Why Barbie has more furniture than me and other linguistic conundrums

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0 Introduction

Research Question: How is it that Barbie, the famous Mattel doll, can have more furniture than a full sized human, despite having a home that would fit on a common coffee table?

Obvious Answer: *Furniture* can be used to quantify over individual pieces of furniture, and thus Barbie has more than us because she has a greater *number* of items.

Problem: How can a general theory of noun phrase semantics be advanced that allows quantification over individuals by some mass nouns (such as *furniture*) but not by others (e.g., *butter, water*), and yet still capture the generalization that when a count noun is converted into a mass noun or mass converted into a count, there is always a loss or gain of individuation?

Goal of this talk: I will address this problem by:

- Proposing that the mass/count distinction is best described by a grammatical feature that we label IND.

- This feature appears in both categories,
  - lexically instantiated in mass nouns,
  - syntactically instantiated in count nouns.

The Structure of this talk:

1. A review three prominent views of noun phrase semantics, and how they differ in their treatment of mass nouns.

2. Discussion of two fundamental generalizations regarding the quantification of mass nouns and count nouns:
   - (a) there exist both mass nouns that quantify over individuals (e.g., *furniture*) and mass nouns that do not (e.g., *water*),
   - (b) there is a systematic shift in sense when a particular term is used in mass and count contexts (e.g., *fewer strings; less string*).

3. A new proposal and its predictions.

1 Theories of mass-count semantics.

Count Nouns: (rather uncontroversial referential implications)

- Count nouns only quantify over individuals. (Bloom, 1999; Bunt, 1985; Gillon, 1996; Gordon, 1985; Jackendoff, 1991; Link, 1983, 1998).

- Count nouns provide a "default dimension and unit of measurement, that of counting individuals." Bunt (1985:137)

Mass Nouns: (more controversial referential implications)- 3 Theories.

1. **Mass nouns only quantify over non-individuals.**(Bloom, 1994, 1999; Gordon, 1985; Link, 1983, 1998; Macnamara, 1986; Quine, 1960; Wisniewski, Imai, & Casey, 1996; Xu, 1997).

    - Speakers "conceptualize the referents of count nouns as distinct, countable, individuated things and those of mass nouns as non-distinct, uncountable, unindividuated things."

    - **PROBLEM:** counter-examples exist such as *furniture*, *equipment*, and *infantry ,* as noted by Gillon (1992, 1996), Chierchia (1998), among others.

    - ***SOLUTION:*** *Deny counter-examples: claim that speakers construe the denotations of such words as being unindividuated despite the obvious presence of individuals in the referent.*

    - *Wisniewski et al. (1996:295): "on a particular occasion, we may conceptualize a swan, several ducks, and a heron on a lake as an unindividuated group called waterfowl, and not think of them individually as birds."*

2. **Mass nouns quantify over individuals and non-individuals.** There is an underspecification of referential implications.(Gillon, 1992, 1996; Bunt 1985)

    - Mass nouns are unspecified to whether they denote individuals or not. Whether or not a particular mass noun refers to individuals is not specified linguistically, but rather is determined via the speaker's inspection of the world.
        - With mass nouns like *space*, the speaker may encounter no units susceptible to enumeration and conclude that the term quantifies over non-individuals.

        - In contrast, an inspection of the world may reveal that furniture

refers to discrete bounded physical objects such as tables and chairs.

3.**Mass nouns only quantify over individuals.** (Chierchia, 1998)

- According to Chierchia (1998:68), "…furniture is no less 'atomic' (i.e. made up of discrete sets of singularities) than *piece of furniture* or, indeed, *table*… At any rate, since in subdividing something we always get to an end, there is no principled reason to maintain that mass nouns (even those whose granularity is unclear) do not have an atomic structure".

- **Thus**, things such as *furniture*, *mustard*, and even *fun* can be divided up only to a certain point before there is no more *furniture,* no more *mustard* and no more *fun.* In each case, individual things – i.e. minimal parts – are being referred to, though they may vary in how easily they are identified.

3 Individuation and comparative constructions: Two fundamental generalizations about mass nouns and count nouns.

Methodology: The use of comparative constructions.

In comparatives, count nouns license a comparison by number of individuals

(2) a. Barbie has more apples than Ken.
b. Ken has more parties than Barbie.
c. Barbie has more ideas than Ken.

Mass Nouns don't usually license such a comparison. (Even if individuals exist as part of the referent.)

(3) a. Ken has more water than Barbie.
b. Barbie has more glue than Ken.
c. Ken has more energy than Barbie.

