salient amount. *the most* in (241) requires *m* to exceed the amount of cotton produced in any previous week and the quantification attributed to *more in* (242) would add that *m* exceeds a salient amount. Solt (2009:105-6) extends this analysis to pseudopartitives like (244) below. In this case, the measure phrase *one ton* is used to set the value of *m* in (243).

(244) **one ton of** cotton was produced this week.

'one ton is the amount of cotton produced this week'

According to the above referenced accounts, the source of 'amount' in (243) is a predicate MEAS in a syntax similar to the one envisioned for numeral constructions. This is instantiated in the structure below for the subject of (244):

(245)



one ton of cotton

The subjects of (239)-(242) have a similar syntax, with an adjectival, quantifier phrase headed by *much* in place of *one ton.* The quantifier phrase is then raised to create the LF with the meaning in (243).

I propose to address the question of amount quantification in a pure event semantics by focusing on the meaning of MEAS with reference to its use in pseudopartitives. I assume that quantification over amounts is unaffected by the choice of a pure or impure event semantics.[45]

Returning to the structure in (245), I propose to start with the meaning in (246) below adapted from Solt (2018:(17)):

(246) $[\![\text{MEAS}]\!]^c = \lambda P\, \lambda d\, \lambda s\, (P(s)\ \&\ \mu_c(s) = d)$ *to be revised*

μ_c is a contextually determined function that assigns measures such as one ton. The choice of function will depend on features of the syntactic and discourse environments. In *one ton of cotton,* the measure phrase *one ton* is decisive: μ_c must be a function assigning weights. In (247), I define such a function[46], which, along with MEAS in (246), gives us the meaning in (250) for the phrase in (248):

---

[45] In Rett's papers, the head of the Measure Phrase is called M-OP. Rett (2018:§5.2) includes a comparison of her and Solt's approaches. For more details on LFs produced by the raising of degree quantifiers, see Figures 7 and 8 in Coppock et al 2020:492-3. Scontras (2021:§3.1) discusses the bracketing in (244) and alternatives to it. Wilson (2018) points to problems with the idea that measure phrases name amounts, arguing instead that measure phrases denote pluralities and that a measure word like *inches* describes individuals that each measure one-inch.

[46] Measure functions with state domains are not new. Wellwood (2019) and Pasternak (2019) invoke functions assigning to states measures of intensity. There are also accounts of propositional attitudes in which belief states are assigned measures (Matthews 2011).

(247) WT($\mathbf{S}$) = m *iff* $\exists s'$ s' is a state of weighing m & ($\mathbf{S} \ominus s'$)

(248) one ton of cotton

(249) $\lambda \mathbf{S}$ **cotton**($\mathbf{S}$) & WT($\mathbf{S}$) = 1 ton

(250) $\lambda \mathbf{S}$ **cotton**($\mathbf{S}$) & $\exists s'$ s' is a state of weighing 1 ton & ($\mathbf{S} \ominus s'$)

Assuming existential closure above the subject in (251) below, we get the meaning in (252):

(251) One ton of cotton was wet.

(252) $\exists \mathbf{S}$ **cotton**($\mathbf{S}$) & WT($\mathbf{S}$) = 1 ton & $\exists \mathbf{S}'$ **wet**($\mathbf{S}'$) & ($\mathbf{S} \ominus \mathbf{S}'$)

Alongside his event-related ships example, Krifka(1990) offers (253) below, which presents a challenge to our proposal for MEAS in (246).

(253) Sixty tons of radioactive waste were transported through the lock last year.

As Krifka points out, "there might be less than sixty tons of radioactive waste" in which case (254) below is false:

(254) $\exists \mathbf{S}$ **radioactive.waste**($\mathbf{S}$) & WT($\mathbf{S}$) = 60 tons

In that case, an analysis along the lines of (251) - (252) is incorrect. Intuitively, (253) is not a report of a single measurement of waste. Instead, as Krifka's discussion makes clear, (253) reports the sum of several measurements, one for each transit through the lock last year, with each measurement involving some of the waste. In addition to a measure function, μ_c, the context has provided a set of states to be measured, one per transportation event. The sentence requires the participants in those measured states to be identified with the participants in a radioactive waste state and it requires the sum of the measures of those contextually supplied states to be 60 tons. This assessment leads to the following revised meaning for MEAS:

(255) $[\![\text{MEAS}]\!]^c = \lambda P\, \lambda d\, \lambda \mathbf{S}\, (P(\mathbf{S}) \,\&\, (\mathbf{S} \ominus \mathbf{S}_c) \,\&\, \Sigma\{\mu_c(s) : s \in \mathbf{S}_c\} = d)$

μ_c is a contextually supplied measure function.

$\mathbf{S}_c$ is a contextually supplied set of states.

$\Sigma\{\mu_c(s) : s \in \mathbf{S}_c\}$ is the sum of the measurements of the states in $\mathbf{S}_c$.

In the radioactive waste example, (253), the states that are measured have distinct run times. But this is not always the case. Consider the following scenario:

(256) Pablo and Arsenio work for a company that tests drinking water. Pablo measures lead content in the water. Arsenio measures arsenic content. The company pays $30 per gallon measured. Sometimes, when he is lonely, Pablo goes over to Arsenio's work station and performs his measurements on the same gallon of water that Arsenio is measuring. When asked by the foreman how many gallons were tested this week, Pablo gives his number and Arsenio gives his. These numbers are added together in the final report sent to billing:

Pablo and Arsenio tested 1000 gallons of water this week.

In this example, the contextually supplied measure function assigns volumes and the set of measure states, S_c, is given by:

(257) S_c = {*s*: *s* is the Theme state of an event of testing in which Pablo is the agent or in which Arsenio is the agent}

If Pablo and Arsenio exceeded a company limit on the amount of water to be tested in a week, then with the same settings for μ_c and S_c we have:

(258) Pablo and Arsenio tested too much water this week.

The amount argument of MEAS is saturated by *1000 gallons* in (256) and quantified in (258).

Examples of this type are important, as they mark the limit of a theory that models amount quantification in terms of portions of matter or stages of portions of matter. A single gallon of water has only one stage at given moment in time, no matter how many tests are being performed on it.

The meaning of MEAS repeated in (259) includes two contextual parameters, μ_c and S_c.

(259) $[\![\text{MEAS}]\!]^c = \lambda P\, \lambda d\, \lambda S\, (P(S)\ \&\ (S \ominus S_c)\ \&\ \Sigma\{\mu_c(s) : s \in S_c\} = d)$

Returning to our earlier example, *one ton of cotton was wet,* suppose we are in context where there is a single measurement and let's assume S_c is assigned the set of states witnessing the existential quantification (crudely $S = S_c$). This allows us to simplify from (260) to (261):

(260) $\exists S\ \textbf{cotton}(S)\ \&\ (S \ominus S_c)\ \&\ \Sigma\{\text{WT}(s) : s \in S_c\} = 1\text{ ton}\ \&\ \exists S'\ \textbf{wet}(S')\ \&\ (S \ominus S')$

(261) $\exists S\ \textbf{cotton}(S)\ \&\ \Sigma\{\text{WT}(s) : s \in S\} = 1\text{ ton}\ \&\ \exists S'\ \textbf{wet}(S')\ \&\ (S \ominus S')$

Given the SG feature in (245), S is a singleton set making the addition superfluous and we can simplify further:

(262) $\exists S\ \textbf{cotton}(S)\ \&\ \text{WT}(S) = 1\text{ ton}\ \&\ \exists S'\ \textbf{wet}(S')\ \&\ (S \ominus S')$

Consider now, the plural partitive in (263) and let's assume again that S_c is the set of states witnessing the existential quantification, in other words, each potato was individually weighed. This gives us (264) (skirting over the thematic role head in *eaten*):

(263) 10 lbs of potatoes were eaten.

(264) $\exists S$ ***potato**(S) & $\Sigma\{\text{WT}(s) : s \in S\} = 10$ lbs & $\exists S'$ **eaten**(S') & $(S \ominus S')$

Consider now the following contrast in reports concerning the eating of small red potatoes:

(265) I've eaten 10 lbs of potatoes this month.
(266) #The potatoes I ate this month were quite heavy.

Assuming 10lbs counts as heavy, if (265) is true, then we might have expected that (266) would be true as well on a collective reading. The infelicity of (266) on a collective reading intuitively stems from the fact that the participants in a heavy state must be co-located. A set of objects dispersed over time and place cannot be deemed heavy, regardless of their combined weight. But presumably the same applies to a state of weighing 10lbs. (265) is felicitous precisely because it does not invoke a state in which the potatoes weigh 10lbs. Measure addition happens even when there is no overcounting.

I have distinguished counting and measuring, invoking CARD for counting and MEAS for measuring. According to Rett and Solt and many others, counting arises with MEAS when μ_c is a function that assigns cardinalities. There are consequences to the choice between CARD versus MEAS-with-cardinality-measure brought out by our earlier Smith example, repeated here:

(267) During Smith's career, she has taught over 100 courses serving **over 2,058 students**.

Recall, this example allows for a counting in which two Jack states are counted, one for each course that Jack took in the same semester. On the CARD analysis, this requires *student* to include both of those states in its extension. The MEAS analysis allows us to maintain that Jack's being a student is distinct from his being a student in Introduction to Quantum Mechanics, and that only the former plain student state is in the extension of *student.* The other student-in-a-course state comes in through S_c. The question of whether the extension of *student* includes student-in-a-course states finds a parallel in discussions of events and verb meanings (see for example the discussion in Higginbotham 2005:§3 of Carol's driving versus Carol's driving quickly.). I've treated counting separately from measuring to allow for integration with previous work on number and on counting, keeping in mind Rothstein (2017), a book dedicated to the proposition that "in a significant number of languages, from different typological families, counting cannot be reduced to measuring".

8.5 Summary

The focus of this section has been expressions standardly understood to be quantifiers over individuals, objects or portions of matter. I hope to have shown that this way of viewing things is a shortcut for theorizing about what is in fact quantification over states.

