2   Mass and count properties of nouns and verbs

The purpose of this chapter is to look at parallels and differences between the nominal and verbal systems which are relevant for the way they interact with quantifying expressions. In this respect the mass/count distinction is a central issue. The example in (1) illustrates the interaction between quantifying expressions and the mass/count distinction in the nominal system. Whereas *much* selects a mass noun (*bread*), *many* combines with a count plural (*sandwiches*):

(1)   a.   John eats too much bread/*sandwiches for breakfast
       b.   John eats too many sandwiches/*bread for breakfast

The mass/count distinction for nominals has often been compared to aspectual differences in the verbal domain. Atelic or unbounded verbs, such as *to run*, are compared to mass nouns, and telic or bounded predicates, such as *to run into the house*, are compared to count nouns. Yet, as will become clear in the course of this thesis, the similarities are only partially reflected by the way they combine with quantifiers.

   This chapter and chapter three are meant to be a primer for the rest of the thesis, where the quantifying expressions themselves will be in the centre of our attention. For the time being Qs will be mentioned only in as far as they illustrate aspects of the mass/count distinction. For ease of exposition, the examples will mostly be taken from English.

   Abstract nouns and verbs will mostly be disregarded in this chapter, but I will come back to them in chapters 5 and 6. It will turn out that psych verbs do not behave in the same way as the stage-level verbs on which I will concentrate in this chapter, while abstract nouns, when used in argument position, do not seem to have properties that are very different from those of other mass or count nouns.

   In the first section the mass/count distinction in the nominal system will be discussed and in the second section properties of mass and count nouns

will be compared to mass and count verb phrases. It will become clear that verbs do exhibit a mass/count distinction which is similar, in several respects, to the one found in the nominal system. Next to the parallels, there are some striking differences as well, the most remarkable one being that the mass/count distinction in the verbal system is to a large extent compositional (cf. Verkuyl 1972), and depends on the reference properties of certain argumental noun phrases. These arguments are said to MEASURE OUT the event. The discussion of measuring out will be postponed until chapter 3.

2.1   Mass nouns and count nouns

The basic semantic difference between mass and count nouns seems to be that count terms always provide us with a criterion for counting, while mass nouns do not, or as I will argue below, not necessarily. Nouns such as *water*, *gold* and *wine* are mass nouns and refer to substance, while *lake*, *ring* and *bottle* are count nouns and refer to objects. The distinction between the two types of nouns is justified by their syntactic distribution. Next to the nouns that refer to physical objects (count) and stuff (mass) there are also abstract nouns that share the mass or count syntax with the count or the mass nouns. Count nouns such as *idea*, *characteristic* and *opinion* do not refer to physical objects but do provide a criterion for counting and share the distribution of count nouns. *Happiness* and *appreciation*, on the other hand, do not, and function as mass nouns.

In the context of the mass/count distinction it is unavoidable to talk about mass-to-count and count-to-mass shifts. An example of a count-to-mass shift is the pair *a chicken/chicken*. Starting out with the count noun *a chicken* we can form the mass noun *chicken*, which refers to chicken meat. On the basis of the mass noun *beer* we can form the count noun *a beer* by mass-to-count shift, which refers to a type of beer, or alternatively a serving of beer. Shifting processes, which are often available, can make it hard to decide with which type of noun we are dealing with. Moreover, if we want to show that in a certain construction only mass nouns or only count nouns are possible, we have to exclude the shifted interpretation. From now on the impossibility of a mass or count form will be marked by #, which indicates that the form is impossible, unless a shift has taken place. Thus the use of # in #*a beer* indicates that the form *a beer* is only possible if the mass noun *beer* has shifted to a count interpretation.

The organization of this section is as follows. In 2.1.1 I will list the most striking distributional properties of count nouns and mass nouns. Count-to-mass and mass-to-count shifting processes will be discussed in 2.1.2. In 2.1.3 we move on to semantic structures of mass and count nouns that have

been proposed within the spirit of Link (1983). In this context the status of collective nouns, such as *furniture*, will be discussed. These challenge the idea that mass nouns never provide us with a criterion for counting (cf. Bunt 1985). In section 2.1.4 I will introduce the notion of *q*-position. The *q*-position, where *q* stands for quantity, is a position in the thematic grid of the noun, which can be saturated by a quantifying expression. In *more tea*, for instance, the *q*-position of the mass noun *tea* is saturated by *more*. The *q*-position can be either scalar or non-scalar, depending on the semantic structure corresponding to the noun.

