

# On the Semantics and the Ontology of the Mass-Count Distinction

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The mass-count distinction is a morpho-syntactic distinction among nouns in English and many other languages. *Tree, chair, person, group*, and *portion* are count nouns, which come with the plural and accept numerals such as *one* and *first*; *water, furniture, silverware*, and *rice* are mass nouns, which lack the plural and do not accept numerals. The morpho-syntactic distinction is generally taken to have semantic content or reflect a *semantic mass-count distinction*. At the center of the semantic mass-count distinction is, in some way or another, a notion of unity or being a single entity, the basis of countability. There is little unanimity, however, of how that notion is to be understood and thus what the semantic mass-count distinction consists in. In this paper, I will give a very general outline of existing approaches to the mass-count distinction, distinguishing between object-based, extension-based, situation-based, and grammar-based approaches. The grammar-based approach appears to meet best certain kinds of challenges that theories of the semantic mass-count distinction face. The paper will discuss existing syntactic versions of the grammar-based approach as well as two semantic versions, an ontological one as well as a novel, truthmaker-based one, both of which, though, will refrain from giving an account of unity itself.

## 1. Criteria for the mass-count distinction

The following are standard diagnostics for the mass-count distinction in English and other languages that display a mass-count distinction (Pelletier/Schubert 1989/2013, Moltmann 1997, Doetjes 2015, Chierchia 1998, 2010, Rothstein 2017).<sup>1</sup> First of all, the mass-count distinction is a morpho-syntactic distinction among nouns: count nouns such as *tree, table, rice grain*, and *portion* come with the plural, but mass nouns such as *water, furniture*, and *rice* don't. Verbs in turn show singular or plural agreement with a count noun phrase (NP) as

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<sup>1</sup> Not all languages share the same diagnostics, though. There may not be a single set of mass-count diagnostics that applies across languages, but rather various sorts of sets, and they may determine a gradual distinction, rather than a binary one (Treves/Rothstein 2020, Bale/Gillon 2020). This means that researchers now often just focus on particular diagnostics and a semantic or syntactic account of them.

subject, but singular agreement only when the subject is a mass NP (*House were built*, \* *Houses were built*, *Water has evaporated*, \* *Water have evaporated*).

Mass and count nouns differ also with respect to the determiners, quantifiers, and anaphora they permit, as well as with respect to the predicates or readings of predicates with which they are compatible. Most importantly, count nouns permit numerals (*one*, *two*, *first*, *second*), but mass nouns don't (*two bags*, \* *two luggage*, *one cup*, \* *one silverware*). Count NPs, moreover, support count anaphora such as *one* and *another*, but not so mass NPs (*John took a cup*, and *Mary took another*, \* *John took some silverware*, and *Mary took another*). Count nouns likewise allow for ordinal numerals *first*, *second*, and *third* (*the first house*), but not mass nouns (?? *the second wood*, ?? *the third furniture*). Count nouns go with count quantifiers such as *many*, *few*, and *several*, mass nouns with mass quantifiers such as *much* and *little*. Count nouns go with the nouns *number* and *couple* (*a great number of tables*, *a couple of cups*, \* *a great number of furniture*, \* *a couple of silverware*); mass nouns go with the nouns *amount* and *deal* (*a large amount of furniture*, *a good deal of stuff*, \* *a large amount of trees*, \* *a good deal of objects*) (Kayne 2005, 2010).

Related to the last two criteria are corresponding semantic selectional constraints on verbs (Moltmann 1997, 2021). Number-related predicates like *count*, *rank*, *list*, and *enumerate* generally apply only to count NPs (*John counted/ ranked / listed / enumerated the pieces of gold*), but not mass NPs (?? *John ranked / listed / enumerated the gold*). A criterion philosophers use more than linguists is the applicability of the predicates *is one of the N* and *are among the N* to count NPs, but not mass NPs; the latter instead allow only for *is some of the N* (McKay 2016) (*This cup is one of the cups Mary owns*, *The two children are among the children admitted to the school*, *This rice is some* / \* *among* / \* *one of the rice that was in the container*).

There is always the question whether particular diagnostics are just a reflection of the morpho-syntactic distinction, a matter of syntactic agreement with a mass or count NP, or whether they can be explained semantically, in terms of the content of the morpho-syntactic mass-count distinction. Whereas the selection of determiners, numerals and anaphora appears strict, not amenable to the sort of accommodation generally available for semantic selectional restrictions, the restrictions imposed by predicates like *count* appear less strict and are more plausibly semantic in nature. Thus, *count* is not strictly excluded with mass nouns such as *clothing* or *carpeting* (though still less acceptable than with corresponding plural nouns such as *clothes* or *carpets*); they contrast in that respect with numerals, which are impossible with any mass nouns whatsoever (\**three clothing*, \**one carpeting*).

Not all languages display a morphosyntactic mass-count distinction. In particular, Chinese does not (at least that is the standard view, adopted, for example, by Rothstein 2017).<sup>2</sup> Instead of making use of a singular count category, Chinese requires the presence of numeral classifiers for the application of numerals (numeral-classifier-N). Classifiers can also be found in languages that do have a morpho-syntactic mass-count distinction. English *two loafs of bread* comes close to a classifier construction, with *loaf* acting as classifiers permitting the application of the numeral *two* to a mass noun. English also displays a classifier construction with adverbials such as *two times* (in *John fell two times*), where *times* acts like a numeral classifier permitting the application of numerals to verbs, which do not come with a morpho-syntactic mass-count distinction (Moltmann 1997, chap. 5). The topic of classifier languages is of considerable complexity and controversy. Recent research in fact indicates that the generalization based on Chinese and European mass-count languages is much too simplified and fails to apply to a great range of languages (Bale / Gillon 2021, Kulkarni et al 2020). However, some general assumptions are safe to retain, such as that numeral classifiers *may* have the same sort of unity-conveying function as singular count nouns.

## 2. Three approaches to semantic mass-count distinction

The mass-count distinction is generally taken to have semantic content, that is, to reflect a *semantic mass-count distinction*.<sup>3</sup> At the center of the semantic mass-count distinction is the notion of unity, the property of being a single entity, which is the basis for counting. The notion of unity, intuitively, appears to be the distinctive feature of the content of singular count nouns as opposed to that of mass nouns. Quite independently of the topic of the mass-count distinction, the notion of unity has played a central role in the history of philosophy, for questions as to what distinguishes an entity from the collection of its parts or what constitutes the unity of matter and form. It is in fact one of the oldest problems in metaphysics; it was at the centre of discussion already in antiquity (Parmenides, Plato, Aristotle) and continues to be a difficult and central topic in metaphysics about which there is little unanimity (Priest 2015). The philosophical discussion, though, has had little influence on the development of formal semantic theories of the mass-count distinction, which has hardly paid attention to it.

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<sup>2</sup> More recently there has been some controversy whether Chinese nouns lack a mass-count distinction. See Doetjes (2012) and Cheng/ Sybesma (1999, 2005) for a view that differs from that of Rothstein (2017).

<sup>3</sup> Not all scholars hold the view though. Given the way the mass-count distinction manifests itself across languages, Bale/Gillon (2020) take the view that the mass-count distinction is merely syntactic, playing a role for syntactic agreement, rather than having a substantial content.