However, some mass nouns do license a comparison by number.

(4) a. Barbie has more furniture than Ken.
b. Ken has more equipment than Barbie.
c. Barbie has more footwear than Ken.

Paraphases of (4a) to (4c):

Barbie has more pieces of furniture than Ken.
Ken has more pieces of equipment than Barbie.

Barbie has more shoes and boots than Ken.

Other mass nouns that license a comparison by number: *luggage*, *advice*, *underwear*, *company*, *glassware*, *wildlife, silverware, cutlery, mail, inventory, waterfowl, jewelry* and *artillery*

- (see Barner & Snedeker, 2004, for psychological tests showing this in 4-year-old children and adults)

(5) **Generalization 1**: Some mass nouns quantify over individuals, others do not.

This generalization is particularly interesting when considering the sentences in (6) as compared to those in (7). The sentences in (6) license a comparison by number but those in (7) do not.

(6) a. Barbie has more ropes than Ken.
b. Ken has more strings than Barbie.
c. Barbie has more stones than Ken.

(7) a. Barbie has more rope than Ken.
b. Ken has more string than Barbie.
c. Barbie has more stone than Ken.

Based on these examples and others like them (e.g., *paper-papers, rock-rocks, tile-tiles, coffee-coffees, chocolate-chocolates, candy-candies,* etc.), we propose a second generalization, which is stated as follows:

(8) **Generalization 2**: No term that can be used in a count context can be used in a mass context to quantify over individuals.

Important Note A about Generalisation 2: It is important to note that this generalization cuts across subcategories of mass nouns and count nouns. It applies to:

- Nouns more amenable to count syntax (such as *dog*, *cake*, *apple*, and *ideas*),
- Nouns more amenable to mass syntax (such as *water*, *mud*, *darkness*, and *coffee*),
- Nouns equally acceptable in either category (such as *paper*, *rock*, *stone*, *thought* and *judgment*).

No matter what the category preference, if a noun is able to appear in both categories it will quantify over individuals in it's count sense and over non-individuals in its mass sense. Furthermore, mass nouns that quantify over individuals cannot normally be used in count syntax.

Important Note B about Generalisation 2:

It holds regardless of the type of semantic conversion that is usually associated with the noun's syntactic flexibility: It holds for:

- so-called ground-noun coercions (coercion from having denotations containing physical objects into denotations consisting of the stuff those objects are made of) such as with *too many apples* vs. *too much apple*, *too many dogs* vs. *too much dog*, and *too many bricks* vs. *too much brick*.

- substance-to-object coercions (coercions from having substance-like denotation to denotations containing objects consisting of that substance) such as with *too much water* vs. *too many waters*, *too much beer* vs. *too many beers,* and *too much coffee* vs. *too many coffees*.

- individuation-by-cause coercions (coercion from denotations of emotions or mental states to denotations individuated in terms of the cause of those emotions or mental states) as with *too much anxiety* vs. *too many anxieties*, *too much fear* vs. *too many fears*, and *too much hope* vs. *too many hopes*.

- individuation-by-instance coercions (coercions from nouns that denote a mental capacity or activity to nouns that denote instances of the capacity or activity in use) as with *too much thought* vs. *too many thoughts*, *too much judgment* vs. *too many judgments*, and *too much kindness* vs. *too many kindnesses*.

No matter how the mass sense is related to the count sense of a word, the mass sense does not quantify over individuals while the count sense does.

These facts are problematic for all the theories of mass noun semantics discussed so far. No theory seems to predict Generalization 2 nor provide an adequate account of Generalization 1.

NO THEORY (reviewed above) can account for both generalizations.

1.Problems with Mass Nouns as uniformly denoting unindividuated quantities.

- •Mass nouns license a comparison by number just like count nouns.
  - •one might be tempted to suggest that within comparatives comparison are made according to the nature of the referent rather than the nature of the construal or denotation. However, such a proposal will not be able to account for the data. If this strategy were used to compute comparatives, then it would be expected that other terms with the same type of content (i.e. individuals) would also quantify over individuals. However, as demonstrated in (6) and (7), nouns like *string* and *stone* change in behavior as they change grammatical categories, even thought their referents remain the same.
- •In flexible use, there is no reason why a flexible noun could not behave like *furniture* if *furniture* is truly unindividuated.

2.Problems with Chierchia's interpretation of Mass nouns as always quantifying over individuals.