9 Adjectival Modification

9.1 Direct and Indirect Modification

In this section, we'll develop an account of adjectival modifiers, taking for granted that modification expresses conjunction. That idea leads immediately to (268) below:

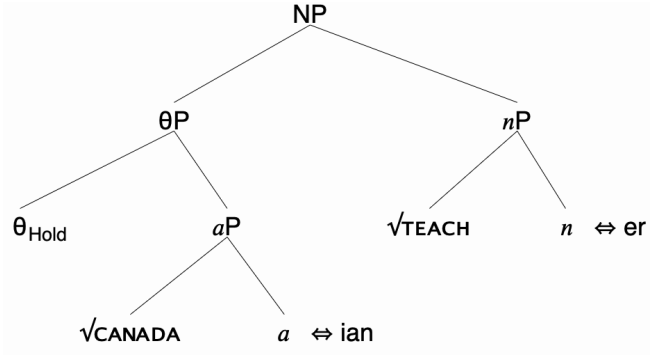
(268) Direct Modification

$[\![a\text{P } n\text{P}]\!] = \lambda s.\ ([\![n\text{P}]\!](s)\ \&\ [\![a\text{P}]\!](s))$

$[\![\textit{strict teacher}]\!] = \lambda s.\ (\textbf{teacher}(s)\ \&\ \textbf{strict}(s))$

Alongside (268), there is another option depicted in (269) below, in which the adjective first combines with a thematic role head (§2.3) and the result combines with the noun (compare Wellwood 2019:77-79).

(269) Indirect Modification



Canadian teacher

(270) $[\![\theta_{\text{Hold}}]\!] = \lambda P\, \lambda s\, (\exists s')\ [P(s')\ \&\ (s \ominus s')]$

(271) $[\![[\theta_{\text{Hold}}\ a\text{P}]]\!] = \lambda s.\ (\exists s')[[\![a\text{P}]\!](s')\ \&\ (s \ominus s')]$

(272) $[\![[\theta_{\text{Hold}}\ a\text{P}]\ n\text{P}]\!] = \lambda s.\ ([\![n\text{P}]\!](s)\ \&\ (\exists s')[[\![a\text{P}]\!](s')\ \&\ (s \ominus s')])$

(273) $[\![[\theta_{\text{Hold}}\ \textit{Canadian}]\ \textit{teacher}]\!] = \lambda s.\ (\textbf{teacher}(s)\ \&\ (\exists s')[\textbf{Canadian}(s')\ \&\ (s \ominus s')])$

These two options for modification, direct and indirect, differ syntactically by the presence of a thematic role head. The meanings that result differ by whether the adjective and the noun describe the same state (direct) or separate states linked via the

same-participants relation (indirect). As a result, direct and indirect modification differ with respect to inference patterns which have long been used to classify interpretations of adjectives used attributively. We'll look at two of them. The first is given in (274) below:

(274) Conjoining Inference

x is Adjective and *x* is a Noun → x is an Adjective Noun.

Below are examples which on their most salient, neutral context readings are valid and invalid respectively:

(275) Premise: My mother was Canadian.
Premise: My mother was a teacher.

Conclusion: My mother was a Canadian teacher. VALID

(276) Premise: My mother was strict.
Premise: My mother was a teacher.

Conclusion: My mother was a strict teacher. INVALID

Indirect modification guarantees a valid conjoining inference. In (275), the logic works as follows. We know from the two premises that my mother was the participant in a Canadian state and she was the participant in a teacher state. It follows that she was a participant in a teacher state that has the same participants as some Canadian state. That is what is required by the conclusion, assuming that *Canadian teacher* is composed with indirect modification, as in (273).

Direct modification does not guarantee a valid conjoining inference. In (276), the logic works as follows. We know from the two premises that my mother was the participant in a strict state and she was the participant in a teacher state. There is no guarantee that the strict state she was in **was also** the teacher state she was in. But that is what is required by the conclusion, assuming that *strict teacher* is composed with direct modification, as in (268). Since direct modification is modeled on Davidsonian adverbial modification, it is no surprise that the logic in this case is precisely the Davidsonian logic that blocks the inference in (277) below:

(277) Premise: Jack danced noisily.
Premise: Jack prayed.

Conclusion: Jack prayed noisily. INVALID

From the first two premises, we know that Jack was the agent of an event that was noisy and that he was the agent of a praying event. But there is no guarantee that the noisy event was also the praying event, as the conclusion requires.

In (278) below is another inference pattern that is used in the classification of adjectives (Kamp 1975:124) and that again, is licenced by indirect modification but not by direct modification.

(278) Noun Substitution

If every N_1 is an N_2, then every Adj N_1 is an Adj N_2.

(279) Premise: Every polling place is a school.

Conclusion: Every urban polling place is an urban school. VALID

(280) Premise: Every polling place is a school.

Conclusion: Every good polling place is a good school. INVALID

Assuming that in (279), *urban* modifies indirectly, the logic is as follows. If *x* is an urban polling place, then *x* is the single participant in a polling-place state *s* which has the same participants as an urban state. By the universal in the premise[47], *x* is also the participant in a school state, *s′*. But since *x* is the sole participant in *s′*, *s′* must also have the same participants as an urban state and so *x* is the single participant in a school state *s′* which has the same participants as an urban state. That is what is required by the conclusion, assuming that *urban school* is composed with indirect modification.

Assuming that in (280), *good* modifies directly, the logic is as follows. If *x* is a good polling place, then *x* is the single participant in a polling-place state *s* and **good** also applies to *s*. By the universal in the premise, *x* is also in a school state, *s′*. But there is no guarantee that **good** applies to *s′*.

Let us pause and summarize. Pursuing the idea that modification expresses conjunction and given our framework developed to this point, we arrive at two possible types of modification, direct and indirect. The two differ by the inferences they licence. We saw that in some examples the inferences are valid and in some they are invalid, leading to the idea that both types of modification are available in the grammar.

In using the examples above to illustrate the inferences and to show the connection to the two types of modification, I assumed that in the valid examples, the adjectives and nouns were combined indirectly and in the invalid ones they were combined directly. There are various factors that might guide the choice between direct and indirect modification, but clearly a key factor is the adjective itself. I'd like to speculate now about how an adjective's meaning might constrain the type of modification it enters into.

Up to now, I would use a metalanguage predicate such as **cow** to apply to states that were informally called '*cow* states'. Any cow is in a state described by **cow** and only cows participate in these states. To be in one of those states is what it means to be a cow. Suppose now that some adjectives work that way as well. What it means to be sick is to

[47] *every* is a quantifier over states. So the reasoning goes like this: by the first premise, every single-participant polling-place state has the same participant as some school state, so if *x* is the participant in a polling place state, *x* is the participant in a school state. The meaning of *every* was given in §8.2.

be a participant in one of the states in the extension of **sick**. Clearly, what it means to be sick could not be the same as what it means to be a cow, so that the statement below could not be true of any state:

(281) **cow**(*s*) & **sick**(*s*)

In that case, *sick cow* will only make sense if *sick* indirectly modifies *cow* and that would be why we readily draw the conjoining inference from *x* is sick and *x* is a cow, that *x* is a sick cow. *sick* and *cow* pick out two different kinds of states. An individual can participate in both kinds simultaneously but no state can be of both kinds. If that is correct, it must be that for adjectives like *strict* and *good,* which do enter in to direct modification, there are interpretations **strict** and **good** that apply to states without determining the kind of state it is. There are two features of these adjectives that attention is often drawn to and that seem to support this idea. The first observation is that these adjectives do not come with fixed applicability conditions. Whether or not **good** applies to *s,* depends on what kind of state *s* is. In that sense, there isn't really such a thing as a '*good* state'. The second observation is that whereas **sick** is intrinsic, these predicates are extrinsic in a sense. They are often predicates whose application to a state is carried over from application to events in which the state they apply to is initiated, manifested, terminated or compensated. A trained nurse engaged in a training event that initiated the nurse state. A good soccer forward plays well, meaning the events in which the forward state manifests are deemed good. A strict teacher observes the rules exactly when carrying out pedagogical duties. A retired policeman has entered retirement, an event that terminated the policeman state.[48]

Summarizing now, in a pure event semantics in which modification expresses conjunction, there are two natural options for merging an attributive adjective with a noun or noun phrase. The adjective and noun phrase can combine directly or they can combine indirectly, with a thematic role head intervening. The two options lead to different interpretations:

(282) Direct Modification

strict teacher $\rightsquigarrow \lambda S.$ (**teacher**(S) & **strict**(S))

(283) Indirect Modification

Canadian teacher $\rightsquigarrow \lambda S.$ (**teacher**(S) & $(\exists S')$[**Canadian**(S') & ($S \ominus S'$)])

[48] Here I am drawing on Maienborn (2020)'s analysis of event-relatedness. On the reading of *beautiful dancer* that does not permit noun substitution (285), if someone is a beautiful dancer, then they perform dances beautifully. For Maienborn, *beautiful* has a meaning spelled out in terms of a metalanguage predicate that applies to a social role. The link to events comes from the fact that "qualities and judgments applying to social roles typically carry over to the activities by which they manifest themselves" (p75). Maienborn provides several arguments for preferring this view to Larson (1998)'s proposal in which *beautiful* applies to an event argument in *dancer*. While *beautiful* does not apply to an event in Maienborn's analysis, it also does not apply to a state. A social role is a trope. Although my discussion of '*cow* states' above was decidedly like how tropes are characterized, I assume Maienborn would like to distinguish tropes and states. For some discussion of states and tropes, see Moltmann (2013).

One can diagnose the kind of modification used to build a noun phrase with the inference patterns in (284)-(285) below, which are licenced when modification is indirect, but not when it is direct.

(284) Conjoining Inference

x is Adj and *x* is a Noun → x is an Adj Noun.

(285) Noun Substitution

If every N_1 is an N_2, then every Adj N_1 is an Adj N_2.

I've speculated that *sick, urban* and *Canadian* are examples of adjectives that are like nouns in that they characterize the intrinsic nature of a state in way that makes it impossible for them to describe the same state that the noun they modify describes. For this reason, they resist direct modification. In that case, they must enter into indirect modification and therefore they reliably licence the inference patterns in (284)-(285) above.