2.1.1   Distributional criteria

There are several distributional differences between mass nouns and count nouns. The first and most striking difference is that count nouns have both a singular and a plural form, and mass nouns do not:[1]

(2)   a.   #golds, #waters, #wines
        b.   rings, lakes, bottles

The examples in (2a) are unacceptable unless we give a count sense to *water*, *gold* and *wine*, as indicated by the sign #.

    Quantifying expressions are often sensitive to mass, count and plurality properties of the nouns they combine with (see chapter 7 for a detailed overview). The indefinite determiner *a* selects a singular count noun, while cardinal numerals and a number of other quantifying expressions such as *several* select a plural count noun:

(3)   a.   a ring, two lakes, several bottles
        b.   *a rings, *two lake, *several bottle
        c.   #a gold, #two water(s), #several wine(s)

When an element such as *kilo*, *litre* or *bottle* is inserted in the examples in (3c), they are fine:

(4)   a kilo of gold, two litres of water, several bottles of wine

The role of these elements, which I call classifiers, will be discussed in 2.1.3 below and in chapter 7.

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[1]   The lack of plural for mass nouns can either mean that mass nouns are always singular, or that they do not bear Number morphology at all. In chapter 7 I will defend the idea mass nouns do not bear Number morphology.

There is also a small set of quantifying expressions that can only be combined with mass nouns. English examples are *much* and *a little*:[2]

(5)   a.   much water, a little wine
        b.   much #ring/*rings, a little #bottle/*bottles

Count plurals and mass nouns have a lot in common. The core of their resemblance is the cumulative reference property, which can be described as follows. If you have two parts which are P (where P stands for a nominal predicate) and when you put them together, the sum is also P, P has the cumulative reference property. Quine (1960) already shows that this is a property of mass terms. Take for instance the noun *tea*. If the liquid in my cup is tea and the liquid in the teapot is too, the sum of these liquids is tea as well. Link (1983) shows that bare plural count nouns share this property with mass nouns: if the animals in this camp are horses and the animals in that camp are horses, the animals in both camps are horses.

Some more evidence for the resemblance of mass nouns and plurals is based on the distribution of quantifying expressions. Mass nouns and plurals are both found in the context of for instance *a lot*, *enough* and *more*, which are incompatible with count singulars:

(6)   a.   a lot of water, enough gold, more wine
        b.   a lot of lake*(*s*), enough ring*(*s*), more bottle*(*s*)

Quantifying expressions such as the ones in (6), which I call degree quantifiers, form a rather large set cross-linguistically and will be extensively discussed in later chapters.

In many languages, bare plurals and mass nouns can have an existential reading, while bare singular count nouns cannot. This is illustrated in (7) for English:

(7)   a.   John read book#(**s**)
        b.   John ate ice cream

French is exceptional in that bare plurals and bare mass nouns cannot be used in argument positions. They have to be preceded by the indefinite determiner *du/ de la/ des* lit. 'of the'. The different forms correspond to the masculine and feminine singular and the plural, respectively:

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[2]   Chierchia (1995) notes that Qs which only combine with mass nouns are quite rare cross-linguistically. There is a tendency to use these Qs with plurals as well. Gathercole (1986) reports that children continue to use *much* with plurals to the age of 8. Marcel den Dikken pointed out to me that *few* is often replaced with *little* even in adult, highly educated English. Cf. also chapter 7.

(8) a. Jean a lu *(des) livres
Jean has read (of-the) books
'Jean read books'

b. Jean a mangé *(de la) glace
Jean has eaten (of the) ice cream
'Jean has eaten ice cream'

The impossibility of bare noun phrases in (8) has been related to the lack of plural morphology (cf. Delfitto & Schroten 1991). In French the distinction between singular and plural is often only a matter of writing, as the plural marker *–s* is generally not pronounced: *livre* 'book' is pronounced in the same way as *livres* 'books'. Only a small class of nouns has an audibly different form for singular and plural (e.g. *cheval* /ʃval/ 'horse' versus *chevaux* /ʃvo/ 'horses').[3]

However, except for the impossibility of using them as existential bare noun phrases, French plural nouns do behave like real plurals. In the first place, they directly combine with cardinals: *un livre* 'a book', *deux livres* 'two books'. In Chinese, as we will see below in 2.1.3.2, there is no Number marking at all and nouns behave like mass nouns in the sense that they can only be combined with cardinals if a classifier is inserted (cf. also (4)). In the second place, phrases such as *trois enfants* 'three children' trigger plural agreement on the verb. In 7.3 it will become clear that this cannot be attributed to the numeral *trois*, as there are some cases in Dutch where a subject containing a cardinal numeral (>1) does not trigger plural. I will assume that even though French nouns are not overtly marked for Number they contain a singular or plural feature, as this makes them compatible with certain Qs including cardinal numerals. With respect to their behaviour in the context of Qs, French count nouns are similar to the English and Dutch ones. These issues will play a role in chapter 7.

