

# Mass-Count Shifts: Exoskeletal Syntax, Iceberg Semantics, and Beyond

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## 1 Introduction

An intuitive approach to the mass/count distinction is to treat it as the grammatical counterpart to the human conceptual categories of substances and objects. These categories are prelinguistic and facilitate word learning in young children (Soja et al., 1991); conversely, children who have mastered the grammatical mass/count distinction use it in order to decide whether a new word refers to an object or a substance (Gordon, 1985; Bloom, 1990).

Theories of the Mass/Count distinction abound and broadly speaking we can think of them as falling within the lexical or syntactic family.

### 1.1 Aims of this paper

The present paper has two goals.

- (1) First, we will offer a new way of analysing the syntax and semantics of the mass/count distinction by synthesising the constructionist framework originating in Borer (2005) with the ‘iceberg semantics’ proposed in Landman (2011, 2016). We believe this synthesis has several conceptual and empirical advantages over existing frameworks. It combines the flexibility and morphosyntax-driven nature of constructionism with an explicit role for human conceptual categories such as INDIVIDUAL, SUBSTANCE and EVENT. It allows us to distinguish between different kinds of mass/count shifts and explains why some of them are harder than others. Furthermore, it clarifies the distinction between stuff reference, number neutrality and countability, three distinct (although interdependent) nominal properties that are often explicitly or implicitly conflated in existing accounts of the mass/count distinction.

- (2) The second aim of the paper is to explore the notion of *portioning-out*, and the various ways it might be active in languages to create NPs and interpretations that do not fully fit into the mass/count dichotomy (neither according to existing lexical approaches, nor to constructionist ones). Among other things, we will provide an analysis of pluralised mass nouns in languages like Greek in terms of ‘mass portions’: a portioned-out denotation that retains its mass properties. In the process, we will argue that the core meaning of the plural, that licenses the use of the plural morpheme, is always the semantic pluralisation operator \*.

## 2 Mass/count: some desiderata

- (3) a. Flexibility  
b. Morphology  
c. Countability

### 2.1 Flexibility: Packaging, grinding and sorting

As is well known, in the right context, a core mass noun can be turned into a count noun with an object-denoting interpretation, and vice versa (Pelletier, 1975; Bunt, 1985, and many others).

- (4) a. Three coffees, please. (‘packaging’)  
b. We offer three white wines. (‘sorting’)  
c. After the truck drove into my Halloween display, there was pumpkin all over the road. (‘grinding’)

In a lexical approach to the mass/count distinction, there are two different ways of dealing with such data. The first is based on polysemy or lexical reanalysis;

On the other hand, the constructionist approach to the mass/count distinction originating in Borer (2005) acknowledges neither lexical reanalysis nor semantic typeshifting; instead, all the mass/count shifts in (4) are treated as morphosyntactic derivations. In addition, the count meanings are always derived from the mass meaning, regardless of which meaning is typical.

The different approaches make different predictions. If mass/count shifts involve some kind of reanalysis, they should come with the associated processing cost; for example, processing sentence (4-b) should be more costly than processing sentence (4-a) since the latter, but not the former, involves a change from a standard denotation to a nonstandard one. Moreover, grinding, packaging and sorting are all expected to be equally costly, since they all involve the computation of a non-standard denotation for the noun.

- (5) a. Academics prefer coffee over tea.  
b. Termites prefer chair over table.

On the other hand, if (5-a) and (5-b) involve exactly the same derivation and no lexical reanalysis, they should be equally easy to process. Furthermore, on a constructionist account, packaging and sorting are predicted to be associated with the same processing cost (since they are equally complex syntactically) and the same morphosyntactic profile.

However, the available evidence - though occasionally conflicting - seems to support a hybrid model, in which mass/count shifts differ in their availability and degree of complexity, sometimes involving reanalysis and sometimes syntactic derivation. In particular, the evidence supports (1) an asymmetry between packaging and sorting, and (2) an asymmetry between packaging and grinding.

An eyetracking study of English by Frisson & Frazier (2005) seems to support the lexicalist prediction: they found that sentences involving packaged and ground interpretations of core mass and count nouns, respectively, was harder than processing sentences in which these nouns were used in a typical way.