Linguists dealing with the mass-count distinction generally presuppose a particular formal identification of the notion of unity. The most common construal of the notion of unity is that of an atom with respect to a noun denotation, where  $x$  is *an atom with respect to a set*  $X$  iff there is no proper part of  $x$  that is in  $X$ . However it is questionable whether the notion of an atom provides the notion of unity or being a single thing (Section 2.1.).

One may argue that semanticists in fact should not make a theoretical decision on a topic that is a philosophers' task. But the mass-count distinction itself, it appears, bears on the scope and importance of the notion and may itself impose conditions on how it should be conceived, apart from the examples that generally figure in the philosophical discussion.

In this paper, I will restrict myself to approaches that take singular count nouns, plural nouns and mass nouns to denote sets of entities.<sup>4</sup> Following common terminology, I will call the entities in the extension of singular count nouns *individuals*, the entities in the extension of mass nouns *quantities*, and the entities in the extension of plural nouns *pluralities*, leaving open, though, whether those entities are of different ontological types.<sup>5</sup> Even though useful, this terminology is actually misleading. Unlike what the singular count *quantity* suggests, elements in the extension of mass nouns (*water*) are neither 'one' nor 'many' (McKay 2016), and unlike what the singular count noun *plurality* suggests, elements in the extension of plural nouns (*students*) are not 'one', that is, single entities, but 'many' (Moltmann 2016). For the purpose of this paper, though, I will adopt the view about plurals that has been most widely accepted in natural language semantics, namely according to which plurals denote sets of sums of entities (Link 1983). This is given below, where  $\oplus$  is the sum formation operator mapping a set of entities to its sum and  $[]$  the function mapping an expression to its extension:<sup>6</sup>

- (1) For a plural noun  $N_{\text{plur}}$ ,  $[N_{\text{plur}}] = \{x \mid \exists X (P \neq \emptyset \ \& \ X \subseteq [N_{\text{sing}}] \ \& \ x = \oplus X)\}$

Three general approaches to the semantic mass-count distinction can be distinguished:

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<sup>4</sup> There is also the view that mass nouns denote kinds or qualities (ter Meulen 1981).

<sup>5</sup> The term 'quantity' was first used in this sense by Cartwright (1970). See also ter Meulen (1081) and Schubert/Pelletier (2012).

<sup>6</sup> The alternative is the view of plural reference, reference to several entities at once, see Moltmann (2016) and references therein.

[1] *the object-based approach*, on which the semantic mass-count distinction consists in a distinction among types of entities, whether in an ontology of the real or an ontology of how we conceive of things

[2] *the extension-based approach*, on which the semantic mass-count distinction consists in different properties of the extensions of nouns, and

[3] *the grammar-based approach*, on which the semantic mass-count distinction, roughly, is directly linked to the use of mass and count nouns.

The object-based approach has traditionally been taken by philosophers (see Steen 2016), though also by linguists such as Jespersen (1924) and Langacker (1987). The extension-based approach is originally due to Quine (1960) and has become particularly influential in natural language semantics following the seminal paper of Link (1983). Proponents of the grammar-based approach are Borer (2005) and especially Rothstein (2017), for whom the semantic mass-count distinction consists in a difference in ‘grammaticized individuation’. A hybrid between the object-based approach and the grammar-based approach is the theory of situated part structure of Moltmann (1997).

The three approaches, one may say, construe the notion of unity in different ways. The object-based approach generally centers on *unifying conditions of integrity* that entities are supposed to fulfill in order to count as one, such as having a form or a boundary or showing maximal connectedness among their parts. On that approach, entities that are unified wholes (by meeting relevant conditions) make up the extension of singular count nouns, whereas entities that fail to be unified wholes make up the extension of mass nouns.

The *notion of an atom* with respect to a noun extension is central on the extension-based approach. On that approach, atoms (relative to a noun extension) make up the extension of singular count nouns, but not (or not generally or necessarily) the extension of mass nouns.

The (semantically relevant) notion of unity on the third approach is strictly linked to the use of count nouns or the use of numeral classifiers. The grammar-based approach embraces discrepancies between the ontology reflected in grammar (in particular, the mass-count distinction) and the ontology at the level of cognition or reality. In particular, the use of a count noun (but not a mass noun) conveys a notion of unity (and hence countability) which need not align with the individuation of entities in language-independent cognition or reality. On the grammar-based approach, unity (in the semantically relevant sense) can be said to be ‘made available’ or ‘be introduced’, rather than being implied by the way things are or are conceived or by properties of the extension of nouns. Singular count nouns and numeral classifiers on that approach thus are *unity-introducing* expressions.

In what follows, I will give a brief discussion of the three approaches without going into greater detail regarding particular proposals.<sup>7</sup> I will instead focus on cases that present difficulties for the object-based and the extension-based approaches, as well as the theory of situated part structures. These cases appear to give support for the grammar-based approach instead, though the particular syntax-based versions proposed by Borer and Rothstein have problems of their own. I will sketch a truthmaker-based account as an alternative grammar-based theory of the mass-count distinction.

## 2.2. The object-based approach

### 2.2.1. Traditional approaches

On the object-based approach, the semantic distinction between singular count, plural and mass nouns resides in the sorts of properties nouns attribute to entities (or conceived entities). Singular count nouns convey properties that imply a boundary, form, or more generally conditions defining an entity as a unified or integrated whole. The notion of form was central already in Aristotle's metaphysics and Aristotle's particular view of unity has more recently been revived by Simons (1987) as well as, in context of semantics, Moltmann (1997). The notion of form or more generally integrated whole played no role, though, in the extensional mereological tradition, which had been dominant in philosophy and natural language semantics for a long time.

A simple version of the object-based approach is this:

#### (2) The semantic mass-count distinction on the object-based approach

Referents of singular *count nouns* come with a form, boundary or more generally integrity; referents of *mass nouns* don't.

One question that this raises, of course, is how exactly is the notion of form or of an integrated whole to be understood? While not aiming to give a full definition of form or integrity, Simons (1987) defines a simple notion of an integrated whole as an entity that is maximal by consisting of entities connected to each other by a relation R:

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<sup>7</sup> Also there are approaches to the mass-count distinction that do not fall within those approaches, such as Chierchia (2010). I will set them aside as far as they do not address the particular issues this paper focuses on.

(3) For a non-formal transitive and symmetric relation  $R$ ,

$x$  is an *R-integrated whole* iff for any proper parts  $y$  and  $z$  of  $x$ ,  $yR^+z$  and no entity  $w$  not a part of  $x$ ,  $yR^+w$ , where  $R^+$  is the transitive closure of  $R$ .

$R$  may be spatial or temporal contiguity, for example, so that an  $R$ -integrated whole will be an entity maximally connected in time or space. A special  $R$ -integrated whole is an  $FF$ -integrated whole, based on a property  $F$ , where the relation  $FF$  is defined as  $x FF y$  iff  $Fx$  and  $Fy$ . This means that maximal entities consisting of entities that share a property are integrated wholes as well. More complex forms of integrated wholes may require various connecting relations as well as possibly functional roles that parts of the whole may play.

It is easy to see that the simple characterization of the mass-count distinction in (2) cannot work. Referents of mass nouns may be integrated wholes by accident. The gold on the table is as much an integrated as the ring on the table, if there is no other gold on the table than the ring. But the gold, whatever form it may take, will only be an accidental integrated whole, whereas the ring is an essential integrated whole. This suggests that referents of singular count nouns should be essential integrated wholes, whereas referents of mass nouns won't be essential integrated wholes. But also this leads to difficulties.