9.2 Extrinsic adjectives and indirect modification

I've used the term 'extrinsic' to describe adjectives such as *skillful, good, strict* and *well-trained*. The term was chosen because those adjectives do not characterize a particular kind of state, at least not on their own, rather their application to a state is carried over from application to events related to the state. When used attributively, extrinsic adjectives can be direct modifiers. Unless otherwise indicated and where possible, speakers take them to be direct modifiers and so they reliably invalidate the inference patterns in (284)-(285) above. But these adjectives can be used, and sometimes are used, as indirect modifiers, as I will now explain.

Contrary to what is often asserted in the literature (and then often retracted in the course of discussion), these adjectives can be used predicatively.

(286) This cellist is good. (Larson 1998:fn10)
(287) Some teacher was strict.
(288) The nurse was well-trained.
(289) Our native driver was skillful and experienced in desert driving.

Spelling out the meaning of one of these examples, makes it clear why their predicative use is unsurprising:

(290) Some teacher was [θ_{Hold} strict].

$(\exists s)[\textbf{teacher}(s) \,\&\, (\exists s')\,[\textbf{strict}(s') \,\&\, (s \ominus s')]]$

In (290), *strict* contributes a predicate of states, as it does when it's used as a direct modifier. In a neutral context, speakers are likely to identify the existentially quantified state, s', with the teacher state s from the first conjunct, leading to synonymy with *some teacher was a strict teacher,* with *strict* used as a direct modifier. But now, given that extrinsic predicates can be used in conjunction with a thematic role head as in (290),

there is nothing to prevent them from serving as indirect modifiers. In principle, we could have:

(291) *strict teacher* $\rightsquigarrow \lambda s.$ (**teacher**(s) & $(\exists s')$[**strict**(s') & $(s \ominus s')$])

However, as we saw above, there is a tendency in a neutral context to interpret the existential as witnessed by the state described by the noun, making indirect modification effectively synonymous with direct modification and hence undetectable. What we need is a context that encourages the existential to be understood as witnessed by a different kind of state. Beesley (1982) presents such an example:

(292) "Consider the hypothetical case of a chess school which specialises in teaching musicians. When asked how lutists, as opposed to oboists, take to chess, an instructor might say, 'We get some good lutists and some bad lutists'. In this context, the goodness will be relative not to lute playing but to chess playing."

In this example, *good* modifies *lutists* indirectly:

(293) $[\![[\theta_{\text{Hold}}\ \textit{good}]\ \textit{lutist}]\!] = \lambda s.$ (**lutist**(s) & $(\exists s')$[**good**(s') & $(s \ominus s')$])

The state s' that makes the instructor's sentence true is a chess player state. In this context, where *good* is an indirect modifier, noun substitution is licensed. If all the lutists were Londoners, one could infer from the instructor's comment that in their chess school they get some good Londoners and some bad Londoners.

In von Fintel (1999), we find what looks like another example of this type. He offers the example in (294)a with the comment in (294)b.

(294) a. The most experienced woman should get the job.
b. [Clearly, we are not looking for the person who has lots of experience at being a woman.] (von Fintel 1999)

Leaving aside the analysis of the superlative, we have:

(295) *experienced woman* $\rightsquigarrow \lambda s.$ (**woman**(s) & $(\exists s')$[**experienced**(s') & $(s \ominus s')$])

where the existential statement is witnessed by some state related to the job in question.

Strict and *good* have meanings that permit them to modify directly and, unless otherwise indicated, that is how we tend to take them. But in the right context, they are used indirectly.

9.3 Intersectivity

The label "intersective" is widely used in discussions of adjectival semantics. I'd like to briefly comment on its use as a way of relating the pure event semantic analysis given here to previous work. The term is introduced in Partee (2021) with the following remarks:

> Adjectives like *carnivorous, rectangular, red,* and *German* are **intersective**: the informally stated meaning postulate in (1) holds for any N.
>
> (1) ‖*carnivorous* N‖ = ‖*carnivorous*‖ ∩ ‖N‖
>
> Intersective adjectives are one-place predicates: a *red dress* is *red* and is a *dress*.
>
> But *skillful* is not intersective, as shown by the invalid inference pattern in (2), familiar from the work of Kamp, Parsons, Clark, and Montague.
>
> (2) Premise: Francis is a skillful surgeon.
> Premise: Francis is a violinist.
> ---
> Conclusion: Francis is a skillful violinist. INVALID

Clearly 'intersective adjectives' are the ones that always modify indirectly, the ones that we early referred to as 'intrinsic'. In an effort to maintain continuity with existing literature, we may call them 'intersective' adjectives, but we obviously can't have in mind the meaning postulate in (1), which, if anything, corresponds to direct modification.

Below the meaning postulate in Partee's (1) is a pointer to an inference pattern used to diagnose intersectivity (cf. McNally 2016:447): a *red dress* is *red* and is a *dress*. This is the reverse of what I've called a conjoining inference and in fact, on the analysis proposed here, it is predicted to hold for indirect modifiers but crucially also for direct modifiers. (296) below is somewhat hard to judge but it is not clearly invalid.

(296) Francis is a skillful violinist → Francis is skillful and Francis is a violinist

I think there are a number of reasons why this inference pattern works as well as it does to isolate 'intersective adjectives'. Sometimes it is used to exclude adjectives that can't be used predicatively, as in McNally (2016)'s example *molecular biologist*. Sometimes it is used with adjectives that are ambiguous. When adjectives are ambiguous between an 'intersective' and 'non-intersective' interpretation, the 'intersective' meaning is strongly or exclusively favored in predicate position (cf. *old friend* Larson 1998*, heavy drinker* Cinque 2010*, religious official* Morzycki 2015:§2.2.2, *close collaborator* Siegel 1977:241). Since the inference in (296) relies on an adjective having a predicative use, it will naturally rule out non-intersective readings of adjectives that can't occur predicatively. Finally, examples like (296) are affected by the way existential quantification works in discourse. On the theory proposed here, (296) has roughly this logic (assuming *skillful violinist* is directly modifying):

(297) $\exists s\,[K(f,s)\ \&\ V(f,s)] \rightarrow \exists s\,K(f,s)\ \&\ \exists s'\,V(f,s')$

While (297) is valid, in discourse we tend to interpret a series of existentials as having non-overlapping domains, causing some uncertainty. Compare:

(298) Someone fried the onions and made the dessert → Someone fried the onions and someone made the dessert.

(299) John drank a beer → John consumed a beer and he drank something.

The inference in (297) becomes invalid if the final two existentials are understood to have non-overlapping domains. This invalidates (296) and so to the extent that one can assume non-overlapping domains, (296) will rule out 'non-intersective' adjectives. This issue does not arise with direct modification which has a different logic:

(300) *x is a red dress → x is red and x is a dress*

$$\exists s\, R(x,s) \,\&\, \exists s' D(x, s') \,\&\, \ominus(s,s') \rightarrow \exists s\, R(x,s) \,\&\, \exists s' D(x,s')$$

Some of these problems are avoided by reversing the order as in our conjoining inference in (274) where Adjective Noun comes in the consequent. But there are problems there as well related to the tendency in a neutral context to interpret the existential in the adjective as witnessed by the state described by the noun. For that reason, the best diagnostic is noun substitution, a version of which comes up at the end of the quote from Partee. Adjectives that reliably validate noun substitution inferences could, following tradition, be called 'intersective'.

One final clarification is in order. In the quote above, Partee uses 'intersective' to characterize an adjective. Appeal is made to a meaning postulate, a tool used to fix word meanings. Similarly, McNally (2016) defines a category of 'intersective modifier'. This contrasts with the use of 'intersective' as it occurs in the phrase 'intersective modification' (e.g. Morzycki 2015:§1.4). In that case 'intersective' characterizes a way of combining meanings[49]. Were we to adopt the term in this use, we would apply it to the semantics of indirect modification.

9.4 The Syntax of Modification

We distinguish direct modification from indirect modification. This is a syntactic distinction with interpretive consequences. The terms 'direct' and 'indirect' originate with Sproat & Shih's (1987) discussion of Mandarin, a language in which adjectives combine with nouns directly or with the intervention of the particle *de*, also used to mark relative clauses and possessives. Direct versus indirect modification lies at the heart of Cinque (2010, 2014)'s study of the syntax of adjectives. Cinque (2014) maintains that adnominal adjectives have two syntactic sources. They can be direct modifiers of the NP or they can be indirect modifiers, in which case they are predicates in a reduced relative clause that modifies the NP. In addition to proposing two sources for modification, Cinque maps out regions of the noun phrase where they reside. This mapping is input to movement operations that may differ across languages. The result is crosslinguistic differences with respect to the position of direct and indirect modifiers. For example, as we have seen, in English both direct and indirect modifiers can occur prenominally. In Italian, only direct modifiers occur prenominally, while postnominally both direct and indirect modifiers are possible. If we return to Beesley's chess school, we can see an illustration of this. Recall that in *good lutist,* as used in (292) above, *good* indirectly

[49] "The **operation** performed by Predicate Modification has also been called "intersective modification", because if we look at the sets instead of at their characteristic functions, it amounts to set-theoretic intersection." Heim & Kratzer (1998:66).
"intersective vs. subsective modification (the **mode** by which A composes with the N it modifies)," Larson (2021:254)

modifies *lutist* and that permits *good* to have a reading that Beesley describes as "goodness relative to chess playing". That reading is possible for *bravi* in (301) below where it follows the head noun *violinisti*. By contrast, when *bravi* precedes the head noun in (302), the chess-playing reading becomes impossible.

(301) *Italian* (Cinque 2014:23)

Abbiamo dei **violinisti bravi** e dei violinisti meno bravi
'We get some good violinists and some bad violinists'
(can be good as chess players)

(302) *Italian* (Cinque 2014:23)

Qui abbiamo solo dei **bravi violinisti**
'Here we get only good violinists'
(cannot be good as chess players, only as violinists)

Cinque notes that Bouchard (2002:99) reports a similar phenomenon in the French expression *habile chirurgien* 'a skillful surgeon' which can only have the interpretation of 'skillful as a surgeon' whereas postnominal *habile* allows for other types of skill (and see Fábregas 2017:§3.2.4 on Spanish).