Based on morphosyntactic evidence from different Germanic languages, Wiese & Maling (2005) argue that sorting always involves lexical reanalysis, as does packaging in English; however, other languages may employ different packaging strategies. In particular, they claim that packaging involves a covert classifier structure rather than reanalysis in languages like Icelandic and German.

- (6) a. Get *ég fengið anna.n kaffi?*  
 May I have another.MASC coffee-NEUT  
 ‘Could I have another (cup of) coffee?’ (Icelandic)
- b. Get *ég fengið anna.ð kaffi?*  
 May I have another.NEUT coffee-NEUT  
 ‘Could I have another (kind of) coffee?’

In (6-a), the determiner *annan* is masculine while *coffee* is neuter; Wiese & Maling argue that *annan* agrees with a covert masculine classifier *bolli* ‘cup’ which is the true head of the sentence. However, the seemingly parallel sorting shift in (6-b) does not appear to involve a covert classifier: the obvious candidates for such a classifier are all feminine nouns, yet the determiner agrees with the neuter *kaffi*. They conclude that sorting does not involve any covert syntactic material, but reanalysis of the noun into a predicate over subkinds. In an ERP study of Icelandic, Whelpton et al. (2014) partially confirm Wiese & Maling’s conclusions: while sentences like (6-a) show the processing profile associated with a head noun reanalysis (that is, a P600 effect), sorting shifts do not. However, sorting shifts also failed to show the expected N400 effect associated with lexical reanalysis. Whelpton et al. note that this finding is consistent with a constructionist approach in which lexical items are underspecified with regard to their count or mass status, but also note that such a conclusion seems to conflict with the findings of Frisson & Frazier (2005).

The asymmetry between sorting and packaging is also partially seen in English:

- (7) a. I take five sugars in my coffee.  
 b. ??I just built a tower out of sugars.

While the use of *sugars* in (7-a) is very natural, and interpreted as ‘units of sugar’ or ‘sugar cubes’, the same interpretation is much harder to access outside of a food context (e.g., (7-b)). Similarly, (8-a) is decidedly unnatural, in contrast to the much more acceptable subkind interpretation in (8-b):

- (8) (Speaker walks into a garage)
- a. ??I need two engine oils: a small one and a large one.
  - b. I need two oils: hydraulic oil and engine oil.

Even within food contexts, unit interpretations of mass nouns take on a meaning that seems to be much more specific than the ‘standard unit of X’ paraphrase that is often suggested; thus, neither (9-b) nor (9-c) is quite accurate in the given context, even though the paraphrase in (9-a) is. Instead, (9-b) and (9-c) seem to convey that Jess was served a certain number of units of wine in the same number of appropriate (and appropriately sized) containers. In other words, packaging is not just about dividing stuff into portions of a certain size; it also incorporates the packaging ‘material’ into the meaning of the resulting noun. In English this incorporation of the packaging appears to involve lexical reanalysis while in Icelandic it involves a covert container noun, but the idea is the same.

- (9) Context: Jess has drunk a beer glass full of wine, which corresponds to two standard units of wine.
- a. Jess has drunk two units of wine. ✓
  - b. Jess has drunk one wine. ×
  - c. Jess has drunk two wines. ×

In Dutch (as well as in German, cf. Wiese & Maling 2005), the asymmetry between sorting and packaging is also reflected morphosyntactically. While sorting behaves as in English (i.e., the addition of any kind of count morphosyntax to a core mass noun turns it into a predicate over subkinds), packaging is limited to restaurant contexts and requires either a diminutive suffix or a dedicated morphosyntactic construction that appears to involve a covert classifier

What about nouns that show more natural flexibility between stuff and object interpretations, such as *touw* ‘rope’, *steen* ‘stone’ and *brood* ‘bread’? While unit interpretations of such nouns behave like ordinary count nouns in every respect (i.e., they accept the full range of count morphosyntax and are not limited to particular contexts), there is some evidence that they are not derived from the mass uses in the same way that sorted interpretations are. Dutch has two grammatical genders, common and neuter. As (10) shows, sorting never changes the gender of a noun; however, it is not unusual for nouns that alternate between mass and count to have a different gender in each incarnation (11):

- (10) a. Jo drinkt graag lekker.∅ bier.  
 Jo drinks eagerly tasty.NEUT beer  
 ‘Jo likes to drink tasty beer.’

