Uncharted Waters: A semantic investigation into mass/count, plurality and countability

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A SEMANTIC INVESTIGATION INTO MASS/COUNT, PLURALITY AND COUNTABILITY

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ABSTRACT

For languages like English, a distinction is often made between count and mass nouns, where the former is able to pluralise (among other things) and the latter is not. However, it can be observed that, in English, certain stereotypical mass nouns can pluralise in certain contexts. This is evident in phrases like *the waters of the sea* or *the sands of the Sahara.* This thesis connects this type of plurals to two other groups of plurals. The first is a group of, on first-sight regular, plurals which seem to denote the extension of phenomenon in space. The prototypical example used throughout this work is that of *mountains*, as used in phrases like *a house in the mountains*, where the plural seems to be used to refer to a mountainous area or a mountain range. The other group consists of plurals that seem to denote a similar extension, but in time rather than space. This includes many plurals of event nouns, such as *negotiations*, *renovations*, or *protests.* Together, these plurals are analysed as *plurals of extension.* Throughout this work, it argued that such plurals of extension denote sets of impure atoms, based on their behaviour in different contexts and in particular the similarities these plurals show with regular singular count nouns.

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1. Introduction

Ojeda (2005) has written that "the noun *clothes* is somewhat of an embarrassment for semantic theory" (p. 389). The same might be said about the plural *waters,* in phrases like the ones below:

(1) a. Hidden beneath the waters of the sea

b. The waters of the Nile

Semanticists often make, for languages like English, the distinction between *mass nouns* (which often denote substances) and *count nouns* (which often denote objects). The most characteristic distinction between mass and count nouns is that the latter can be counted, as the name suggests, while the former cannot. Thus, we can speak of, for example, *three grains,* but not of *#three rices.* Similarly, we can count *drops,* but not *bloods.* A closely related property of count nouns is that they can occur in the plural. Mass nouns, on the other hand, cannot be pluralised. This is why a noun like *clothes* presents a puzzle for semantic theory: despite occurring in the plural, *clothes* is not countable. Hardly any native speaker would say that they have, for example, bought *#three clothes.* Since *clothes* refers to a collection of pieces of clothing in bulk, it often considered a mass noun, though a very contested and unconventional one. More stereotypical mass nouns are those that denote liquids, like *water.* Yet, we see in (1) that *water* can occur in the plural in English as well. The existence and interpretation of such plural forms of mass nouns are not accounted for by the traditional theory of the mass/count distinction (which has been presented very briefly and simplified in the paragraph above). The noun *water* is not the only mass noun that can occur in the plural. Similar examples can be found: we can, for example, speak of *the sands of the Sahara, the Autumn rains,* or *the depths of hell.* These examples, where a typical mass

noun occurs in the plural have sparsely been discussed in the literature for English. As such, they will form the starting point of our investigation.

Although the plural form of standard mass nouns like *waters* thus present the starting point of this study, a large part of this work will be concerned with another type of plural. Consider the example in (2), which will be repeated fairly frequently throughout this work.

(2) A house in the mountains

At first sight, *mountains* is just a regular plural count noun here. Yet, intuitively we can already tell that is not quite right. After all, the house is not on – let alone in – multiple mountains. Rather, an English speaker will take the sentence in (2) to mean that the house is in a mountainous area or a mountain range. Once again, other plurals of this type can easily be found. Someone can, for example, fall from *the cliffs* or live in *the hills.*

Thus, we have seen cases of unaccounted usage of the plural for mass nouns – exemplified by *the waters* – and unconventional usage of plural count noun – exemplified by *the mountains.* What these two plurals have in common is that they seem to denote a larger area characterised by water, mountains, sand or cliffs. This work will show that these plural forms are closely connected. Discussing them together will enable us to connect different insights into mass nouns, countability and plurality.

The rest of this work will be structured as follows: **Chapter 2** will describe and discuss existing account of the mass/count distinction, focussing on its connection with plurality. **Chapter 3** will introduce the data at the core of this investigation. The chapter will introduce the term *plurals of extension* to describe the plurals under consideration here. **Chapter 4** will present a first analysis of such plurals of extension. In particular, the chapter will argue that they are associated with *impure atoms.* **Chapter 5** will attempt to extent this analysis to

event-denoting nouns. **Chapter 6** will provide a short discussion on language other than English for which similar plural forms are attested as well as theories proposed in the literature for those languages. **Chapter 7** will finally provide some concluding remarks.

2. Theoretical Background

This work is particularly interested in the occurrence of certain mass nouns in the plural as well as certain count nouns that receive an unconventional interpretation in the plural. Before describing the relevant data in the next chapter, this chapter will discuss some of the previous literature on the mass/count distinction. As such, the similarities and differences between mass nouns, singular count nouns and plural count nouns will be discussed, as well as some previous analyses thereof. However, before doing so, it is necessary to make a brief comment on the mass/count distinction from a cross-linguistic perspective. In English, count nouns differ from mass nouns in (amongst other things) that they can directly be counted, while mass nouns cannot. This distinction does, however, not hold for all languages. Mandarin Chinese is sometimes argued to only have mass nouns, which all need a measure phrase or classifier in order to be countable. That said, even languages that at first sight might seem mass-only, often do make a distinction between mass and count nouns (see Cheng & Sybesma (1999) for Mandarin). Other languages are sometimes argued to be count-only (in particular Yudja (Lima, 2014)). However, this work focuses on English and some related languages, and will leave the discussion on whether the mass/distinction plays the same role in all languages to the side.

2.1. Grammatical distinction

In languages which make a distinction between mass and count nouns there are a number of grammatical properties that are sensitive to this distinction (cf. Chierchia 1998b, Doetjes 2012, Rothstein 2017 a.o.). These properties tend to be universal for languages with a grammaticalizes mass/count distinction, but will here be described in relation to English, which is the main focus of this work. The following section will describe a number of those properties. The first criterium for distinguishing mass and count nouns is their ability to

participate in a singular-plural distinction. While count nouns unproblematically occur in the plural, plural morphology is generally not available for mass nouns (except when they have been coerced into a count meaning – something we will come back to later). It is this property of mass nouns that we are most concerned with here. Later sections will show that mass nouns can, in fact, sometimes occur with plural morphology while keeping their mass meaning.

(3) a. There are shoes in this store.

a.' #There are footware in this store.

b. There are drops on the wall.

b.' #There are bloods on the wall.

[Chierchia, 1998, p. 55]

The second, and closely related, property is the ability to occur with numeral determiners. While count nouns can, as the name suggests, be counted, mass nouns cannot.

(4) a. ten shoes

a.' #ten footwear

b. three drops

b.' #three bloods

Mass nouns cannot, as shown above, be counted; they can, however, be measured. In order to do this, they need to be combined with a classifier or measure phrase. In this context, mass nouns can combine with numerals. Count nouns, on the other hand, do not normally combine with classifiers in the singular.

(5) a. three drops of blood, three liters of blood

b. #three pieces of shoe, #three kilos of shoe

The third criterium for distinguishing mass and count nouns has to do with their ability to occur with certain determiners (in particular quantifiers). Some determiners occur only with count nouns. These include *every, each,* and *a*, which only occur with singular count nouns, and *several, few* and *many*, which require a plural to occur after it. Since we have already established that mass nouns cannot occur in the plural, it is unsurprising that (6b') is unacceptable.

(6) a. each/every/a shoe

a'. #each/every/a blood

b. several/few/many shoes

b.' #several/few/many bloods

Other determiners occur only with mass nouns, such as *little* and *much.*

(7) a. little/much blood

b. #little/much shoe(s)

There is also a class of determiners which occur with plurals and mass nouns, but not with singular count nouns. This group includes *a lot of, all, more* and *most.*

(8) a. a lot of/more blood; a lot of/more shoes

b. #a lot of/more shoe

We have seen three groups of determiners that are sensitive to the mass/count distinction. There are also determiners that occur unrestricted with all nouns, such as *the, some, any, no.*

There are a few more syntactic contexts that distinguish between mass and count nouns. For example, Schwarzschild (2011) has argued that predicates of size and shape, like *large* or *round,* are stubbornly distributive and as such cannot apply to mass nouns when targeting the entire quantity. In this context mass nouns thus differ from singular count nouns. These predicates of size and shape can apply to object mass nouns such as *footwear* or *furniture* (which will be discussed in more detail in section 2.2.2), but only with distributive reading where the predicate applies to each individual piece of footwear or furniture. Thus, (9e) does not have a collective reading where the pile of footwear is large, but only a distributive reading where each piece of footwear is large.

(9) a. #the round snow

b. the round pile of snow

c. the large shoe

d. the large pile of footwear

e. #the large footwear

The last criterium for distinguishing mass and count nouns that will be discussed here is the ability to occur with 'number-related verbs' (Moltmann, 2020). Such verbs cannot apply to mass NPs, but can apply to plural count NPs. This is illustrated below for the verbs *count* (a), *outnumber* (b) and *rank* (c).

(10) a. #John counted the wood.

a.' John counted the pieces of wood.

b. #John's luggage outnumbers Mary's.

b.’ John’s pieces of luggage outnumber Mary’s.

c. #John ranked the decoration.

c.’ John ranked the pieces of decoration.

Thus, we have seen that mass and count nouns occur in different morpho-syntactic contexts. Count nouns can occur with plural morphology and with numerals, while mass nouns cannot. Furthermore, there are many determiners that are sensitive to the grammatical mass/count distinction, such as *many/few* and *much/little* in English. Additionally, we have seen that certain predicates are incompatible with mass arguments. Predicates of size and shape as well as number-related verbs make a distinction between mass and count nouns.

2.1.2. Coercion

It has been shown above that mass nouns and count nouns occur in different morpho-syntactic contexts. However, conventional mass nouns can pattern like count nouns in a few well-established cases (Pelletier & Schubert, 1987; Chierchia, 1998b; Doetjes, 2012). The first is when the mass noun is coerced to denote some standard portion or unit (11a), the second when it is coerced to denote a type (11b).

(11) a. I would like three waters, please.

b. We serve three waters: still, sparkling and tap.

The meaning of the conventional mass noun *water* has thus been shifted into that of a count noun: both standard servings of water (i.e. glasses or bottles) and types of water are individuated enough to be counted. In these cases, the mass nouns can occur with plural morphology and with numerals, as shown above.

The reverse, where count nouns are converted to mass nouns, is also possible.

(12) a. John put some apple in the salad.

b. There is dog all over the road.

This shift is sometimes analysed as the result of an operation called the Universal Grinder (Pelletier, 1979). The Universal Grinder takes an object and grinds it to a mass-like substance, resulting in the mass reading of a conventional count noun, as illustrated in (12).

2.2. Semantic distinction

As shown in the previous section, it is possible to distinguish mass and count nouns based on morpho-syntactic properties. However, we can also characterise the distinction based on semantic criteria. There are a few concepts that are often used to not only characterise the distinction between the semantics of count nouns and mass nouns, but also between singulars and plurals.

The first concept is that of *cumulative reference* (Quine, 1960). We can say that something refers cumulatively when, if two elements in the extension of the noun, their sum is also in the extension of the noun. In other words, two portions of, for example, *water* can still be referred to by *water*. This property does not hold necessarily for singular count nouns: if *a* is *an apple* and *b* is *an apple,* then the sum of *a* and *b* does not count as *an apple.* However, Link (1983) has shown plural count nouns also have cumulative reference, just like mass nouns. If I put two crates of *apples* together, the result can still be referred to as *apples.* Or, using Link's example, "if the animals in this camp are horses, and the animals in that camp are horses, then the animals in both camps are horses" (1983, p. 128).

The second relevant concept is that of *divisive reference.* This sometimes also referred to as *distributive reference* or as Cheng's condition (after Cheng, 1973). Divisive reference can be understood as the reverse of cumulative reference; a predicate can be said to be

divisive if and only if whenever it holds of something, it also holds of its proper parts (Champollion & Krifka, 2019). In other words, any part of what counts as *water* is still *water*. Whereas cumulative reference holds of both mass nouns and plural count nouns, divisive reference is argued to only hold of mass nouns. As such, divisive reference (or *homogenous reference*, which is the combination of divisive and cumulative reference) is sometimes taken as a defining property of mass nouns. However, the idea that mass nouns have divisive reference is not uncontested (Bunt, 1985; Gillon, 1992; Landman, 2011). The question is whether mass terms are indeed indefinitely divisible. There comes a point when it is impossible to divide a quantity of *water* into two parts that are *water* as well. At the latest we run into trouble once we get to the level of molecules and atoms. Whereas one H2O molecule might still count as water, a single hydrogen atom certainly does not. This *minimal-parts problem* is even more clear for object mass nouns such as *furniture*, where it is clear that half a chair does not count as furniture anymore. It is thus questionable whether mass nouns are indeed indefinitely divisible, or if they are only divisible up to their minimal parts (as plural count nouns are). It follows that it is also questionable whether divisive reference is actually a defining property of mass nouns.

How big a problem the minimal-parts problem actually is, depends on whether one sees it as a hypothesis about the entities denoted by mass nouns or about the use of mass nouns in natural language. The latter position presents an opening for going around the minimal-parts problem: divisiveness is not a property of real-world entities, but a linguistic property of expressions. This position is taken by Bunt (1985), who argues that "mass nouns provide a way of speaking about things *as if they do not consist of discrete parts"* (p. 45). In other words, nothing in the use of such mass nouns requires a commitment to the existence of minimal parts. Even so, the idea that mass nouns have divisive reference remains contested.

In conclusion, cumulative reference and, in particular, divisive reference have been proposed to be the defining semantic feature of mass nouns. However, cumulative reference also holds for plural count nouns and it is questionable if mass nouns can be considered to be truly divisive. What rests are a few words on the semantics of count nouns. Singular count nouns are considered to be neither cumulative nor divisive. Instead, singular count nouns are considered to be *atomic*, meaning that they denote a set of atoms, of individuals with not proper parts. We will return later to the exact denotation of singular and plural count nouns as well as how the latter are derived from the former.

2.2.2. Problematic cases

The two sections above have described the generally morpho-syntactic and semantic properties of mass nouns and count nouns. However, not all nouns fit the patterns above. The first class of problematic nouns is that of *object mass nouns.* These mass nouns do not denote a substance, but (on the face of it) refer to objects. In fact, object mass nouns are often super-ordinates in English, meaning that they denote different types of objects (Rothstein, 2017). For example, *furniture* includes chairs, tables and closets, and *jewellery* includes necklaces, bracelets and rings and so on. We have already seen that object mass nouns present the clearest counter example to the assertion that all mass nouns have divisive reference. However, these nouns also raise a more general question about whether all mass nouns have the same type of reference at all. Object mass nouns are interpreted differently than substance mass nouns in comparative constructions. Barner & Snedeker (2005) have shown that *more furniture* generally is interpreted as meaning ‘more pieces of furniture’ rather than ‘a higher volume of furniture’. This suggests that object mass nouns quantify over individuals, while regular mass nouns do not.

