Thinking about Mass and Count

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What's *supposed* to happen in this talk

- Informal background about +mass and +count
- Two general theoretical attitudes
  - mass/count as Syntax
  - mass/count as Semantics
- But – a problem!
- And a proliferation of theories
- Some other, general problems
  - Problems with Syntax
  - Problems with Semantics
  - Evaluation, and a common feature
- Jeff's Theory – a different approach
  - Lexical nouns are *neither* +mass *nor* +count
  - Lexical nouns are *both* +mass *and* +count
  - Of course. . .
- Are There Any Empirical Differences?

Informal background on mass/count

- +mass: water, blood, air, sand, . . .
- +count: person, dog, tree, house, . . .
- +abst,+mass: advice, knowledge, curiosity, software, . . .
- +abst,+count: suggestion, belief, apology, program, . . .
- +mass: dirty water, red blood that is on the floor, too much justification, . . .
- +count: tall person, big dog that is sleeping in the corner, each freedom we have listed, . . . ,

Some syntactic conditions in English:

- Count nouns, but not mass nouns, have plural forms and thus can agree with plural verbs
- Count nouns, but not mass nouns, can occur with numerals and counting phrases
- Singular count nouns, but not mass nouns, employ the quantifiers *each, every, few, many*, (stressed quantifier) *some*
- Singular count nouns, but not mass nouns, occur with the indefinite *a(n)*

Some more syntactic conditions in English:

- Mass nouns, contrary to count nouns, do not have plural forms and thus all verb agreement is singular
- Mass nouns, contrary singular count nouns, can occur with measure phrases like *liters of, amount of*
- Mass nouns, but not count nouns, employ the quantifiers *much, little*
- Mass nouns, but not singular count nouns, employ the unstressed *some*

Some semantic features

(Supposed to be independent of language because these features characterize either the reality being denoted ["externalism"] or the mental item being occasioned by the term ["internalism"] – neither of which are intended to be "merely" features of a language):

- Count nouns, but not mass nouns, designate a set of (countable) *entities*
- Mass nouns, but not count nouns, designate *stuff*

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- Mass nouns, but not count nouns, designate *stuff*

Two classes not intended to be covered by these categories

- Collectives (singular count nouns that refer to multiple entities)
  - *team, committee, army, herd, alphabet, . . .*
- Pluralia tantum (inherently plural nouns that nonetheless sometimes seem to be like mass nouns)
  - "Dual entity" (*scissors, earmuffs, pants, pliers, binoculars, . . .*)
  - "Co-occurring similar objects" (*suds, intestines, bleachers, ruins, remains . . .*)
  - "Object groupings" (*groceries, spoils, odds and ends, valuables, contents, . . .*)
- Both groups of nouns challenge certain definitions of the +mass/+count distinction. But I mention them only to set them aside for some future work.

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1. mass/count as syntax

Syntactic theories view the fact that some noun (e.g., *water*) is a mass term as giving an explanation for why some combinations with other words are ungrammatical. For example, they might put forward the syntactic criteria mentioned before as the rationale for classifying the paradigm examples cited above:

- +mass: water, blood, air, sand, ...
- +count: person, dog, tree, house, ...
- +abst,+mass: advice, knowledge, curiosity, software, ...
- +abst,+count: suggestion, belief, apology, program, ...

mass/count as syntax

In syntactic theories of +mass/+count, violations of the constraints involving these features yield ungrammatical results that have the same status as other syntactic violations. Our examples

- *The bright red blood that is on the floor are slippery
- *Each bright red blood that is on the floor is slippery

are no more a part of English than are

- *Person now rash.
- *That fact the because.

2. mass/count as semantics

Semantic theories think of the +mass/+count distinction as a description of the semantic properties of the denotation of the terms. Mass meanings contrast with count meanings because of the semantic properties mentioned above. This general semantic categorization has some more particular manifestations in the meanings of lexical items:

- Mass meanings are *divisive in reference*; count meanings are *true of a unit as a whole*
- Mass meanings are *cumulative in reference*; (singular) count meanings are *not true of groups of that which they are true*
- Stuff that mass meanings are true of *cannot be counted*; count meanings are true of *individuated items that can be counted*
- Stuff that mass meanings are true of *can be measured*; (singular) count meanings are *not measurable*

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mass/count as semantics

In a semantic approach, the features +mass/+count are descriptions of the semantic value of lexical nouns and the larger CNPs and the still larger determiner phrases (DPs) and noun phrases (NPs), etc.