- b. Jo drinkt graag een lekker.∅ bier.  
 Jo drinks eagerly a tasty.NEUT beer  
 ‘Jo likes to drink a tasty beer.’ (subkind only)
- c. Jan drinkt graag lekker.e wijn.  
 Jan drinks eagerly tasty.COMM wine  
 ‘Jan likes to drink tasty wine.’
- d. Jan drinkt graag een lekker.e wijn.  
 Jan drinks eagerly a tasty.COMM wine  
 ‘Jan likes to drink a tasty wine.’ (subkind only)
- (11) a. Het draad  
 the-NEUT thread  
 ‘the thread’ (mass)
- b. De draad  
 the-COMM thread  
 ‘the thread (count)’
- c. Het kiezel  
 the-NEUT shingle  
 ‘the shingle/gravel’
- d. De kiezel  
 the-COMM pebble  
 ‘the pebble’

Regardless of whether we take a lexicalist or constructionist view of gender, this type of data point towards an asymmetry between sorting and packaging that is predicted by neither view. Moreover, it suggests (contra the constructionist view) that there is a derivational difference between count interpretations of inherently flexible nouns, and count interpretations of core mass nouns.

Grinding (i.e., the use of core count nouns in mass DPs), in English as well as Dutch, seems to pattern with sorting rather than with packaging. It is not limited to restaurant contexts or foodstuffs, and is not associated with any special morphosyntax in Dutch.

- (12) a. This song needs more cowbell!  
 b. Jan and Jo are fighting over three inches of shelf again.  
 c. My upstairs neighbour threw a party yesterday, hence the bits of ceiling all over the floor.  
 d. Upon opening the door, I was jumped by 90 pounds of excited dog.

In short, unlike stuff interpretations of inherently flexible nouns, grinding has a derivational flavour; the meaning of the mass DP is determined relative to the noun’s object interpretation, which itself continues to be present in the background. In line with this, mass and count uses of core count nouns in Dutch always have the same gender:

- (13)
- a. Al die ruzie om een schamel.e boekenplank!  
all that fight over a mere.COMM book-shelf  
'All that fighting over a mere bookshelf!'
  - b. Al die ruzie om een paar centimeter schamel.e boekenplank!  
all that fight over a few centimeters mere.COMM bookshelf  
'All that fighting over a few centimeters of mere boobookshelf!'
  - c. Tijdens het feestje van mijn bovenbuurman is helaas een behoorlijke  
during the party of my upstairs-neighbour is sadly a considerable  
hoeveelheid monumentaal.∅ plafond op mijn vloer beland.  
quantity monumental.NEUT ceiling on my floor ended-up  
'During my upstairs neighbour's party, a considerable quantity of monumental  
ceiling has sadly ended up on my floor.'
  - d. De kamer heeft een prachtig.∅ monumentaal.∅ plafond.  
the room has a gorgeous.NEUT monumental.NEUT ceiling  
'The room has a gorgeous monumental ceiling.'

Let's sum up the various asymmetries between different types of mass/count shifts that we have covered in this section.

(14)

Type	Context	Morphosyntax	Semantics
Sorting, Grinding	Context-independent	Regular morphosyntax; preserves gender in Dutch	Predictable meaning ('kind of X', 'X-stuff')
Inherently flexible nouns	Context-independent	Regular morphosyntax mass/count may have different genders in Dutch	Predictable meaning ('X-stuff' / 'piece of X-stuff')
Packaging	Licensed in context	Irregular morphosyntax in Icelandic, Dutch, German	Unpredictable meaning ('X-stuff + specific container')

Taken together, these data suggest that sorting of core mass nouns and grinding of core count nouns are morphosyntactic derivations involving the same lexical items, while packaging of core mass nouns involves either lexical reanalysis or additional (covert) lexical material. In addition, inherently flexible nouns really seem to form a separate class from 'core' mass/count nouns: the Dutch gender data suggest that they either involve distinct lexical entries, or derivations that diverge at a point much closer to the lexical root (before gender is assigned).