One of them is that mass nouns may stand for integrated wholes, in particular so-called *object mass nouns*. Object mass nouns are mass nouns like *clothing*, *luggage*, *hardware*, *jewelry*, *faculty*, *furniture*, *population*, *personnel*. Object mass nouns form a significant class of mass nouns whose lexical content appears to describe well-individuated entities, but which behave as mass nouns in a number of respects (no plural, singular agreement with the verb, incompatibility with numerals, selection of mass determiners etc). Object mass nouns pose a challenge not only for the object-based approach to the mass-count distinction, but also the extension-based approach. In general, what appears to be going on with object mass nouns is that they describe entities in terms of their function or overall quality, putting their individuality in the background.

Another problem is that there are singular counts that appear to characterize accidental integrated wholes, such as the head nouns in *the (loose) collection*, *the queue (of people)*, *the collection of stuff on the desk* (Moltmann 1997).

Finally, there are nouns that fail to convey integrity defined in terms of maximality: a continuous part of a sequence or line is again a sequence or line, a continuous part of a fence is again a fence, any part of a portion of wine is again a portion of wine, any part of an entity is again an entity. These are what I will call *sequence-type nouns* (Moltmann 1998,

Zucchi/White 2001, Rothstein 2010). a type of noun that is also a challenge to the extension-based approach.

Despite the challenges of object mass nouns and *sequence*-type nouns and others to be discussed in later in Section 3, clearly integrity does play a role in the choice, formation, and meaning of count nouns. It is manifest particularly with nouns that have both a mass and a count version. The count noun *apple* generally refers to whole apples (*John put an apple in the salad*), the mass noun *apple* (*John put more apple in the salad*) to pieces of apple, whatever the outcome of the ‘universal grinder’ (Pelletier/Schubert 2012). The noun *part* comes with a count and a mass version. The count version implies the part being a whole possibly with a particular functional role (??? *the rice was a part of the meal*); the mass nouns does not imply that (*the rice was part of the meal*) (Moltmann 1998). While verbs themselves are not marked for mass or count, count nominalizations of verbs are chosen when the verb describes bounded events (*death, completion*), mass nominalizations when the verb describes actions or states (*rain, love*).<sup>8</sup> Non-technical uses of the count nouns *entity, thing, and object* generally imply that the entity referred to is an enduring integrated whole, contrasting in that respect with the mass nouns *stuff* and *matter*.

## 2.1. The extension-based approach

On the extension-based approach, the semantic distinction between singular count, plural and mass nouns resides in properties of their extensions, generally formulated in terms of extensional mereology (Link 1983, Krifka 1989, Chierchia 1989, Champollion/Krifka 2017). A common version of the approach is based on cumulativity and atomicity as below, where  $<$  is a transitive and irreflexive part relation:

### (4) The semantic mass-count distinction on the extension-based approach

- a. For a singular noun  $N$ ,  $[N]$  is atomic.
- b. For a mass noun  $N$ ,  $N$  is cumulative and  $[N]$  is not atomic.

- (5) .a. A set  $Y$  is *atomic* iff  $\forall x(x \in Y \rightarrow \forall y(y < x \rightarrow \neg y \in Y))$
- b. A set  $Y$  is *cumulative* iff  $\forall X(X \neq \emptyset \ \& \ X \subseteq Y \rightarrow \oplus X \in Y)$

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<sup>8</sup> This is a simplification, though. See Barner et al. (2008) for a detailed discussion of event nominalizations.



Sometimes a stronger condition than lack of atomicity is imposed on mass nouns, namely divisiveness (a predicate  $N$  is divisive iff  $\forall x(N(x) \rightarrow \forall y(y < x \rightarrow N(y)))$ ) (Cheng 1973). There are various versions and details of the extensional mereological approach, which I will not discuss in greater detail. Instead I will focus on two general problems for the extension-based approach of the semantic mass-count distinction.

One of them, again, is object mass nouns as well as granular nouns such as *rice grains*, *beans* etc. The approach, at least on its simple version given in (4), does not offer an account of pairs like *luggage – pieces of luggage*, *policemen – police force*, *clothes – clothing*, *rice grains – rice* etc., which will have the very same extensions, yet display the usual differences between mass and count (Chierchia 1998, Rothstein 2017).<sup>9</sup>

Another problem for the extension-based approach is that atomicity does not generally hold for *sequence*-type nouns. *Sequence*-type nouns are a problem shared with the object-based account that made use of unifying conditions of integrity

There is a more general issue, though for the extension-based approach and that is the issue whether being an atom with respect to a set really captures the notion of unity, the notion of being a single, countable entity. *Sequence*-type nouns are not atomic, but are their referents thereby non-countable? Even if a noun has uncountably many entities in its extension ordered by the part-of relation, this does not mean that those entities could not be single entities.

### 2.2.2. The theory of situated part structures

On the theory of situated part structures (Moltmann 1997, 1998), the semantic mass-count consists in a distinction between situation-relative properties, rather than types of objects. In addition to the cases where count nouns do not convey essential integrity and mass nouns stand for entities with essential integrity, the theory of situated part structures has been motivated by data that specifically involve part structures in situations, data to which the traditional, object-based approach could hardly apply.

First, distributivity and part structure-sensitive semantic selection may take contextually relevant parts of a plurality or quantity into account.<sup>10</sup> Thus, (6a) permits a reading on which John evaluated particular, contextually relevant groups of students, and (6b) one on which

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<sup>9</sup> There are developments within the extension-based approach that aim to account for object mass-nouns and *sequence*-type nouns, such as relativizing the denotation of a count noun to a context (Landman 2020).

<sup>10</sup> See also Grimau (2021) for a discussion of such phenomena.

compares those groups. Similarly, (7a, b) have readings on which *weigh* and *compare* in target the maximal quantity of silver and the maximal quantity of gold (in the context):

- (6) a. John evaluated the students.
- b. John compared the students.
- (7) a. John weighed the silver and the gold.
- b. John compared the silver and the gold.

The traditional object-based approach does not provide a way of giving structure to pluralities and quantities. The theory of situated part structures does so by relativizing part structures of pluralities and quantities to situations, situations that represent linguistic and, to an extent, non-linguistic information. Predicates (or distributive readings of predicates) then do not apply to entities, but pairs consisting of entities and situations.

Second, there are part-structure-sensitive modifiers such as *whole* and *individual*, which the object-based account can hardly deal with. *Whole* has the effect of shifting the perspective of an entity to one on which it is viewed as a plurality of parts, making distributive readings available that generally are unavailable with singular count nouns, as seen in the contrast between (8a) and (8b).<sup>11</sup> *Individual* in (8c) has the effect of blocking a reading on which the predicate takes into account contextually relevant subgroups of students:

- (8) a. The whole collection is expensive.
- b. The collection is expensive.
- c. John compared the individual students.

The theory of situated part structures deals with such cases by having *whole* and *individual* shift the reference situations: *whole* in (8a) removes properties that define an entity as an integrated whole in the reference situation, and *individual* ensures that no proper subgroups are integrated wholes in the reference situation (so that only the individual members count as relevant parts of the plurality). The theory of situated part structures is based on the view that information based on lexical meaning and syntactic construction may play the same sort of role as the mass-count distinction itself.