While mass nouns that range over individuals present one type of problem, count nouns that do not range over atoms present the reverse problem. As has been pointed out, not all count nouns have stable atoms (Rothstein 2010, 2017). Nouns like *twig, fence, line, rope* and *sequence* can be argued to have homogenous reference. It is possible to divide a fence into two parts in such a way that both parts count as a fence. Furthermore, it two neighbours start building a fence between their front yard and the street, and those two fences meet on the border between the two front yards, we can talk about two adjoined fences, but we can also talk about one fence built by two people.

What the discussion of object mass nouns and homogenous count nouns has shown is that, even though concepts like atomicity, cumulative reference and divisive reference are useful when discussing the semantic properties of mass and count nouns, they cannot fully account for the mass/count distinction.

2.3. Approaches to the mass/count distinction

The following section will discuss a few of the approaches that have been taken to analyse the mass/count distinction over the last decades. The first is presented by Link (1983) and is based on the intuitions about the semantic properties of mass and count nouns that have been discussed above. Mass and count nouns are taken to denote different kinds of entities – namely homogenous and non-homogenous entities respectively. To capture this difference, Link argues that mass and count nouns have their denotation in different domains: count nouns have their denotation in an atomic domain, while mass nouns have their denotation in a non-atomic domain. Both domains are structured as lattices. In the atomic domain, a singular count noun denotes a set of atoms. The related plural denotes the closure under sum of that set, resulting in a complete join semi-lattice. Mass nouns also denote a semi-lattice, but do so

in a non-atomic domain. As both mass nouns and plural count nouns denote semi-lattices, this analysis naturally captures some of the shared properties of mass and plural count nouns.

Link (1983) thus proposed that the domain of individuals is divided into two separate (but connected) domains. Such a two-domain approach is intended to solve the so-called *gold-ring paradox.* This paradox is concerned with examples as in (13):

(13) The ring is new, but the gold of which it is made is old.

Since *the ring* and *the gold* refer to entities that take up the same spatio-temporal position, we are tempted to say they denote the same object. Yet, sentence (13) is not necessarily contradictory. In Link's approach, *the gold* and *the ring* refer to entities in different domains: *the gold* refers to an entity in the non-atomic domain, whereas *the ring* refers to an entity in the atomic domain. These two are related by the material-part relation. The statement in (13) is thus not contradictory, as it is perfectly fine for two different (or even contradictory) properties to hold of two different entities in two different domains.

That said, Link's approach also runs into a few problems. First of all, it does in fact not solve the gold-ring paradox entirely. As Rothstein (2010) has pointed out, the same paradox can be created within one domain. Consider example (a) for the count domain and example (b) for the mass domain:

(14) a. The wall is new, but the bricks are old.

b. The curtaining is new, but the fabric it is made of is old.

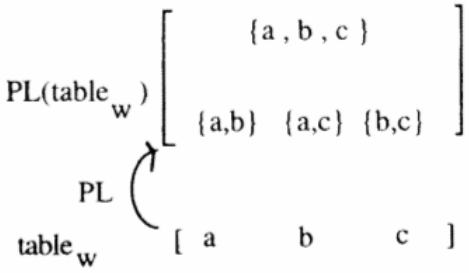
Furthermore, Link's approach makes an ontological distinction between stuff and objects that seems implausible for near-synonyms such as *carpets/carpeting* (Chierchia, 1998b; Bale, in press).

Additionally, it is not clear how object mass nouns fit into this analysis, since they are mass nouns but are also (as we have seen) atomic. It is thus not clear in which domain they have their denotation. In fact, as has been discussed above, it is questionable whether mass nouns in general are indeed divisive and lack minimal parts. If mass nouns have minimal parts, they should not be modelled in a non-atomic domain.

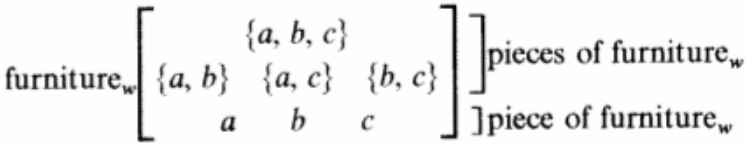
This is exactly the position taken by Chierchia (1998a, 1998b). According to Chierchia, mass and count nouns do not differ in whether or not they have minimal parts, but in how vague their minimal parts are. According to this approach both mass and count nouns have their denotation in an atomic domain. We have seen that Link argues that count nouns can be modelled as semi-lattices; singulars denote a set of atoms and plurals denote that set of atoms closed under sum. Chierchia argues that mass nouns also denote a Boolean algebra. In other words, they denote the closure under sum of a set of atoms. However, what counts as an atom is generally vague and the set of atoms can thus not be specified. Essentially though, plurals and mass nouns have a similar denotation.[1] The essential difference is that mass nouns come out of the lexicon already plural. This directly explains why they cannot be pluralised. Furthermore, although mass nouns are, in principle, atomic, they do not provide a suitable counting criterium: their atoms are often individuated too vaguely for counting and they do not isolate a set of non-overlapping entities.

[1] In Chierchia's (1998a, 1998b) approach, a plural count noun denotes the set of plural elements without the atoms, while the denotation of mass nouns does include the (vague) atoms. As such, the denotations of plurals and mass nouns are not exactly the same. It is however, debated in the literature whether or not the denotation of plural count nouns includes the atoms denoted by its singular counterpart. The fact that questions like *Do you have children?* allow to be answered in the affirmative when one has only one child, while a negative answer in the same situation is infelicitous, suggests that singular entities are included in the denotation of plurals. Chierchia (2010) takes the position that plurals are inclusive.

(15) *Denotation of singular and plural count nouns* (Chierchia, 1998b, p. 60).



(16) *Denotation of mass nouns* (Chierchia, 1998b, p. 68)



Chierchia's (1998a, 1998b) approach has a few advantages over Link's two-domain approach. Firstly, it is more economical: only one domain is postulated and the properties of mass nouns can be accounted for by the same structure that accounts for the properties of plural count nouns. Secondly, it automatically accounts for object-mass nouns such as *furniture*, as their denotation is naturally modelled in an atomic domain. Vagueness can come in degrees, so the minimal part of an expression like *furniture* can be less vague than those of more prototypical mass nouns like *water*. It should be noted that this position is somewhat retracted in Chierchia (2010), where vagueness still plays an important, though somewhat different, role. Under this account, object mass nouns are lexical accidents and retain their atomic denotation. As such they are considered to be 'fake mass'.

A third approach is presented by Rothstein (2010, 2017), sharing some basic ideas with Krifka (1989). Rothstein's analysis is based on two key observations. Firstly, the observation that even when you can count the objects in the denotation of mass nouns implicitly, you cannot count them grammatically. We have seen this for object-mass nouns,

whose elements are accessible in comparative constructions (Barner & Snedeker, 2005), but still cannot occur with numeral determiners. Secondly, even if you can count things grammatically, this does not mean that they necessarily come in units or are inherently atomic. We have seen this for homogenous count nouns such as *fence, line* and *twig,* which can be counted but do not have a set way of being divided into units. Based on these two observations, Rothstein concludes that the mass/count distinction can only be explained in terms of how expressions refer, rather than in terms of the things they refer to. In other words, the distinction is a grammatical one and not an ontological one.

Rothstein proposes that count nouns are a mechanism for grammatical counting, i.e. count nouns allow direct grammatical counting. However, what counts as one entity is context dependent. We have seen that what counts as one fence may depend on the context or a person's perspective. Thus, the denotation of a count nouns must specify the context in relation to which they are interpreted. According to Rothstein, each nominal is associated with an abstract root noun. These root nouns are the input to the operations deriving N_{mass} and N_{count}. The function MASS that derives mass nouns is the identity function, which means that mass nouns are just root nouns.

(17) $MASS(N_{root}) = N_{root}$

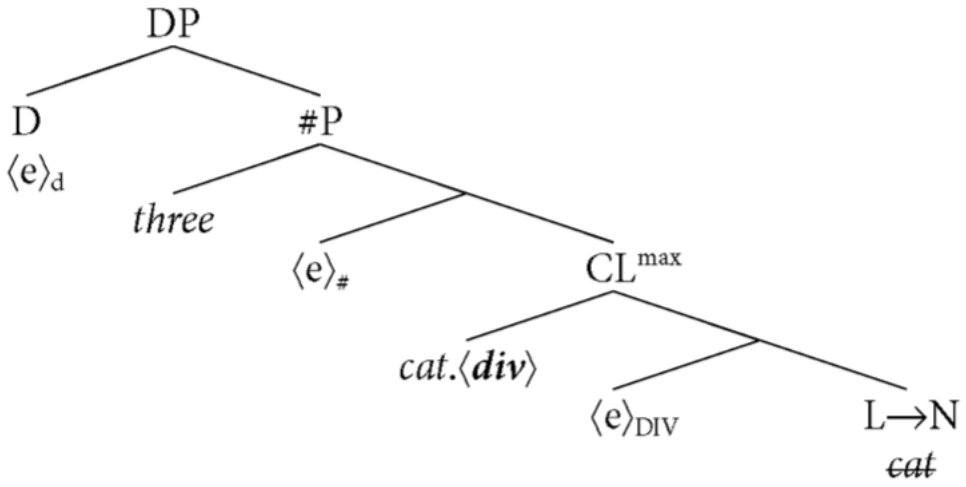
The denotations of mass nouns are structured like Boolean algebras. Just like in Chierchia (1998a, 1998b), they denote the closure under sum of a vague set of minimal parts. Count nouns are derived from root noun meanings via the $COUNT_k$ function, which applies to root noun meanings and returns a set of ordered pairs consisting of a context *k* and the entities that count as atoms in that context.

The atoms derived in this way are *semantic atoms*. However, it is important to note here that root nouns may be more or less *naturally atomic.* Most object mass nouns and count

nouns are derived from highly naturally atomic roots. However, count nouns like *fence* are derived from non-naturally atomic roots. Thus, both mass and count nouns can be naturally atomic. However, only count nouns can be semantically atomic; count nouns are derived by the operation COUNT_k, which turns root nouns into semantically atomic predicates. When COUNT_k applies to naturally atomic roots, it can only pick out those natural atoms. For predicates that are not naturally atomic, COUNT_k might yield more variable results depending on the choice of context.

Lastly, there are also analyses of the mass/count distinction that take a more syntactic approach. One such analysis is propagated by Borer (2005). Borer's account is based on the observation that mass nouns can occur in count contexts and count nouns can occur in mass contexts, as discussed in the section on coercion. The question is how we account for this flexibility. Borer proposes that it is structure that gives rise to the mass-count distinction. In other words, whether a noun is interpreted as being mass or count is not a property of the lexeme itself, but of the structure it is embedded in. This approach shares with Rothstein (2010, 2017) the idea that mass nouns are somehow more basic. A mass interpretation is the default interpretation of roots and count nouns are then derived from or build up on those roots. Under Borer's analysis, count nouns are in principle mass nouns embedded under a syntactic classifier. Both number and classifiers fill the same syntactic position in the structure and have the same function: namely to introduce a dividing operation DIV. The presence of DIV is a necessary condition for counting. Simply put, nouns get their count interpretation from being embedded under a DIV head. Since the DIV operator is a general productive operation, all nouns can have both a mass and count interpretation. The approach proposed by Borer (2005) has been presented here in a slightly simplified manner. The rather complex structure given by Borer herself is presented below.

(18) *Structure for 'three cats'* (Borer, 2005, p. 109).



2.4. Mass plurals

The previous sections have briefly discussed some of the approaches to the mass/count distinction that can be found in the literature. However, this work is mainly concerned with its connection with plurality. Accordingly, this section will discuss which implications the different approaches have on theories of plurality. In particular, we will discuss the possibility of plural mass nouns in some more detail.

According to conventional wisdom, plural mass nouns should thus not exist. Under an analysis where mass nouns come out of the lexicon already plural (as in Chierchia 1998b), mass nouns cannot occur with plural morphology, because pluralising them is at best superfluous. In the analysis as presented by Borer (2005), plural morphology and having divided reference goes hand in hand. Under such an approach, plural mass nouns are logically impossible. After all, plural morphology is the spell-out of the abstract head (feature) DIV, which has a dividing function.

However, there are plural nouns that are non-count. For example, nouns like *clothes* or *groceries* behave differently in combination with, for example, numerals and quantifiers

than regular plurals. Such nouns can be considered plural mass nouns. Acquaviva (2004) argues that the category of plural mass nouns does not only include pluralia tantum like *clothes* and *groceries;* there are also mass plurals whose singular is already mass. This group includes the plural *depths* as in *the depths of hell* or *rains* as in *the Autumn rains.* Furthermore, there are also count nouns that have a regular opposition between the singular and plural, but can get an additional mass-like interpretation in the plural form (Acquaviva, 2004):

(19)	*fund*	'sum of money set aside for a purpose'
	funds	'more than one fund'
	funds	'money set aside for a purpose'
(20)	*holiday*	'festive day or period of time'
	holidays	'more than one holiday'
	holidays	'festive time'

It is important to note that, while all these plurals are argued to have a mass interpretation by Acquaviva (2004), we will propose a different analysis for at least some of these 'mass plurals' later on. Furthermore, it should be observed that there exists some variation. For example, *clothes* is not acceptable with numeral determiners, but is acceptable with some count quantifiers, as in *a few clothes* (McCawley, 1975). That said, such plurals raise a few questions that are not directly answered by the standard theories of mass and count nouns that have been discussed in in the previous section. For the plurals that have a singular count counterpart, the main question is how their meaning is derived. The interpretation of *holidays* as 'festive time' or of *funds* as 'money set aside for a purpose' is not the standard meaning generated by a pluralization operator, which takes a set of entities and returns the powerset of that set minus the empty set. The plurals that have a singular mass counterpart ask a perhaps

even more fundamental question: how is it possible that these mass nouns can get a plural form? After all, many of the theories of the mass/count distinction are aimed at explaining exactly the opposite assertion, namely that mass nouns (unlike count nouns) cannot be pluralised.