### 2.1.1 Towards a non-atomic account: overlap and disjointness

Not all lexicalist approaches to the mass/count distinction rely on an ontological or type distinction between mass and count denotations. An alternative approach, most recently

advocated in a series of talks and papers by Fred Landman and some associates (Landman, 2011, 2016; Khrizman et al., 2015; Sutton & Filip, 2016, e.g), is to treat the distinction in terms of overlap versus disjointness.

## 2.2 Countability and morphology

Iceberg semantics shares a few shortcomings with its fellow lexicalist accounts. First, a core assumption of Iceberg semantics (which we will examine in more formal detail in section 3) is that a predicate's overlap properties can only be changed by intersecting it with other lexical material - a classifier, a measure, anything that itself denotes a set of sums. Because this is based on intersection, a change in countability always goes hand in hand with reference to a subset of the original predicate. However, examples like (15) suggest that countability properties may be directly manipulated by functional morphology, without any intersective modification:

- (15) Het ge.dier.te  
the GE.animal.TE  
'the animal(s), the fauna' (Dutch)

In (15), a perfectly prototypical count noun (*dier* 'animal') is turned into an uncountable number neutral predicate by morphological derivation.

## 2.3 Countability and number neutrality

The second bit of evidence that supports a move towards a more constructionist framework also has to do with the nominal properties of countability and number neutrality. Countability affects the ability of a noun to appear directly with numerals and count quantifiers like *each* or *several*. Number neutrality refers to the inclusion of plural as well as singular individuals, or, more generally, closure under sum. Mass nouns like *sand* are uncountable (*\*each sand*) and number neutral: all possible quantities of sand from individual grains to the sum of all the world's sand can be referred to as *sand*. English uninflected count nouns like *cat* are countable but not number neutral: we can say *one cat* or *each cat*, but the sum of my six cats cannot be referred to as *my cat*. Their plural counterparts are also countable (*six cats*); in addition, it is generally agreed in the literature that English plurals like *cats* include singular cats as well as cat-sums in their extension and are therefore number neutral (e.g. Sauerland et al., 2005, among others)). In many languages, such as Hungarian (Farkas & de Swart, 2010), Indonesian (Sneddon, 1996; Chung, 2000), Turkish (Corbett, 2000, p14), and Western Armenian (Bale & Khanjian, 2008), uninflected count nouns are number neutral (but may still be pluralised); English itself has a small class of countable number neutral nouns such as *staff* and *police* (*each staff*, *several police*). In pure classifier languages like Mandarin, all nouns are uncountable number neutral.

- (16) Bezdig vase.ts  
child run.PAST(3, SG)

‘One or more children ran.’

(Western Armenian)

As these examples show, crosslinguistically, uninflected countable predicates may or may not be number neutral. However, the reverse does not hold: there seems to be no language in which uninflected predicates are uncountable but not closed under sum. Thus, no language refers to cats or water with a predicate *tac* or *retaw* such that (17-a-b) are ungrammatical and (17-c) is true:

- (17) a. \*one *tac*, \*each *retaw*  
b. (Pointing to my six cats) \*Look, my *tac*!  
c. The contents of glass 1 are *retaw*. The contents of glass 2 are *retaw*. The contents of Glass 1 and 2 put together is not *retaw*.

In Iceberg semantics, countability and number neutrality are independent: disjoint predicates may be singular or closed under sum, and number neutral predicates may be disjoint or overlapping. Nothing blocks the availability of uncountable predicates that are not closed under sum, either

### 3 ‘Exoskeletal Iceberg Semantics’

#### 3.1 Iceberg Semantics

In Iceberg Semantics, nouns and NPs denote *i-sets* (iceberg sets): a pair  $\langle \mathbf{body}, \mathbf{base} \rangle$  where both **body** and **base** are sets of mereological sums, and **base** *generates* **body** under Boolean join:

- (18) A set of sums  $X$  *generates* a set of sums  $Y$  under  $\sqcup$  iff  $Y \subseteq *X$  and  $\sqcup(X) = \sqcup(Y)$   
(19) a.  $cat \rightarrow \langle \text{CAT}, \text{CAT} \rangle$  (count: CAT is disjoint)  
 $cats \rightarrow \langle *CAT, \text{CAT} \rangle$  (plural count: CAT is disjoint)  
b.  $water \rightarrow \langle \text{WATER}, \text{WATER} \rangle$  (mess mass: WATER overlaps)  
(20)  $furniture \rightarrow \langle *MEUBEL, *MEUBEL \rangle$  (neat mass: \*MEUBEL overlaps, but MEUBEL is disjoint)