- •He cannot explain the different behavior of mass nouns in comparatives. For him, all mass noun have the same semantics.
  - •He does employ a notion of vagueness but vague count nouns still license a comparison by number.

(10) a. Ken has more ideas than Barbie about what to do today.
b. British Columbia has more mountains than Saskatchewan.

- •*He cannot account for why flexible nouns lose their ability to quantify over individuals when used as mass nouns.*

3.Problems with a theory of underspecification.

- •unable to explain conversion facts: Such theories fail to hypothesize a strong lexical link between a word and its ability to quantify over individuals. Rather, they rely on world knowledge about the referent to predict whether the word can pick-out individuals or not.
  - •For example, according to Gillon (1996:9) "World knowledge tells one that ammunition has minimal parts, or atoms, known as rounds."

- Similarly, in describing why certain mass noun quantify over individuals) Bunt (1985:130) states, "[A] mass noun whose referent is actually *believed* to be discrete is represented by [a referring] expression denoting a discrete ensemble; a mass noun whose referent is actually *believed* to be continuous is represented by [a referring] expression denoting a continuous ensemble." (Italics are ours. Note that by *discrete* Bunt means that it contains individuals.)

However, further data from comparative constructions suggest that for some terms, quantification by number is *never* considered acceptable, even when perfectly good individuals are present in the world:

(11) a. Ken has more pasta than Barbie.
b. Barbie has more hair than Ken.
c. Ken has more spinach than Barbie.

Interestingly, each of these terms do quantify over individuals in other languages, where they appear canonically as count nouns.

FRENCH*: des pates* (roughly "some pastas"), *des cheveux* ("some hairs" – even in the context of washing it/them), and *des epinards* ("some spinaches").

3 The lexical and syntactic sources of individuation: The Proposal

A Feature called IND (for individual/individuation):

IND licenses the noun's principle of individuation.

- ex. The noun *apple* is able to be used to pick out individual apples when it appears in a noun phrase. The noun's concept specifies the principles of individuation to do so. However, these principles are not licensed (the concept cannot be used to pick-out individuals) if the IND feature is not present in the noun phrase.

Two environments for IND:

- **Lexically** instantiated for mass nouns that denote individuals, such as *furniture*, *equipment*, *clothing*, etc.
  - IND as a feature contained in the lexical entry of the noun.

- **Syntactically** instantiated for all count noun environments.
  - IND as part of the nominalizing head.

Number and dimensional incommensurability: A scale of individuals

- "a comparative construction is semantically well-formed only if the compared

adjectives have the same dimensional parameter." Kennedy (1999:50; see Klein, 1991, for discussion)

(12) a. Barbie is taller than that desk is wide.
b. ??Barbie is taller than Ken is late.

When there is no adjective to determine the dimension of measurement, Count nouns allow for a comparison by number. However mass nouns do not. So when comparing count nouns to count nouns, and mass nouns to mass nouns we can compare using the same scale. However, comparing mass nouns to count nouns often results in a deviation.

(13) a. Ken has more apples than Barbie has oranges.
b. Barbie has more milk than Ken has apple juice.
c. ?Ken has more cars than Barbie has gasoline.
d. ? Barbie has more water than Ken has apples.

The presence or absence of the IND feature in the NP determines the dimension of measurement for the comparatives in (13).

Interestingly, this effect appears to persist whether the feature is lexical or syntactic.

(14) a. Ken has more apples than Barbie has silverware.
b. ?Barbie has more furniture than Ken has water.

Furthermore, the role of the dimension of measurement in determining decidable comparisons is not related to conceptual content per se.

(15) a. Barbie has more shoes than Ken has friends.
b. Barbie has more ideas than Ken has fingers to count them on.
c. Ken has more furniture than Barbie has places to put it.

The impossibility of furnitures

- English, regular past tense morphology cannot be applied to irregular items that are specified lexically for the past tense (e.g., **broked*, **stoled*, **wepted*). Similarly, regular plural morphology is prohibited wherever irregular items are specified lexically as plural (e.g., *mens, *feets).

- GENERAL CLAIM: NO FEATURE DOUBLING
    - Or at least no feature doubling while maintaining the same interpretation.

- Extending this to our current discussion, the assertion that a single feature resides in both count syntax and lexically specified terms like *furniture* also predicts that the two should not co-occur.

This explains both:

1. why nouns that quantify over individuals as count nouns fail to do so as mass nouns,

2. why words like *furniture* cannot be used as count nouns.

FIRST EXPLANATION: Demonstrated by the sentences in (16).