The following paragraphs will briefly outline how Acquaviva (2004, 2008) and Alexiadiou (2011) have attempted to answer these questions. Acquaviva (2004, 2008) argues that such plurals are mass plurals and that these mass plurals are lexical. According to Acquaviva, the key observation about mass plurals is that, while they are plurals, we don't know what they are plurals of. While it is clear what counts as a 'part' of the referent of a plural like *books* (namely a book), there is generally no clear criterion for what counts as a part for the mass plurals. Acquaviva argues that mass plurals denote manifold complexes, though he does not define what exactly is meant by this. The core of the proposal seems to be that mass plurals refer to complexes that are made-up of parts, but that they lack clear specification of what the parts of this manifold structure are. As such Acquaviva follows one-domain approaches to the mass/count distinction, such as Chierchia's (1998b), which argue that mass nouns have part-structure just like (plural) count nouns, even if the minimal parts are vague or ill-defined. The difference between mass as homogenous substance and mass as manifold complex is, according to Acquaviva, a difference in conceptualization rather than in ontological properties. What sets mass plurals apart from count plurals is their conceptualization as complexes of parts that are not individual wholes.

Two essential questions remain: firstly, how does this interpretation come about and secondly, what is the relation between this plural and the plural on regular plural count nouns? Acquaviva (2004) argues that mass plurals have the semantics of plurality but are not the result of pluralization. Most theories of plurality define some sort of pluralization operator, which maps a set of atoms to a set of pluralities consisting of those atoms.

Acquaviva replaces this pluralization operator with a predicate meaning "is a plurality", which is not an entirely uncontroversial move. Acquaviva eventually arrives at the following definition of the predicate:

(21) $[\![\text{ plural }]\!] = \lambda\, x\, \exists\, a\, \exists\, b\, [\, a < x \wedge b < x \wedge a \neq b\,]$

This predicate can be conjoined with the lexical predicate to form the lexical plural, which is what happens for mass plurals. This means that, for mass plurals, plurality is part of the descriptive content of the lexical item itself. The difference between the regular count plural interpretation and the mass plural interpretation of *funds* can be represented as follows (Acquaviva, 2004):

(22) *funds* [count]: PL(fund)

funds [mass]: (fund & PL)[2]

It should be noted that the plurality on mass plurals is not a special plurality predicate for mass plurals. The difference in interpretation for mass and count plurals is the result of a difference in composition, as (22) illustrates.

Alexiadou (2011) builds on the ideas presented by Acquaviva (2004, 2008). She presents a similar analysis of mass plurals from a more syntactic perspective. Working within an exoskeletal framework (Distributed Morphology in particular), Alexiadou argues in favour of a split analysis of Plural number. On the one hand, there is the grammatical plural, which

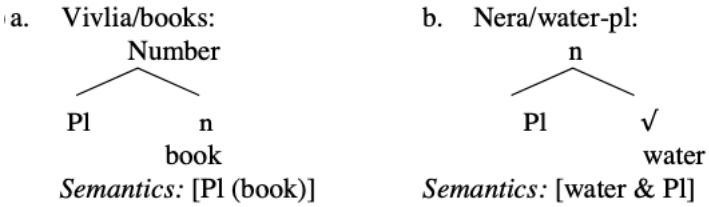
[2] Tsoulas (2009) presents a similar analysis for (abundance) plurals in Greek, arguing that the plural morpheme represents a modifier, resulting in a structure similar to that of intersective adjectives:

i. waters = water(x) ∧ plural(x) (or nonsingular)

However, Tsoulas does not present a split analysis of the plural, instead arguing that all plurals in Greek are formed this way, while all plurals in English are formed by a pluralization operator. Thus, his comments point towards a typological difference between the two languages. We will not discuss this point, but see Chierchia (2015) for another analysis of the difference between Greek and English number marking.

is on Number^0 and realizes individualization features. On the other hand, there is the lexical plural, which is on *n* and functions as a nominaliser. It attaches to a root and is involved in the word formation process itself, whereas grammatical plural attaches to a (already formed) word. The difference is schematically represented as follows by Alexiadiou (2011, p. 37):

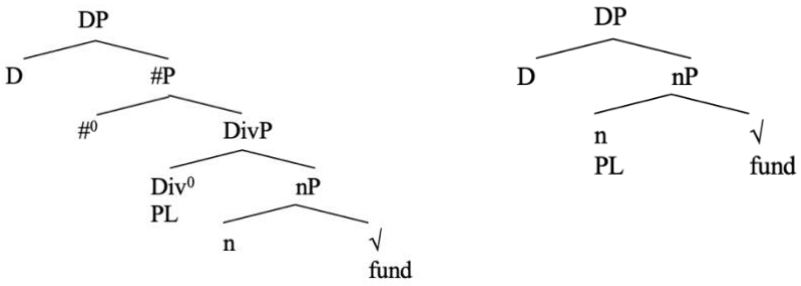
(23)



As can be seen in (22), for lexical mass plurals, PL is below the nominalizer *n.* For regular, grammatical count plurals on the other hand, PL is in a higher position above *n.*

Transposing this analysis to the very similar system developed by Borer (2005), the two meanings of *funds* could be represented something like this.

(24) *funds* [count] *funds* [mass]



Alexiadiou's (2011) analysis would also directly explain why the plurals that are analysed as being lexical cannot be counted or occur with certain quantifiers. Since PL is in *n* rather than Div^0, DivP is not present, which means that numerals and some quantifiers are not licensed. A further benefit of an analysis of mass plurals as lexical plurals might be that the same

plural (predicate) is involved for both mass and count plurals, even if they have a different compositional structure.

2.5. Conclusion

We have seen that, in general, mass nouns have different properties than count nouns. Most importantly, count nouns can occur with plural morphology, while mass nouns cannot. Furthermore, count nouns can directly combine with numerals, but mass nouns cannot. There are also different classes of determiners that are sensitive to the mass/count distinction. Mass and count nouns also exhibit different semantic characteristics. Firstly, mass nouns have cumulative reference, while singular count nouns do not. However, plural count nouns also refer cumulatively. As such, this property alone cannot distinguish between mass and count nouns. The second proposed characteristic of mass nouns is that they have divisive reference. This property would distinguish mass nouns from both singular and plural count nouns. However, it is contested in the literature whether mass nouns indeed do have true divisive reference or if they have minimal parts of some sort.

Over the years, different analyses of the mass/count distinction have been proposed. Link (1983) has argued that mass and count nouns refer in two different domains. However, most theories afterwards have taken a one-domain approach. Chierchia (1998b) for example, has argued that both mass and count nouns have minimal parts, though those of the former are vaguer than those of the latter. Rothstein (2010, 2017) has argued that although both mass and count nouns can be naturally atomic, only the latter can be semantically atomic, while what counts as an atom may be context dependent. Borer (2005) has argued that whether a noun is interpreted as being mass or count is not a property of the lexeme itself, but of the structure it is embedded in. Under this analysis, mass interpretations are the default

interpretations of roots, while count nouns are derived by inserting these roots in more syntactic structure.

The analyses described above are different ways to account for some or all of the morpho-syntactic and semantic properties discussed. Since one of those properties is the inability of mass nouns to occur in the plural, these analyses generally excluded this possibility, though some more explicitly than others. However, we have already briefly seen one attempt to account for such plural mass nouns. Acquaviva (2004, 2008) and Alexiadou (2011) analyse plural mass nouns as lexical plurals, which are contrasted with grammatical plurals. In the following chapter we will discuss such plural mass nouns in more detail. In particular, we will show that there is a class of English mass nouns that can occur in the plural outside of the well-established coercion contexts. We will then connect these plural mass nouns with certain plural count nouns and pluralia tantum, and argue that they receive a similar interpretation.

3. The Data: Plurals of Extension

3.1. Mass nouns

The previous chapter has established that, in general, mass nouns cannot occur with plural morphology, except in coercion context where the noun is taken to denote some standard portion or unit (25a) or a type (25b).

(25) a. I would like three waters, please

b. We serve three waters: still, sparkling and tap

It is clear why in such contexts plural morphology is allowed: both standard servings of water (i.e. glasses or bottles) and types of water are individuated enough to be counted. However, it seems that certain mass nouns can be pluralised in different contexts as well. Take (26) as an example:

(26) Hidden beneath the waters of the North Sea are the Zechstein reefs.

Here, the plural does not refer to multiple standard units or types of water, but rather to some large amount or surface. This type of pluralisation of mass nouns is not an exception, as multiple examples can be found for English: plurals like *sands, snows, mists,* and *fogs* can receive a similar interpretation in phrases like the ones below:[3]

(27) a. the sands of the Sahara

b. the snows of Kilimanjaro

c. the mists of Avalon

d. lost amid the fogs

[3] I thank Hanna de Vries for pointing out this group of plural mass nouns to me.

Furthermore, the abstract mass nouns *depth* and *height* can be used in the plural to denote some area (or areas) that is deep or high respectively:

(28) from the depths of the sea

The contrast pointed at above is also described by Acquaviva (2008), who states that *depths* "sharply differs from *depth* in denoting not an abstract property, but some area or areas having that property" (p. 108). The following example, ascribed to Joseph Bayer, also highlights this semantic difference (Acquaviva 2008, p. 108, n. 15).

(29) I admire the depth / #depths of his knowledge

The previous paragraphs have established that mass nouns may be pluralised in some contexts. These mass plurals are not widely discussed in the general literature and as such, will be the focus of this study. In particular, we will explore those plurals that seem to denote some sort of spatial extension (their exact denotation will be discussed in later sections). However, to get a full grasp on the issue at hand, it is necessary to look beyond the domain of mass nouns.

3.2. Pluralia tantum and proper names

So far, we have focused on the pluralization of mass nouns. However, there also exists a class of pluralia tantum that receive a similar interpretation. Examples include English nouns like *woods* or *outskirts,* which are (almost) exclusively used in the plural and do not have a clear singular counterpart. In the same category we consider some proper names. In particular those of mountain ranges, such as *the Alps* or *the Pyrenees.* The plurals do not seem to denote a collection of individual Alps or Pyrenees, but rather a mountainous area. A similar

interpretation might be given to the names of certain islands groups, such as *the Bahamas, the Antilles* or *the New Hebrides.*

3.3. Count nouns

It can even be argued that regular plural count nouns can receive a similar interpretation to the mass nouns discussed above. Two examples are given below:

(30) a. a house in the mountains

b. born in the jungles of Burma

In a phrase like (30a), the plural does not seem to denote a plurality of mountains, but rather a mountainous area (similar to the Alps or the Pyrenees). The use of plural in (30b) is particularly striking, as it is unlikely for someone or something to be born in multiple jungles. Instead, what the plural denotes is a jungle-like area, perhaps consisting of multiple (whether or not overlapping) jungles.

In these cases, the plural again is used to express an area characterized by mountains or jungles. One could also say that these plural nouns denote a collective, rather than a collection (a mountain range rather than mountains). In the right context, English plurals like *skies, hills, shores, fields, plains, marshes, cliffs, streets, ruins, waves* and *clouds* may receive the same interpretation.

3.4. Plurals of extension

The previous sections have provided the beginning of a description of a group of plurals that receive a similar interpretation. The plurals are listed together in Table 1 below. However, two caveats need to be made about this table. Firstly, the table presented below does not pretend to be exhaustive; there is a long list of mass nouns that may be pluralised in English

without any clear coercion taking place. The interpretation of these plural mass nouns may coincide in some respects. However, the focus of this investigation will for now be on those nouns that are geographical and meteorological term and such form a coherent semantic class. Secondly, the point of this table is not to characterise the nouns under discussion as either mass or count nouns, but rather to show that nouns from the entire countability spectrum may show certain similarities when used in the plural in certain contexts.

MASS	PLURALIA TANTUM & PROPER NAMES	COUNT
waters	woods	mountains
sands	outskirts	hills
snows	catacombs	cliffs
mists	Alps	shores
fogs	Pyrenees	fields
depths	New Hebrides	jungles
heights	Antilles	plains
	Bahamas	marshes
	British Isles	streets
		ruins
		waves
		clouds

Table 1: plurals under investigation

The plurals in Table 1 can be argued to denote the extension of a phenomenon in space. Thus, *the sands* denotes something like a sandplain, while *the mountains* denotes a larger area with mountains. Therefore, based on this intuition, we might call this type of plural the *plural of*

extension. This term is used by Waltke & O'Conner (1990) to denote a certain set of plurals in Biblical Hebrew. Included in their discussion are plurals like יָמִים (lit. seas'; 'surface of the sea') as well as plurals referring to body parts (e.g. guts) and plurals derived from abstract terms (e.g. depths). Overall, the term plurals of extension captures the meaning of our set of plurals quite nicely in two senses: firstly, these plurals denote something that has an extension; something that is concrete. In other words, a spatio-temporal manifestation. Secondly, as something that is extensive, i.e. a vast or large area. As observed by Acquaviva (2008), a plural like waters can only describe a large body of water:

(31) a. the waters in the sea

b. #the waters in the bottle/pool

We will thus dub the forms in Table 1 *plurals of extension*, and will refer to them as such throughout the rest of this work. The following chapter will discuss the behaviour of these plurals in more detail, as well as propose a unified analysis for them.

4. The Impure Atom Analysis

In chapter 2, we have seen that Acquaviva (2004, 2008) and Alexiadou (2010) argue that plural mass nouns exist. By this, they mean nouns that are plural and mass. This group includes the pluralised form of standard mass nouns, such as *waters* or *sands*, but also cases where a standard count noun receives an additional, mass-like interpretation in the plural. This holds for terms like *funds* or *holidays*. Talking specifically about plurals like *mountains* and *cliffs*, Acquaviva (2008) argues that they get a mass-like interpretation as well. After all, the plural *cliffs* can be used to mean something like 'cliff-like landscape'. However, Acquaviva points out that the entities that make up the reference of *cliffs* or *mountains* are still cliffs or mountains, while the things that constitute, for example, *funds* are not single funds. In the end, he concludes that "the mass-like interpretation of plurals like *cliffs* stems from the lack of perceptual boundaries, not from a conceptualization as a continuous mass" (p. 101).

In the following sections, we will not argue that the plurals of extension under consideration in this work are mass plurals (though it is not a position that should be dismissed immediately). Instead, we will argue that the plurals denote something akin to *impure atoms*. The term impure atom comes from Link (1984), who uses it to describe group terms as well as plurals and conjunctions when they are understood as individuals. However, the term impure atom has since been mainly used to discuss group terms like *group*, *team*, or *committee*. These nouns directly capture the intuition that a *team* or *committee* is an entity in and of itself, and not just the sum or set of its members. The examples below show that what is true of the groups is not necessarily true of its members and vice versa. Consider a situation where Bill and John are the only members of the committee. Even then, sentence (a) does not entail sentence (b): if Bill and John just met in the pub as friends on Friday, then this does not entail that the committee had an official meeting.

(32) a. Bill and John met on Friday.

b. The committee met on Friday.