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<sup>11</sup> *Whole* actually has two readings. On a second reading, *whole* has the opposite effect, ensuring that the entity in question is regarded ‘as a whole’, which triggers a collective reading, see Moltmann (2005) for a unified analysis of the two readings of *whole*. On the second reading, *whole* naturally applies to mass nouns as well (*the whole furniture won’t fit into the lorry*).

Like the object-based approach, the theory of situated part structures takes the semantic mass-count distinction to consist in that (singular) count nouns convey properties of integrity of some sort, whereas mass nouns don't, but now relative to a situation. The central assumption of the theory of situated part structures is that predicates do not apply to entities as such, but entities in *reference situations*, that is, situations associated with the use of NPs that carry information about the integrity of entities or their parts provided by lexical content or syntactic construction. Entities may then be integrated wholes in a reference situation on the basis of linguistic information not tied to the use of count nouns, for example by being sums of individuals or quantities sharing a property.

Given the role of reference situations, the theory of situated part structures distinguishes singular count, plural, and mass nouns semantically as follows:

(9) The semantic mass-count distinction within the theory of situated part structures

- a. If N is a singular count noun, then for an entity  $x$  and a situation  $s$ , if  $\langle x, s \rangle \in [N]$ , then  $x$  is an integrated whole in  $s$ .
- b. If N is a mass noun, then for any entity  $x$  and any minimal situation  $s$  such that  $\langle x, s \rangle \in [N]$ ,  $x$  is not an integrated whole in  $s$ .

The restriction to a minimal situation in (9b) rules out that other information in the reference situation defines the referent of a mass NP as an integrated whole.

Given (9), referents of singular count nouns may very well be accidental integrated wholes.

Object mass nouns can be dealt with if situations are allowed to 'leave out' essential properties defining referents of nouns as integrated wholes.<sup>12</sup> As was mentioned, object mass nouns describe entities by focusing on their function or overall quality, which is thus what the relevant situations should represent. Situations then would have a perspectival status, rather than being on a par with possible worlds (which always specify entities with their essential properties). This, though, will require a different development of the notions of a situation as generally used in current semantic theories.<sup>13</sup>

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<sup>12</sup> See also also Cohen (2021) for suggestions to that effect.

<sup>13</sup> It has been argued, though, that object mass nouns and plural nouns reflect not just a semantic, but also a cognitive difference (Wisniewski / Imai / Casey 1996).

*Sequence*-type nouns may be dealt with by exploiting the role of situations: if a part of a sequence is maximal in a particular situation, it will still come out as an integrated whole in that situation.

Distributive readings as well as part-structure-sensitive semantic selection by predicates like *compare* will target pluralities or quantities with the particular structure they have in the reference situation. Thus, the subject NP in (7a, b) will stand for a quantity that in the reference situation is divided into two maximal subquantities consisting in silver and gold respectively. Part-structure modifiers like *whole* and *individual* specifically shift reference situations, thus influencing the availability of distributive readings.

There is one general problem with the theory of situated part structures and that is that it fails to distinguish two properties that must be kept apart (Moltmann 2016):

[1] the property of having unity (being countable)

[2] the property of being an integrated whole (in a situation).

This distinction bears on an important metaphysical issue, namely what makes a collection of entities that bear particular relations to each other a unified whole (a single thing), as opposed to a structured plurality of things (many connected things)?

The distinction between [1] and [2] is apparent first of all with definite plurals. Distributive interpretation and predicates like *compare* can take into account contextually given subgroups as in (6a) and (6b). However, number-related predicates like *count*, *list* and *enumerate* as well as numerals can target only individual members of a plurality (Moltmann 2016, 2021). Thus, (10) can only mean that John *counted*, *enumerated*, or *listed* the individual students, not contextually given student groups:

(10) John counted / enumerated / listed the students.

Also numerals can never apply to subgroups, but only to individual members of pluralities. Thus *two* in the examples below can apply only to individuals, not subgroups:

(11) a. The men and the women, the two never met.

b. John and Mary, the two never met.

c. The students are two.

Likewise, number-related predicates cannot take distinguished subquantities of a quantity into account. Thus, whereas (12a) is acceptable, even if not quite natural, *count* in (12b) cannot target the clothing as one thing and the food as another thing:

- (12) a. ? John counted Sue and Mary – he counted two.  
 b. ??? John counted the clothing and the food – he counted two.

Subgroups may be integrated wholes in the relevant situation, thus enabling distributive readings and a particular understanding of part-structure-sensitive predicates. But those do not count as single things for the purpose of the application of number-related predicates.<sup>14</sup>

This motivates the following distinction between two types of predicates: predicates that may take contextually given divisions of a plurality or quantity into account, such as (13a), and predicates that care only about individuals or individual members of a plurality, such as (13b) (Moltmann 2016, 2021):<sup>15</sup>

- (13) a. Predicates applicable to contextually given divisions of quantities and pluralities  
*Compare, gather, embrace, similar, related, connected, rate*  
 b. Number-related predicates  
 Cardinal and ordinal numerals, *list, rank, enumerate, numerous, count*

The metaphysical distinction between a structured plurality that counts as ‘many’ and a single thing that has the same structure and composition thus is well-reflected in the lexical semantics of natural language.

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<sup>14</sup> Number-related predicates are also hard to apply to object mass nouns and granular nouns, they are the harder to apply the more the noun emphasizes overall function rather than individuality of the objects composing the noun referent, as seen below:

- (i) a. ? John listed the decor.  
 b. ?? John counted / listed / enumerated the decoration.  
 (ii) a. ? John counted the rice.  
 b. ?? John counted the garnish.  
 (iii) a. ? John listed / enumerated / counted the art work.  
 b. ?? John listed / enumerated / counted the art.  
 (iv) a. John counted the metal pieces.  
 b. ??? John counted the reinforcement.

<sup>15</sup> The distinction between *gather* and *numerous* has recently been discussed by Kuhn (2020) as a distinction between mass and count – in the sense of the semantic, not the morphosyntactic mass-count distinction.

### 3. The problems for all existing approaches: portion and collection nouns

There is one particular challenge that all the approaches to the mass-count distinction face, the object-based and extension-based approaches as well the theory of situated part structure. These are certain (uses of) count nouns that imply neither atomicity nor convey any sort of condition defining an entity as an integrated whole (even in a situation). They consist in [1] *portion nouns* such as *portion*, *amount*, *quantity*, and *body* (as in *body of water*) and [2] *collection nouns* such as *bunch*, *collection*, *group*, *sum*, and *set* (on a non-technical use). NPs with portion nouns classify as singular count NPs, by the various syntactic and semantic criteria (Khrizman et al 2015): they come with the plural and select count determiners (*many*, *few*, *three*). With the uses of the nouns as portion nouns, *the portion of wine John drank* and *the quantity of rice John ate* appear to stand for the very same entities as *the wine John drank* and *the rice John ate*, respectively, except that the former counts as a single thing, whereas the latter is a mere quantity.<sup>16</sup> The use of count nouns as portion nouns maybe ‘technical’, and in fact *quantity* and *portion* have been introduced as terms to specifically refer to any mass noun referent whatsoever (Cartwright 1970, see Section 2). However, technical usage is legitimate usage of language and needs to be covered by the semantic theory as well.