So far we have seen that there are important distributional differences between mass nouns, count singulars and count plurals, especially in the context of quantifiers. Furthermore, there is an overlap in the distribution of mass nouns and count plurals.

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[3] Plural morphology on a noun can surface in so-called liaison contexts. In case of liaison, an otherwise silent word final consonant is pronounced under influence of a following word starting in a vowel. The plural ending *–s* of a noun may surface as /z/ if followed by a modifier starting in a vowel, as in *les Etats-Unis* /lezeta**z**yni/ 'the United States'. Liaison between a plural noun and a subsequent modifier starting in a vowel is not required, and often absent in colloquial speech. This case of liaison is a property of the plural *–s*, as a final silent consonant of a singular noun cannot surface: the *-t* in *un savant agréable* /œsavã(*t)agreabl/ cannot be pronounced. Cf. Gougenheim (1938) and Morin & Kaye (1982) for discussion. For a general overview of liaison, cf. Tranel (1981).

2.1.2 Shifts

Nouns can easily shift from a count sense to a mass sense and vice versa. This section focuses on count-to-mass and mass-to-count shifts, and I will argue on the basis of the way these shifting processes function that there must be a lexical distinction between mass and count nouns. As we will see below count-to-mass shifts follow more or less a regular pattern, while mass-to-count shifts are quite unpredictable. In both cases there are examples of nouns that resist shifting, which shows that it cannot be the case that either all mass nouns are derived through count-to-mass shift or all count nouns through mass-to-count shift. I will not consider formal properties of shifts, but see Link (1983) and Landman (1990).

In count-to-mass shifts, a major role is played by the "Universal Grinder" (this term is due to David Lewis), which turns a count noun into a mass noun. In principle, any count term that has physical objects in its extension can be used as a mass term given an appropriate context (cf. Pelletier 1975, Gleason 1965 and Hoepelman and Rohrer 1981). An example illustrating this idea due to Gleason (1965) is the following. A mother termite complains about her son and says:

(9)   Johnny is very choosy about his food. He will eat book, but he won't touch shelf.

In this example a typical count nouns are used as if they are mass. The nouns *book* and *shelf* correspond here to 'substance a book/shelf is made of'. Nouns that do not denote physical objects do not undergo count-to-mass shift. Examples of nouns that cannot 'pass through the grinder' are abstract count nouns such as *characteristic*, *mile* and *aspect*. The process of shifting from a count meaning to a mass meaning is quite regular. In general, nouns that physical objects in their extension can undergo a shift in which case they denote the substance an object they would normally refer to is made of, though some cases are obviously more common than others.

Shifts from mass to count are far more complex. It is often possible to interpret a mass noun N_{mass} as a count term referring to *a type of* N_{mass}, *a serving of* N_{mass} or *a piece of* N_{mass} but these processes are not transparent. Note, for instance, that having the *type of* N_{mass} reading does not imply that mass-to-count shift has taken place. A Dutch example of a mass *type of* N_{mass} reading is given in (10):

(10)   Ze verkopen dit hout   al jaren
        they sell   this wood   since years
        'They have been selling this (type of) wood for years'

The word *hout* cannot be a count term in this *type of* N_{mass} reading, because it cannot be pluralized. In order to obtain the plural meaning, the complex form *houtsoorten* 'kinds of wood' is used, as is shown in (11):

(11)   Ze verkopen verschillende duurzame
        they sell   different   durable
        *houten/houtsoorten
        woods/kinds of woods
        'They sell different kinds of durable wood'

It is not the case that the mass noun *hout* cannot be used as a count noun at all. In *slaghout/slaghouten* 'bat/bats', lit. 'beat-wood(s)' the noun is count, as the existence of both singular and plural shows. Other words that resist mass-to-count shift via the *type of* N_{mass} reading are *glas* 'glass', *zand* 'sand', *afval* 'waste' etc., though there might be some variation among speakers.