Thus, terms like *group, team* or *committee* can be considered to be atomic, because they denote a single entity. However, these atoms are considered to be impure, because the members or parts of this entity are sometimes linguistically accessible. Group nouns can, for example, sometimes get distributive interpretations. Consider the examples below (De Vries, 2015, p. 45):

(33) a. The team smiled.

b. My family has blue eyes.

Sentence (33a) is interpreted as meaning that the individual members of the team smiled, while (33b) means that my different relatives have blue eyes.

The plurals of extension discussed in the previous chapters can be considered to be associated with impure atoms as well. In our standard example below, *the mountains* refers collectively to the whole collection of mountains, without referring to the individual mountains that make up that collection. In other words, the plural might be analysed as being on par with a noun phrase like *the mountain range.*

(34) A house in the mountains

Thus, we will argue that plurals of extension, like *mountains* denote a set of impure atoms. As such, they are similar to regular singulars, with the difference being that most regular singulars, like *mountain,* or *dog,* denote a set of pure atoms. When the plurals of extension are used in a definite noun phrase, as in the (34), the noun phrase refers atomically to a set or

sum of mountains as denoted by the 'regular' plural, making the individual mountains unavailable for counting, quantification and distributive interpretations, as will be shown in the following sections. As such, our plurals of extension might be considered to be the inverse of traditional group nouns: the parts of groups are sometimes linguistically accessible, despite the group term being morpho-syntactically singular. The plurals of extension are, on the other hand, morpho-syntactically plural, yet their parts are sometimes linguistically inaccessible. For the plural count nouns under consideration, it is clear what those parts are. However, for plurals like *waters* or *sands* it is perhaps less obvious what the parts that make up the whole are. However, we will assume that the parts are there, and that they may be vague, overlapping or nested.

Thus, we have argued that plurals of extension denote a set of impure atoms. This term captures two intuitions about these plurals: firstly, despite being morpho-syntactically plural, they refer collectively. In other words, they refer to a collection of mountains, cliffs or water instances as a whole, as an atom. On the other hand, they are plurals because they refer to something that is complex rather than simplex. The atoms they refer to are thus impure. The following sections will expand further on the idea that plurals of extension denote sets of impure atoms.

4.1. Countability and quantification

We have argued that the plurals of extension denote sets of impure atoms. As such, the parts that make up the whole are not always linguistically accessible. This means that generally, these plurals cannot be counted or quantified. Thus, while the nouns can unproblematically occur in the plural in certain contexts, they cannot always occur in the singular in the same contexts. In general, we can say that under the intended reading the nouns under consideration cannot be quantified by *a* or *one.*

(35) a. #a sand of the Sahara

b. #one of the snows of the Kilemanjaro

c. #a depth of the ocean

Two exceptions to this generalisation are formed by the nouns *mist* and *fog*, which seem to be more acceptable in the singular, with a similar meaning to the plural.

(36) a. through a mist of tears

b. We stumble around in a fog

A similar pattern holds for proper names and pluralia tantum, which more obviously cannot occur in the singular:

(37) a. a cabin in {the woods / #a wood}

b. #we climbed only one Pyrenee

Of course, the plurals that are derived from regular count nouns can unproblematically occur in the singular. However, even here we see that the singular is not always acceptable in the same situations as the plural. Sentence (38) is semantically odd when used with the singular (though not unacceptable), while (39) shows that the use of the plural requires a change in preposition.

(38) We went on holiday to {the mountains / #a mountain}

(39) a. A house in the mountains

b. A house on a mountain

For the nouns that can be classified as mass nouns or pluralia tantum, it holds that they generally cannot occur with *a* or *one.* For these nouns it is more difficult to say what they are plurals of, despite unproblematically occurring in the plural.

The point that plurals of extension denote impure atoms is affirmed by the fact that, under the intended interpretation, the plural nouns are not countable. This observation holds for mass and count nouns alike:

(40) a. The city is hidden beneath the waters of the North Sea – #all five of them.

b. John explored the depths of the ocean – #both of them.

c. We have a cabin in the mountains – #in how many mountains is your cabin?

d. We have a cabin in the woods - #in how many woods is your cabin?

e. #The Pyrenees – all 79 of them – are situated between France and Spain.

Furthermore, any type of quantification seems to be excluded:

(41) a. #a house in some/a few/many/all mountains

b. #hidden beneath some/a few/many/all waters of the sea

c. #we climbed some/a few/all Pyrenees.

However, there are again a few nuances to be made to the generalisations above. For example, within the class of proper names, it is generally quite difficult to pick out single instances, as shown above. The exceptions to this are *The Alps* and to some extend *The British Isles.* Comparing (42a-b), we see a difference between *The Pyrenees* and *The Alps:* it is (slightly) easier to pick out a single mountain for the latter than for the former.

(42) a. #we climbed only one Pyrenee.

b. ?we climbed only one Alp.

A similar difference can be observed regarding quantification, which seems to be more acceptable with *Alps* than with *Pyrenees.*

(43) a. #we climbed some/a few/many/all Pyrenees.

b. ?we climbed some/a few/many/all Alps.

Another interesting example is the name *The Antilles,* which denotes an archipelago. For *Antilles,* while it is not possible to pick out a single island (a), or count different islands (b), it is possible to pick out a subset of the islands (c) – though arguably, these are proper names again:

(44) a. #we have a house on an Antille

b. #the Antilles – all 7000 of them – lie in the Caribbean Sea

c. The Greater/Lesser/Dutch Antilles

Overall, we have seen that for the nouns that occur as plurals of extension, the singular is less acceptable in certain contexts than the plural. For all nouns it holds that they are uncountable when used in the plural under the intended reading. Lastly, these plurals generally resist any form of quantification. These three facts provide further support for the idea that, despite being morpho-syntactically plural, the plurals of extension refer to some sort of collection. The entities that make up this collection are not accessible for counting and quantification. As such, we can classify their reference as being atomic.

4.2. Distributive and part-of constructions

We have already seen that, in the relevant contexts, the plurals resist counting and quantification. Furthermore, they also seem to resist distributive readings, at least to greater

extent than regular plurals. The lack of distributive readings becomes clearer in constructions with an indefinite singular object. In (45a) a distributive reading where each girl eats a sandwich and thus multiple sandwiches are eaten is available. However, in (45b) no such reading is available. We cannot say that each water swallowed a boat and that multiple boats were swallowed. The only possible reading is one where the waters collectively swallowed a boat.

(45) a. The girls are eating a sandwich.

b. The waters of the sea swallowed a boat

Another piece of evidence for the atom-like behaviour of the plurals under consideration comes from partitive constructions. Pearson (2011) has introduced the *half-of* test. Consider the following contrast:

(46) a. Half of the bricks had been painted yellow.

b. Half of the wall had been painted yellow.

Sentence (46a) is true in fewer situations than (46b). While the example in (46b) would be true if half of every brick had painted yellow (figure 1a), example (46a) would not. This sentence would only be true if, of all the bricks, half had been painted completely yellow (as in figure 1b). We can say that if the 'distributive' reading (as in figure 1a) is acceptable, the noun phrase ranges over an atom. In this case, the only requirement for a *half-of* sentence to be true is that half of the total denoted by the noun phrase is painted yellow. This is argued by Pearson to be true of singular noun phrases like *the wall.* In this case, the wall is perceived as an atom, and half of that atom needs to painted yellow. The only requirement is thus that half of the surface of the wall is yellow. We will call the reading represented by figure 1a thus the

'atomic' reading. If a *half-of* sentence is only true in a situation like in figure 1b, we can say that the noun phrase ranges over a set. The *half-of* phrase then picks out half of the elements in this set. This assumed by Pearson to be true when the noun phrase is headed by a plural count noun, as in *the bricks.* In this case, the *half-of* phrase ranges over a set of bricks, half of which need to be painted yellow.

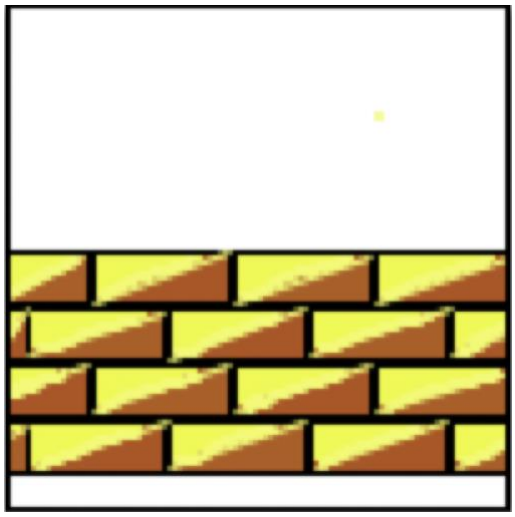


Figure 1a half of each brick

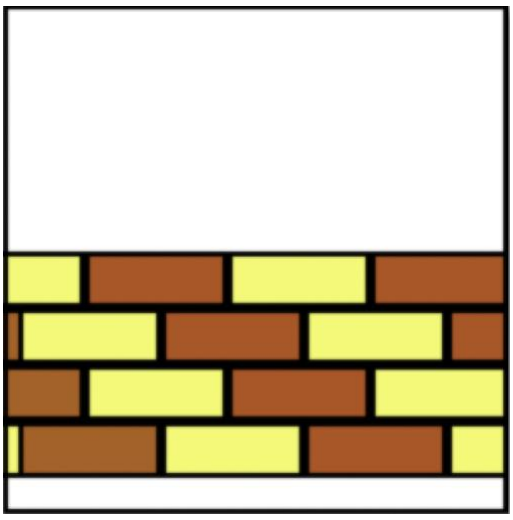


Figure 1b half of the bricks

Our plurals, however, seem to pattern with the atomic singular *wall* rather than the plural *bricks*. Thus, a sentence like (47) will be true as long as half of the cliff-like area is painted yellow. If *cliffs* patterned like *bricks*, we would not expect sentence (47) to be true in the situation as described by figure 2a. However, an informal survey (see appendix A) has confirmed that sentence (47) is true for figure 2a for the majority of speakers.

(47) Half of the cliffs had been painted yellow.

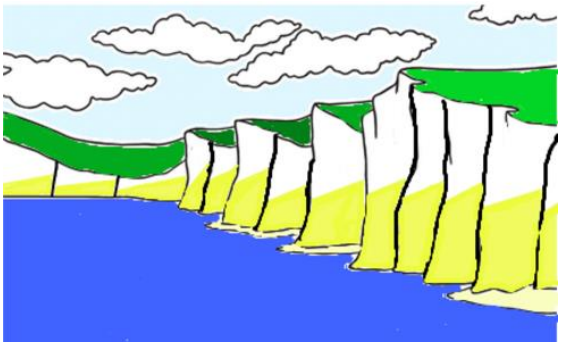


Figure 2a half of each cliff

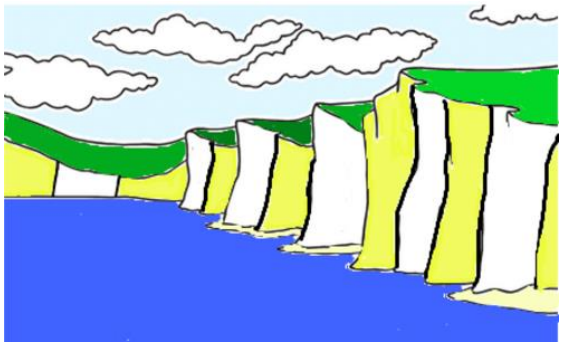


Figure 2b half of the cliffs

The survey had 37 participants, all of whom are native speakers of English. The results revealed that 23 of those accepted the atomic reading for *the cliffs* (figure 2a), compared to only 13 for *the bricks* (figure 1a). This also means that, contra Pearson's assertions, the atomic reading is not entirely out for plurals like *bricks.* This is in line with De Vries (2015), who found that inanimate NPs tend to be interpreted as atoms regardless of their number in Dutch. However, our results do still show a clear difference between the inanimate plural NP *the cliffs* and the inanimate plural NP *the bricks.*

Similar constructions are discussed by Schwarzschild (1996), who argues that the word *part* is a quantifier that can only range over singularities. As such, it can be considered the reverse of the quantifier *each*, which only combines with noun phrases that denote pluralities. Based on the following examples, Schwarzschild concludes that *each* only combines with pluralities and that a plural form like *funds* does not denote a plurality:

(48) a. Each of the cars was painted.

b. *each of the car was painted

c. #each of the funds was ill-gotten.

While *each* thus only combines with regular plurals and not with singulars or non-count plurals like *funds*, the reverse holds for *part:*

(49) a. Part of the car was painted

b. Part of the funds were ill-gotten

c. #part of the boys were in Texas

We can consider the plurals of extension under consideration in this study to be in-line with *funds*:[4]

(50) a. Part of the waters of the Mediterranean Sea belong to Israel.

b. The Northern part of the Pyrenees lies in France

c. The Southern part of the mountains lie in Nepal.

Thus, the resistance of our plurals of distributive readings as well as the fact that they tend to pattern with singular noun phrases in partitive constructions suggest that these nouns can have atomic denotation in some contexts despite occurring with plural morphology.

4.2.1. Alternative analysis

So far, we have shown that the behaviour of plurals of extension is compatible with an impure atom analysis. In particular, we have shown that they often pattern together with regular singular nouns rather than plural nouns. However, the data above would also be compatible with another analysis, namely one where our plurals are mass nouns. It is therefore warranted to discuss this alternative analysis in some more detail. We have already

[4] In English, *part of N* construction may present agreement problems as *part* is singular but *N* is plural in our examples. Our survey with 37 participants also tested these constructions. For *mountains*, the difference between plural and singular VP agreement was marginal, with the sentence with plural agreement being rated 3.6 on average on a 5-point scale and the sentence with singular agreement being rated 3.4 on average. The difference was larger for *part of the waters*, where the sentence with plural agreement was rated 3.6 on average and the construction with singular agreement only 2.8 on average.

briefly mentioned that our plurals of extension and similar plurals are sometimes analysed as plural mass nouns, most explicitly by Acquaviva (2004, 2008), who analyses plurals like *funds* and *clothes* as plural mass nouns. Intuitively, a plural like *mountains* receives a similar interpretation in our contexts as a plural like *clothes.* It is thus entirely plausible to analyse our plurals of extension as mass plurals. In fact, a few of the test we have used to show that the plurals pattern with singulars and thus denote some sort of atom, can also be used to argue that the plurals behave like mass nouns. Firstly, while we have argued that our plurals pattern with singulars in *part-of* construction, it can be observed that mass nouns pattern similarly:

(51) a. #part of the boys are from Texas.
b. part of the bike is green.
c. part of the waters of the Mediterranean Sea belong to Israel.
d. part of the funds were ill-gotten.
e. part of the milk has been spilled.