(16) a. Ken has more ropes than Barbie.
b. Barbie has more rocks than Ken.
c. Ken has more rope than Barbie.
d. Barbie has more rock than Ken.

Since the nouns *rope* and *rock* appear as count nouns in (16a) and (16b), they must not be lexically specified for the IND feature. Hence the shifts in meaning in (16c) and (16d).

SECOND EXPLANTION: On analogy with unacceptable expressions like **mens*, **feets*, and **broked*, is supported by the corresponding unacceptability of the sentences in (17).

(17) a. ?Ken painted several furnitures.
b. ?Ken stored many equipments in his cellar.
c. ?Barbie bought several clothings.
d. ?Barbie had never seen so many ammunitions.

In each case, the construction is either judged to be unacceptable, or is assigned a type interpretation, on par with the interpretations made available by the pluralization of irregular plurals (e.g., *exotic fishes; indigenous peoples*).
Nouns like *furniture*, *equipment*, *infantry*, and *ammunition* cannot be used as count nouns to refer to individual pieces of furniture, equipment, infantry and ammunition.

This prohibition must be grammatical, given the fact that many languages allow the use of exactly these terms in count syntax, to refer to exactly these same individuals.

- **French**, *des meubles, des equipments,* and *des vetements*.

Details of the Proposal

- the lexical entries for nouns like *furniture*, *equipment, waterfowl, mail, clothing* and *cutlery* all contain the IND feature as part of their lexical entry.

- Thus the entry for *furniture* might be something like

  [FURNITURE, IND, ….]

  - where FURNITURE is an abbreviation for the conceptual content of the noun not related to IND and where the triple dots represents further lexical features of the noun.

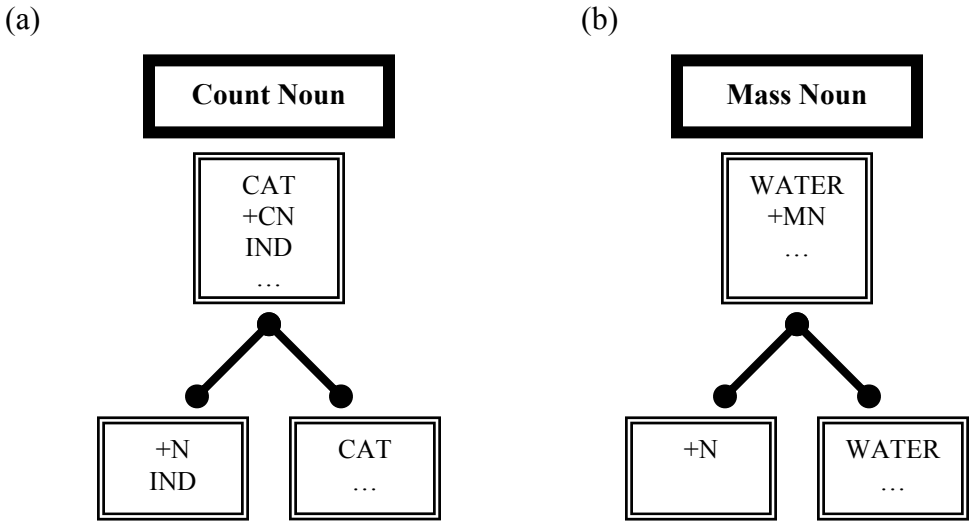
- In contrast, the lexical entries for nouns like *water*, *sand*, and *glue* will be similar to the ones for *apple*, *rope*, and *rock* in that they do not contain the IND feature.

- The IND feature is introduced syntactically, bundled with other features in the count noun head (on par with suggestions made by Marantz, 1997).

COUNT NOUNS such as *apples*, *rocks*, *ropes*, and *chickens* are all complex syntactic objects consisting minimally of a root lexical item under one node, and the IND feature itself under another node.

