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Introduction

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1. The syntactic mass-count distinction

The mass-count distinction is a morpho-syntactic distinction among nouns that is generally taken to have semantic content. This content is generally taken to reflect a conceptual, cognitive, or ontological distinction and relates to philosophical and cognitive notions of unity, identity, and counting. The mass-count distinction is certainly one of the most interesting and puzzling topics in syntax and semantics that bears on ontology and cognitive science. In many ways, the topic remains under-researched, though, across languages and with respect to particular phenomena within a given language, with respect to its connection to cognition, and with respect to the way it may be understood ontologically. This volume aims to contribute to some of the gaps in the research on the topic, in particular the relation between the syntactic mass-count distinction and semantic and cognitive distinctions, diagnostics for mass and count, the distribution and role of numeral classifiers, abstract mass nouns, and object mass nouns (*furniture, police force, clothing*).

In what follows, I will present the classical view about the mass-count distinction, which is mainly based on English (and related European languages) as well as Chinese. It provides the background to the contributions of the volume, some of which present serious challenges of that view, in particular from recent crosslinguistic research.

There are a range of criteria for the syntactic mass-count distinction.¹ Foremost is the inability of mass nouns to participate in a singular-plural distinction. Mass nouns do not come

¹ See, for example, Pelletier (1979b), Bunt (1985), Link (1983), Doetjes (2012), Gillon (1992), Rothstein (1910, 2017).

with a plural (unless, of course, they have been turned into count nouns, with a corresponding change in meaning):²

- (1) a. apple, apples
b. rice, * rices

Mass nouns also trigger singular agreement of the verb, whereas count nouns trigger singular or plural agreement.

A second criterion is the inability of mass nouns to allow for cardinal and ordinal numerals:

- (2) a. ten apples
b. * ten rice
- (3) a. the first / second tree
b. * the first / second wood

Furthermore, unlike count nouns, mass nouns do not allow count quantifiers such as *few* and *many*, but take mass quantifiers such as *much* and *little*, which are excluded for count nouns:

- (4) a. few / many pears
b. * a few rice / many rice
c. too much / too little apples
d. too much / too little rice

Moreover, unlike singular count nouns, mass nouns disallow singular quantifiers *every*, *each*, and *a*:

- (5) a. every / each / a cherry
b. * every / each / a rice

Generally, mass quantifiers are taken to have a different semantics than count quantifiers. That is, *many*, *few* and *a* and the mass quantifiers *much*, *little*, and *some* do not just differ in syntactic category.

² Exceptions are 'plurale tantum' such as *belongings* or *shavings*, which are mass nouns taking the form of plurals.

Another standard criterion for the mass-count distinction is that NPs do not permit *one*-anaphora, unlike singular count NPs:

- (6) a. John ate a cherry, and Bill ate one too/ *some too
 b. John ate rice, and Bill ate *one too/ some too

There are also some lesser known lexical semantic criteria that distinguish mass and count nouns. One of them is that predicates of size or shape are inapplicable to mass nouns when targeting the entire quantity, and that in adnominal and predicative position (Moltmann 2004, Rothstein 2010, Schwarzschild 2011):

- (7) a. ?? the round wood
 b. the round piece of wood
 c. ?? the large water
 d. the large amount of water
 (8) a. ?? The wood (ok The piece of wood) was round.
 b. ?? The water (ok The amount of water) was large.

Predicates of size and shape are applicable to certain types of mass nouns, namely object mass nouns such as *furniture* and *luggage*, nouns whose denotations consist in pluralities of individuals (or ‘atoms’). However, predicates of size and shape have only a distributive reading with object mass nouns, applying to the individuals that make up the denotation of those mass nouns. Thus (9) is acceptable as long as *round* and *large* apply to individual pieces of furniture or luggage:

- (9) a. round furniture
 b. large luggage

(9a, b) fail to have a ‘collective’ reading with *round* and *large* applying to the maximal quantity of furniture or luggage.

Another lesser known lexical semantic criterion for the mass-count distinction consists in that number-related verbs, as one may call them, are inapplicable to mass nouns. First, the verb *count* hardly applies to mass NPs, as opposed to plural count NP (Moltmann 1997):

- (10) a. ??? John counted the wood.
 b. John counted the pieces of wood.

The same holds for *outnumber* and the adjective *numerous*:

- (11) a. ?? John's luggage outnumbered Mary's.
 b. John's pieces of luggage outnumber Mary's.
 (12) a. ?? The luggage is numerous.
 b. The pieces of luggage are numerous.

Second, the verb *rank* does not apply to mass NPs, but only to plural NPs (Moltmann 1997):

- (13) a. ??? John ranked the decoration / the carpeting.
 b. John ranked the pieces of decoration / the carpets.