Cinque provides another example showing the post- and pre-nominal contrast in Italian, this time using the adjective *buon* 'good' and requiring less contextual enrichment. In (303) below, postnominal *buono* can modify directly, giving rise to an interpretation in which the forward is extrinsically good, in the sense that his playing is good. Postnominal *buono* can also modify indirectly giving rise to an interpretation in which the forward is good-hearted:

(303) *Italian* (Cinque 2014:5)

Un	**attaccante**	**buono**	non	farebbe	mai	una	cosa	del	genere
a	forward	good	not	would-do	never	a	thing	of-the	kind

'A forward *good at* playing forward would never do such a thing'
'A *good-hearted* forward would never do such a thing'

When *buon* is used prenominally, only direct modification is possible:

(304) *Italian* (Cinque 2014:5)

Un	**buon**	**attaccante**	non	farebbe	mai	una	cosa	del	genere
a	good	forward	not	would-do	never	a	thing	of-the	kind

'A forward *good at* playing forward would never do such a thing'
'A *good-hearted* forward would never do such a thing'

There is a long-standing debate about whether *good* is ambiguous between an absolute and a relative reading or whether it is always relative. Some history of the debate can be found in Beesley (1982:§3.3). Given our theory, the data in (304) does not decide the issue. If 'good-hearted' represents an absolute reading, then *good* on that reading

describes an intrinsic state of goodness – what Byrne (2016) might call 'goodness simpliciter'. On that reading, *good* could not combine directly (recall our discussion of *sick cow*) and hence it would be banned from prenominal position in Italian. On the other hand, if there is no such thing as goodness simpliciter, then the 'good hearted' reading comes about by not applying **good** to the forward-state but to some other kind of state. But then again, indirect modification is called for and prenominal position is impossible.

We began our discussion of modification using conjoining inferences and noun substitution to identify a particular interpretation for adjectival modification often described as 'intersective'. We associated the 'intersective' interpretation with an indirect syntax and 'non-intersective' with a direct syntax. Cinque's work lends support to the idea that intersective/non-intersective interpretive differences have a basis in syntax. At the same time, Cinque's discussion of meaning takes place in a framework where an 'intersective' interpretation is quite literally the result of set intersection. In that setting, it's hard to see why more structure would be needed to achieve an intersective interpretation.[50] Heim & Kratzer (1998)'s oft-cited rule of Predicate Modification embodies the idea that modification expresses conjunction and shows clearly how, in a setting where nouns and adjectives are one place predicates of individuals, direct adjective noun combination can lead to an intersective interpretation. No extra syntax is necessary. By contrast, in a pure event semantics an intersective interpretation requires the interpolation of the same-participant relation, as explained earlier. This requires some additional syntax, a thematic role head. So, an aspect of Cinque's theory is explained. But an adjective plus a thematic role head is presumably less than what Cinque posits, namely a relative clause. A relative clause would work as well to introduce the same-participant relation but it isn't necessary. In fact, using adverb extraction as a probe, Talić (2017) shows that attributive adjectives can have intersective interpretations without being inside a relative clause. It could be that we have two sources for modification arranged in the way Cinque says, and that the indirect modifiers are more complex than direct modifiers but still not clausal. Cinque posited relative clause structure as a way to explain the systematic identity in behavior between indirect modifying adjectives and the same adjectives in the predicate position of a relative clause. Perhaps a smaller, predicative syntax is sufficient to explain that identity.

Cinque lists several other meaning distinctions that appear to correlate with distinct regions in the noun phrase. Many of these correlations are found in earlier work, some going back quite far (Fábregas 2017 cites Andres Bello's 1847 grammar for the absence of restrictivity in prenominal position in Spanish). Some of these correlations may be related to the presence or absence of predicative syntax, but many of them probably are not.[51]

9.5 Intensionality

Kamp(1975:125) reports the following example of an invalid noun substitution supplied to him by Professor Lewis:

---

[50] "The question of why direct and indirect modification adjectives have the cluster of interpretive properties that they have, rather than the opposite, is a deeper question, and one to which I cannot offer a definite answer." Cinque (2010:33)

[51] For recent analyses of some of these contrasts see Leffel (2014) and Martin (2021).

> "Even if (in a given world) all and only cobblers are darts players, it may well be that not all and only the skilful cobblers are skilful darts players."

On the basis of this behavior, Kamp classifies *skillful* as a "non-extensional adjective". Noun substitution is blocked with *skillful*, on this view, for the same reason that it's blocked with *alleged*. These adjectives are taken to represent operations on intensions. This contrasts with our treatment of *skillful* which follows Larson (2002) by relying on eventualities in the extension of *skillful* and by following the model of Davidsonian explanations for substitution blocking with adverbs, which in the past was also thought to be a matter of intensionality. Larson recounts two ways in which *skillful* contrasts with intensional adjectives *alleged* and *supposed*. The first has to do with nouns with null extensions. Assuming there is no levitation, there could be an alleged levitator but not a skillful levitator. The second has to do with non-specific indefinites: "if *Boris was a skillful perpetrator of a crime* is true, there must be a crime that he skillfully perpetrated" but "if Boris is a supposed perpetrator of a crime, it doesn't follow that there is a particular crime that Boris has been supposed to commit."

9.6 Conclusion

In this section, we've seen how adjectival modification can work in a grammar where nouns and adjectives are one place predicates of states. Taking modification to express conjunction, there are two natural ways of combining adjectives and nouns, directly or with the interpolation of a thematic role head. The two syntactic structures lead to distinct interpretations.

(305) Direct Modification

strict teacher $\rightsquigarrow \lambda s.\ (\mathbf{teacher}(s)\ \&\ \mathbf{strict}(s))$

(306) Indirect Modification

Canadian teacher $\rightsquigarrow \lambda s.\ (\mathbf{teacher}(s)\ \&\ (\exists s')[\mathbf{Canadian}(s')\ \&\ (s \ominus s')])$

The interpretation that arises from indirect modification licenses noun substitution: If Francis is a Canadian teacher and Francis is a father, then Francis is a Canadian father. Direct modification does not licence noun substitution. Interpretations that licence noun substitution are widely known as "intersective" and so, pure event semantics gives a rationale for the generalization in (307) below which comes out of the cross linguistic study of the distribution of intersective and non-intersective readings of adnominal modifiers.

(307) Non-intersective interpretations are the result of direct combination of the adjective with the noun, while intersective interpretations require first building a predicative structure around the adjective.

I've speculated (§9.2) about what makes for an 'intersective adjective' and, drawing on Maienborn (2020)'s discussion of event-relatedness, I tried to characterize adjectives that

admit direct modification. Some adjectives are like nouns in that they say of their argument what kind of a state it is. **sick**(*s*) says that *s* is a state of sickness. I assume these kinds are mutually exclusive (being sick and being a dog can't be the same thing) and so these adjectives can't combine directly with the noun. They are always indirect modifiers. Other adjectives are extrinsic predicates. They say something about entities that are related to the states they apply to. These adjectives can be direct modifiers.

Acknowledgments

My research was nourished by the wisdom and the fellowship of these colleagues: Christopher Baron, İsa Bayırlı, Rajesh Bhatt, Tanya Bondarenko, Lucas Champollion, Simon Charlow, Gennaro Chierchia, Veneeta Dayal, Amy Rose Deal, Kai von Fintel, Danny Fox, Jane Grimshaw, Martin Hackl, Nina Haslinger, Sabine Iatridou, Angelika Kratzer, David Nicolas, Paul Portner, Jessica Rett, Barry Schein, Philippe Schlenker, Viola Schmitt, Katrin Schulz, Peter Sutton, Alexis Wellwood and Alexander Williams. I am grateful to all of them and apologize to those I have forgotten. I am indebted to the organizers and the audiences of these venues: Amsterdam Colloquium (2009), MACSIM (U. Maryland), NELS 39 (Cornell), NELS 45(MIT), ESSLLI (Toulouse, 2017), colloquia at CUNY, ENS, Georgetown, Humboldt, Leiden, Lomonosov Moscow State, NYU, UCLA, UMass, UPenn, USC, seminars at Harvard, MIT and Rutgers. I owe special thanks to Daniel Altshuler, my fellow states man, for being guide and goad. In the final phase, as the research veered into regions unknown (to me) I relied on generous feedback and guidance from Renate Raffelsiefen and Stan Zompì. Books by Ruth Kramer and Grev Corbett were indispensable then. This paper has roots in my reaction to Chierchia's Plurality of Mass Nouns, specifically the problem of stubbornly distributive predicates. As I was searching for insight from that phenomenon, I found myself asking "What would Barry say?" and that was the genesis of the central theme of this paper. Harbour and Martí's work on number features brought clearly relevant phenomena within my reach.

References

These references come in a variety of styles. That's how you know this is a draft.

Acquaviva, P. (2008) *Lexical Plurals, A Morphosemantic Approach*, *Oxford Studies in Theoretical Linguistics*, Oxford: Oxford University Press.

Acquaviva, P. (2015) "65. Singulatives," in Peter O. Müller, Ingeborg Ohnheiser, Susan Olsen and Franz Rainer (eds) *Volume 2 Word-Formation: An International Handbook of the Languages of Europe*, Berlin, Boston: De Gruyter Mouton, 1171-1183 DOI 10.1515/9783110246278-021

Adger, David, Susana Bejar, & Daniel Harbour (2003) Directionality of Allomorphy: A Reply to Carstairs-McCarthy. *Transactions of the Philological Society* **101(1)**:109–115.

Alexiadou, A. (2021) Lexical Plurals. In P. Cabredo Hofherr and J. Doetjes (eds.), *The Oxford Handbook of Grammatical Number*. Oxford University Press. DOI: 10.1093/oxfordhb/9780198795858.013.11

Alexiadou, A. (2011) "Plural Mass Nouns and the Morpho-syntax of Number," in Mary Byram Washburn, Katherine McKinney-Bock, Erika Varis, Ann Sawyer, and Barbara Tomaszewicz (eds), *Proceedings of the 28th West Coast Conference on Formal Linguistics* 33-41. Somerville, MA: Cascadilla Proceedings Project.