That portion nouns, unlike mass nouns, stand for entities that count as one is apparent from the applicability of *is one of*-predicates, *one*-anaphora, as well as predicates of counting:

- (14) a. The portion of rice John just ate is one of / is among the portions of food he ate today.  
       b. ??? The rice John ate was one of the portions of food he ate today.
- (15) a. This is a quantity of rice; that is one too.  
       b. ??? This is rice. That is one too.
- (16) a. There are uncountably many quantities of water in that container.  
       b. ??? There is uncountably many water in the container.

Just like portion nouns, the use of nouns as collection nouns does not imply any unifying conditions of what is being referred to, making the following pairs semantically indistinguishable, even with situations of reference:

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<sup>16</sup> Scontras (2017) discusses degree uses of NPs with the head noun *amount*:

(i) John drank the amount of wine Bill drank.

But this is not the reading that portion and collection nouns generally exhibit.

- (17) a. the bunch of papers Mary proposed as readings – the paper Mary proposed as readings  
 b. the collection of things that remained in the house – the thing that remained in the house

Yet, collection nouns also contrast semantically with the corresponding plural NPs, allowing for *is one of*-predicates and *one*-anaphora, and generally referring to things that are ‘one’, rather than ‘many’.

Portion and collection nouns are equally problematic for the extension-based approach, since with the use as portion and collection nouns, *portion of wine* and *bunch of papers* share the very same extension with the mass noun *wine* and the plural noun *papers* respectively. Portion and collection nouns are not atomic and no context may ensure atomicity for cases like (16a).<sup>17</sup>

On non-technical uses, portion and collection nouns tend to go along with some form of integrity of the referent (e.g. maximal portions or collections in the relevant contexts). However, the use of the singular count category in natural language does not require that. This means that what distinguishes count nouns from mass nouns just cannot consist of substantive unifying conditions of integrity or of atomicity (perhaps relative to a context). The possibility of using nouns as portion or collection nouns thus shows a fundamental inadequacy of integrity-based and extension-based approaches. Singular count nouns carry a notion of unity or being a single entity without that being reducible to unifying conditions of integrity or atomicity. How such a notion of unity without substantive unity is to be understood remains a philosophical challenge, though. The notion is closely related to language and needs to be part of any semantic theory of count nouns and perhaps numeral classifiers, yet it appears clearly a topic for metaphysicians to deal with.

#### 4. The grammar-based approach to the semantic mass-count distinction

The third approach to the mass-count distinction does not construe the distinctive semantic feature of count nouns as a property derivable from lexical meaning or extensions, but rather relates it to the use of the morpho-syntactic count category itself. The question is whether this

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<sup>17</sup> Landman (2020) builds a theory of the mass-count distinction based on disjointness, which would apply to uses of portion nouns in particular contexts. However, disjointness is not a plausible condition on count nouns in general and hardly applicable to NPs with collection nouns such as *committee*, for example, which may easily stand for overlapping collections.

necessarily amounts to a syntactic account of mass-count phenomena or permits a semantic notion of unity as well.

The grammar-based approach has been motivated by object mass nouns like *furniture* and the relative arbitrariness of the choice of mass or count across languages as well as within the same language, with mass nouns and count nouns often competing for the same items (*clothes* - *clothing*, *shoes* - *footwear*, *hair* – ital. *capelli* (plural), *dishes* – German *Geschirr* (mass)). A further motivation has been the fact that in classifier languages such as Chinese, countability is conveyed by classifiers rather than nouns (on the standard view).

The basic idea of the grammar-based approach to the semantic mass-count distinction is that (only) the use of a count noun and expressions acting like individuating classifiers convey the semantically relevant notion of unity, that is, the notion of unity that permits the application of number-related predicates such as numerals and predicates of counting.<sup>18</sup> The point of departure of the grammar-based approach is the recognition that that notion of unity need not align with the individuation of entities at the level of (language-independent) cognition or reality. There are two versions of the grammar-based approach in the literature: Borer (2005), who posits different syntactic structures for mass and count NPs, and Rothstein (2020, 2017), who posits a semantic type distinction for mass and count NPs.

On Borer's (2005) theory of the mass-count distinction, count NPs are distinguished from mass NPs by the presence of an implicit classifier *ind*. Thus, whereas the mass NP *the water* has the structure [<sub>DP</sub> *the* [<sub>NP</sub> *water*]], the count NP *the man* has a structure that includes a classifier phrase headed by *ind* [<sub>DP</sub> *the* [<sub>CP</sub> *ind* [*man*]]]. The category *ind* hosts singular or plural morphology in English and numeral classifiers in languages such as Chinese. The selection of numerals is accounted for syntactically, in terms of their requirement of a (silent or overt) classifier.

By construing the mass-count distinction as a syntactic distinction between classifier and count NPs on the one hand and mass NPs on the other hand, this is a grammar-based account.<sup>19</sup> The problem with Borer's theory, though, is that it treats constraints on mass and count syntactic constraints concerning the presence or absence of a classifier, with no place for semantic selectional requirements, as would be needed for number-related predicates such as *count* and predicates such as *is one of the N* and *is among the N*.

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<sup>18</sup> This also matches Greenberg's idea of classifiers as a multiplicands: 'all the classifiers are . . . merely so many ways of saying 'one' or, more accurately, 'times one' Greenberg (1990 [1972], 172).

<sup>19</sup> Borer (2005), though, gives an extension-based account of the interpretation of *ind*, which, however, does not play a role for the selection of numerals.



Rothstein's (2010, 2017) version of the grammar-based approach posits a semantic type distinction for count nouns and mass nouns, which is to explain the restrictions on mass and count determiners and modifiers. For Rothstein, a count noun *N* applies to an entity *d* only relative to a context *k* in which *d* counts as an atom with respect to *N*, a context being a restricted set of entities. This is meant in particular to accommodate sequence-type nouns, where atomicity will hold only relative to a context. Mass nouns, by contrast, apply just to entities, which means that they do not guarantee that the entities they apply to are atoms in the context. The difference between count nouns and mass nouns thus consists in that mass nouns are of type  $\langle e, t \rangle$  (properties of entities), whereas count nouns are of type  $\langle (e, k), t \rangle$  (properties of entities in contexts). The difference in type is used to explain why numerals and count quantifiers require count nouns: they only select nouns of type  $\langle (e, k), t \rangle$ , but not of type  $\langle e, t \rangle$ . Classifiers semantically map predicates of type  $\langle e, t \rangle$  onto predicates of type  $\langle (e, k), t \rangle$ , thus making numerals applicable.

One potential difficulty for Rothstein's theory is that there are NPs that need to be neutral between mass and count, for example the pronouns *what* in *What did John eat? John ate soup and beans*. *What* would have to be assigned multiple types, as would *eat*. Second, Rothstein's type-theoretical account has difficulties accounting for conjunctions of NPs, as in *John took the wood and the stones* since *the wood and the stones* would have to stand for a sum of entities that belong to different types. Moreover, in *the wood and the stones in the garden*, the restriction *in the garden* would have to be of multiple types. The type-theoretic approach would have to assign all verbs multiple types with respect to their subject or object position, since verbs generally take both count and mass NPs, with exceptions such as *count*, *rank* and *list*.