Secondly, neither plural mass nouns like *clothes* nor 'regular' mass nouns like *blood* can occur with *a* or *one:*

(52) a. #I have a clothe
b. #there is a blood on the wall
c. #a water of the sea
d. #a house in a mountain

Furthermore, neither the mass nouns nor our plurals of extension can be counted:

(53) a. #I have three clothes

b. #there are three bloods on the wall

c. #hidden beneath three waters

d. #a house in three mountains

While plurals of extension thus pattern with regular mass nouns in some contexts, a distinction between attested mass nouns and our plurals can also be made, namely that the latter are completely incompatible with any type of quantification while the former are not. In English mass nouns are generally quantified by *much* and *little,* while count nouns are quantified by *many* and *few*.

(54) a. There is much/little blood on the wall.

b. I have many/few shoes.

It should be noted, however, that plurals mass nouns like *clothes* present an inconsistency to this generalisation, as some discussion exists as to what the right quantifier is for such nouns:

(55) a. %I have too much clothes.

b. %I have too many clothes.

Tsoulas (2009) has argued that, in Greek, the plural form of mass nouns occurs determiners that only occur with mass-nouns and plurals. On the other hand, count-only determiners cannot occur with mass nouns, regardless of whether or not they occur in the plural

(56) Den eho xanadi perissotera *nera* sto patoma
Neg have seen more *waters* on-the floor
'I have never seen more water on the floor.'
[Tsoulas, 2009, p, 137]

However, the same does not hold for our pluralised mass nouns in English:

(57) #hidden beneath much waters

Neither does it hold for our plural count nouns, which are just as incompatible with mass determiners as with count determiners:

(58) #a house in many / much mountains.

Thus, unlike Greek mass plurals, our plurals of extension do not occur in mass-only contexts, such as with the quantifiers *much* and *little*. Based on the determiners the nouns discussed can and cannot occur with, it thus does not seem likely that our plurals of extension are truly mass nouns, though it is perhaps still possible that, semantically, they refer to masses.

If our plurals of extension are mass nouns a further question remains: what is the difference between *water* and its plural counterpart *waters?* Acquaviva (2004) argues that, in general, plural mass nouns conceptualize their reference as 'manifold complexes', while singular mass nouns conceptualize their reference as 'a homogenous substance'. The difference between plural and singular mass nouns is thus one of conceptualization. This difference of conceptualization also requires the referents of plurals mass nouns to be 'articulated' in space, time or function. This might explain why our plurals almost exclusively occur in referential NPs, though Acquaviva does not define what exactly it means to be articulated. Overall, though it is not the approach chosen in this work, analysing plurals of extension as plural mass nouns is an approach worth exploring. This section has only briefly outlined what such an approach might look like, and what problems it might possibly encounter.

4.3. Locative prepositional phrases

The plurals under consideration can (and very often do) occur in locative expressions. The examples in the previous sections have amply illustrated this. This section will only briefly underline the relevance of this observations.

Firstly, we have argued that in the case of abstract nouns like *depth* and *height,* the plural may denote a place while the singular does not. This fact is evident when looking at the prepositions with which these forms can occur. The plurals can occur with locative prepositions like *in*, while the singulars cannot (a). The singulars denote the abstract property of being deep or high respectively, rather than a place having that property. This meaning can be preserved in the plural, but only with different preposition, as in sentence (b).

(59) a. Dante placed them in the {depths/*depth} of Hell.

b. This device can be used at depths up to 130 feet.

The second way in which this observation is important is that it, again, shows that these plurals denote something which is perceived as a whole. In the literature on locative prepositional phrases, it is generally said that prepositional phrases denote the relation between a Figure and a Ground, where the Figure is that object whose location is at issue and the Ground is the reference landmark for that location. Thus, in sentence (60), *a house* is the Figure and *the mountains* is the Ground.

(60) We have a house in the mountains.

What is interesting here, is that it is possible for the Ground to have plural form while the Figure is singular. For more stereotypical plurals, this would often lead to semantically odd

constructions. For example, sentence (61) would require John to be in multiple locations at once for it to be true (or perhaps consecutively sit down in each car)

(61) #John is sitting in the cars.

However, the plurals under discussion here do not require anything of the sort. Thus, in (60) the house does not need to be in multiple mountains at once. Instead, it suffices for the house to be somewhere in the mountainous area. A similar interpretation can be given to the sentences in (62) below. These examples are particularly illustrative as somebody or something can only be born or found once at one location. Thus, an iterative interpretation is always out.

(62) a. John was born on international waters.

b. The statue is a replica of a sculpture found in the ruins of Pompeii.

c. She was born in the jungles of Burma.

It thus seems that in locative expressions, the plurals under consideration denote one larger area, rather than a collection of multiple individual objects. This idea is not entirely new, as the behaviour of referential plural NPs in locative expressions has been discussed in Mador-Haim & Winter (2012, 2015), who propose a theory of *eigenspaces* to account for the semantics of locative NPs. The starting point of the discussion by Mador-Haim & Winter is the observation that the indefinite appearing in the locative prepositional phrase in (63a) receives a different interpretation from the one in (63b):

(63) a. Michael is far from a gas station

b. Michael is close to a gas station

In the context where Michael is driving around in his car and running out of gas, the two sentences have different interpretations. Whereas Michael needs to be far from all gas stations for (63a) to be true, he only needs to be close one gas station for (63b) to be true. In other words, we can say that the indefinite has a universal interpretation in (63a), but an existential interpretation in (63b). In order to account for this alternation, Mador-Haim & Winter argue that the indefinites are derivationally ambiguous between properties and existential quantifiers. This means that sentence (63a) can be analysed in two ways, where *GS* is used for the property denoted by the indefinite *a gas station* and **gs** for the set associated with the extension of this property.

(64) Michael is far from a gas station

a. $\exists x \in \mathbf{gs}.\ \mathbf{far\_from}(\mathbf{m}, x)$

b. $\mathbf{far\_from}(\mathbf{m}, GS)$

In the context as described above, the property-based analysis in (64b) gives the correct interpretation. There are other contexts, for example when the indefinite refers to *a certain* gas station, for which (64a) gives the right interpretation.

Locative expression like (65) express a binary relation between two entities:

(65) Michael is far from London.

More precisely, the relation FAR_FROM holds between two spatial objects. In the case of (65), the location of Michael and the location of London. Mador-Haim & Winter refer to the location of an entity as the entity's *eigenspace*.

In (63a), however, the spatial relation holds between an entity and a property. To analyse such expressions, Mador-Haim & Winter argue that (spatial) properties have

eigenspaces as well, just like spatial entities. Thus, in this case the relation FAR_FROM holds between Michael's eigenspace and the eigenspace for the property *GS*. To formally define the eigenspace of a property, they formulate the *Property-Eigenspace Hypothesis*, where the eigenspace of an entity is simply the location of that entity:

(66) *Property-Eigenspace Hypothesis (PEH)*

A property's eigenspace is the **union** of eigenspaces for entities in its extension

This explains the different readings in (63) as, simply put, in order to be close to the union, one needs to be close one part of it, while in order to be far away from the union one needs to be far away from each part of it. The (pseudo-)universal reading of (63a), that would be unexpected under a quantificational approach of indefinites, is thus explained by a property-based approach in combination with the PEH. Formally, this reading can be captures as follows, where LOC is used as notation for the eigenspace of an entity or property.

(67) $\text{FAR\_FROM}(m, \bigcup\{\text{LOC}(x) : x \in \mathbf{gs}\})$

Mador-Haim & Winter hypothesise that, since properties have an eigenspace just like spatial entities, the behaviour of locative indefinites should behave similarly to locative referential NPs. We have already seen this in (65), where the same pseudo-universal interpretation holds: If Michael is far from London, he is far from every part of London. On the other hand, Michael only needs to be close to one part of London in order to be close to London. Mador-Haim & Winter argue that referential plurals like *the mountains* behave similarly to the indefinite singulars and singular referential NPs discussed above, in that they exhibit the same part-whole structure. In order to be close to *the mountains* one needs to be close one mountain, whereas one needs to be far away from each mountain in order to be far away from

the mountains. However, it is argued that the assignment of eigenspaces to plural NPs is not completely identical to the assignment of eigenspaces to indefinite property-denoting singulars. This becomes particularly clear when looking at nouns that denote entities that are more clearly individuated than *mountains.* The example used by Mador-Haim & Winter (2015) is *the poles.* They observe that for the situation in figure 3, we can say that the house is 10 meters away from *the poles,* even if the house is more than 10 meters away from all individual poles:

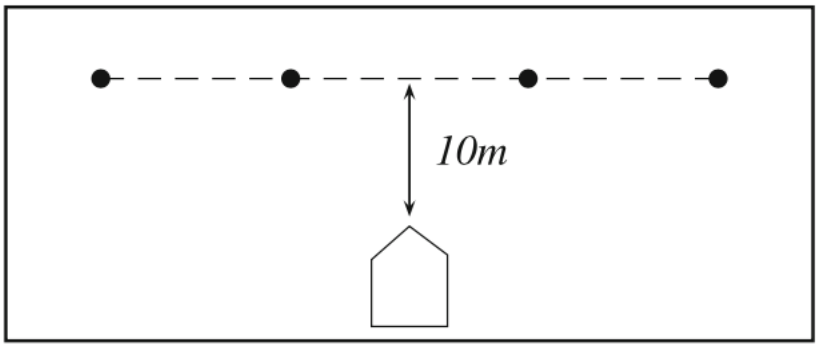


Figure 3. The house is 10m from the (row) of utility poles/ #10m from a utility pole

From this we can conclude that the eigenspace of locative referential NPs is not just the union of the eigenspaces of the entities in its extension. Instead, Mador-Haim & Winter observe that some sort of geometrical 'extension' procedure is at work in these cases, just like with the mass plurals under consideration in this paper. To solve this, they propose that the eigenspace of plural terms is the convex hull[5] of the location of its parts. This means that the

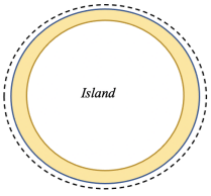
[5] The convex hull of a region A is mathematically defined as the smallest region B containing A, such that for every two points $x, y \in B$, the line segment between x and y is contained in B. The convex hull is perhaps a bit too general for our purpose. For a phrase like *the shores of Iwo Jima*, the convex hull of *the shores* would, by definition, be the entire island (a). This is quite clearly not the right result. We do not want to assert that you are on *the shores* when you are in the middle of the island. Perhaps something like the smallest possible outline containing the location of all the parts would be better (b).

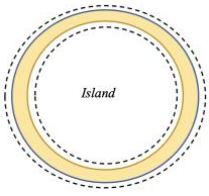
eigenspace of a plural term like *the poles* is a proper superset of the union of eigenspaces for the single poles. A sidenote to this analysis is that in order for this to hold, the individual poles must be sufficiently close and/or organised so that they are perceived as a group. This point is discussed in more detail in Mador-Haim & Winter (2012), where it is argued that the plurals should have a collective interpretation. In other words, they can be represented as impure atoms, where *the poles* is co-referential with expressions like *the collection of poles.* Based on this discussion, the following *Collections-Eigenspace Hypothesis* is formulated (p. 29):

(68) *Collection-Eigenspace Hypothesis (CEH)*

The eigenspace of an (impure) atom **a** is the union of eigenspaces for **a**'s members, or the convex/functional hull thereof.

It is clear that the CEH captures the interpretation of the plurals under consideration in this work quite nicely. In particular, it allows us to be a bit more specific about the spatial properties of these plurals. In one the first discussions of the plurals of extension, Landgraf (1906) suggests that "the Latin Language…uses the plural to denote the uninterrupted expansion and extension of a phenomenon in space or time" (p. 66; my translation). For mass nouns, we share Landgraf's intuition that generally these plurals denote an interrupted area or surface, like a sand or sea surface. For count nouns, it is less clear whether the extension needs to be uninterrupted. While the area denoted by something like mountains is perhaps uninterrupted, the mountains themselves may be (somewhat) scattered. If we take names like *The New Hebrides* to be of the same type, there is no other option than to allow some

(a) 

(b) 

scatteredness, as multiple islands are – by definition – separated. The CEH allows us to be more specific about the interrupted-ness of our plurals: the eigenspace of the plurals (the convex hull of the eigenspace of the parts) will, by definition, be uninterrupted, while the parts making up the whole themselves might be scattered.

Secondly, an eigenspace analysis captures some of the vagueness over what is and is not included in the meaning of our plurals. It seems that a house in the mountains might actually be located in a valley, without giving rise to any contradictions. This intuition is shared by Wierzbicka (1988):

> It seems, however, that geographical entities such as the New Hebrides, the Bahamas or the British Isles are thought of as AREAS defined by groups of islands rather than as COLLECTIONS of islands. I don't want to claim that the waters between the different islands which are jointly called "the New Hebrides" are clearly included in the concept 'the New Hebrides', but I don't think that they are clearly excluded either (p. 538).

Under the CEH, the water between the islands is part of the eigenspace of *the New Hebrides*, as it falls within the convex hull of the eigenspaces of the island. As such, we can say that someone is in *the New Hebrides* when they are on a boat between the island, without necessarily having to commit to the assertion that the water is part of *the New Hebrides.*

We have seen that the eigenspace analysis of locatives as proposed by Mador-Haim & Winter (2012, 2015) provides some insights into the interpretation of plurals of extension in locative expressions. However, two questions remain open: firstly, is a plural like *the mountains*, *the cliffs,* or *the Pyrenees* exactly the same as a plural like *the poles*? Secondly, can we extend the CEH unproblematically to the plural form of mass nouns, like *the waters* or *the sands?* Regarding the first question, it seems that the impure atom interpretation for a plural like *the mountains* is more dominant than for a plural like *the poles.* Essentially, there

are two ways to explain this difference: contextually and lexically. It is argued by Mador-Haim & Winter (2012, 2015) that whether or not *the poles* denotes an impure atom is determined by the context. We can the argue that in the real world there are simply more contexts where a group of mountains form a coherent whole than where a group of poles form a coherent whole. After all, things like mountains, cliffs or hills do not occur very often in a random, unorganised and scattered pattern. However, the difference between *the mountains* and *the poles*, does not seem to be solely a matter of real-world facts. The two plurals also behave differently linguistically. For example, while we have shown that our plurals of extension cannot be counted, this does not hold plurals like *the poles.* In (57a), the impure atom interpretation remains, as *those five poles* can be understood as a collective.

(69) a. The house is 10 meters away from those five poles.

b. #The house is in those five mountains.