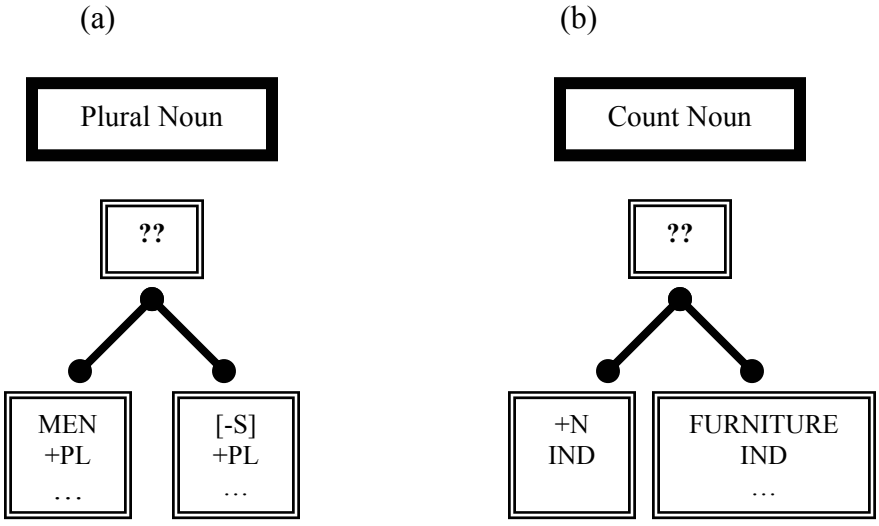
MASS NOUN head contains no IND feature.

Figure 1.



Constraint Against Feature Doubling:

Figure 2.



DENOTATIVE SEMANTICS:

- Denotation of a singular count noun is the set of individuals within a context to which that noun applies.
- Denotation of a plural count noun is an aggregate (group, plurality, collective) equivalent to the join of all the individuals that are members of the singular noun's denotation.
- Denotation of mass nouns will be much like plural nouns in that they are an aggregate. However, it is not necessary that the aggregate be equivalent to a join of individuals, rather it can simply be a join of all the non-individuated quantities to which the concept can apply within a context.

For similar theories see Link's (1983) and Gillon's (1992), and only differs minimally from Chierchia's (1998)

My Theory:

- All nouns (prior to being specified as count or mass) can be associated with a join semi-lattice whose top member (supremum) is an aggregate containing all the *stuff* to which the concept applies. The sub-constituents of the semi-lattice are sub-aggregates of the supremum (i.e. subparts of the top-most element to which the noun can still apply).

- The IND feature forces the semi-lattice to have minimal parts that are individuals by licensing the concept's principle of individuation. Without this feature no noun can denote a semi-lattice that has individuals as its minimal parts.

SYNTACTIC EFFECTS ON DENOTATIONS:

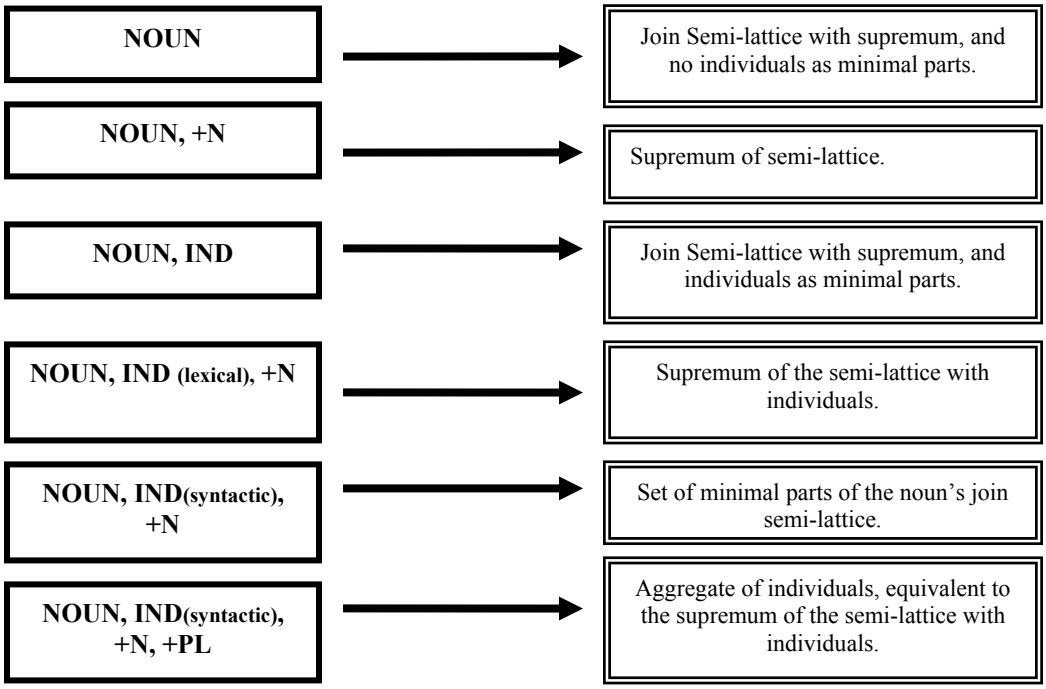
- When a noun that does not have the IND feature enters into the syntactic environment of a mass noun phrase, the denotation will be an aggregate without individuals.