Thus, they do not figure in the syntactic well-formedness constraints of a grammar, but would emerge as a description of what the semantic values of the embedded nouns are, and how these semantic values get altered by the syntactic combination of those nouns with other words.

In such a picture, these features do not syntactically rule anything out; the most that can be said is that certain combinations are "semantically anomalous", and hence can't be interpreted.

What's More Fundamental? Syntax or Semantics?

Some theorists think that the syntactic descriptions are the theoretically fundamental aspects of the mass/count distinction, and that the semantic consequences will follow automatically from them.

> *Thus phrases like *each blood, *three bloods, *much dog, *amount of person are syntactically ill-formed, and therefore the impossibility of individuating blood, or of measuring a person follows.*

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> *Therefore *each blood, *three bloods, *much dog, *amount of person will be impossible. (But there are not really any such syntactic features – they are instead just an impression imposed upon the syntax. In reality these phrases are not really grammatically ill-formed, but rather are semantically uninterpretable.)*

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Syntax vs. Semantics

There are a number of places where the syntactic and semantic criteria diverge, as well as cases where one or the other of the types of criteria seem to give the intuitively wrong categorization. As well, the types of criteria appear to work differently in different languages.

These are all important considerations when trying to give a reasonable account of the mass/count distinction, but I'm not going to dwell on them immediately (but will return to them below), other than to mention that ...

Everyone has to acknowledge that . . .

. . . there are many, many nouns that seem equally to be +mass *and* +count. For example, *cake* in the first here is +mass while it is +count in the second

- John baked cake for dessert. Mary likes cake. Cake is healthier than ice-cream.
- John baked a cake for dessert. Mary liked the cake. That cake is healthier than those bonbons.

And indeed, it seems impossible to say that one is more basic than the other – except by some arbitrary dictum. In fact, some theorists, following Keith Allen (1980), think that *all* nouns admit of some degree of ±mass and thus some degree of ±count. *Cake* just is one of the nouns where the degree is 50-50.

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. . . and the Resulting Proliferation of Theories

Thus we somehow need to recognize the fact that at least some nouns can, at least sometimes, be seen as +count and sometimes as +mass — the common name for such nouns is "dual-life noun".

There are a number of ways theorists have decided to take up the challenge of dual-life nouns.

These theories can be distinguished by the basic difference as to whether they hold:

+mass and +count are to be associated with lexical nouns

+mass and +count are to be associated with something else

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Within the "+mass and +count are features of lexical items" group,

There are theories that

- attribute the existence of dual-life nouns to the presence of syntactic(?) "levels of countability" of the noun;
- hold there to be "coercion principles" which will convert +count into +mass and conversely.
  - some hold that all nouns are at bottom +mass, and that all the coercion principles operate to sometimes convert them to +count;
  - others hold that all the nouns are at bottom +count and the coercion principles sometimes convert them to +mass;
  - there are those who hold that some are basically +mass, others are basically +count (and perhaps there are some that are truly dual-life). This type of theory of course will employ both types of coercion.

It's always a good idea to ask these theorists whether they are imagining their theory to be one of syntactic features or semantic features!!

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Within the "+mass and +count are features of something else" group,

There are theories that

- hold them to be features of a *sense* of a lexical item
  - All (or: almost all) lexical nouns have *both* a mass and a count sense
  - There are meaning-coercion principles operating on senses
    - All senses are basically +mass
    - All senses are basically +count
    - Some senses are +mass others are +count
- hold them to be a features of a noun's occurrence in a sentence
- claim that these are not features even of occurrences of nouns; they apply only to entire NPs

These theories seem most suited to taking mass/count as semantic features

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More on Dual-Life Nouns: problems for syntactic theories

The lexical items are assigned either a +mass or +count feature, and this feature controls the syntactic admissibility or inadmissibility of larger phrases. But there are many words that have both mass and count meanings, for instance

- Concrete terms
  - a lot of chocolate / many more chocolates
  - more discipline / an academic discipline
  - too much paper / write a paper
  - drink beer / drink a beer
- Abstract terms
  - much discussion / three different discussions
  - much justification / many justifications
  - a lot of difference / two differences
  - much more data / many more data

More on Dual-Life Nouns: problems for syntactic theories

There are many more of these dual life (also called "duplex", "flexible", "mass-count") terms, sometimes forming regular patterns, but sometimes not:

- Mass terms used "countily"
  - Pinot Noir is *wine* / Pinot Noir is *a wine*
  - Kim produces *sculpture* / Kim is producing *a sculpture*
  - Sandy likes *lamb* / Sandy likes *every lamb*
  - *Beer* on the table/Three *beers* on the table/Eight *beers* on tap
- Count terms used "massily"
  - Leslie has more *car* than *garage*
  - Chris Pronger, 100 kilos of ice hockey *defenseman*...
  - He's got *woman* on his mind
  - What a hunk of *man*!
  - Some people like *data* better than *theory*

Problems for syntactic theories

- Pelletier (1975) "Universal grinder": insert an object that falls under any (concrete) count noun into one side. . . for example, a hat. Push the button, and the result is that there is hat all over the floor. Another push of the button and we can have book all over the floor. An unfortunate accident might generate curious cat all over the floor.
- "Universal sorter": Any time there is a use for a particular type or sort of some mass then there can be a count term that describes it – for example, *a finely-silted mud*, which can be a name for a type or sort of mud and also a predicate that is true of all individual exemplars of this type.
- "Universal packager" And if there is a standardized amount of *M* that is employed in some use, then there will be a count term that describes this amount, such as *a beer* or *an ice cream*.

A death-knell for syntactic theories?

These considerations show that the appropriate theory needs to talk about *meanings* of terms, or *uses* of the terms, or maybe *occurrences* thereof (some occurrences are +mass , others of the same word are +count). But then this is no longer a syntactic account!

And in any case the syntactic approach just doesn't work. For, it will turn out that since *any* noun can be either mass or count, a +mass/+count syntactic distinction does no work – *nothing* is ruled out by the syntactic rules.

Problems for Semantic Theories of mass/count

Many formal semanticists (e.g., Link 1983, Chierchia 1998 (Mass), Chierchia 1998 (Kinds), Pelletier & Schubert 1989/2003) take the Semantic Criteria given above to be best accounted for in terms of a semi-lattice theory, or related formalisms like mereology or ensemble theory (Bunt 1979, 1985).

A semi-lattice has no lowest elements and is atomless. The idea is that anything that *water*, for example, might be true of has subparts – things in the lattice that are its parts – of which *water* is true; and any two elements in the *water*-lattice find a joined element also in the lattice that represents the merge of those two elements.

Problems for Semantic Theories of mass/count

But it should be noted that many mass terms obviously are not "atomless" in the sense required by this theory ["fake mass", "mismatches", "aggregate terms"]. Consider

furniture, cutlery, clothing, equipment, jewelry, crockery, silverware, footware, bedding, toast, stemware, gravel . . .

Clearly there are atomic parts of these, and yet they are considered mass terms by any of the traditional grammars. So it cannot be an atomless mereology that accounts for the mass nature of these words; and by extension, since it doesn't account for the mass nature of these particular words, there seems to be no reason to think it accounts for the mass nature of *any* words.

Problems for Semantic Theories of mass/count

Some theorists, e.g., Huddleston & Pullum 2002, take this as evidence that terms like these are of a different nature than what we have been calling 'mass terms', and are to be treated differently. They call such words 'aggregate terms' and semantically distinguish them from other mass terms by virtue of their being true of "very different sorts of things". The idea is that *furniture*, for example, is true of sofas, chairs, tables, carpets, and so on, and that these are "very different" from one another. But a true mass term, for example *blood*, is really true only of one kind of thing.

But one might still wonder: are *any* words at all that obey the condition on divisiveness? Or put another way, are there really any words that are atomless – whose referent has no smallest parts? Doesn't *water*, for example, have smallest parts: H_2O molecules perhaps? Certainly coffee and blood have smallest parts as do other mixtures.

Fake Mass Terms and Pseudo Sortal Terms

In addition to the fake mass terms that obey the $+\text{mass}_{syn}$ properties but do not obey the $+\text{mass}_{sem}$ properties, the philosophical literature has long discussed the opposite type of term, calling them "pseudo-sortal terms" . . . obeying (some of) the semantic features of $+\text{mass}_{sem}$ even though they completely follow the $+\text{count}_{syn}$ tests. Examples of such terms are *thing, entity, object, . . .*: terms that are homogeneous in their reference but nonetheless have count syntax.

Problems for Semantic Theories of mass/count

The standard defense of the divisiveness condition: distinguish "empirical facts" from "facts of language". An empirical fact: water has smallest parts; but English does not recognize this in its semantics. The word *water* presupposes infinite divisibility. *Thing* is homogeneous, but English doesn't acknowledge this, acting as if we can individuate and count things.