We might thus argue that the difference between *the poles* and *the mountains* is lexical rather than contextual. In other words, whether or not *poles* can be used in a definite noun phrase to refer to an impure atom is contextually determined, while this information is part of the lexical entry *mountains.* Thus, we follow Acquaviva (2004, 2008) in arguing that our plurals of extension are lexical plurals (though our interpretation of them is different). The plural form *mountains* can then be analysed in two ways: as the result of regular pluralization of the singular and as a lexical entry, which denotes a set of impure atoms. The lexical entry *mountains* might be analysed as being somewhat on par with terms like *mountain range*, which is always used to refer to a collective regardless of context. This is how we have proposed to analyse plurals of extension throughout this work.

The second point concerns the question whether the CEH can be extended to cover plurals mass nouns. The CEH states that the eigenspace of an impure atom ***a*** is the covexhull

of the eigenspaces of the members of ***a***. For noun phrases like *the waters* or *the sands*, it is not directly clear how the CEH applies to them. What is needed to apply the CEH to the plural form of mass nouns are two assumptions. Firstly, that phrases like *the waters* or *the sands* refer to an impure atom. This is exactly what we have been arguing for in this chapter and will thus assume to hold. The second is that these impure atoms have members that have a defined eigenspace. This assumption is perhaps less obvious. For the impure atom denoted by *the mountains,* we can argue that the members are the individual mountains. This is relatively clear cut, even if those mountains might have some vague boundaries. However, it is less clear what water-quantities make up *the waters.* Yet, though the instances of water making up *the waters* may be vague, nested or overlapping, we can still determine the eigenspace of the plural following the CEH. After all, the eigenspace of the impure atom is the convex hull of the eigenspaces of its members. This means that every water-quantity that is part of the waters has to be part of the eigenspace of *the waters.* Whether or not those quantities overlap or are nested is irrelevant for the derivation. As such, extending the CEH to plural mass nouns does not seem to present any additional problems. Taking an eigenspace-approach to analysing the meaning of plurals of extension in locative expressions thus has the added benefit of enabling us to give a similar analysis for all the plurals discussed, ranging from *waters* to *Pyrenees* to *mountains.*

4.4. The (weak) definite

The previous sections have discussed the behaviour of plurals of extension in different contexts. This final section will say a few words about the use of the definite in combination with our plurals. As observed by Acquaviva (2008), definite descriptions are by far the most usual syntactic context for the intended reading of plurals of extension. In particular, these plurals often occur in constructions of the form 'the Xs of Y':

(70) a. The sands of the Sahara

b. The snows of Kilimanjaro

Abstract nouns like *depth* and *height* can be used to literally denote a deep place, as in (a), but have a tendency to be used with more abstract complements in a more figurative sense (b):

(71) a. The depths of the ocean

b. The depths of despair

While the mass nouns under consideration mostly need some form of descriptive modification in order to occur in the plural, this restriction seems somewhat less strict for count nouns:

(72) a. A cabin in the mountains (of Mourne)

b. Mary was standing on the cliffs (of Dover).

For at least some of these plurals it holds that, when they occur without any further modification, they can be considered to be *weak definites.* Some stereotypical exampels of weak definites are given in (73):

(73) a. Mary is reading *the newspaper*.

b. John went to *the store.*

In these cases, the definite does not refer uniquely to a particular context. This becomes particularly clear in elliptical contexts, as pointed out by Carlson & Sussman (2008). Consider the example they give below (p.72):

(74) Mary heard about the riot on *the radio,* and Bob did too.

In order for (74) to be true, Mary and Bob need to have heard about the same riot. However, it is possibly that have heard about it on different radios. The definite *the radio* is argued to receive a weak reading which means that it has non-unique reference. Another interesting characteristic of weak definites is that they can refer to more than one entity. Take example (75), given by Aguilar-Guevara & Zwarts (2010, p. 183).

(75) Lola took *the train* from A to B.

Now, imagine a situation where Lola has travelled from A to B by train, but has had to make a transfer along the way. In this example, Lola has actually taken two trains. However, sentence (75) can still be used to describe such a situation.

In order to account for these properties of weak definites, Aguilar-Guevara & Zwarts (2010) have argued that weak definites refer to kinds.[6] The idea that definite singular nouns can refer to kinds is, of course, not new. In a sentence like (76), *the lion* does not refer uniquely to a specific lion either:

(76) The lion vanished from Africa.

[6] Schwarz (2014) presents another account of weak definites based on kinds. While Aguilar-Guevara and Zwarts (2010) propose that weak definites involve kind reference at the level of the definite noun phrase, Schwarz argues that weak definites are regular definites that occur in verb phrases which are interpreted as kinds of events.

Such definite generics are often contrasted with kind-referring bare plurals (see Dayal 2004; Chierchia, 1998a a.o.). Returning to weak definites, Aguilar-Guevara & Zwarts propose that weak definites, like generic definites, refer to atomic kind individuals. Importantly, analysing weak definites as kind referring explains why they do not refer to unique entities. However, examples (73-75) are not directly about kinds, but about instantiations of those kinds. Afterall, Lola is reading a specific newspaper, and not some abstract newspaper-kind. Without going into detail about the logic at play, Aguilar-Guevara & Zwarts assume, following Carlson (1977), a realization relation R between individual objects and the kinds that they are realizations of. What is important here is that not only an atomic entity (a train), but also a sum of entities (two trains), can be a realization of a kind. This explains why (75) is still true if Lola has taken two trains to go from A to B.

Having laid some groundworks on weak definites, we can return to our plurals of extension. While so far all the weak definites discussed have been singulars, there are also plural weak definites. We can see that the plural *the mountains* in (77a) has a similar interpretation as the weak definites discussed so far. The sentence suggest that Mary went to a mountainous area, without specifying which one. Furthermore, (77b) is true even if, for example, some people went to the Pyrenees and some to the Alps.

(77) a. Mary went to the mountains.

b. Everybody went on holiday to the mountains this year.

Aguilar-Guevara & Zwarts present a few further examples of plural weak definites (2010, p.187):

(78) a. John went to the movies

b. Lola is doing the dishes

They acknowledge that such plurals at first sight present a problem for their analysis of weak definites as referring to singular atomic kinds. However, they argue that these examples fit into their theory once one recognizes that are not really semantically plural: "the plural noun *dishes* does not compositionally relate to a singular noun *dish*, as the set of sums built up out of individual dishes, but it refers to an individual collection of dirty dishes."

Of course, we are not so much interested in the use of the definite here, but rather in the use of the plural. However, the discussion of weak definites has hopefully shown that at least some of the plurals under consideration in this work behave similarly to singular noun phrases like *the newspaper*. The analysis presented above fits in with our theory that plurals of extension denote sets of impure atoms and as such share many characteristics with regular singular nouns. The fact that our plurals can occur as weak definites, which are analysed by Aguilar-Guevara & Zwarts (2010) as referring to atomic kinds, provides further support for the claim that they denote something akin to an impure atom.

However, the idea that plurals of extension can, in some examples, be interpreted as weakly referential and as such be analysed in terms of kind reference will not be uncontroversial. In fact, is does not directly fit in with theory presented in this work that the plurals refer to some sort of extension of a phenomenon in time or space. So far it has thus been argued that these plurals refer to something that is concrete and located in time and space. In fact, the possibility of plural mass nouns like *waters* to have a kind-level reading is explicitly ruled out by Acquaviva who argues that "plural mass nouns must denote concrete, spatiotemporally situated instances, and cannot be interpreted as kinds" (2016, p. 229). This is assertion is supported by the following example:

(79) The formula of {water / *waters} is H_2O

It is repeatedly argued by Acquaviva that (for mass nouns) plurality is directly tied to instantiation. In Acquaviva (2016) he argues that for mass plural like *waters,* a Div is needed, which partitions the set of sums denoted by *water* into a more restricted set of concrete 'water quantities'. A kind-reading is excluded because, according to Acquaviva, "what makes the plural possible (the partition) is also what enforces an instantiation reading" (2016, p. 229).

This assertion, however, does not ring true as we have already seen that weak definites exist, both in singular and plural form. Furthermore, it is possible to find examples of cases where plural mass nouns seem to refer weakly. Consider for example the following two (slightly archaic) expressions:

(80) a. An estimated 3.3 billion airline passengers took to the skies last year.

b. Many people visited the spa town to take the waters.

In these examples, *waters* and *skies* do not seem to refer to specific (sets of) water or skie quantities or instances. Instead, they refer weakly, similarly to what has been shown for other plurals of extension (e.g. *mountains)*. As such, Acquaviva's assertion that plural mass nouns can only refer to instances does not seem to hold.

The fact that our plurals of extension can occur as weak definites is a fact which Acquaviva cannot account for. However, the fact that plurals of extension may occur as weak definites does not necessarily pose a problem for the theory that has been proposed in this work. If, as has been argued, plurals of extension denote sets of impure atoms, and are as such, very similar to regular singulars, the same mechanisms that account for the weak reading of singular definites such as *the newpaper* can account for the weak reading of our plural definites. Thus, while our plurals of extension often do refer concretely to instances located and extended in time and space, they do not necessarily do so. It is possible for plurals of extension to occur as weak definites, as has been shown and discussed above.

4.5. Summary

In this chapter, we have proposed that plurals of extension denote sets of impure atoms. They are used to refer to something which has parts (hence the plural), but those parts are referred to collectively. We have showed that the plurals of extension pattern with singular nouns rather than regular plurals in multiple contexts. Firstly, despite being morpho-syntactically plural, the nouns under consideration cannot occur with numerals or quantifiers in the relevant contexts. Secondly, we have shown that plurals of extension pattern with singular count nouns in distributive and partitive contexts. Furthermore, we have used the eigenspace theory as set out by Mador-Haim & Winter (2012, 2015) to describe the behaviour of plurals of extension in locative expressions. Again, we see that the plurals are understood as referring to impure atoms, resulting in a reading where the location of the referential plural NP is the convex hull of the location of its parts. Lastly, it has been shown that plurals like *mountains* can occur as weak definites, which are analysed as referring to atomic kinds by Aguilar-Guevara & Zwarts (2010). Overall, this chapter has discussed the behaviour of plurals of extension in different contexts more extensively, and in doing so, has provided more evidence for the idea that they denote sets of impure atoms.

5. Extending the analysis to time

So far, we have discussed plural forms of mass and count nouns which denote some sort of spatial extension. Thus, *waters* can denote something like 'surface or body of water', *sands* 'sandplain', *cliffs* 'cliff-area' and *mountains* 'mountainous landscape' or 'mountain range'. However, there seems to be a group of nouns which receive a similar interpretation in the plural, with the difference being that they primarily denote an extension in time rather than space. This is the result of the fact that most of these nouns denote events rather than objects or substances. Following paragraphs will attempt to show the similarities between these time-oriented plurals and the space-oriented ones discussed in the previous section.

There is thus a group of nouns that seem to denote an extension in time in the plural. The most discussed example in the literature is the plural *rains,* particularly when used in expressions like *the seasonal rains.* It is argued by Rothstein that "plurals of mass nouns may denote multiplicities of events" (2021, p. 62). Rothstein argues that, since these plurals do not acquire all properties of count nouns (e.g. being modifiable by numerals), they remain mass when pluralised. A similar analysis is given by Acquaviva, who writes that "*the Autumn rains* refers to multiple raining events during Autumn, making up a manifold mass entity whose parts, although possibilty disjoint in time, are not individual enough to be autonomously referred to as **one rain*" (2004, p. 393). Other examples of plural event nouns discussed by Acquaviva (2004, 2008) include *holidays* and *plans.*

It can be noted that the discussion in the literature has often been limited to those plurals that are derived from standard mass nouns such as *rains,* and plurale tantum such as *nuptials.* However, we will broaden the discussion to include plurals that have a singular count counterpart. To start, take the word *time* itself, which can be used in the plural in expressions like *a sign of the times,* or *love in times of cholera.* Another example would be the already mentioned *holidays,* which can be used to refer to a festive period, rather than

simply a collection of holy-days. Another, similar, example would be the plural use of *celebrations.* Further examples, which have as far as I am aware not been discussed extensively in the literature, include terms like *negotiations, demonstrations, riots, protest,* and *renovations.* Other nouns that can be argued to receive a similar interpretation in the plural are nouns that refer more explicitly to time periods themselves, as can be seen in phrases like *the first months of his presidency, the early days of the epidemic* or *the early stages of the war.*

As with the plurals of extension discussed in the previous chapters, we will thus cast a rather wide net in our discussion of these time-plurals, including plurals with mass and count singular counterparts. Furthermore, unlike Rothstein and Acquaviva, we will not argue that these plurals are mass nouns. Instead, we will argue that they form a sub-class of the previously discussed plurals of extension and as such denote sets of impure atoms. This means that *the rains* or *the negotiations* are taken to refer collectively to a whole rather than a mass.

5.1. Quantification and countability

For the spatial plurals it has been shown in the previous chapter that they cannot occur in the singular in the same contexts as the plural. For the time plurals, this behaviour is a bit more variable. Of course, this is not possible for pluralia tantum like *the Troubles* or *nuptials.* Furthermore, consider the examples in (81) below:

(81) a. Cattle graze throughout the open areas during the rains and early dry season

b. Our desert area can become alive with seas of wildflowers during the rains

c. #Our desert area can become alive with seas of wildflowers during a rain

In the plural, *rains* seems to denote a time period characterised by excessive rainfall as shown by the conjunction with the phrase *early dry season* in (a). A similar interpretation does not arise with the singular. That said, it is possible to use the noun in the singular as a count noun, where *a rain* means something like 'a rainshower'. It is possible that this count usage of the noun underlies the plural as well. Even so, there is still a meaning alternation between *rain* and *rains* that is not accounted for by pluralisation alone. In the same way that *mountains* does not denote a plurality of mountains but a mountainous area (at least in our examples), so does *rains* not denote a plurality of rainshowers, but a rainy time period.

A similar alternation can be seen for the count noun *celebration,* thought the meaning difference might be a bit more subtle.

(82) a. The palace gardens are decorated, and the celebrations begin.

b. The firewood is decorated with daisies prior to the celebration.

However, the indefinite singular is often used deverbally to mean something like 'a celebrating of…', as in (84a). Here the difference in meaning becomes clearer. In (83b), the plural is used to denote a festive and celebratory time period:

(83) a. This is a celebration of Indian culture and heritage

b. During the celebrations, many activities took place

The exact meaning of the singular and plural of *holiday* diverges on different sides of the pond, and so will not be discussed in detail here. It suffices to observe that in a phrase like *over the Christmas holidays* the plural denotes a time period longer than just the 25th and 26th of December. Overall, the time plurals denote a collection of events that might be made up of

multiple sub-events, but those parts cannot always be picked out. Thus, the time plurals can be considered to denote impure atoms as well.