A general problem that the syntax-based approaches of Rothstein's and Borer's share is that it is on their view whether a predicate like *is a single thing* or *is one (of the N)* is true of an entity is determined by the syntactic category or type of the subject NP. But this cannot be right, since then the same subject NP should then also be fine, and thus true, with *is not a single thing* or *is not one (of the N)*, but that leads to a contradiction. Whether a predicate like *is a single thing* or *is one (of the N)* is true of an entity should rather depend on the nature (or presentation) of the entity itself. What is needed thus is a semantic version of the grammar-based approach.

## 5. Semantic versions of the grammar based approach

In what follows I will present two semantic versions of the grammar-based approach: an ontological version, which makes use of a rich ontology that is in part language-driven, and a situation-based version, which makes use of situations that keep track of linguistic information. Those versions do not hinge on a particular elaboration of the unity itself; rather the notion will just be represented by a predicate ‘U’, which stands for the property of ‘being one’ or a single entity’, however that will ultimately be accounted for. The property U will be considered part of the content of the syntactic category of singular count nouns as well as of unity-introducing expressions such as classifiers in languages such as Chinese (given the standard view).

### **5.1. An ontological version of the grammar-based approach**

The ontological version of the grammar-based account, outlined in Moltmann (2021), is based on a plenitudinous or maximalist view of ontology – the ontology of what there actually is. This is, roughly the view that ‘for any type of object such that there can be objects of that type given that the empirical facts are exactly what they are, there are such objects’ (Eklund 2008). Such an ontology is rich in spatio-temporally coincident entities. In particular, for any entity that is a single entity, there is also one minimally different from it in not being a single entity (and vice versa). The latter would be entities in the denotation of mass nouns or any expressions that do not come with a morpho-syntactic mass-count distinction (such as Chinese nouns). Given such a ‘permissive’ ontology, entities referred to as ‘clothes’ and ‘clothing’ will be distinct entities, as will be entities referred to as ‘the loaf of bread’ and ‘the bread’ and entities referred to as ‘the portion of rice’ and ‘the rice’ (in a given context). Moreover, on that view, the ontology reflected in the mass-count distinction is a language-driven ontology, to be distinguished from the ordinary ontology, which includes the domain of ordinary objects and is based on language-independent conditions of individuation. Semantic selection targets the language-driven ontology, though the ordinary ontology may be available for other semantic purposes.

Given such a maximalist view of an ontology, using a count noun, classifier, or lexical item conveying unity means selecting a unified whole, a single entity, rather than its non-single correlate. Semantically, this means that singular count categories select single entities and classifiers map entities onto correlates that are single things. Structured pluralities are considered entities distinct from mere pluralities, namely as ‘configurations’, which means pluralities that come with certain connections among their members. Also part-structure-

modifiers will now be considered expressions that characterize an entity ontologically. Thus ‘the students’ (on a subgroup reading) and ‘the individual students’ will be distinct entities (pluralities), as will be ‘the exhibition’ and ‘the whole exhibition’.

There are important questions, though arising for the view, in particular how the two levels come into play in the semantics and relate to each other. How does reference work, if NPs stand for entities that may diverge from their correlate in the ordinary ontology? Quite generally, many philosophers will have reservations about adopting such a fine-grained ontological view and prefer to view distinctions such as that between ‘the clothes’ and ‘the clothing’ as well as ‘the exhibition’ and ‘the whole exhibition’ as a matter of perspective, rather than ontology.

## **5.2. A situation-based version of the grammar-based approach**

A semantics based on situations promises an alternative to the permissiveness of the ontological version of the grammar-based approach. The theory of situated part structures, of course, faced difficulties by not distinguishing unity as such from conditions of integrity (in a situation). This suggests that there would be a simple way of modifying the theory, by adding the property *U* and distinguishing it from properties defining integrated wholes (such as *R*-integrated wholes). The characterization of the mass-count distinction would then be as in (9), except that ‘integrated whole’ is replaced by the predicate ‘*U*’. Crucially, one and the same entity may have *U* in one situation and lack *U* in another situation. Semantic selection involving entities in situations may care about whether an entity has *U* in the situation or not. The problem, however, is that the theory allows reference situations to be richer than what is strictly given by the description used to refer to entities; they depend on speaker’s intentions, not just the descriptive content of the description. For example, situations may contain information defining pluralities as particular structured pluralities, and situations should contain the domain of entities relative to which a definite description is evaluated and which constitute the domain of quantification for quantificational NPs (Barwise / Perry 1983, Elbourne 2005) – at least that way situations would be independently motivated.<sup>20</sup> But this means that in such a situation an entity may have *U* even if it is a referent of a plural or mass noun, and that should be excluded.

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<sup>20</sup> One would thus expect reference situations to also take on the role of resource situations in Situation Semantics, which provide the domain for quantificational and definite NPs (Barwise / Perry 1983).

There is a different way of bringing situations into the semantics of sentences, namely by making use of the notion of truthmaking, in the sense of Fine's (2017) recent development of truthmaker semantics. Exact truthmaking is a relation that holds between a situation and a sentence just in case the situation makes the sentence true and is fully relevant for the truth of the sentence. While in the theory of situated part structures, reference situations could include nonlinguistic information, situations as 'exact truthmakers' serve to keep just track of the linguistic material being used. In particular, this would be particular information about the unity of referents of NPs.

There need not be a single such situation, though; rather different situations may act as exact truthmakers of, for example, *A or B*, situations that A true and situations that make B true, so that *the director or president* will involve reference situations in which the individual referred to is director as well as situations in which she is president. Referential NPs thus better denote pairs consisting of an entity and a set of situation, the *reference situation type*. Such types of situations keep track of how an entity has been described at the relevant point in the composition of the meaning of a sentence, which, for present purposes, can be taken to be the set of situations that are its exact truthmakers.<sup>21</sup>

The distinction between referents of singular count NPs and referents of mass NPs will now be understood as the distinction between entities that have unity and entities that lack unity in the relevant situation type. To formulate that, the exact truthmaking relation  $\models$  will now also apply to formulas ' $P(<d, S>)$ ' consisting of a one-place predicate ' $P$ ', a term ' $d$ ' for an object  $d$  (represented by itself) and a term ' $S$ ' for a situation type  $S$  (again represented by itself).  $s' \models P(<d, S>)$  will require  $s'$  to have as part some situation  $s$  that belongs to  $S$  (I will restrict myself to one-place predicates):<sup>22</sup>

(18) Condition on situational inclusion

For a situation  $s'$ , a type of situation  $S$ , a predicate  $P$ , and an entity  $d$ , if  $s' \models P(<d, S>)$ , then for some situation  $s \in S$ ,  $s < s'$ .

Then we have:

<sup>21</sup> In Fine's (2017) truthmaker semantics, sentences the denotation of a sentence is actually a bilateral proposition, a pair consisting of the set of truthmakers and the set of falsitymakers. I will disregard the negative part for the sake of simplicity.

<sup>22</sup> This means that  $S$  is a partial content of the set  $\{s' \mid s' \models P(<d, S>)\}$ , in the sense of Fine (2017).

(19) Semantic conditions on singular count nouns and mass nouns

- a. For a singular count noun  $N$ , an entity  $d$ , a situation  $s$ , and a situation type  $S$ ,  
if  $s \models N(\langle d, S \rangle)$ , then  $s \models U(d)$ .
- b. For a mass noun  $N$ , an entity  $d$ , a situation  $s$ , and a situation type  $S$ ,  
if  $s \models N(\langle d, S \rangle)$ , then  $\neg s \models U(d)$ .