Semantic operations such as pluralisation, measuring (*kilo of rice*) and classifiers (*glass of wine*) are defined as operations on the body. In the case of measure and classifier constructions, which are complex NPs involving multiple nouns, the base is affected indirectly, through a mechanism known as the Head Principle:

- (21) Head Principle for complex NPs:  
 $\mathbf{base}(C) = (\mathbf{body}(C) \cap \mathbf{base}(H))$   
(where  $\mathbf{body}(C)$  is the set of all Boolean parts of  $\mathbf{body}(C)$ )

The Head Principle determines whether a complex NP is interpreted as mass or count. Since complex NPs inherit the base from the head noun following (21), the head also

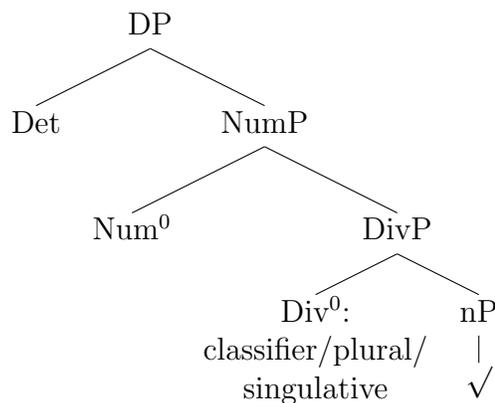
determines whether the complex NP is count or mass: if the head of a complex NP has a disjoint base, the NP will be countable, but if the head has an overlapping base, the NP will be mass.

Iceberg Semantics and the Head Principle make it possible to analyse the denotation of a complex count NP such as *portion of soup* or *piece of cheese* in a way that accounts for both their countable nature and the fact that they nevertheless refer to ‘stuff’: a portion of soup is soup, and a piece of cheese is cheese (Khrizman et al., 2015; Landman, 2016). Similarly (as we will see), we can exploit the Head Principle in order to account for the interpretation of NPs that looks morphologically count on the surface (*lots of soup*) but nonetheless lack countability (*\*three lots of soup*).

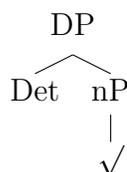
### 3.2 Towards a constructionist Iceberg semantics

The core idea behind Landman’s analysis - that the mass/count difference is about “different perspectives on the same stuff” is quite similar to the way the distinction is treated by Borer (2005). As we briefly discussed, Borer assumes that both count and mass DPs are derived from classless ‘lexemes’ (usually called ‘roots’ in later work). The difference is that count DPs involve a dividing projection DivP, while mass DPs are undivided ‘stuff’. This dividing function can be performed by classifiers, but also by the plural; evidence comes from the fact that classifiers and plural are mostly in complementary distribution, both across languages and within the rare languages that have both (e.g. Western Armenian).

(22) a. Count DP:



b. Mass DP:



#### 3.2.1 The meaning of roots

One of the key assumptions of constructionist frameworks, like Borer’s exoskeletal syntax or the similar framework of Distributed Morphology, is that lexical material does not have an inherent word class. Instead, the categories of noun, verb and adjective are assigned

in syntax by a functional head. On the semantic side, we may similarly wonder whether roots have an inherent ontological class or whether these are also assigned in syntax. In the former view, a root would be lexically specified as a predicate over a particular kind of entity: individuals or physical substances, events, degrees, qualities, possible worlds, tropes or whatever ontological categories we would like to assume.

One of the points of assuming that roots are classless is the separation of conceptual and grammatical knowledge; since events, degrees, individuals and so forth are part of the ontology of language and as such linguistic concepts, relegating them to the grammar along with other functional material seems an obvious next step. In doing so, we increase the referential possibilities of the root, leaving open the possibility that the individual meaning of *exam* (for example) is contained within the root  $\sqrt{\text{EXAM}}$  and directly accessible from the beginning, just like the event meaning is. This seems particularly appropriate for roots for which it is unclear which ontological class is ‘basic’. For example, is *paint* the stuff one paints with, or the thing one does with paint? Is *waste* the things that we waste, or is it the act of making waste out of something? Assuming it is, say, the latter, is there a point during language acquisition where a child actively has to throw out all the individuals from its mental representation of the root *waste* and recalculate the whole thing as a predicate over events and nothing else?