This matches the semantic behavior of ordinal numerals such as *first*, *second*. The same holds for the related verbs *list* and *enumerate* (Moltmann 1997):

- (14) a. ??? John listed the clothing.
 b. John listed the pieces of clothing.
 (15) a. ??? Mary enumerated the weakness of the paper.
 b. Mary enumerated the points of weakness of the paper.

Lexical generalizations of this sort indicate that object mass nouns differ from plural nouns not only syntactically but also semantically.

Mass nouns have the general ability to undergo syntactic shifts to count nouns, with corresponding shifts in meaning. Typical count uses of mass nouns are those with a standard packaging reading (16a) and a taxonomic reading (16b):

- (16) a. John ordered three waters. (servings)
 b. This region produces two wines. (types)

Conversely, certain count nouns can be converted into mass nouns, with a shift in meaning sometimes called 'the universal grinder':

(17) John put some apple in the salad.

There is certainly a connection between an individual and the quantity (matter) it is made of. How the connection is to be understood is a topic of controversy in philosophy (with some philosophers maintaining identity, others difference between the two). Certainly, for the semantics of the count-mass shift that a noun like *apple* may undergo a function is needed mapping an individual to the matter that constitutes it (Link 1983).

The notion of a singular count noun is closely related to the notion of a sortal, which plays an important role in philosophy, but the two notions do not coincide (Grandy 2007, Pelletier 1979a). *Thing, object, quantity*, for example are singular count nouns, but not sortals.

2. Approaches to the semantic mass-count distinction

Two sorts of approaches to the content of the mass-count distinction can be distinguished:

[1] the extensional mereological approach (which can be traced to Quine 1960)

[2] the integrity-based approach (which can be traced to Jespersen 1924).

The first approach distinguishes singular count, plural and mass nouns in terms of properties of their extensions, which are generally formulated in terms of extensional mereology (Link 1983, Krifka 1989, Ojeda 1993, Champollion / Krifka 2017, Champollion 2017).³ Mass nouns, it is generally agreed, have extensions that are cumulative, that is, the fusion of two elements in the extension of a mass noun N is again in the extension of N (Quine 1960). Cumulativity, though, obtains also for the extension of plural nouns.

Divisiveness has been proposed as a distinguishing property of mass noun extensions; that is, for any element x in the extension of a mass noun N a proper part of x is again in the extension of N (Chang 1973). Cumulativity and divisiveness together define homogeneity.

Divisiveness, however, is problematic in that it raises the minimal-parts problem for all mass nouns (Bunt 1985). It is particularly implausible for object mass nouns, such as *furniture, police force, luggage, personnel, hardware*. Object mass nouns form a rather large class in English, and they challenge extensional mereological characterizations of mass nouns.

Singular count nouns are generally characterized as atomic; that is, no element x in the

³ Theories that take mass nouns to be inherently plural (Gillon 1992, Chierchia 1998) can be subsumed under the extensional mereological approach broadly understood. Chierchia (2015) gives an epistemic version of the extensional mereological approach. Rothstein (2017) makes use of extensional mereology, but relativizes the denotation of count nouns to a context.

extension of an atomic noun N has a proper part that is again in the extension of N.

The semantic peculiarity of object mass nouns also manifests itself in comparisons: *more wine* involves measurement of quantities, whereas *more furniture* is generally evaluated in terms of pieces, rather than, say volume (Barner / Snedeker 2005). The latter, though, does not hold when the functionality of the individuals plays less of a role (*more fruit* can be evaluated by volume as well as by pieces). For the semantics of mass nouns in general, two different sorts of measure functions need to be distinguished: extensive (additive) measure functions for dimensions such as weight and volume and intensive (non-additive) measure functions for dimensions such as heat (Lønning 1987, Krifka 1998, Tovena 2001).

Atomicity, given the extensional mereological approach, is widely assumed to be the defining semantic feature of singular count nouns. But there are a range of counterexamples to it. Nouns such as *string, stone, fence, entity, sum, collection* are not atomic, permitting proper parts of elements in their extension to be in their extension again (Rothstein 1990, 2017, Moltmann 1997). Let me call this the ‘divisiveness problem’ for count nouns.

The extensional mereological account also faces limitations in that particular quantities or pluralities may display a semantically relevant division into substructures, often based on linguistically provided information. Thus, (18a) has a distributive reading on which different subgroups of students gathered and (18b) one on which John compares the jewelry in one box to the jewelry in another box for the different boxes (Moltmann 1997):

(18) a. The students gathered.

b. John compared the jewelry in the boxes.

Such readings require augmenting the semantics of plurals and mass nouns with contextually given partitions (Gillon 1987, Moltmann 1997).