- When a noun that does have the IND feature specified lexically enters into such a syntactic environment, the denotation will be an aggregate that is equivalent to the join of all the individuals that serve as the minimal parts of the semi-lattice. Such mass nouns will be denotationally equivalent to plural count nouns.

- When a noun with no lexically specified IND feature is inserted into a count noun context, it will concatenate with the IND feature. The feature will force the lattice associated with the noun to have individuals as minimal parts. The individuals will then form the set that makes up the denotation of the singular count noun.

Summary of denotative implications

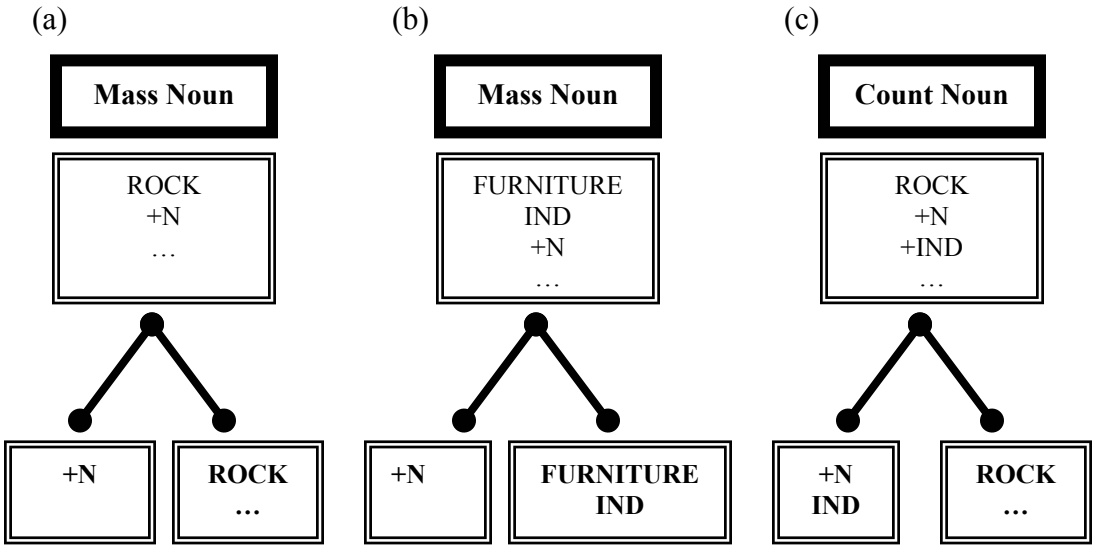
Figure 3.



EXPLAINING GENERALIZATION 1:

- Some nouns have IND lexically specified, whereas others do not.
- In a mass noun context, IND is not concatenated syntactically.
    - Thus the denotative result of mass nouns that are lexically specified for IND will be denotatively equivalent to plural count nouns, whereas
    - The denotative result of mass nouns without the IND feature will not have a denotation containing individuals.

Figure 4.



EXPLAINING GENERALIZATION 2:

- In order to appear in a count noun context, the lexical noun must not have the IND feature specified lexically. Otherwise, there would be a conflict between features as in figure 2 (part a).

- Hence, when that same noun is used in a mass noun syntactic context, the noun is no longer concatenated with the IND feature. The result will be a denotation that does not contain any individuals. This contrast is represented pictorially in figure 4, part (a) versus part (c).

The inadequacy of conversion rules

Some theories could employ conversion rules to capture the right generalizations. A conversion rule would be something like (18)

(18) individuating count noun $\rightarrow$ non-individuating mass noun

However, note that in such theories the relationship between the grammatical categories "mass" and "count" and the features that specify semantic interpretation co-occur coincidentally (i.e. the relationship is purely arbitrary).

As a result, such accounts provide no principled reason why languages should not exist where such correspondences are reversed or in some way violated.

In contrast, by identifying the feature that specifies interpretation with the feature that governs distribution as I have proposed in the case of the IND feature, this need for arbitrary syntax-semantics mappings disappears.

In count NP's, the IND feature specifies individuation and is part of the phrase itself, and not part of the lexical concept.

Correspondingly, in cases where the IND feature is part of the lexical item, the item cannot appear in count NP's, without a shift in sense. This means that it is impossible for a term to appear in both mass and count contexts, while maintaining quantification over individuals throughout.

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