Allan, K. (1980) "Nouns and Countability," *Language* 56:541-567.

Altshuler, Daniel. (2021). A puzzle about narrative progression and causal reasoning, in Emar Maier, and Andreas Stokke (eds) *The Language of Fiction*, Oxford: Oxford University Press, 255-276 DOI 10.1093/oso/9780198846376.003.0010

Anscombe, G. E. M. (1979) "Under a Description," *Noûs* **13.2**:219-233

Arregi, K. and A. Nevins (2014). A monoradical approach to some cases of disuppletion. *Theoretical Linguistics*, *40*(3-4), 311-330 DOI 10.1515/tl-2014-0014

Asher, N. (2011) *Lexical Meaning in Context: A Web of Words*, Cambridge: Cambridge University Press. DOI 10.1017/CBO9780511793936.

Bacon, J. (1973) "Do Generic Descriptions Denote?," *Mind* **82.327**: 331-47, DOI 10.1093/mind/LXXXII.327.331

Baggio, P. and T. Trigg (2019) "Pluralia Tantum: What they tell us about Plurality," talk abstract for 2019 Annual Meeting of the Linguistics Association of Great Britain (LAGB). Queen Mary University of London, 9-12 September 2019

Baldi, B. & Savoia, L. M. 2018. Morphosyntactic Reorganization Phenomena in Arbëresh Dialects: The Neuter. *Quaderni di Linguistica e Studi Orientali* 4:109-130. DOI 10.13128/QULSO-2421-7220-23841

Bale, A.C. and D. Barner (2009) "The Interpretation of Functional Heads: Using Comparatives to Explore the Mass/Count Distinction," *Journal of Semantics* **26.3**:217-252

Bale, A. (2017) "Presuppositions, Subcategorization, Lexicalism, Coercion and the Mass-Count Distinction," ms, lingbuzz

Bale, A. (2021) "Ontology, Number Agreement, and the Count–Mass Distinction," in Tibor Kiss, Francis Jeffry Pelletier and Halima Husić (eds.), *Things and Stuff: The Semantics of the Mass/Count Distinction*, Cambridge University Press, Cambridge, 237-260

Bale, A. and B. Gillon. (2020) "Re-examining the Mass-Count Distinction," in Friederike Moltmann (ed.), *Mass and Count in Linguistics, Philosophy, and Cognitive Science*, John Benjamins, 13-36

Barker, C. (1999) "Individuation and Quantification," *Linguistic Inquiry* **30.4**:683-691.

Barker, C. (2010) "Nominals don't Provide Criteria of Identity," in Monika Rathert and Artemis Alexiadou (eds.), *The Semantics of Nominalizations across Languages and Frameworks*, (Interface explorations; 22), de Gruyter Mouton, 9-23

Bar-Lev, M E (2021) "An Implicature account of Homogeneity and Non-maximality," *Linguistics and Philosophy* **44**:1045–1097 DOI 10.1007/s10988-020-09308-5

Barner, D. and J. Snedeker. (2005). Quantity judgments and individuation: Evidence that mass nouns count. *Cognition*, 97: 41–66.

Bassi, I. (2021) *Fake Features and Valuation from Context* MIT Phd

Beesley, Kenneth Reid. 1982. Evaluative adjectives as one-place predicates in Montague grammar. *Journal of Semantics* 1(3): 195–249.

Bobaljik, J. 2017 Distributed Morphology. *Oxford Research Encyclopedia of Linguistics.* DOI 10.1093/acrefore/9780199384655.013.131

Borer, H. (2005) *In Name Only* Oxford: OUP.
Brasoveanu, A. and R. Henderson (2009) "Varieties of Distributivity: *One by One* vs *Each*," in Ed Cormany, Satoshi Ito, and David Lutz (eds.) Proceedings of the 19th Semantics and Linguistic Theory Conference, held April 3-5, 2009 at The Ohio State University, 55-72
Bücking, S. (2018) "The Compositional Semantics of Modification," in Mark Aronoff (ed.), *Oxford Research Encyclopedia of Linguistics*, Oxford & New York, NY: Oxford University Press, DOI: 10.1093/acrefore/9780199384655.013.354.
Bücking, S. and C. Maienborn (2018) "Coercion by Modification. The Adaptive Capacities of Event-sensitive Modifiers," *Semantics and Pragmatics* **12.9**:1-39, DOI: 10.3765/sp.12.9
Bunt, H.C. (1985) *Mass Terms and Model Theoretic Semantics,* Cambridge Studies in Linguistics 42, Cambridge University Press.
Burge, T. (1977) "A Theory of Aggregates," *Noûs* **11.2**:97-117
Byrne, T. (2016) "Might anything be plain good?," *Philosophical Studies*, 173(12), 3335-3346
Carretero García, Paloma. (2017). Agreement in Asturian. In Butt, Miriam, & King, Tracy Holloway (Eds.): *Proceedings of the LFG'17 Conference, University of Konstanz*, 188–208. Stanford, CA: CSLI Publications.
Champollion, L. (2016) "Overt Distributivity in Algebraic Event Semantics," *Semantics and Pragmatics* **9**, Article 16, 1-65
Chierchia, G. (1998) "Plurality of Mass Nouns and the Notion of 'Semantic Parameter'," in Susan Rothstein (ed.) *Events and Grammar* Kluwer 53-103.
Chierchia, G. (2010) "Mass Nouns, Vagueness and Semantic Variation," *Synthese* **174.1**:99-149
Chierchia, G. (2017). Clouds and blood. More on the mass/count distinction. Synthese, **197.7**:2523–38.
Chierchia, G. (2021) "Mass vs. Count: Where do we stand? Outline of a theory of Semantic Variation," in Tibor Kiss, Francis Jeffry Pelletier and Halima Husić (eds.), *Things and Stuff: The Semantics of the Mass/Count Distinction*, Cambridge University Press, Cambridge, 21-54
Cinque, G. (2010) *The syntax of adjectives. A comparative study*. Cambridge, MA: MIT Press.
Cinque, G. (2014) "The Semantic Classification of Adjectives. A View from Syntax," *Studies in Chinese Linguistics*, **35.1**:1-30
Conklin, Harold C. 1962. Lexicographical treatment of folk taxonomies. In: Fred W. Householder and Sol Saporta (eds.) *Problems in Lexicography (Publication of the Indiana University Research Center in Anthropology, Folklore, and Linguistics 21, International Journal of American Linguistics 28, no. 2, pt. 4)*, 119–41. Bloomington: Indiana University. [Second edition 1967.]
Cooper, R. (1983) *Quantification and Syntactic Theory*, Dordrecht: Reidel.
Coppock, Elizabeth, Elizabeth Bogal-Allbritten and Golsa Nouri-Hosseini (2020). Universals in Superlative Semantics. *Language* **96(3)**: 471-506.
Corbett, G. G. (2000) *Number*, Cambridge: Cambridge University Press.
Corbett, G. G. 2006. *Agreement*. Cambridge: Cambridge University Press.

Corbett, G. G. (2019) “Pluralia Tantum Nouns and the Theory of Features: A Typology of Nouns with Non-Canonical Number Properties,” *Morphology* **29**:51-108

Corbett, G. G. (2012). *Features*. Cambridge: Cambridge University Press.

De Belder, Marijke (2011) “A Morphosyntactic Decomposition of Countability in Germanic”, *The Journal of Comparative Germanic Linguistics* 14(3): 173–202.

De Belder, Marijke, Faust, Noam, and Lampitelli, Nicola (2014) “On a low and a high diminutive: Evidence from Italian and Hebrew,” in Artemis Alexiadou, Hagit Borer and Florian Schäfer (eds.) *The Syntax of Roots and the Roots of Syntax*, Oxford, Oxford University Press, 149-163.

Deal, A.R. (2017) “Countability Distinctions and Semantic Variation,” *Natural Language Semantics*, **25**:125-171

Despić, Miloje and Sarah Murray (2018) On binary features and disagreeing natural classes: Evidence from Cheyenne and Serbian, *The Linguistic Review* **35.2**:219-241, doi:10.1515/tlr-2017-0025

Doetjes, J. (1997) *Quantifiers and Selection*. Doctoral Dissertation, Rijksuniversiteit Leiden

Dressler, W. U. and L.M. Barberesi (1994). *Morphopragmatics: Diminutives and intensifiers in Italian, German, and other languages*. Berlin: Mouton de Gruyter

Dressler, W. U. and L.M. Barberesi (2001) Morphopragmatics of diminutives and augmentatives: On the priority of pragmatics over semantics. In: István Kenesei and Robert M. Harnish (eds.), Perspectives on Semantics, Pragmatics, and Discourse, 43−58. Amsterdam/Philadelphia: Benjamins.

Ember, A. (1905) “The Pluralis Intensivus in Hebrew,” *The American Journal of Semitic Languages and Literatures*, **21.4**:195-231

Embick, D. (2015) *The Morpheme*. *A Theoretical Introduction* De Gruyter Mouton

Erbach, Kurt 2019 “A measure based analysis of plural mass nouns in Greek,” in: M. Teresa Espinal, E. Castroviejo, M. Leonetti, L. McNally, and C. Real-Puigdollers (eds.) *Proceedings of Sinn und Bedeutung 23*, vol. 1, 413–431. Universitat Autònoma de Barcelona, Bellaterra (Cerdanyola del Vallès).

Fábregas, A. 2017. “The syntax and semantics of nominal modifiers in Spanish,” *Borealis* **6.2**:1-102. DOI 10.7557/1.6.2.4191

Florio, S. and D. Nicolas 2020 “Plurals and Mereology,” *Journal of Philosophical Logic*. DOI 10.1007/s10992-020-09570-9

Fortin, A. (2011) *The Morphology and Semantics of Expressive Affixes*, PhD thesis, Oxford University

García González, F. (1985) “Algo más sobre el ‘neutro de materia,’”*Lletres Asturianes: boletín oficial de l’Academia de la Llingua Asturiana* **17**:31-36

Gardelle, L. (2016) “Lexical plurals for aggregates of discrete entities in English. Why plural, yet non-count, nouns?,” *Lingvisticæ Investigationes* **39.2**:355–372. doi 10.1075/li.39.2.08lga

Georg, Stefan (2007) *A Descriptive Grammar of Ket* (*Yenisei-Ostyak*) Kent,UK: Global Oriental

Gesenius, W., E. Kautzsch and A.E. Cowley (1909) *Hebrew Grammar* written by Wilhelm Gesenius, edited and enlarged by Emil Kautzsch and translated into English by Arthur Ernest Cowley, Clarendon Press: Oxford.