In other cases the *type of* N_{mass} reading does involve a mass-to-count shift as plural can be formed. An example is *wijn* 'wine':

(12)   Marie heeft verschillende wijnen geproefd
        Marie   has   different   wines   tasted
        'Marie tasted different wines'

The examples in (11) and (12) demonstrate that the availability of the count *type of* N_{mass} reading is not free, at least not in Dutch. Other possibilities for interpreting N_{mass} as a count noun are *serving of* N_{mass} or *piece of* N_{mass}. Again, these processes are not predictable as is the count-to-mass shift discussed above. This is illustrated by the Dutch examples in (13). (13) illustrates three ways in which a mass noun can be used as a count noun. The count noun can be the same form that is used as mass noun (*wijn* 'wijn'), it can be a compound in which the noun is preceded by a specification of what the object is used for (*slaghout* 'bat') and it can be a diminutive form (*slaapje* 'nap'). Diminutives are always count. It is not the case, however, that the compounds and the diminutives in (13) must be derived from the simple count noun, after mass-to-count shift has taken place. The diminutive and the compound can exist when there is no corresponding simple count noun as in (13a), (13d) and (13f). Moreover, there can be a difference in meaning between the diminutive or compound and the simple count noun, which also shows that they are directly derived from the mass noun. For instance, there are two mass nouns *stof*, one of which is neuter and means 'dust', the other of which is feminine and means 'fabric'. The diminutive *stofje* (which is always neuter, due to the presence of the diminutive suffix) can be used to refer to either a dust-particle or to a type of tissue. Only in the latter interpretation the deminutive is derived from the count noun *stof*, as the

count noun *stof* is always feminine and cannot mean 'dust particle'. In the leftmost column of (13) the original mass noun is given, in the middle column the corresponding count noun, with its plural ending between brackets, and in the rightmost column the diminutive form. Compounds are only added in case they are not derived from the simple count form. The schema does not include jargon.

(13)		mass	count (plural)	compound	diminutive
	a.	hout	-	e.g. slaghout(en)	houtje
		wood		*'hitwood(s)',*	*piece of*
				bat(s)	*wood or stick*
	b.	bier	bier(en)		biertje
		beer	*type(s) of beer*		*serving of beer*
	c.	elastiek	?elastiek(en)		elastiekje
		elastic band	*piece(s) of elastic band*		*piece of elastic band*
			NOT *type of elastic band*		
	d.	boter	-		botertje
		butter			*serving of butter*
	e.	stof N/F	stof(fen) F		stofje
		dust (N)	*type(s) of stuff,*		*dust-particle;*
		stuff, fabric (F)	*fabric*		*type of fabric*
	f.	slaap	-		slaapje
		sleep (mass)			*nap*
	g.	plastic	plastic(s)		plasticje
		plastic	*type(s) of plastic*		*any small piece*
					of plastic
	h.	ijzer	ijzer(s)	e.g. strijkijzer(s)	ijzertje
		iron	*type(s) of iron*	*flatiron(s)*	*small piece of iron*
	i.	wijn	wijn(en)		wijntje
		wine	*type(s) of wine*		*serving/type of wine*
	j.	glas	glas (glazen)		glaasje
		glass	*piece of glass,*		*small piece of glass,*
			a glass, NOT *type of glass*		*a glass*
	k.	goud	-		-
		gold			

The examples in (13) show that the possible interpretations of derived count forms vary quite seriously. Certain types of meaning show up frequently: *a piece/a serving of* N_{mass} and *a type of* N_{mass}. In general, the diminutive refers to a small *piece/serving of* N_{mass}, while the bare noun form refers to the *type of* N_{mass} reading. However, we cannot predict which forms are possible and which meanings are allowed. As I showed above, the count *type of* N_{mass} reading is not always available. In the *piece* or *object of* N_{mass} reading, we do not know what kind of object the count version of the mass noun refers to. *Een glas* or *een glaasje* 'a (piece of) glass' can be used for a drinking glass, the chimney of an oil-lamp or a spectacle-glass, but not for a glass vase or a fragment of broken glass. Alongside the unpredictable meanings, there are several unpredictable gaps in the paradigm. The mass nouns *slaap* and *boter*

must be diminutive in order to be count. The form *botertje* 'serving of butter' is not accepted by all Dutch speakers. The mass noun *goud* 'gold' lacks a count use for all speakers, apparently even for chemists, who often can use stuff names for molecules or atoms, as in *two coordinated waters*.[4]

The examples in (13) show that a lot of information about possible and impossible count meanings is stored in the lexicon. It is not possible, given a mass noun, to predict whether there is a count meaning in the first place and, if there is one, what it would be. In this respect the mass-to-count shifts show far more variety than the more regular count-to-mass shifts. We have seen that there are mass nouns and count nouns that cannot have a shifted interpretation. Abstract count nouns such as *characteristic* and *mile* are examples of count nouns that resist the Universal Grinder. The mass noun *goud* 'gold' in Dutch seems to be always mass. This observation is important, because it shows that mass nouns and count nouns both exist, independently of each other.