Consider also a word like *trumpet*, which might refer to a musical instrument (an individual), a particular sound (abstract ‘stuff’), or the act of bringing forth such a sound (an event). Intuitively, what these meanings have in common is the musical instrument, so we might assume that the root  $\sqrt{\text{TRUMPET}}$  is a predicate over individuals and all the other denotations are derived in syntax. For example, the trumpeting events might be derived by means of a  $v^0$  head that means something like  $\lambda x \lambda e [e \text{ is an event in which an } x \text{ is put to its typical use}]$  (cf. *to bin, to spear, to clock, to Netflix...*). But this cannot be right, since elephants trumpet without the involvement of an actual trumpet, and would be able to do so even if trumpets ceased to exist in all worlds. So in computing a syntax and semantics for the sentence “Dumbo trumpeted”, any derivation that requires the existence of some nonempty set of trumpet-individuals (in any world) would give us the wrong truth conditions. But then, there must necessarily be more to the denotation of  $\sqrt{\text{TRUMPET}}$  than the set of trumpet-individuals. The obvious way of modelling that is allowing both individuals and events to be encoded as part of the root meaning.

We will model the semantics of roots as *root concepts*: sets of mereologies. For example, the root  $\sqrt{\text{TRUMPET}}$  is associated with a ‘physical’ mereology of trumpet parts and sums, but also with an event mereology of trumpeting events and subevents, a more abstract mereology of trumpet sound, and whatever other ontological domains the word *trumpet* may draw its possible meanings from. A root concept represents conceptual knowledge; it is not yet a grammatical object. We will assume it is the job of the grammar to turn root concepts into predicates; not just by providing it with a ‘lexical’ category (adjective, noun or verb), but also by providing it with an ontological one. We will furthermore assume that syntactic and semantic categorising are independent, since nouns do not necessarily range over individuals, events are not necessarily expressed by verbs, and so on.

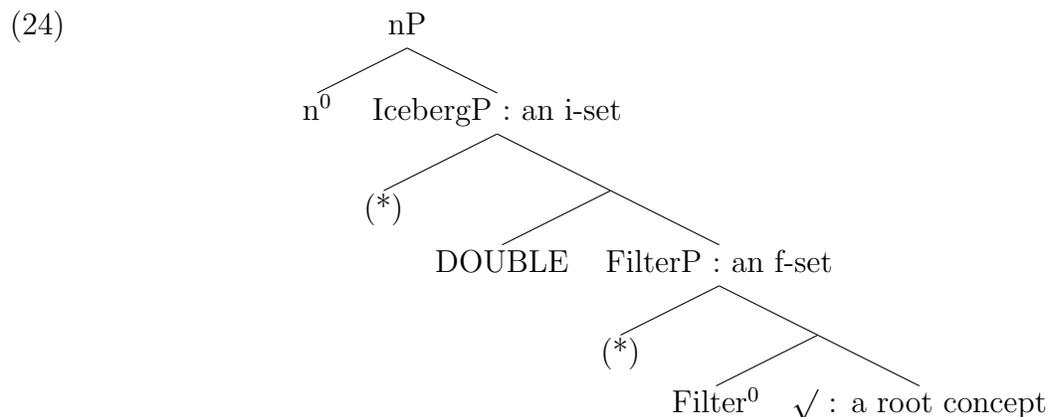
### 3.2.2 The Filter Phrase

We propose that roots are assigned an ontological category - along with particular countability properties - as part of a syntactic derivation we will call Filter Phrase. The head of FilterP contains an intersective filtering operation, which takes a root as its complement and turns it into a grammatical object by selecting from the root concept only those sums that match a criterion imposed by the *filter head*. In the physical domain - on which we will focus here - the available filter heads are INDIVIDUAL and SUBSTANCE:

- (23) a. INDIVIDUAL:  $\lambda C \lambda x [C(x) \wedge \text{INDIVIDUAL}(x)]$ .  
 b. SUBSTANCE:  $\lambda C \lambda x [C(x) \wedge \text{SUBSTANCE}(x)]$ .