Gil, D. (1996) “Maltese ‘Collective Nouns’: A Typological Perspective,” *Italian Journal of Linguistics*, **8.1**:53-87
Gillon, B. (1992) “Towards a Common Semantics for English Count and Mass Nouns,” *Linguistics and Philosophy* 15:597-640
Gillon, B. S. (2012) “Mass Terms,” *Philosophy Compass* 7/10 (2012): 712–730, 10.1111/j.1747-9991.2012.00514
Gillon, C. (2015) “Innu-aimun plurality,” *Lingua* **162**:128-148, DOI 10.1016/j.lingua.2015.05.006.
Glass, L. (2018a) “Deriving the distributivity potential of adjectives via measurement theory,” in Patrick Ferrell (ed.), Linguistic society of America (LSA), 3. Washington, DC: Linguistic Society of America, DOI 10.3765/plsa.v3i1.4343
Glass, L. (2018b) *Distributivity, lexical semantics, and world knowledge* Stanford University Phd
Goddard, C. (2010) “A Piece of Cheese, a Grain of Sand: The Semantics of Mass Nouns and Unitizers” in Francis J. Pelletier (ed.) *Kinds, Things and Stuff*: *Mass Terms and Generics* (New Directions in Cognitive Science), Oxford University Press, p132-165
Gotham, M. (2021) “Event-Related Readings and Degrees of Difference”. *Proceedings of Sinn und Bedeutung*, Vol. 25, 325-39, DOI 10.18148/sub/2021.v25i0.940.
Gouskova, Maria and Jonathan David Bobaljik (2020). Allomorphy and vocabulary insertion. submitted to *The Handbook of Distributed Morphology*, Cambridge University Press. eds. Artemis Alexiadou, Ruth Kramer, Alec Marantz, and Isabel Oltra-Massuet.
Grandy, R. (1975) “Stuff and Things,” *Synthese*, **31.3/4**:479-485
Grimm, S. (2018) “Grammatical Number and the Scale of Individuation,” *Language* **94.3**:527-574
Grimm, Scott and Aeshaan Wahlang (2021) “Determining Countability Classes,” in Tibor Kiss, Francis Jeffry Pelletier and Halima Husić (eds.), *Things and Stuff: The Semantics of the Mass/Count Distinction*, Cambridge University Press, Cambridge, 357-375
Hackl, M. (2000) *Comparative Quantifiers.* Ph.D. thesis, MIT
Hale, Kenneth 1997. Some observations on the contributions of local languages to linguistic science, *Lingua* **100**:71–89. DOI 10.1016/S0024-3841(96)00029-0.
Harbour, D. (2011a) Descriptive and explanatory markedness *Morphology* **21**:223–245 DOI 10.1007/s11525-010-9167-0
Harbour, D. (2011b) “Valence and Atomic Number,” *Linguistic Inquiry* **42.4**:561-594
Harbour D. (2014) “Paucity, Abundance, and the Theory of Number,” *Language* **90.1**:185-229, DOI 10.1353/lan.2014.0003
Harbour Daniel 2020 Frankenduals: Their typology, structure, and significance. *Language*, Volume 96, Number 1, 60-93 DOI: 10.1353/lan.2020.0002
Harðarson, G.R. (2021) On the domains of allomorphy, allosemy and morphophonology in compounds, *Natural Language and Linguistic Theory* **39**:1173–1193 DOI 10.1007/s11049-020-09499-3
Harley, Heidi. 2014) “On the identity of roots,” *Theoretical Linguistics*, vol. 40, no. 3-4:225-276, DOI 10.1515/tl-2014-0010
Haspelmath, Martin. 1993. *A Grammar of Lezgian*. Berlin: Mouton de Gruyter.

Heim, I. and A. Kratzer (1998) *Semantics in Generative Grammar* (Blackwell Textbooks in Linguistics) Wiley Blackwell.

Higginbotham, J. (2005) "Event Positions: Suppression and Emergence," *Theoretical Linguistics* **31**:349-358

Hirsch, A. (2017) *An inflexible semantics for cross-categorial operators*, MIT Phd

Hobbs, J. R. (2010) "Clause-Internal Coherence," in P. Kühnlein, A. Benz, and C. Sidner (eds.), *Constraints in Discourse 2*, John Benjamins Publishing Company, Amsterdam, 15-34.

Jackendoff, R. (2010) "The Ecology of English Noun-Noun Compounds," Chapter 13 of *Meaning and the Lexicon: The Parallel Architecture 1975-2010*, Oxford University Press.

Jeanne, LaVerne Masayesva. 1978. Aspects of Hopi grammar. Ph.D. dissertation, MIT

Jespersen, O. (1961/65) *A Modern English Grammar on Historical Principles*, *Part II, Syntax* (*First Volume*), London: George Allen and Unwin, LTD, Copenhagen: Ejnar Munksgaard.

Joosten, F. (2010) "Collective nouns, aggregate nouns, and superordinates: When 'part of' and 'kind of' meet," *Lingvisticæ Investigationes* **33.1**:25–49.

Jurafsky, D. (1996) "Universal Tendencies in the Semantics of the Diminutive," *Language*, **72.3**:533-578

Kamp, J.A.W. (1975) "Two Theories about Adjectives," in *Formal Semantics of Natural Language*, Edward L. Keenan (ed.) 123-155.Cambridge: Cambridge University Press.

Kazakevich, O., I. Samarina and V.N. Tyganova (2002) A Cuckoo Tale, lingsib.iea.ras.ru/en/languages/ket.shtml

Kiparsky, P. & Tonhauser, J. 2012. Semantics of Inflection. In C. Maienborn, K. von Heusinger & P. Portner (eds.). *Handbook of Semantics*, *Volume 3,* 2070-2097. Berlin: de Gruyter.

Kiss, T., F.J. Pelletier, and H. Husić (2021a) (eds.) *Things and Stuff: The Semantics of the Mass/Count Distinction*, Cambridge University Press, Cambridge

Kiss, T., F.J. Pelletier, and H. Husić (2021b) "Polysemy and the Count–Mass Distinction: What Can We Derive from a Lexicon of Count and Mass Senses?," in Tibor Kiss, Francis Jeffry Pelletier and Halima Husić (eds.), *Things and Stuff: The Semantics of the Mass/Count Distinction*, Cambridge University Press, Cambridge, 377-397

Klockmann, H. (2017) *The Design of Semi-lexicality: Evidence from Case and Agreement in the Nominal Domain,* Doctoral dissertation, Utrecht:LOT

Kouneli, M. (2019) "Plural marking on mass nouns: evidence from Greek" in Éric Mathieu, Myriam Dali, and Gita Zareikar (eds.) *Gender and Noun Classification*, Oxford Studies in Theoretical Linguistics, DOI 10.1093/oso/9780198828105.003.0011

Kouneli, M. (2020) "Number-based noun classification. The view from Kipsigis," *Natural Language and Linguistic Theory*, DOI 10.1007/s11049-020-09494-8

Kramer, R. (2015) *The Morphosyntax of Gender* Oxford University Press

Kramer, R. (2016a) "A split analysis of plurality: Number in Amharic," *Linguistic Inquiry* **47**.3:527-559

Kramer, R. (2016b) The location of gender features in the syntax, *Lang Linguist Compass*, 10, 661–677, doi: 10.1111/lnc3.12226

Kramer, R. (2020) “Grammatical Gender: A Close Look at Gender Assignment Across Languages,” *Annual Review of Linguistics* **6.1**:45-66

Kratzer, Angelika (2002). The Event Argument and the Semantics of Verbs. ms., works.bepress.com/angelika_kratzer/5/.

Krifka, M. (1990) “Four Thousand Ships Passed Through the Lock,” *Linguistics and Philosophy* **13.5**:487-520.

Križ, M. (2017) “Bare Plurals, Multiplicity, and Homogeneity,” ms IJN

Križ, M. and B. Spector (2021) “Interpreting Plural Predication: Homogeneity and Non-Maximality,” *Linguistics and Philosophy* **44.5**:1131-1178. DOI:10.1007/s10988-020-09311-w

Landau, I. (2016) “DP-internal Semantic Agreement: A Configurational Analysis,” *Natural Language and Linguistic Theory* **34.3**:975-1020. DOI 10.1007/s11049-015-9319-3

Landman, F. (2020) *Iceberg Semantics for Mass Nouns and Count Nouns: A New Framework for Boolean Semantics*, Cham: Springer

Larson, R. K. (2021) “Rethinking Cartography,” *Language* **97.2**:245-268, DOI 10.1353/lan.2021.0018

Larson, R.K. (1998) “Events and Modification in Nominals,” In: D. Strolovitch and A. Lawson (eds.) *Proceedings from Semantics and Linguistic Theory (SALT) VIII.* Cornell University, Ithaca, NY

Larson, R.K. (2002) “The Grammar of Intensionality,” in Gerhard Preyer and Georg Peter (eds). *Logical Form and Language*, Oxford: Clarendon Press, 228-262

Lasersohn, P. (2011) “Mass Nouns and Plurals,” in Claudia Maienborn, Klaus von Heusinger and Paul Portner (eds.) *Semantics: An International Handbook of Natural Language Meaning*, *Volume 2,* Berlin: de Gruyter, 1131-1153.

Lauwers, Peter (2021) “Plurality Without (Full) Countability: On Mass-Like Categories in Lexical Plurals,” in Tibor Kiss, Francis Jeffry Pelletier and Halima Husić (eds.), *Things and Stuff: The Semantics of the Mass/Count Distinction*, Cambridge University Press, Cambridge, 337-355

Laycock, H. (1972) “Some Questions of Ontology,” *Philosophical Review* **81**:3-42

Lecarme, Jacqueline (2002). Gender “polarity”: theoretical aspects of Somali nominal morphology. In Paul Boucher and Marc Plénat (eds), *Many Morphologies*. Somerville, Mass.:Cascadilla Press, 109–41.