As with the spatial plurals discussed before, quantification is not available under the intended reading:

(84) a. #some/a few/many/all celebrations lasted all day

b. #Cattle graze throughout the open areas during some/a few/many/all rains

c. #in some/a few/many/all times of cholera

d. #he had lost his family during some/a few/many/all riots

This can be seen most clearly for the noun *plan.* The meaning of (85a), when the plural is used under the intended reading, means something like 'I am busy tonight'. However, when quantified, this reading disappears and only the more compositional reading 'there are multiple things I intend to do' is available. This difference was pointed out by Acquaviva (2008, p. 44):

(85) a. I have plans tonight

b. I have a few plans tonight

In other words, quantification makes the intended reading unavailable. This can also be seen in the following pair of sentences. In (86a), the reading where the plural denotes some sort of entirety of riots (perhaps composed of smaller sub-riots) is the dominant one. This is the impure atom interpretation that we are interested in. Under this reading, the police either did or didn't use teargas. However, in (86b), the dominant reading is one where multiple, disconnected, riots took place. The police may have used teargas during some of these riots, while not using teargas during others.

(86) a. The police used teargas during the riots.

b. The police used teargas during a few/many/all riots

Furthermore, despite being in the plural, the nouns cannot be counted.

(87) a. #The celebrations – all 5 of them – lasted all days.

b. #The renovations of the house – all 5 of them – took 8 weeks.

b. Cattle graze throughout the open areas during the rains – #during how many rains do the cattle graze?

c. It's a sign of the times – #of how many times is it a sign?

Overall, we have shown that, despite being morpho-syntactically plural, noun phrases like *celebrations, riots* and *negotiations* cannot occur with numerals and quantifiers. In this respect they behave similar to the plurals of extension discussed in chapter 3.

5.2. Distributive and partitive constructions

We have seen that plurals like *waters* and *mountains* have atomic denotation distributive and partitive constructions. The same holds for the time plurals discussed here. In general, the dominant reading seems to be a collective one (b), in contrast to other more regular plurals which allow both a collective and distributive reading (a).

(88) a. The games lasted 90 minutes.

i. The games lasted 90 minutes in total.

ii. Each game lasted 90 minutes.

b. The riots lasted 10 hours.

i. The riots lasted 10 hours in total.

Furthermore, it seems that time plurals pattern more like regular singulars than regular plurals in partitive constructions. In (89b), it is shown that *part* cannot be used with a noun phrase denoting a true plurality. However, constructions as in (89c) are acceptable.

(89) a. The formal part of the wedding

b. #the formal part of the weddings

c. The formal part of the celebrations

Other examples of the type in (89c) that can be found are listed below:

(90) a. The intergovernmental part of the negotiations

b. The newsworthy part of the protests

c. The best part of the holidays

Overall, this data suggests that time plurals have atomic denotations in the same contexts as the plurals of extension discussed in chapter 3.

5.3. Temporal prepositional phrases

Lastly, a parallel can be drawn between the locative prepositional phrases in which our spatial plurals can occur and the temporal prepositional phrases in which our time plurals can occur. We have seen that the spatial plurals can occur in locative expressions with *in* and *on*, serving as the Ground to a singular Figure. Similarly, the time plurals can occur with a preposition like *during*, which we take to be the temporal equivalent of *in.* The nouns following *during* generally denote a period of time, during which a certain event (the Figure) has taken place. This period of time is generally denoted by a singular noun phrase, as in (a).

As with the spatial plurals, the use of more stereotypical plurals leads to a semantically odd reading. Thus, example (b) only makes sense if John fell asleep multiple times (in which case the Figure is actually a plurality of falling-asleep-events).

(91) a. John fell asleep during the party.

b. #John fell asleep during the parties.

No such suggestion is present for (92a). The time plurals under consideration here can occur unproblematically with a singular Figure as the complement of a preposition like *during.* A few other illustrative examples are listed below.

(92) a. John fell asleep during the celebrations.

b. John was killed during the riots.

c. The company was founded during the early days of the internet.

In the examples above, *the celebrations, the riots* and *the early days* refer to one longer time period, rather than a collection of individual celebrations, riots or days.

In chapter 4, we have argued that the interpretation of plurals of extension in locative expressions can be explained through the eigenspace-analysis as presented by Mador-Haim & Winter (2012, 2015). They have formulated the Collection-Eigenspace Hypothesis (CEH), which is repeated below:

(93) *Collection-Eigenspace Hypothesis (CEH)*

The eigenspace of an (impure) atom **a** is the union of eigenspaces for **a**'s members, or the convex/functional hull thereof.

This means that the eigenspace of a plural like *the mountains* can be visually represented to be something like this:

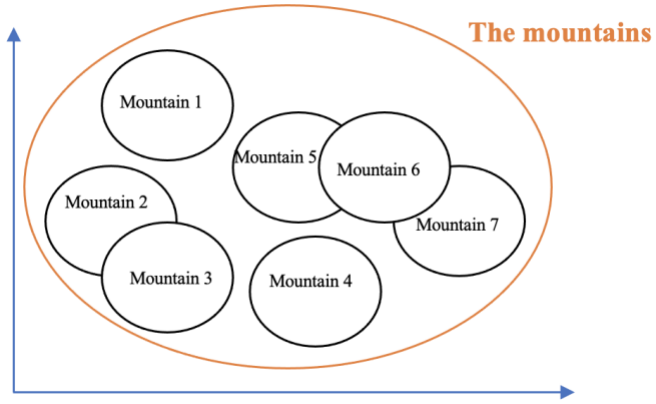


Figure 4. The eigenspace of 'the mountains'

The eigenspace of the impure atom *the mountains* is thus the convex hull of the eigenspaces of the individual mountains. If we want to present a parallel analysis for the temporal expressions discussed above, we first need to define what the 'eigentime' of an event is; let us define that the eigentime of an event is simply the time at which the event takes place. Then, we can formulate a 'Collection-Eigentime Hypothesis' as follows:

(94) *Collection-Eigentime Hypothesis*

The eigentime of an (impure) atom **a** is the union of eigentimes for **a**'s members, or the convex/functional hull thereof.

If we imagine time to be like a line, we can then visualise the meaning of plurals of extension in temporal expressions as follows:

Figure 5. The eigentime of 'the celebrations'

Thus, an expression like *during the celebrations* can be taken to mean somewhere during the time period captured by the convex hull of the eigentimes of the celebrations. As with plural noun phrases like *waters* or *mountains,* the noun phrase needs to be understood as an impure atom in order for this interpretation to hold.

5.4. Summary

In this chapter we have shown that there is a group of plural nouns, including *celebrations*, *negotiations* and *riots* amongst others, that seem to denote the extension of a phenomenon in time in the same way that plurals like waters and mountains denote the extension of a phenomenon in space. As such, these plurals can also be considered to be plurals of extension. Just as with the plurals discussed in the previous chapter, we argue that these time plurals denote sets of impure atoms. This is supported by the fact that, despite being morpho-syntactically plural, these noun phrases are not available for counting or quantification. Furthermore, they behave like singular count nouns in partitive constructions. Lastly, we have attempted to show that Mador-Haim & Winter's (2012, 2015) Collection-Eigenspace Hypothesis can be adapted in a fairly straightforward manner to account for the interpretation of plurals of extension in temporal expressions.

6. Cross-linguistic Outlook

Even though the focus of this investigation is on English, we will briefly foray into other languages and language families. The purpose of this section is to show that the existence of plurals of extension are not just some eccentricity of the English language, but that they can be found in many other languages as well. In particular, we will show that mass nouns can occur with plural morphology in multiple languages, despite general consensus that mass nouns should not be able to pluralize, resulting in an interpretation similar to one we have seen for English. Furthermore, we will briefly discuss how similar plurals are analysed in the literature for different languages.

6.1. Latin

There is a surprisingly extensive body of literature on Latin which discusses this type of plurals (cf. Delbrück, 1893; Maas, 1902; Landgraf, 1906; Meisterfeld, 1998). In particular, the use of the plural *harenae* 'sands' is extensively discussed, with Landgraf (1906) listing a dozen or so examples. In fact, the usage of the plural *harenae* to indicate a dessert or sandplain is so well-established that is listed in many dictionaries (Lewis & Short, 1897; Pinkster 2018). However, *harenae* is not the only example from Latin. For example, Landgraf also shows that Virgil has used *glacies* 'lit. ices' to mean something like 'glacier' or 'ice-plain' (Georg. 4,517). Much attention is paid in the literature to the plural use of certain noun classes, in particular mass nouns, abstract nouns and nouns referring to body parts. However, the plural use of count nouns has also been discussed, for example in relation to *lit*ora ('shores') and *ripa* ('riverbanks') (Cunningham, 1949). Of these plurals, Löfstedt wrote "the tendency, the possibility to describe the coast pluraly…is rooted in its extensive character, which often automatically develops for the plural of a local term" (1942, p.36, n.4, my translation). Here we already see the idea that plurals can denote some sort of spatial

extension shine through. For Latin, it is quite easy to find further examples of plural count nouns that receive a similar interpretation as our plurals of extension. When, in the famous first line of the Aeneid, Virgil writes that Aeneas was the first to depart to Italy from the coasts of Troy (95), he does not mean that he literally departed from multiple coasts at the same time, but rather from a coastal area. In this example, not only is *oris* in the plural, but we also see another example of the usage of the plural form *litora* later in the sentence.

(95) … Troiae qui primus ab oris Italiam
Troy.gen.sg who.nom.sg first from coast.ABL.PL Italy.ACC.SG
…Laviniaque litora venit
Lavinian.acc-and shore.ACC.PL came.3SG
'[a man] who first came from the coasts of Troy to Italy and the Livinian shores'

Of course, the few examples above are from an exhaustive discussion of the use of the plural in classical Latin. However, they have hopefully shown that there exist mass and count nouns in Latin which receive a similar interpretation when pluralised as the English nouns discussed. Much of the discussion in the philological literature has been centred around the question whether such plurals should be considered to be *poetic plurals* or not. However, Landgraf (1906) has convincingly shown that, while such plurals may have first been used in Augustinian poetry, they are later also encountered in prose from the silver age. Furthermore, Landgraf argues that those plurals are not poetic by any definition as 1) they are not meaningless and 2) cannot be explained on purely metric grounds. The Latin plurals discussed above can thus be considered to be on par with the plurals of extension discussed for English.

6.2. Greek

Another language in which plural forms of mass nouns can be found is Greek. In fact, mass nouns seem to appear with plural morphology quite freely in this language. One example is given below:

(96) *Trehoun* *nera* *apo* *to* *tavani.*
drip-3rd-pl water-pl-neut-nom from the ceiling-neut-sg
'water is dripping from the ceiling'
[Tsoulas, 2009, p. 133]

While there is some discussion in the literature regarding how such plurals are derived (cf. Tsoulas, 2009; Alexiadou, 2011; Kane et al., 2015; Kouneli, 2019; Erbach, 2019), we will focus on the semantic interpretation of such mass plurals. It has often been argued that these plurals carry a 'much' or abundance inference; the example in (96) is thus associated with a reading where a lot of water is dripping from the ceiling. However, more recently, it has been argued by Kouneli (2019) that the meaning of plural mass nouns is one of 'spread over a surface in a disorderly way'. The following minimal pair illustrated the difference between the abundance reading and the spread/scattered reading:

(97) a. *I* *baniera* *ine* *gemati* *nero*
the.NOM bathtub.NOM.SG is.3SG full.NOM.SEG water.ACC.SG
'the bathtub is full of water.'

b. *I* *baniera* *ine* *gemati* *nera*
the.NOM bathtub.NOM.SG is.3SG full.NOM.SEG water.ACC.PL
'there is water all over the bathtub's surface.'

The salient reading for sentence (97b) is that there is water scattered on the surface of the bathtub. This reading was paraphrased by one of Kouneli's informants as 'the bathtub is wet'. There is a strong implicature that the bathtub is not full of water. This reading is, however, available for (97a) where the singular is used. These examples argue against an abundance reading, as the amount of water involved in (97b) is in fact smaller than the amount of water involved in (97a)[7]. It is argued by Erbach (2019) that this 'spread/scattered' reading is not available for mass plurals in English and the mass plurals found in Greek do thus differ from the ones under investigation here. However, mass nouns can occur in the plural in the same contexts as in English:

(98) *Tzóni efthymise anakalóntas sti mnímі tou to pálai poté kinitó tou kai tin olympiakón epidóseon voutiá pou ékane sta **nerá** tou Saronikoú.*
'Johnny was right in recalling his dive into the waters of the Saronic Gulf.'

[Corpus of Modern Greek; cited by Erbach 2019, p. 428]

Erbach (2019) argues that the most straightforward way of analysing cases like the ones in (98) is to say that these are a different type of plurals (lexical) than the 'spread/scattered' cases (grammatical). However, we would not argue that the notion of spreadness is irrelevant for our English plurals of extension. In the case of *sands,* the plural seems to suggest that the sand is spread out over a larger surface or plain, while the plural *negotiations* seems to suggest that the negotiations were spread out over time (in multiple sessions). The plural form *riots* suggests that that the riots were spread out over time as well as space. Regardless of the analysis, we have to conclude that the use of plurality for mass nouns is more restricted for English than for Greek, both in terms of the list of nouns that can be pluralised and in terms of the interpretations the resulting plurals can get.

[7] Mass plurals receive a similar reading in Persian (Sharifan & Lofti, 2003).

6.3. Dutch and German

Contrary to Latin and Greek, examples of mass plurals are difficult to find for Dutch and German. Many of the examples listed above for English do not work in those languages (e.g. **de zanden van de Sahara* 'the sands of the Sahara). To illustrate the difference between English on the one hand and Dutch and German on the other, it is informative to look at the domain of literature. Hemingway's short story *The snows of Kilimanjaro* has been translated into German under the title *Schnee auf dem Kilimandscharo* (lit. 'snow on the Kilimanjaro'). However, it is possible to pluralise mass nouns in both Dutch and German, as can, for example, be seen in the tile *Die Nebel von Avalon* ('the mists of Avalon'). Another interesting example from Dutch is the mass noun *water* 'water', which can be pluralised but only in the set combination *internationale wateren* 'international waters'. In this combination, the plural can be used if it does not refer to multiple bodies of water (99a). In other, similar, contexts, the plural is generally less acceptable (99b).

(99) a. Renny is geboren op internationale wateren
Renny is born on international waters

b. #de wateren van de zee
the waters of the sea

Overall, it is more difficult to find suitable examples of mass plurals for Dutch and German, though not impossible. The pluralisation of mass nouns is thus more restricted in Dutch and German than in English.