As on the theory of situated part structures, part-structure-sensitive semantic selectional restrictions will care about the information in the reference situation type, not entities as such, and those situations will include attributions of unity coming from count nouns or other unity-introducing expressions. Thus, number-related predicates can be true or false only of pluralities of single entities (where a plurality may itself consist of just a single entity):

(20) Selectional requirement of number-related predicates

For a number-related (one-place) predicate  $P$ , an entity  $d$ , and a situation type  $S$ ,  
if  $s \models P(\langle d, S \rangle)$  or  $s \models \neg P(\langle d, S \rangle)$ , then either for all  $s' \in S$ ,  $s' \models U(d)$ , or for all  $s' \in S$ , all  $d'$ ,  $d' < d$ ,  $s' \models U(d')$  and  $s' \models \neg U(d)$ , provided  $\exists_{>1} d' (d' < d)$ .

Taking classifiers as well as portion and collection nouns to be unity-introducing expressions requires the information content of situations to be built incrementally. Here is how this may work compositionally. Sentence meanings will be built by first applying semantic operations to pairs consisting of an object  $d$  and the set consisting of the empty or null situation  $s_0$ , the situation that is part of every situation. Subsequently semantic operations apply to outcomes of such operations. Two sorts of semantic operations need to be distinguished: what I will call *predication* and *modification*, semantic operations that are associated respectively with expressions acting as predicates (leading to sentence meanings) and as modifiers (leading to other predicate meanings). When an expression  $P$  acts as a predicate, it is interpreted by an operation mapping a pair  $\langle d, S \rangle$  (consisting of an entity  $d$  and a type of situation  $S$ ) onto the set of situation  $S'$  such that for all  $s' \in S'$ ,  $s' \models P(\langle d, S \rangle)$ :

(21) The semantics of predication

For a one-place predicate  $P$ , an entity  $d$ , and a situation type  $S$ ,  
 $[P](\langle d, S \rangle) = \{s' \mid s' \models P(\langle d, S \rangle)\}$ , if  $\langle d, S \rangle$  satisfies the presuppositions of  $P$ ;  
 undefined otherwise

Nouns as heads of referential or quantificational NPs as well noun modifiers are interpreted by modification, as are classifiers (I will come to portion nouns, which have a somewhat different semantics, below). If a noun  $N$  acts as a modifier, then  $N$  denotes a function that maps a pair  $\langle d, S \rangle$  onto a pair  $\langle d, S' \rangle$ , where  $S' = \{s' \mid s' \models N(\langle d, S \rangle)\}$ . Modification may be unity-introducing in the sense of not just shifting a situation of reference, but possibly mapping an entity to one distinct from it by being a unified whole:

(22) The semantics of modification

For a one-place predicate  $N$ , an entity  $d$ , and a situation type  $S$ ,

$[N](\langle d, S \rangle) = \langle d', \{s' \mid s' \models N(\langle d, S \rangle)\}$ , whereby  $d'$  may be minimally distinct from  $d$  in that  $s' \models U(\langle d', S \rangle)$ , but  $\neg s' \models U(\langle d, S \rangle)$ .

Expressions interpreted as modifiers can be stacked. Thus, the interpretation of an intersective adjective  $A$  and a noun  $N$  applied to an entity  $d$  and a situation type  $S$  will be  $[A N](\langle d, S \rangle) = [A]([N](\langle d, S \rangle)) = \langle d', S' \rangle$ , where  $S' = \{s' \mid s' \models N(\langle d', S \rangle)\}$  ( $d'$  may be minimally different from  $d$  in that  $s' \models U(\langle d', S \rangle)$ ).

A simple definite description *the*  $N$  will be evaluated as  $[the N] = \langle d, S \rangle$  such that  $S = \{s \mid s \models N(d, \{s_0\})\}$  if there is a unique entity  $d$  for any situation  $s \in S$ , undefined otherwise.

Collection and portion nouns are unity-introducing expressions, but they, syntactically, apply to bare plurals and mass nouns respectively, and thus, semantically, to kinds of quantities (substances) and kinds of individuals, the referents of bare mass nouns and plurals (Carlson 1977). The semantics of quantity will consist in a function mapping a substance  $k$  and a situation  $s$  to the set of pairs of instances  $d$  of  $k$  and types of situations  $S$  in which the instances have unity (I being the instantiation relation):

(23) The semantics of quantity

a. For a substance  $k$  and a type of situation  $S$ ,

$quantity(\langle k, S \rangle) = \{\langle d, S' \rangle \mid d I k \ \& \ S' = \{s' \mid s' \models quantity(\langle d, S \rangle)\}$

b. If  $s' \models quantity(\langle d, S \rangle)$ , then  $s' \models U(\langle d, S \rangle)$ .

The unity-introducing expression *quantity* thus sets up a situation type for a kind  $k$  such that an instance of  $k$  is a single thing in  $S$ .

While the situation-based version of the grammar-based account avoids a commitment to a permissive ontology, one major drawback appears to be the lack of an independent motivation for how situations are used on that account. Note that as exact truthmakers of the descriptive content of an NP *the N'*, situations could only consist of entities of which *N'* is true and thus could no longer serve the identification of a unique referent of the NP within a domain given by the nonlinguistic context.

## 7. Conclusion

The notion of unity is at the centre of the semantic mass-count distinction. Standard extension-based and object-based approaches of the semantic mass-count distinction construe the notion in very different ways, yet they both fail to cover important types of cases, such as object- mass nouns, *sequence*-type count nouns, and portion and collection nouns. Those cases appear to give support for the grammar-based approach, but the two existing syntax-based versions fail to explain the semantic aspects of the phenomena. However, as the paper made clear, there are also semantic versions of the grammar-based approach, an ontological one and one cast in terms of a situation-based truthmaker semantics. On both versions, the notion of unity was not further explained, though, but left a challenge for philosophers and linguists alike.

The situation-based version of the grammar-based approach indicates that the mass-count distinction requires a similar sort of hyperintensional move as the notion of content. Just as situation-based semantic theories have been developed to overcome the problems for extensional and intensional theories of content, the situation-based version of the grammar-based approach, is meant to overcome the challenges to extension-based and object-based theories (the latter being ‘intensional’ in the sense of not generally identifying entities constituted of the same matter).

## References

- Bale, A. and B. Gillon (2021): ‘Re-examining the mass-count distinction’. In F. Moltmann (ed.): *Mass and Count in Linguistics, Philosophy, and Cognitive Science*. Benjamins, Amsterdam.
- Barner, D., L. Wagner and J. Snedeker (2008): ‘Events and the ontology of individuals: Verbs as a source of individuating mass and count nouns.’ *Cognition* 106.2, 805-832.