Leffel, T. J. (2014) *The semantics of modification: adjectives, nouns, and order*. Ph.D. thesis, New York University.

Leisi, Ernst (1971) *Der Wortinhalt. Seine Struktur im Deutschen und im Englischen.* 4th ed. Heidelberg:Quelle & Meyer.

Link, G. (1983) “The Logical Analysis of Plural and Mass Terms: A Lattice-Theoretical Approach,” in R. Bäuerle, C. Schwarze and A.von Stechow (eds.), *Meaning, Use and Interpretation of Language*, Berlin: de Gruyter, 302-323. [reprinted in *Formal Semantics: The Essential Readings* Paul Portner and Barbara H. Partee (eds.) 2002, Blackwell Publishing]

Lipkind, W. (1945) *Winnebago Grammar* New York: King’s Crown Press

Loporcaro, M. (2018) *Gender from Latin to Romance. History, Geography, Typology,* Oxford University Press.

Maienborn, C. (2019) “Events and States,” in Robert Truswell (ed.) *The Oxford Handbook of Event Structure*, 50-89, DOI 10.1093/oxfordhb/9780199685318.013.6

Maienborn, C. (2020) “Revisiting Olga, the beautiful dancer: An intersective A-analysis,” in J. Rhyne, K. Lamp, N. Dreier & C. Kwon (eds.) Proceedings of SALT 30: 63-82. Ithaca NY: LSA and CLC.

Manzini, M. R. (2020) “The Morphosyntactic Structure of Number in Italian and Albanian. High and Low Plurals,” *Catalan Journal of Linguistics* **19**:127-157. DOI 10.5565/rev/catjl.319

Manzini, M. Rita, and Leonardo M. Savoia (2017) “N Morphology and its Interpretation: The Neuter in Italian and Albanian Varieties.” In Anna Bloch-Rozmej and Anna Bondaruk (eds.) *Constraints on Structure and Derivation in Syntax, Phonology and Morphology*, 213-236. Frankfurt: Peter Lang.

Marantz, A. (2013) “Locality Domains for Contextual Allomorphy across the Interfaces,” in Ora Matushansky and Alec Marantz (eds.), *Distributed Morphology Today: Morphemes for Morris Halle*. Cambridge, MA: MIT Press, 95-115

Martí, L. (2020a) Numerals and the Theory of Number. *Semantics and Pragmatics* 13(3). doi:10.3765/sp.13.3

Martí, L. (2020b) “Inclusive Plurals and the Theory of Number,” *Linguistic Inquiry* **51.1**:37-74, DOI 10.1162 / ling_a_00330

Martin, J. (2022) *Compositional routes to (non)intersectivity*. Ph.D. thesis, Harvard University.

Matthews, R.J. (2011) Measurement-Theoretic Accounts of Propositional Attitudes, *Philosophy Compass 6/11*: 828-41, 10.1111/j.1747-9991.2011.00438.x

McCawley, J. D. (1979) “Lexicography and the Count-Mass Distinction”, chapter 17 of *Adverbs, Vowels and other Objects of Wonder* by James D. McCawley, Chicago University Press, 165-73.

McGinnis-Archibald, Martha. 2016. Distributed morphology. In *The Cambridge Handbook of Morphology,* ed. Andrew Hippisley and Gregory Stump, Cambridge Handbooks in Language and Linguistics, 390–423. Cambridge: Cambridge University Press, DOI 10.1017/9781139814720.015

McKay, G. (1981). “Pronominal Person and Number Categories in Rembarrnga and Djeebbana.” *Oceanic Linguistics* 17.

McNally, L. (2016) “Modification,” in Maria Aloni and Paul Dekker (eds.) *The Cambridge Handbook of Formal Semantics*, Cambridge University Press, 442-464

Mihatsch, W. (2015) “66. Collectives,” in Peter O. Müller, Ingeborg Ohnheiser, Susan Olsen and Franz Rainer (eds) *Volume 2 Word-Formation: An International Handbook of the Languages of Europe*, Berlin, Boston: De Gruyter Mouton, 1183-1195 DOI 10.1515/9783110246278-022

Moltmann, F. (2013) “On the Distinction Between Abstract States, Concrete States, and Tropes,” in Alda Mari, Claire Beyssade & Fabio Del Prete (eds.), *Genericity.* Oxford: Oxford University Press, 292-311, DOI 10.1093/ac-prof:oso/9780199691807.003.0011

Moore, S. (1994) “Events, Objects, and Eventual Objects,” in Erin Duncan, Donka Farkas and Philip Spaelti (eds.), *The Proceedings of the Twelfth West Coast Conference on Formal Linguistics,* 577-590, Stanford, CSLI.

Moravcsik, J. M. E. (1970) “Subcategorization and Abstract Terms,” *Foundations of Language* ***6***:473-87.

Morzycki, M. (2015) *Modification* Cambridge University Press

Moskal, Beata (2015) “Limits on Allomorphy: A Case Study in Nominal Suppletion,” *Linguistic Inquiry* **46.2**:363–376. DOI 10.1162/ling_a_00185

Moskal, B & P. Smith (2016) “Towards a theory without adjacency: hyper-contextual VI-rules,” *Morphology* **26.3-4**:295-312.

Mufwene, Salikoko S. (1980). Number, countability and markedness in Lingala LI-/MA- noun class. *Linguistics* 18(11-12). 1019-1052

Musan, R. (1995) On the Temporal Interpretation of Noun Phrases, PhD dissertation, MIT, [Published in 1997 by Garland Press, New York.]

Nevins, Andrew. 2011. Marked targets vs. marked triggers and impoverishment of the dual. *Linguistic Inquiry* 42. 413–444. https://doi.org/10.1162/LING_a_00052.

Nevins, Andrew and Coelho da Silva, Mário (2020) “Maxakalí has suppletion, numerals and associatives but no plurals,” *Linguistic Variation* **20.2**:271-287, doi:10.1075/lv.00020.nev

Noyer, Robert Rolf. 1992. Features, Positions and Affixes in Autonomous Morphological Structure. Ph.D. dissertation, MIT. Revised version published by Garland, New York, 1997.

Ojeda, O. (2005) “The Paradox of Mass Plurals,” in Mufwene et al. (eds.) *Polymorphous Linguistics. Jim McCawley’s Legacy*. Cambridge, Massachusetts, MIT Press, pp. 389-410.

Ott, Dennis (2011). “Diminutive-formation in German: Spelling out the classifier analysis”, *Journal of Comparative German Linguistics* 14: 1–46. DOI 10.1007/s10828-010-9040-x

Paparounas, L. (2021) “Default by intervention: Allomorphy and locality in the Modern Greek verb,” Proc Ling Soc Amer 6(1). 499–513. DOI 10.3765/plsa.v6i1.4985.

Partee, B. H. (2021). Formal Semantics, Lexical Semantics, and Compositionality: The Puzzle of Privative Adjectives. *Philologia*, **7.1:**1–24.

Pasternak, R. (2019) “A lot of hatred and a ton of desire: intensity in the mereology of mental states,” *Linguistics and Philosophy*

Payne, J. and R. Huddleston (2002). Nouns and noun phrases. In R. Huddleston & G. K. Pullum (eds.), *The Cambridge grammar of the English language* (pp. 323–523). Cambridge: Cambridge University Press.

Quine, W.V.O. (1960) *Word and Object* MIT Press.

Raffelsiefen, R. (in press) “Morpho-phonological asymmetries in affixation,” in Peter Ackema, Sabrina Bendjaballah, Eulàlia Bonet, and Antonio Fábregas (eds*) The Wiley Blackwell Companion to Morphology*. John Wiley & Sons.

Ramchand, G. (2005) “Post-Davidsonianism,” *Theoretical Linguistics* **31**:359-373

Renans, A., J. Romoli, L. Tieu, M. Makri, H. de Vries, R. Folli and G. Tsoulas, (2018) “The Abundance Inference of Pluralised Mass Nouns is an Implicature: Evidence from Greek,” *Glossa: a Journal of Generative Linguistics*, **3(1)**:1-34, DOI 10.5334/gjgl.531

Rett, J. (2007) "How *many* Maximizes in the Balkan Sprachbund," in Masayuki Gibson and Jonathan Howell (eds.), *Proceedings of Semantics and Linguistic Theory 16*. CLC Publications, Cornell University, Ithaca, New York, pp. 190-227

Rett, Jessica. 2014. The polysemy of measurement. Lingua 143.242–66. DOI: 10.1016/j.lingua.2014.02.001.

Rett, J. (2018) "The Semantics of *many, much, few,* and *little*," *Language & Linguistics Compass*, **12.1**:1-18

Ritter, Elizabeth 1995. On the syntactic category of pronouns and agreement. *Natural Language and Linguistic Theory* **13**:403–43.

Rothstein, S. (2004) *Structuring Events: A Study in the Semantics of Lexical Aspect*, Blackwell Publishing, Malden MA and Oxford

Rothstein, S. (2010) "Counting and the Mass/Count Distinction," *Journal of Semantics* **27.3**:343-397

Rothstein, S. (2017) *Semantics for Counting and Measuring* Cambridge: Cambridge University Press.

Sasaki, K. and D. Altshuler (2022) "Clause-internal coherence: A look at deverbal adjectives," paper presented at Sinn und Bedeutung 27, sub27.ff.cuni.cz

Sauerland, U. (2003) A New Semantics for Number," in Rob Young & Yuping Zou (eds.), *Proceedings of SALT 13*, 258-275 Salt 13, Cornell University, CLC-Publications, Ithaca, N.Y.

Sauerland, U. (2008) "On the semantic markedness of phi-features," in Daniel Harbour, David Adger, and Susana Béjar, (eds.) *Phi Theory: Phi-Features across Modules and Interfaces*, 57–82, Oxford: Oxford University Press

Scha, R. J. H. (1981) "Distributive, Collective and Cumulative Quantification," in Jeroen Groenendijk, Martin Stokhof, & Theo M. V. Janssen (eds.), *Formal Methods in the Study of Language*, Mathematisch Centrum, Amsterdam, reprinted in Groenendijk et al. (eds), *Truth, Interpretation and Information*, Foris Publications, Dordrecht (1984).