Is this true?? If so, it suggests interesting questions about the notion of semantics. If *water* is divisive but water isn't, then water can't be the semantic value of *water* (can it?). It suggests a notion of semantics that is divorced from "the world", and so semantics would not be a theory of the relation between language and the world. But also it's not to be a relation between language and a speaker's mental understanding, since everyone *believes* that water has smallest parts. So the mental construct that corresponds to the word *water* can't be the meaning of *water* either.

Thus illustrating a tension within "natural language metaphysics"

Problems for Semantic Theories of mass/count

More problems with the semantic approach: there are pairs of words where one is mass and the other is count and yet the items in the world that they describe seem to have no obvious difference that would account for this. Postulating a *semantic* difference should have some reflection in the items of reality that the terms designate. But there seems to be nothing in the *referent* of the following mass vs. count terms that would explain why they should be distinguished

- Concrete terms
  - baklava vs. brownies
  - spaghetti vs. noodles
  - garlic vs. onions
  - rice vs. beans
- Abstract terms
  - success vs. failures
  - knowledge vs. beliefs
  - flu vs. colds

Two onions in right hand. Two whats in left hand??

Evaluation

I wish to point the direction to the kind of theory that can avoid the listed difficulties. In particular, I want to avoid the syntactic approach's use of syntactic features that don't ever make any construction be ungrammatical.

And I want to avoid the semantic approach's view that the (alleged) violations are not syntactic claims, for example the claim that *Three water* is just "semantically anomalous" and not syntactically ill-formed.

I also would like to challenge the semantic approach's claim that there is some deep ontological backing to the distinction between +mass and +count.

A common feature of the Syntactic and Semantic approaches

- What the syntactic and semantic views have in common is that they make +count/+mass be features of lexical nouns.
- It could instead be a "constructional feature" introduced when lexical nouns are formed into CNPs and when CNPs are formed into DPs and NPs.
- My goal is to have syntactic features that gives rise to ill-formedness when violated, and to have semantic consequences would follow from these constructions.
- These semantic consequences could be described in terms of some semantic features that track or mirror the syntactic ones.

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Lexical nouns are *neither* mass *nor* count!!

Syntactically speaking, the proposal is that lexical nouns do not have any syntactic marker for +mass or +count, but the phrases they occur in can become marked either +mass or +count.

- *beer* lexically lacks any syntactic feature of +mass/+count.
- *dark beer, beer on the table* (CNPs) lack any syntactic feature of +mass/+count.
- *beers* (a CNP) has the syntactic feature +count
- *is beer* (PRED) has the syntactic feature +mass
- *a beer, many beers* (NPs) have the syntactic feature +count
- *sm beer, a lot of beer, beer* (DPs/NPs) have the syntactic feature +mass

Lexical nouns are *neither* mass *nor* count!!

+mass and +count are not lexical features: no lexical item has them. An alternative way of putting this is that lexical nouns are *unspecified* for the syntactic features +mass/+count.

So the existence of "dual life" nouns is no problem—there aren't any, really. Instead, sometimes the noun syntactically composes to form a larger phrase that is +mass, sometimes it forms one that is +count.

Chocolate is neither +mass nor +count, but composed with *a* to form *a chocolate*, the resulting NP is marked as +count; when composed with *much* to form *much chocolate*, the resulting NP is marked +mass.

Lexical nouns are *neither* mass *nor* count!!

As well, the observed syntactic violations that are attributed to violations of the restrictions on +mass and +count are honored: they do in fact occur, and the violations are just as described—except that the violations are caused by these features as they occur on longer phrases, not in the lexical items. Thus

* Much honeys

is bad because *honeys* has been marked +count (in accordance with the example rules mentioned above) and (as the syntactic approach had always alleged), *much* cannot combined with +count on syntactic grounds. This can hold even though the following are perfectly fine NPs:

Most honeys (+count) / Most honey (+mass)
Much honey (+mass) / Most honey that comes from clover (+mass)
Most honeys that come from clover (+count)

Lexical nouns are *neither* mass *nor* count!!

It is difficult to see how this could be accommodated in a theory of syntactic +mass/+count lexical features, except by having a stable of syntactic coercion rules that changed +mass to +count and conversely.

But that's just a bad syntactic idea.

I think the examples given when discussing problems with the syntactic approach, as well as the apparent viability of the present approach, shows that the syntactic +mass/+count features just shouldn't be associated with the lexical nouns, but rather ought to be "constructional" in nature—introduced in the construction of larger phrases.