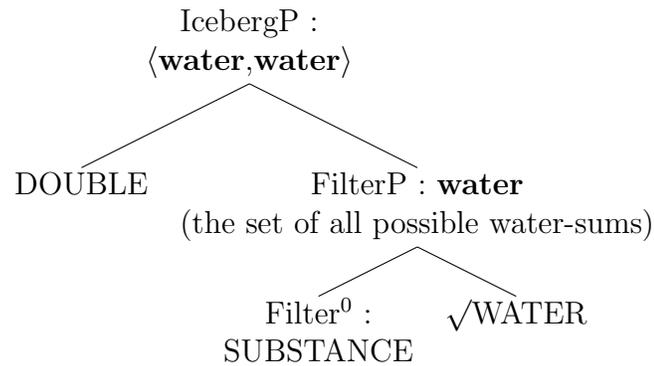
These two filter heads represent our main innate cognitive perspectives on the physical world, as evidenced from the acquisition research in e.g. Soja et al. (1991). INDIVIDUAL returns all the Boolean sums that embody the root concept and also meet our requirements for what it means to be individuated; for example, INDIVIDUAL( $\sqrt{\text{STONE}}$ ) is the set of all stone-sums that qualify as individuals. SUBSTANCE returns all the Boolean sums that embody the root concept and also meet our requirements for ‘physical stuff’. For example, SUBSTANCE( $\sqrt{\text{STONE}}$ ) is the set of all stone-sums, whether they correspond to an individuated stone or not.

We will call the set that results from applying a filter to a root an *f-set* (filter set). Note that f-sets derived with SUBSTANCE are inherently closed under sum, while f-sets derived with INDIVIDUAL are semantically singular. Depending on the language, a singular f-set may be closed under sum with \*; we will assume that classifier languages do this covertly and by default, while singular/plural languages may do so optionally, and will generally spell this out overtly. Pluralising an f-set creates, by definition, an overlapping set, and therefore an uncountable predicate.



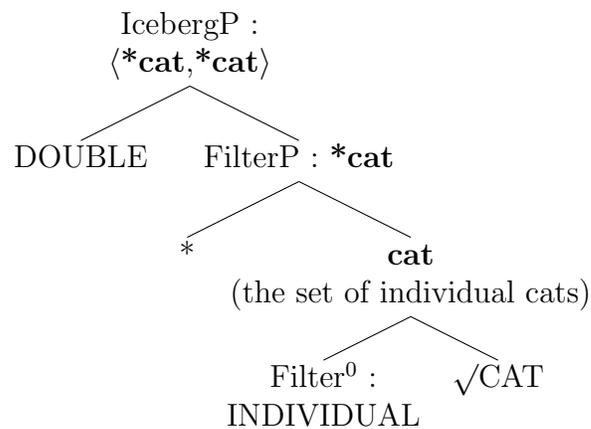
The present framework derives one type of substance predicate and three types of individual predicate: exactly the basic predicates that are crosslinguistically attested. (25) shows the semantic derivation of a core mass nP like *water*, which we will assume is universal.

(25)

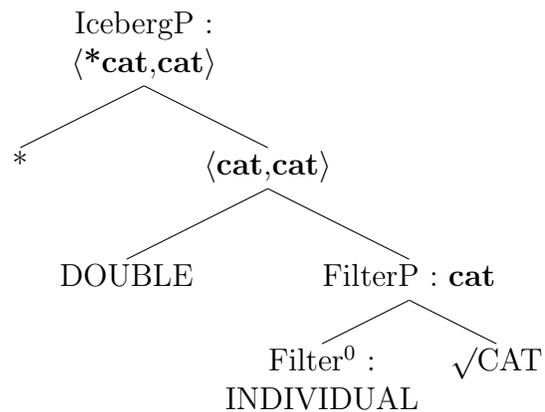


The three attested types of individual-denoting predicate are illustrated below:

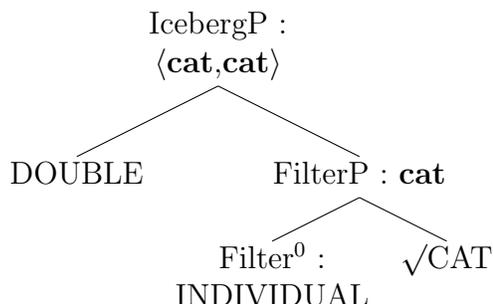
(26) a. Uncountable number neutral object reference (e.g. Mandarin)



b. Countable number neutral object reference (e.g. Hungarian, Indonesian, Western Armenian)



- c. Countable singular object reference (e.g. Dutch, English)



## 4 Back to our desiderata; conclusions

### 4.1 Flexibility

Implementation-wise, the present account is fully constructional; following Borer, there is no structural difference between ‘mass roots’ and ‘count roots’.