- Barner, D. and J. Snedeker (2005): 'Quantity judgments and individuation: Evidence that mass nouns count.' *Cognition* 97, 41–66.
- Barwise, J. / J. Perry (1983): *Situations and Attitudes*. MIT Press, Cambridge (Mass.)
- Borer, H. (2005): *In Name only (Structuring Sense I)*. Oxford UP, Oxford
- Carlson, G. (1977): 'A Unified Analysis of the English Bare Plural'. *Linguistics and Philosophy* 1, 413-457.
- Carrara, M., A. Arapinis, and F. Moltmann (eds.) (2017): *Unity and Plurality. Logic, Philosophy, and Semantics*. Oxford UP, Oxford.
- Cartwright H. M. (1970): 'Quantities'. *Philosophical Review* 79 (1):25-42 (1970)
- Champollion, L. and M. Krifka (2017): *Mereology*. In P. Dekker and M. Aloni (eds): *Cambridge Handbook of Semantics*. Cambridge UP, Cambridge.
- Cheng, C.-Y. (1973): 'Comments on Moravcsik's paper'. In J. Hintikka, J. Moravcsik, and P. Suppes (eds.): *Approaches to Natural Language*. Reidel, Dordrecht, 286–288
- Cheng, L. and R. Sybesma (1999): 'Bare and not so bare nouns and the structure of NP'. *Linguistic Inquiry* 30.4., 509-542.
- Chierchia, G. (1998): 'Plurality of mass nouns and the notion of 'semantic parameter''. In S. Rothstein (ed.): *Events and Grammar*, Kluwer, Dordrecht, 53–103.
- (2010): 'Mass nouns, vagueness and semantic variation'. *Synthese* 174, 99–149
- (2015): 'How universal is the mass/count distinction? Three grammars of counting'. In A. Li, A. Simpson, and W.-T. Tsai (eds.): *Chinese Syntax in a Cross-linguistic Perspective*. Oxford UP, New York.
- Cohen, D. (2020): 'Activewear and other vaguery: A morphological perspective on aggregate-mass'. In F. Moltmann (ed.): *Mass and Count in Linguistics, Philosophy, and Cognitive Science*. Benjamins, Amsterdam.
- Doetjes J. (1997): *Quantifiers and Selection: The Distribution of Quantifying Expressions in French, Dutch and English*. Ph.D. Dissertation. University of Leiden
- (2012): 'Count/mass distinctions across languages'. In C. Maienborn, K. v. Heusinger, and P. Portner (eds.): *Semantics: an International Handbook of Natural Language Meaning, Part III*. De Gruyter. Berlin, 2559-2580.
- Eklund, M. (2008): 'The pictures of reality as an amorphous lump'. In T. Sider / J. Hawthorne / D. W. Zimmerman (eds.): *Contemporary Debates in Metaphysics*. Blackwell, 382—396.
- Elbourne, P. (2005): *Situations and Individuals*. MIT Press, Cambridge, Mass.
- Fine, K. (2017): 'Truthmaker Semantics'. In B. Hale et al. (eds.): *A Companion to the Philosophy of Language V*, Wiley-Blackwell, Oxford, 556–577.



- Greenberg, J., 1990[1972]: 'Numerical classifiers and substantival number: problems in the genesis of a linguistic type'. In K. Denning and Kemmer, S. (eds.): *On Language: Selected Writings of Joseph H. Greenberg*. Stanford University Press, Stanford, CA. (First published 1972 in *Working Papers on Language Universals* 9, 1--39. Department of Linguistics, Stanford University, Stanford, CA), pp. 166--193
- Grimau, B. (2021): 'Structured Plurality Reconsidered'. *Journal of Semantics* 38.1., 145-193.
- Jespersen, O. (1924): *The Philosophy of Grammar*. Reprinted in 1992 by Chicago UP, Chicago.
- Kayne, R. (2005): 'Some Notes on Comparative Syntax with Special Reference to English and French'. In G. Cinque and R. Kayne (eds.): *The Oxford Handbook of Comparative Syntax*, Oxford UP, Oxford, 3-69.
- (2010): *Comparisons and Contrasts*. Oxford UP, New York.
- (2015): 'Once and Twice'. *Studies in Chinese Linguistics* 36(1), 1-20.
- Khrizman, K. et al. (2015): 'Portion readings are count readings, not measure readings,' In T. Brochhagen, F. Roelofsen and N. Theiler (eds.), *Proceedings of the 20th Amsterdam Colloquium*, ILLC, Amsterdam.
- Kuhn, J. (2020): 'Gather/numerous as a mass/count opposition'. *Natural Language Semantics* 28.1.
- Kulkarni, R., S. Rothstein, and A. Treves (2020): 'Syntactic-semantic interaction of mass and count nouns: A neural network study'. In Moltmann (ed.): *Mass and Count in Linguistics, Philosophy, and Cognitive Science*. Benjamins, Amsterdam.
- Landman, F. (2006): *Iceberg Semantics for Mass Nouns and Count Nouns. A New Framework for Boolean Semantics*. Springer, New York.
- Langacker, R. (1987): *Foundations of Cognitive Grammar*. Stanford UP, Stanford.
- Link, G. (1983): 'The logical analysis of plurals and mass terms: A lattice-theoretical approach'. In R. Bäuerle et al. (eds): *Meaning, Use and Interpretation of Language*. De Gruyter, Berlin, 303--323.
- Ter Meulen, A. (1981): 'An intensional logic for mass terms'. *Philosophical Studies* 40, 105-125.
- Moltmann, F. (1997): *Parts and Wholes in Semantics*. Oxford UP, Oxford.
- (1998): 'Part structures, integrity, and the mass-count distinction'. *Synthese* 116(1), 75--111.
- (2005): 'Part Structures in Situations: The Semantics of *Individual* and *Whole*'. *Linguistics and Philosophy* 28(5), 599-641

- (2013): *Abstract Objects and the Semantics of Natural Language*. Oxford UP, Oxford.
- (2016): 'Plural reference and reference to a plurality. Linguistic Facts and Semantic Analyses'. In M. Carrara, A. Arapinis, and F. Moltmann (eds.): *Unity and Plurality. Logic, Philosophy, and Semantics*. Oxford University Press, Oxford, 93-120.
- (2021): 'Levels of ontology and natural language: The Case of the Ontology of Parts and Wholes'. In J. Miller (ed.): *The Language of Ontology*. Oxford University Press, Oxford.
- Quine, W. v. O. (1960): *Word and Object*. MIT Press, Cambridge, Mass.
- Priest, G. (2015): *One*. Oxford UP, New York.
- Rothstein, S. (2010): 'Counting and the mass/count distinction'. *Journal of Semantics* 27(3), 343–397.
- (2017): *Semantics for Counting and Measuring*. Cambridge, Cambridge UP, Cambridge.
- Pelletier/Schubert (2012): 'Mass expressions'. In F. Guenther / D. Gabbay (eds.): *Handbook of Philosophical Logic*, 2nd edition. Vol. 10. Kluwer, Dordrecht, 249– 336. (Updated version of the 1989 version in the 1st edition of Handbook of Philosophical Logic)
- Steen, M. (2016): 'The Metaphysics of Mass Expressions', *The Stanford Encyclopedia of Philosophy* (Winter 2016 Edition), Edward N. Zalta (ed.), URL = <https://plato.stanford.edu/archives/win2016/entries/metaphysics-massexpress/>.
- Wisniewski, E. J., M. Imai, and L. Casey (1996): 'On the equivalence of superordinate concepts'. *Cognition* 60(3), 269–298.
- Zucchi, S. and M. White (2001): 'Twigs, sequences and the temporal constitution of predicates'. *Linguistics and Philosophy* 24, 187–222