Lexical Nouns are *both* mass *and* count!!

The theory being developed here holds that the semantic value of every lexical noun contains *all* the values of which the noun is true.

Thus, since a noun such as *chocolate* is true of some individual candies as well as of the stuff of which they are made, both of these meanings will be identified as parts of the semantic value of the lexical noun *chocolate*.

Let's suppose that the semantic value of any +count-noun meaning is the set of things of which it is true. And that the semantic value of a mass meaning is a mereology or semi-lattice structure (atomic or non-atomic, depending on the noun) or an "ensemble".

So the semantic value of the lexical noun *chocolate* would be the union of the set of individual chocolate candies and the semi-lattice of chocolate.

Lexical Nouns are *both* mass *and* count!!

When the lexical noun *chocolate* is syntactically combined with the determiner *a* to form the NP *a chocolate* [recall that this entails adding the syntactic feature +count to the NP] the correlated semantic rule has the effect of deleting the mass part of the meaning of the lexical *chocolate*.

So, the resulting semantic value of *a chocolate* now contains only the set of individual pieces of chocolate candies, and not the semi-lattice of chocolate. In turn, this means that the description of the semantic value of *a chocolate* obeys the semantic characteristics of +count.

And that is all done compositionally.

Lexical Nouns are *both* mass *and* count!!

Standard semantic views of mass/count take one or another of the +count or +mass meanings as basic, and then expect the semantic rule to construct the other one upon demand.

If the +mass notion of *chocolate* were taken as basic, then the semantic rule we have been discussing would have to construct the correct meaning of "set of individual pieces of chocolate candies" out of the semi-lattice of chocolate.

But here, rather than semantic type-shifting or coercion or construction of a related meaning, all these values already are part of the lexical meaning of *chocolate*. And the effect of the semantic rule is to *delete* (or leave unchanged) some aspects of the lexical item's semantic value from consideration in the current syntactic context.

In a more general terminology, the proposal for lexical semantic value is this. Given a [−abst] lexical noun N, its (extensional) semantic value, $\mu(N)$, would be (something like)

$$\mu(N) = \{N^o \cup N^m \cup N^s \cup N^{ss} \cup N^k \cup \ldots\}$$

that is, the union of all the things of which it is true. (N^o represents the objects that are N; N^m is the material that N is true of; N^s are the standard servings of N; N^{ss} are the standard sizes of servings of N; N^k are the kinds of N; etc.)

Lexical Nouns are *both* mass *and* count!!

I should emphasize how common "dual life" nouns are. (Here's Huddleston & Pullum 2002, p.335: "...the dual use of *chocolate* is not even remotely exceptional but is representative of an extremely widespread phenomenon." They follow this with a list of 25 such "dual life" nouns, chosen from an *extremely* wide range of different types of nouns.) It is hard to avoid the impression that the vast majority of nouns have both a "natural" count meaning and a "natural" mass meaning.

In the present proposal, all lexical nouns are "dual nouns".

In this way, the meaning of lexical nouns is *both* +mass and +count.

Of course. . .

Of course, it is not really true that lexical nouns are neither +mass nor +count in the same sense for which they are both +mass and +count. The former sense is syntactic, the latter sense is semantic.

For clarity we should subscript or otherwise indicate which sense we are discussing, whenever the topic of whether some piece of language is or isn't +mass/+count.

We might use $+\text{mass}_{syn}$ vs. $+\text{count}_{syn}$ and $+\text{mass}_{sem}$ vs. $+\text{count}_{sem}$.

Lexical nouns are neither $+\text{mass}_{syn}$ nor $+\text{count}_{syn}$,
but are both $+\text{mass}_{sem}$ and $+\text{count}_{sem}$

My proposal uses both $+\text{mass}_{syn}/+\text{count}_{syn}$ and $+\text{mass}_{sem}/+\text{count}_{sem}$

I worry about this . . .

Is there really any empirical difference amongst and between any of these theories?

I'm willing to take a "wide view" of what counts as empirical:

- Features of lexical items
- Features of use
- Thoughts about the metaphysics of the world (stuff vs. things)
- Simplicity/generality of theory
- Psychological data (e.g., reaction times, eye tracking evidence)
- Brain data (e.g., fMRI evidence)

But it just seems that each theory has its own explanation of the evidence.

Ideas about how these might work? Other empirical evidence?

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Jeff is very puzzled about empirical evidence

Please Help!!