Count nouns, however, easily receive the same interpretation in the plural as the English examples cited so far; *een huisje in de bergen* ('a cabin in the mountains') has the same meaning as its English equivalent. Similar usage can also, for example, be attested for

Dutch nouns like *heuvels* ‘hills’ or *bossen* ‘forests’ and German nouns like *Bergen* ‘mountains’ or *Klippen* ‘cliffs’, among others.

6.4. Hebrew

A few examples from other language branches can be found as well. For example, in Ukrainian (as well as Russian), the plural *piski* ‘sands’ is used to explicitly refer to a landscape form, as in this example from Acquaviva (2008, p. 111)

(100) sered landšaftnix form Avstralii golovnim
among landscape.GEN.PL form.GEN.PL Australia.GEN main.INSTR
činom prevaljujut’ piski
way.INSTR prevail.3.PL sand.PL
‘among the landscape forms of Australia, deserts are prevalent’

Moving away from Indo-European languages entirely, we see that in Biblical Hebrew the plural יָמִים ‘lit. seas’ is used to denote ‘surface of the sea’ (Waltke & O’Connor, 1990). Waltke & O’Connor (1990) dub such plurals *plurals of extension.* The plurale tantum מַעֲמַקִּים ‘depths’ is included in this term, as well as plurals from other semantic classes, such as body parts (e.g. עֲוָאִרִים ‘neck’) and complex inanimate nouns (e.g. אֹהָלִים ‘encampment’; also ‘tents’). In Modern Hebrew, mass nouns can also occur in the plural without gaining a count reading (Doron & Müller, 2013). There are mass pluralia tantum, including *haris-ot* ‘ruins’ and *šam-áyim* ‘sky-pl’ amongst others, as well as mass nouns that have a morphological contrast between singular and plural forms. The following list of examples from this group of mass nouns is given by Doron & Müller:

(101) *géšem / gšam-im*
rain.masc / rain-pl

déše / dša'-im
grass.masc / grass-pl

adam-a / adam-ot
land-fem / land-pl

késep / ksap-im
money.masc / money-pl

ħol / ħol-ot
sand.masc / sand-pl

merħab / merħab-im
space.masc / space-pl

šéleg / šlag-im
snow.masc / snow-pl

ed / ed-im
steam.masc / steam-pl

dam / dam-im
blood.masc / blood-pl

ašp-a / ašp(-at)-ot
rubbish-fem / rubbish-pl

ruaħ / ruħ-ot
wind.fem / wind-pl

For the mass terms in (101), the plural form, which contrasts with the singular, are argued denote an *abundance plural* (Doron & Müller, 2013). As such, they might be similar to mass plurals found for Greek. Epstein-Naveh (2015) discussed such plurals in more detail and argues that nouns like *deše* ('grass') and *ħol* ('sand') the plural is used to denote a plurality of physical locations where grass or sand is found, rather than to the stuff itself. Epstein-Naveh considers such nouns to be *quasi mass nouns* and their meaning to be that of *locations of N.* This interpretation is the closest to the one found for English.

While the list presented above is likely to be far from exhaustive, it has hopefully shown that mass nouns can occur in the plural in a range of languages and language families to express some sort of spatial extension. The same holds for the time plurals discussed, as the last part of this section will show.

6.5. Time plurals

In chapter 5, we have attempted to extent our analysis to nouns that denote an extension in time. In particular, we have looked at event denoting nouns such as *celebrations,* negotiations and *riots.* Similar plurals can be found in other languages as well. It is quite common cross-

linguistically to use plurals to denote festivals, rituals or celebrations. We have already seen the English *holidays, celebrations* and *nuptials*. The meaning of the latter is also denoted with a plural in Lithuanian (*vesuves),* Finnish (*häät*) and Latin (*nuptiae*) (Acqauviva, 2008, p. 105). In Latin, the plurals *idus* and *calendae* denote a single day (though of each month). The plural *feriae* 'holiday' can, in turn, be used to refer to both *idus* and *calendea* as well as other single day holidays. Festivals with plural names include, among others, *Saturnalia* and *Bacchanalia.* Furthermore, a funeral can be denoted by the plural *funera.* The same holds for Russian, which has the plural *pochorony* 'funeral'. In Russian, the plural *imjaniny* means 'name-day' (Delbruck, 1893, p. 164-5). Lastly, the plural can be found in German in the names of multi-day holidays such as *Weinachten* 'christmas', *Ostern* 'easter' and *Pfingsten* 'pentacost'. For some of these nouns, the use of the plural can be traced back to the fact that these festivities either lasted multiple days, or included multiple rituals or celebrations. Regardless, we see that the use of the plural to denote some time period characterised by festivities or rituals is found across many languages.

7. Conclusion

One of the key characteristics of mass nouns described in the literature is the fact that they cannot occur in the plural. Whenever they do occur in the plural, they are coerced into a count meaning, often denoting a standard portion or a type. However, English mass nouns occur in the plural in other contexts as well, for example in phrases like *the waters of the sea* or *the sands of the Sahara.* This observation has served as the starting point of this investigation. While the existence of these plurals is interesting enough in and of itself, this work has shown that they receive a similar interpretation as certain plural count nouns: where *the sands* can be used to mean something like a sandplain, the plural noun phrase *the mountains* can be used to refer to a mountainous area. Plurals of these two types, together with some pluralia tantum and proper names have been dubbed *plurals of extension* in this work.

While such plurals have occasionally been mentioned in the literature, they have never been described in much detail. This work has made a few key observations about these plurals of extension. Firstly, they resist practically any form of counting or quantification. Furthermore, they pattern with singular count nouns in part-of and half-of constructions, often being interpreted atomically. Furthermore, they seem to be more resistant to distributive readings than regular plurals. Lastly, they occur very often in locative expression, for example with the prepositions *in* and *on.* In such expressions, the plural is interpreted collectively; in other words, the house in the mountains is not taken to be in multiple mountains at once, but rather to be somewhere in the space taken up by the mountains together. We have used the Collection-Eigenspace Hypothesis as formulated by Mador-Haim & Winter (2012) to account for this fact, and to argue that the eigenspace of our plurals of extension is the convex hull of the eigenspace of their members.

Based on these observations, it has been proposed that the plurals of extension denote sets of *impure atoms*. When used in definite noun phrases, they refer to collections of mountains, cliffs or water- or sand-instances, but these collections are considered to be entities in their own right. In this, they resemble other impure atoms, for example those referred to by group nouns. The atomic denotation of our plurals of extension explains why they often pattern withs singulars, for example in their ability to occur as weak definites, their resistance of quantification, or their behaviour in part-of and half-of constructions.

Most of the discussion in this work has been focussed on a group of nouns that also form a semantic class: mountains, cliffs, woods, waters and sands are all elements of the landscape. As such they all denote larger areas, or, in other words, the extension of a phenomenon in space. However, we have connected this group of nouns to another group of nouns, namely those that denote a similar extension in time in the plural. These are mainly event-denoting nouns. Examples of such plurals are *celebrations, negotiations,* and *riots.* Here, the plural definite refers atomically to a collection of celebrating/negotiating/rioting (sub-) events. They behave similar to the plurals of extension in all the tests discussed so far. We have proposed a Collection-Eigentime Hypothesis to account for they behaviour in temporal expressions, for example with prepositions such as *during.* Overall, they can be considered to be another subclass of plurals of extension.

The last chapter has briefly shown that the type of plurals discussed in this work do not just exist in English, which has been the focus of this work, but can be found in many different languages. Thus, even though their resistance to be pluralised is considered to be one of the most important characteristics of mass nouns cross-linguistically, plural mass nouns can be found across different languages and language families. In some cases, the ability of mass nouns to pluralise is more restricted than in English, as is the case for Dutch and German, while in others, for example in Greek, plural mass nouns occur more frequently.

Plural mass nouns are often, especially in the literature of Greek, associated with an abundance or spread- or scatteredness reading. This somewhat similar to the readings we have associated with our plurals of extension.

It is thus likely that the (mass) plurals found in other languages can be analysed in a similar way as done here for English. Further research may describe other languages in more detail, and compare those languages to English more thoroughly. Another area for further research would be other semantic groups. Two groups come to mind in particular. Firstly, those nouns related to body parts and illnesses. Plurals like *guts, bowels, measles* or *haemorrhoids* may be analysed in a similar way. Secondly, plural forms related to more abstract properties, in particular to mental states. Examples of this group would be *feelings, sorrows, loyalties* and *powers.* It remains to be seen if those nouns pattern similarly to the plurals of extension discussed in this work, or if differences in behaviour and interpretation can be found.

Another question that remains open if the plural mass nouns found are lexical or grammatical plurals. We have followed Acquaviva (2008) in suggesting that the plural forms are lexical and thus differ from regular plurals which are the result of pluralisation. An alternative analysis which would argue that the plural forms are derived grammatically, would have more wide-reaching theoretical implications. In particular, it would have to deal with the fact that mass nouns are often distinguished from count nouns on their (dis-)ability to pluralise. A more grammatical account would thus have to account for the mass/count distinction, as well as explain why some mass nouns can be pluralised while most other mass nouns cannot.

APPENDIX A

For this study a small survey has been carried out. The participants have been recruited online through social media, using the author's personal network. There were 37 participants who completed the survey, all native speakers of English. Of the 37 participants, 16 were speakers of American English, 15 of British English and 3 of Canadian English, Of the remaining three participants, two identified as speakers of a mix between British English and another variety, while one was a speaker of Indian English.

For the first part of the survey, the speakers were asked to rate thirteen sentences on a five-point acceptability scale, where a score of 1 corresponds to 'completely unacceptable'

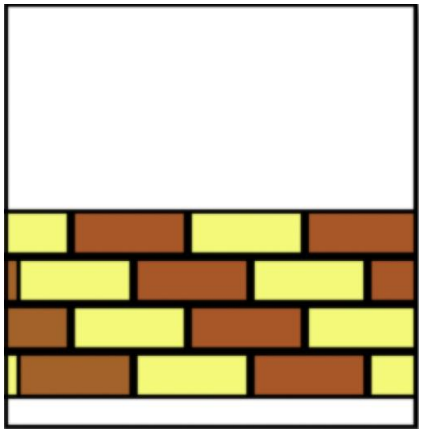
	1	**2**	**3**	**4**	**5**	**mean**
1. We have a house in the mountains.	1	0	0	2	34	4.84
2. The town of Zagora lies in the sands of the Sahara	1	6	2	16	12	3.86
3. The ruins of a lost city were found beneath the waters of the sea	0	3	3	10	21	4.32
4. We have a house in some mountains	12	16	5	3	1	2.05
5. We have a house in many mountains	24	12	1	0	0	1.38
6. We were in Austria for two weeks, but only climbed one Alp.	9	12	2	11	3	2.65
7. We were in Spain for two weeks, but only climbed one Pyrenee	12	13	2	8	2	2.32
8. The Northern part of the Pyrenees lies in France	2	4	2	11	18	4.05
9. Part of the waters of Lake Victoria lies in the Kagera region	7	14	2	8	6	2.78
10. Part of the waters of the Mediterranean Sea belong to Israel.	3	4	6	16	8	3.59
11. The southern part of the mountains lie in Nepal.	1	11	1	14	10	3.57
12. The nortern part of the mountains lies in Nigde province	3	8	5	12	9	3.43
13. The waters of the Atlantic Ocean are larger than the waters of the Baltic Sea	6	8	4	16	3	3.05

and 5 corresponds to ‘completely acceptable’. The table below summarises how many participants gave each score, as well as the mean rating of all responses.

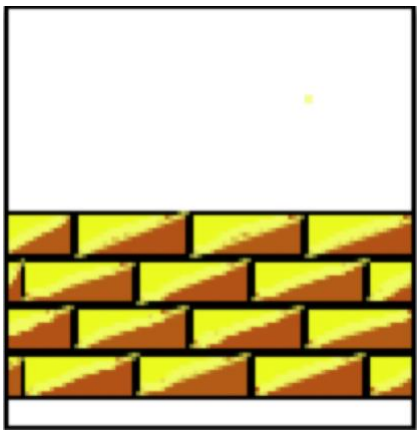
The first three sentences were used to check whether the participants accepted the plurals form at all. As can be seen, the simple sentences 1-3 were generally rated highly. Sentences 4-5 were used to confirm that plurals of extension cannot be quantified. As can be seen from the results, the sentences with *some* or *many* are clearly less acceptable than the corresponding sentence without a quantifier in 1. Sentences 6-7 were used to compare *Pyrenees* with *Alps*. The results show that latter is slightly more acceptable in the singular than the latter. Sentence 9-12 researched whether or not plurals of extension can occur in *part-of* constructions. In general, such constructions are (somewhat) acceptable, though judgements differ. Comparing sentence 9 with 10, we see that sentence 10 with plural agreement on the verb receives a higher mean rating. However, this difference in agreement preference is less clear when comparing sentence 11 to sentence 12.

The second part of the survey presented two sentences to the participants and asked them under which circumstance these sentences were true. The questions were presented as follows:

1. *Half of the cliffs had been painted yellow.*

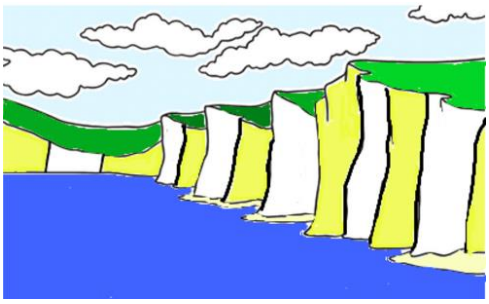


Picture a

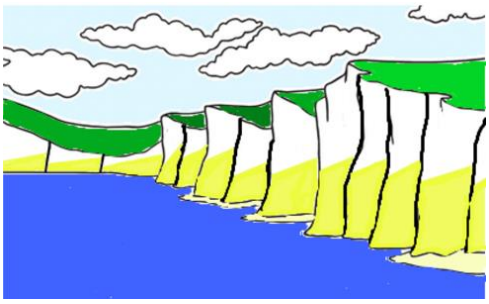


Picture b

2. *Half of the bricks had been painted yellow.*



Picture a



Picture b

The participants were asked whether the sentences were true for the situation in picture a, for the situation in picture b, for both, or for neither. The results were as follows:

	a	**b**	**both**	**neither**
Half of the bricks had been painted yellow	24	0	13	0
Half of the cliffs had been painted yellow.	14	2	21	0

For sentence 1 with *the bricks*, we see that every participant accepted the sentence to be true for the situation in picture a, while 13 participants also accepted the situation in picture b. For sentence 2, where *the cliffs* is used instead, the results are different. Most importantly, we see that a majority of the participants judges the sentence to be true in the situation depicted by picture b. This is the case for 23 speakers. Furthermore, while almost all speakers still judge the sentence to be true for picture a, there are two participants for whom sentence 2 is only true in the situation depicted in picture b.

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