The second approach to the semantic mass-count distinction distinguishes mass nouns and count nouns in terms of properties of entities in their extensions, such as having a boundary or integrity of some sort, a notion that goes back to Aristotelian notion of form (Simons 1987). A version of the approach can be found already in Jespersen’s (1924) characterization of mass nouns: ‘There are a great many words which do not call up the idea of some definite thing with a certain shape or precise limits. I call these ‘mass-words’; they may be either material, in which case they denote some substance in itself independent of form, such as silver, quicksilver, water, butter, gas, air, etc., or else immaterial, such as leisure, music, traffic, success, tact, commonsense’ (Jespersen, 1924, p. 198).

A situation-based version of the integrity-based approach has been developed in Moltmann (1997, 1998). On that view, count nouns are taken to characterize entities as integrated wholes of one sort of another in situations of reference, whereas mass nouns specify entities as not being integrated wholes in situations of reference. The second approach does not face the divisiveness problem, since it does not make use of the notion of an atom for the characterization of singular count nouns. Moreover, the approach permits subgroups or subquantities to have integrity in situations of reference, setting up another level of structure (division into subgroups) besides the one imposed by the noun itself.

The second approach may be considered unsatisfactory because of the vagueness of the notion of integrity. There are more substantial difficulties for the view when applying it to count nouns such as *amount*, *patch*, or *collection* and when applying it to the semantics of pairs like *clothes – clothing*, *coins-change*, *shoes-footwear*. Certainly, the approach has the same difficulties dealing with object mass nouns as the extensional mereological approach.

There is something unsatisfactory about both approaches to the mass-count distinction and that is that both take quantities and pluralities to be single entities which make up the extension of mass nouns and plural nouns respectively. If they are single entities, then those entities should be countable, which they aren't. Quantities and pluralities can never be counted as 'one'. Thus (19a) and (19b) cannot have readings on which the verb *count* targets (contextually individuated) subquantities or subgroups:

- (19) a. ?? John counted the jewelry. (meaning: counted heaps of jewelry)
 b. ?? John counted the students. (meaning: counted the groups of students).

The fact that pluralities and quantities never count as one in the context of the semantics of natural language is something that mereological approaches don't seem to give justice to (whether based on extensional mereology or mereology with integrity conditions). For plurals, the recent approach of plural reference avoids the problem by taking pluralities to be 'collections as many' rather than 'collections as one', to use Russell's phrase; that is, on that approach, *the students* refers plurally to each student at once, rather than referring to a single thing that is a plurality (sum or set) (Oliver/Smiley 2013, Moltmann 2017).

3. Numeral classifiers

Numeral classifiers are a category of expressions that have an individuating function, making,

it seems, counting and quantifying possible (Cheng / Sybesma 1999, Borer 2005, Doetjes 2012, Rothstein 2017). They play an important role in classifier languages such as Chinese, which lacks a syntactic mass-count distinction. At the same time, recent research shows that the presence of classifiers in a language does not strictly go along with the absence of a mass-count distinction, and vice versa. Classifier languages include most East and Southeast Asian languages, some Australian aboriginal languages and some native American languages. In general, in classifier languages numerals are obligatorily followed by a classifier that indicates the semantic class of the host noun (Allan 1977, Downing 1996, Senft 2000, Aikhenvald 2003). Classifiers often convey properties of shape, as in the Mandarin Chinese examples below:

- (20) a. yi zhang zhi/lian/chuang
 one CL-flat paper/face/bed
 b. yi tiao shengzi/she
 one CL-long-thin rope/snake

A common view is that all nouns in classifier languages are mass or better number-neutral, which means that entities in the extension of nouns in those languages can be counted only in virtue of the presence of a unit-specifying classifier.

Generally two sorts of classifiers are distinguished: sortal classifiers and mensural classifiers (Lyons 1977, Doetjes 2012). A sortal classifier is a classifier which specifies units in terms of types of entities (sorts), whereas a mensural classifier is a classifier which specifies units in terms of quantities. Sortal classifiers actualise individuation condition already belonging to the concept to which they apply, making them linguistically visible (Bisang 1999). Mensural classifiers create units by applying external scales. In English, measure phrases such as *one slice* in *one slice of bread* and *three cups* in *three cups of milk* have the function of mensural classifiers (Lehrer 1986).

Classifiers come in a range of categorisation devices, which differ, among other things, in their grammatical status, degree of grammaticalisation, meaning, and conditions of use (Aikhenvald 2003). In some languages, classifiers are morphemes or words that select nouns or verbs in syntactic constructions for counting or quantifying entities. Classifiers can also be noun categorisation devices that are syntactically associated with verbs but categorise nominal subjects or objects.