However, even though the distinction between objects and stuff is not built into the lexical roots themselves, it plays a large role in the filtering process. We cannot define a filter head such as INDIVIDUAL, which takes a root concept and returns the set of objects embodying that concept, without some kind of notion of what constitutes an individual. In a sense, this approach takes psycholinguistic findings on the prelinguistic nature of such notions more seriously than a lexical approach to the mass/count distinction does, since it relies on a truly independent notion of objecthood.

This does not mean that all filters are equally compatible with all roots, or that a concept like WATER can just as easily be embedded in a count DP as it may a mass one. Filtering out the individuals from a root concept is only possible if this root concept is in fact associated with individuals. For example, while it is technically possible to derive a filter set **water** by applying the filter INDIVIDUAL to the root  $\sqrt{\text{WATER}}$ , this filter set will end up empty since water-sums do not correspond to individuals as such. Even in highly flexible languages like English a count nP *water* does not refer just to particular quantities of water, but to a specific kind of water (water-as-a-beverage) in an appropriately sized container; it seems reasonable to treat this as a distinct root concept.

On the other hand, a root like  $\sqrt{\text{STONE}}$  can be selected by either an INDIVIDUAL or a SUBSTANCE base with meaningful (i.e., non-empty) results in both cases, since there are some stone-sums that clearly match our prelinguistic objecthood criteria.

Finally, since individuals are made out of physical stuff, we predict that  $\text{SUBSTANCE}(\sqrt{X})$  will be nonempty if  $\text{INDIVIDUAL}(\sqrt{X})$  is nonempty; that is, it is always possible to derive a meaningful stuff interpretation for any non-abstract noun. (This is probably not entirely accurate as an analysis of ‘grinding’, given the absence of ground readings in Mandarin and the Dutch gender data.

We identified an asymmetry between packaging and grinding: while it is relatively easy to derive a stuff interpretation for core count nouns, the reverse - deriving a unit interpretation for core mass nouns - is considerably more difficult. Under the current assumptions, this asymmetry falls out. For core count (and flexible) nouns, both the stuff and the object interpretation can be extracted from the same root. But for core mass nouns, the unit interpretation involves an enriched meaning (stuff + container) that cannot be directly extracted from the same root; instead, we have to shift to a different root meaning (the English strategy) or explicitly add a container noun to our syntax (the Icelandic strategy).

For sorting (interpreting a noun as a predicate over subkinds), the explanation is similar: both stuff and subkind interpretations can be directly extracted from the same root.

Summing up, the present account distinguishes both derivational (non-costly, more or less context-independent, operates on the same root) and coercive (costly, context-dependent, involves lexical reanalysis of the root) ways of shifting from a mass to a count denotation and vice versa. This distinguishes it from both Borer's approach, in which there is no such thing as coercion, and (most) lexical approaches, in which all mass/count flexibility involves lexical reanalysis.

## 4.2 Morphology

By introducing FilterP, it becomes possible to distinguish between mass-ness and number neutrality, as well as between number neutrality and countability, as follows:

- (Mess) mass ('stuff reference'): Overlapping base.
- Countable singular: disjoint base, body = base.
- Countable number neutral: Disjoint base, body = \*base.
- Non-countable number neutral: Overlapping base generated by a disjoint set (cf. Landman's story on 'neat mass'). Body = base.

However, even though countability and number neutrality are modelled as separate properties, the compositional derivation of these properties rules out singular uncountable predicates of the type  $\langle X, *X \rangle$  (with X a disjoint set). Operations applied to the filter set before the i-set is created affect both body and base in the same way, while operations applied after i-set creation only apply to the body (affecting the base only indirectly, via the Head Principle). This means that pluralisation can never affect just the base.

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