Schein, B. (2017) *'And' Conjunction Reduction Redux,* Cambridge: MIT Press.

Schlechtweg, M. and G.G. Corbett (2021) "The duration of word-final s in English: A comparison of regular-plural and pluralia-tantum nouns," *Morphology* 31, 383–407 DOI 10.1007/s11525-021-09381-x

Scontras, G. (2021). Measure phrases. In D. Gutzmann, L. Matthewson, C. Meier, H. Rullmann, & T. E. Zimmermann (Eds.), *The Wiley Blackwell companion to semantics*. New York: Wiley.

Scontras, G. (2014). *The semantics of measurement*. Ph.D. thesis, Harvard University.

Scontras, G. and N.D. Goodman (2017) "Resolving Uncertainty in Plural Predication," *Cognition* **168**:294–311

Sharifian, F. and A.R. Lotfi (2003) "'Rices' and 'Waters': The Mass-Count Distinction in Modern Persian," *Anthropological Linguistics* **45.2**:226-244.

Sharvy, R. (1980) "A More General Theory of Definite Description," *Philosophical Review* **89.4**:607-624.

Sider, T. (2008) "Temporal Parts" in Theodore Sider, John Hawthorne, and Dean W. Zimmerman (eds.) *Contemporary Debates in Metaphysics* (*Contemporary Debates in Philosophy*), Malden, Mass.: Basil Blackwell.

Siegel, M. E. A. (1977) "Measure Adjectives in Montague Grammar", in Steven Davis

and Mariane Mithun (eds.,) *Linguistics, Philosophy, and Montague Grammar*: 223-262, University of Texas Press, Austin.

Smith, P.W. (2016) "Count-mass nouns, inherent number and the unmasking of an imposter," in Ross Burkholder, Carlos Cisneros, Emily R. Coppess, Julian Grove, Emily A. Hanink, Hilary McMahan, Cherry Meyer, Natalia Pavlou, Özge Sarıgül, Adam Roth Singerman and Anqi Zhang (eds.) *Proceedings of the 50th Annual Meeting of the Chicago Linguistics Society* 427-439

Smith, Peter W. (2017) "The syntax of semantic agreement in English," *Journal of Linguistics*, **53.4**:823-863. DOI:10.1017/S0022226716000360

Solt, Stephanie. (2009) The Semantics of Adjectives of Quantity. Ph.D. dissertation, City University of New York.

Solt, S. (2015) "Q-Adjectives and the Semantics of Quantity," *Journal of Semantics* **32.2**:221-273

Solt, S. (2018). Proportional comparatives and relative scales. In R. Truswell, C. Cummins, C. Heycock, B. Rabern, & H. Rohde (Eds.), *Proceedings of Sinn und Bedeutung*, (Vol. 21, pp. 1123–1140).

Sproat, Richard and Shih, Chilin (1987) "Prenominal Adjectival Ordering in English and Mandarin," North East Linguistics Society: Vol. 18 : Iss. 3 , Article 12, scholarworks.umass.edu/nels/vol18/iss3/12

Svenonius, Peter. 2019. "Syntactic Features," *Oxford Research Encyclopedia of Linguistics.* DOI /10.1093/acrefore/9780199384655.013.179

Syrett, K. (2015). Mapping properties to individuals in language acquisition. In Elizabeth Grillo and Kyle Jepson (Eds.), *Proceedings of the 39th Annual Boston University Conference on Language Development,* Somerville, MA: Cascadilla Press. 398-410

Talić, Aida (2017) "Long-Form and Short-Form Prenominal Adjectives are not Reduced Relative Clauses in Bosnian/Croatian/Serbian," *Linguistic Inquiry* **48.1**:194-212.

Tonhauser, J. (2021) "Temporal Properties of Noun Phrases," in Daniel Gutzmann, Lisa Matthewson, Cécile Meier, Hotze Rullmann and Thomas E. Zimmermann (eds) *The Wiley Blackwell Companion to Semantics*. Oxford: Wiley.

Trommer, J. (2012) "∅ Exponence," Chapter 9 in Jochen Trommer (ed.) *The Morphology and Phonology of Exponence* Oxford University Press, 326-354

Traugott, E.C. (2006) "Semantic Change: Bleaching, Strengthening, Narrowing, Extension," in Keith Brown (eds.) *Encyclopedia of Language and Linguistics, 2nd edition*, Boston: Elsevier, 124-131 DOI 10.1016/B0-08-044854-2/01105-6

Truswell, R. (2009) "Attributive Adjectives and Nominal Templates," *Linguistic Inquiry* **40**:525–533. DOI10.1162/ling.2009.40.3.525.

Tsiakmakis, Evripidis, Joan Borràs-Comes and M.Teresa Espinal (2021) "The interpretation of plural mass nouns in Greek," *Journal of Pragmatics* **181**:209-226

Tsoulas, G. (2006) "Plurality of Mass Nouns and the Grammar of Number," *29th GLOW Colloquium,* Universitat Autònoma de Barcelona, April 6 - 8 2006 (handout)

Tsoulas, George (2009). 'On the grammar of number and mass terms in Greek', in C. Halpern, J. Hartman, and D. Hill (eds.), MIT working papers in linguistics, Volume 57: 333-348.

Vicente, A. and I. Falkum 2017. 'Polysemy,' in *Oxford Research Encyclopedia of Linguistics*, DOI 10.1093/acrefore/9780199384655.013.325.

Viebahn, E. (2013) "Counting Stages," *Australasian Journal of Philosophy* **91.2**:311-324
von Fintel, K. (1999) "Class Notes on Adjectives," unpublished ms. MIT
Wągiel, M. (2015) "Counting Minimal Groups: Towards a Unified Semantics for the Polish Measure Word *para*," *Grazer Linguistische Studien* **83**:169–177.
Wągiel, M. (2017) "Pairs of Things and the Meaning of the Plural," in Wiktor Pskit (ed.) *Topics in Syntax and Semantics*: *Linguistic and Philosophical Perspectives*. Łódź: Wydawnictwo Uniwersytetu Łódzkiego, 111-128
Wechsler, Stephen. 2011. Mixed agreement, the person feature and the index/concord distinction. *Natural Language and Linguistic Theory* 29: 999–1031.
Wechsler, Stephen 2015. 'The syntactic role of agreement.' In Tibor Kiss and Artemis Alexiadou (Eds.): Syntax – Theory and Analysis. An International Handbook. Volume 1. 309-342. Berlin: Mouton de Gruyter
Wechsler, S. and H.-J. Hahm 2011. "Polite plurals and adjective agreement." *Morphology* **21**:247–281 10.1007/s11525-010-9168-z
Wehbe, J. (2022) "Against the lexical view of cumulative inferences and homogeneity," paper presented at Sinn und Bedeutung 27, sub27.ff.cuni.cz
Wellwood, A. (2014). *Measuring Predicates*, University of Maryland Phd.
Wellwood, A. (2019). *The Meaning of More*. Oxford, UK: Oxford University Press.
Werner, Heinrich (1997) *Die Ketische Sprache*. Harrassowitz Verlag.
Wiese, H. (2012) "Collectives in the intersection of mass and count nouns: A cross-linguistic account," in Diane Massam (ed.) *Count and Mass Across Languages*. Oxford University Press, Oxford, pp. 54-74.
Williams, A. (2015) *Arguments in Syntax and Semantics*, Cambridge University Press
Wilson, E Cameron. 2018. *Amount superlatives and measure phrases*: City University of New York dissertation.
Wiltschko, M. (2006) "Why should diminutives count?" in: Broekhuis, H., N. Corver, R. Huijbregts, U. Kleinhenz & J. Koster (eds.) *Organizing Grammar. Linguistic Studies in Honor of Henk van Riemsdijk*. Berlin: Walter de Gruyter: 669-679.
Wiltschko, M. (2008) "The Syntax of Non-Inflectional Plural Marking," *Natural Language and Linguistic Theory* **26**:639-694 DOI 10.1007/s11049-008-9046-0
Wiltschko, M. (2021) "The Syntax of Number Markers," in Patricia Cabredo Hofherr and Jenny Doetjes (eds.), *The Oxford Handbook of Grammatical Number*, Oxford University Press, 164-196, DOI 10.1093/oxfordhb/9780198795858.013.8
Wiltschko, M. and O. Steriopolo 2007. "Parameters of variation in the syntax of diminutives" In: Milica Radisic (ed.) *Proceedings of the 2007 Canadian Linguistics Association Annual Conference*
Winter, Y. and R. Scha (2015). Plurals. In Shalom Lappin & Chris Fox (eds.), The handbook of contemporary semantic theory, 2nd ed. (pp. 77-113). Malden, MA, Oxford, and Chichester: Wiley.
Wierzbicka, A. (1988) *The Semantics of Grammar* (Studies in Language Companion Series 18), Benjamins, Amsterdam.
Wisniewski, E.J. (2010) "On Using Count Nouns, Mass Nouns, and Pluralia tantum: What Counts?" in Francis Jeffry Pelletier (ed.) *Kinds, Things and Stuff*: *Mass Terms and Generics* (New Directions in Cognitive Science), Oxford University Press,166-190
Wood, J. (2021) "Icelandic nominalizations and allosemy," ms. available on lingbuzz

Zhang, N. N. (2012) “Countability and numeral classifiers in Mandarin Chinese,” in Diane Massam (ed.) *Count and Mass Across Languages*. Oxford University Press, Oxford, 220-237, DOI 10.1093/acprof:oso/9780199654277.003.0010

Zobel, Sarah. 2017. The sensitivity of natural language to the distinction between class nouns and role nouns. In Dan Burgdorf, Jacob Collard, Sireemas Maspong & Brynhildur Stefansdottir (eds.), *Semantics and Linguistic Theory (SALT)*, vol. 27, 438–458. Ithaca, NY: CLC. doi: 10.3765/salt.v27i0.4182.