Classifiers in classifier languages require more complex syntactic structures of noun phrases. One recent proposal is that of Zhang (2013). Besides the functional projections NumP representing number and QuantP hosting quantifiers, Zhang takes the structure below DP to contain a unit phrase *UnitP*, which ensures the applicability of a numeral, as well as a delimitative phrase *DelP*, which conveys delimiting information related to size and shape. Another influential proposal regarding the syntax of classifier phrases is that of Borer (2005). Borer's proposal goes beyond classifier languages and takes nouns to be number-neutral even in languages like English. Borer posits a functional head *ind* for numeral classifier phrases, which is present both in Chinese classifier constructions and in English measure phrases. *Ind* moreover serves to host singular and plural morphology in languages with a mass-count distinction such as English, where nouns are now considered number-neutral. Borer's view is not uncontroversial, though, since there are languages that allow classifiers to go together with count syntax. The syntactic structure of classifier systems and the generalizations they are based on continues to be a widely debated topic in syntax. Of particular interest in the general debate is the variation of classifier languages that there are and that may behave rather differently from Chinese.

4. Contributions in this volume

The mass-count distinction and the related topic of classifier languages raise a range of questions that the articles in this volume will contribute to.

One general question the mass-count distinction raises is: what cognitive or ontological distinction does it go along with? **Srinivasan and Barner** in their contribution to the volume approach the question from an empirical cognitive perspective, dealing with the phenomenon of object mass nouns as well as minimal pairs of a count and a mass noun that appear to stand for the very same entities (such as (English) *hair* (mass), Italian *capelli* (count)), quantitative comparisons (which for count nouns are number-based, but for mass nouns may be measurement- or number-based), and the acquisition of counting. They argue that countability conveyed by count nouns does not just depend on syntactic and lexical representation, but that additional conceptual and pragmatic factors come into play. **Treves and Rothstein's** contribution falls within the same topic. Making use of a neural network and crosslinguistic findings, they argue against the common view of a binary distinction between semantic mass and count markers to correlate with the syntactic mass-count distinction; instead they favor a graded distribution of correlations. They also argue that, crosslinguistically, there are different

ways for a noun to be situated on a graded scale between pure count and pure mass. Finally, they argue against a strict correlation between mass-count syntax and (standard) semantic distinctions, and in favor of viewing the syntactic mass-count distinction as encoding a perspectival contrast between entities presented grammatically as countable and entities presented as non-countable in a context.

Another question that the mass-count distinction raises is that of the classification of categories of number itself. Most of the literature is focused on the distinction between mass, singular count, and plural. **Ojeda** in his contribution to the volume elaborates with a range of crosslinguistic cases the richness and diversity of the category of number and proposes formal semantic analyses for different number categories using extensional mereology. The categories Ojeda discusses include the dual, the co-dual, the paucal, and the multal, and the universal number, a category of nouns that applies to both individuals and pluralities. The latter, surprisingly, is found in English as well, as Ojeda points out, namely in roots of nouns, which are used in compounds such as *one-car garage*, *two-bedroom apartment*, *three-pound package*.

The mass-count distinction with its opposition to classifier systems such as that of Chinese is not as clear-cut as it first might have seemed given a broader crosslinguistic perspective, which is what **Bale and Gillon's** contribution is about. Bale and Gillon show that Western Armenian lacks a mass-count distinction, yet has plural marking with a completely optional use of classifiers. Moreover, they give examples of languages (Ch'ol and Mi'gmaq) where classifiers are required by the use of certain numerals, but not by nouns themselves. They suggest that the syntactic mass-count distinction may not go along with a semantic distinction at all, but rather is on a par with gender-marking.

The mass-count distinction has primarily been studied with respect to nouns for concrete objects, but not abstract nouns, such as *hope* and *joy*. **Zamparelli's** contribution focuses on abstract mass nouns and the productive countability shifts they may undergo.

Hinterwimmer's contribution is a study of abstract mass nouns and their distinctive semantic behavior with respect to both mass and count quantifiers.

Mass nouns in English include one notoriously tricky subcategory, that of object mass nouns, mass nouns whose denotations appear to consist in pluralities of well-distinguished individuals, such as *furniture*, *police force*, *footwear*, *hardware*. **Cohen** in her contribution points out that object mass nouns are obtained by various active morphological processes in English, French, and Hebrew and that this has consequences for how the semantics of such nouns is to be viewed. She suggests a perspectival semantics of object mass

nouns, on which common functionality is emphasized and individual members are backgrounded.

Object mass nouns are also the focus of the contribution of **Rothstein and Pires de Oliveira**. They point out a fundamental difference in the way object mass nouns in comparatives behave in English and in Portuguese Brazilian. Whereas in English object mass nouns in comparatives are compared strictly numerically (*John has more furniture than Bill*), in Brazilian Portuguese such comparison may involve counting as well as measurement. Rothstein and de Oliveira give a semantic explanation for this difference.

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Susan Rothstein has (co-)contributed two articles to this volume, and she was one of the most important contributors to the linguistic debate of the mass-count distinction in general. It is immensely regretful that she was not going to see the publication of this volume.

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