The claim that all nouns in English might actually be mass nouns has been put forward by Sharvy (1978). Sharvy argues that the mass-to-count shift might not be lexical, but realized through the insertion of an empty classifier in syntax. The use of the mass noun *beer* as a count noun in *two beers* is possible because of the presence of an empty classifier at the syntactic level, which is responsible for the shift. In this respect English might be similar to numeral classifier languages, such as Chinese, in which all nouns have mass-noun syntax and need the presence of a classifier in the context of a cardinal numeral (see 2.1.3.2 below). Nouns are mass and count interpretation involves the syntactic operation of classifier insertion.

There is, however, evidence against this claim, which shows that shifts function as lexical and not as syntactic operations. The argument against Sharvy's claim is based on the form of the noun. Mass nouns are not marked for plural when used with a classifier, as in *two glasses of beer(#s)*. Mass nouns that have undergone the mass-to-count shift typically bear plural morphology when used in a plural context (*different wine*s, *three glass*es etc.). One might be tempted to say — as Sharvy does — that the plural morphology of a silent classifier gets transposed onto the head noun. This hypothesis is highly unlikely for the following reason. The plural morpheme can be left out in certain specific contexts. In a restaurant setting we can use phrases such as *two rice* and *three beer*, without plural morphology on the verb. Phrases of this type are possible in certain numeral classifier languages as well. In Vietnamese, for instance, the otherwise obligatory classifier can be left out in cases such as *two chicken, three beef* and *two coffee* etc. in a

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restaurant setting.[5] The use of this type of construction in classifier languages, plus the fact that the form of the mass noun in these cases is the same as in the context of an overt classifier, suggests that there is in fact an empty classifier present in these constructions. This in turn shows that the presence of plural in *three wines* is quite suspect within Sharvy's approach, as plural is not found in the context of an empty classifier in the restaurant cases. As a consequence, the mass-to-count shift has to be situated in the lexicon.

We can conclude that there must be, in the lexicon, mass nouns and count nouns. We cannot assume that all nouns are inherently count, and that mass nouns are derived by count-to-mass shift through the Universal Grinder, given the existence of mass nouns that can never be used as count nouns. Examples are *hout* 'wood' and *goud* 'gold'. Moreover, there are mass/count noun pairs where the count noun only has a *type of* N_{mass} reading (e.g. *wijn* 'wine' and *bier* 'beer' in Dutch).[6] These count nouns do not refer to physical objects and hence grinding is impossible, which means that in these cases, the count noun cannot be the source of the mass noun, so that the mass meaning cannot be derived through count-to-mass shift. We cannot assume either that all nouns are inherently mass, given the existence of nouns such as *characteristic*, *mile* and *aspect*, which do not correspond to a mass noun. Furthermore, I argued that the mass-to-count shift itself is a lexical process, and not the result of syntactic insertion of a silent classifier, contra Sharvy (1978).

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[5]   The information on which this argument is based was provided by David Gil's query on classifiers on the Linguist List (summary: 13th April 1994).

[6]   Note that the *serving of* N_{mass} reading is only available for the diminutive forms *biertje* 'beer+DIM' and *wijntje* 'wine+DIM', not for the plural count noun *bieren/wijnen* 'beers'/'wines':

(i)   a.   twee   bieren/wijnen
               two   beers/wines
               'two types of beer/wine' (not: 'two servings of beer/wine')
         b.   twee   biertjes/wijntjes
               two   beer+DIM.PL/wine+DIM.PL
   'two types/servings of beer/wine'

The forms *twee bier* 'two beer' and *twee wijn* 'two wine' also have the *serving of* N_{mass} reading, but these are cases of empty classifier insertion, not of lexical mass-to-count shift (cf. the examples *two coffee* and *two beef* discussed in the main text).

2.1.3 The structures of mass nouns, count nouns and plurals

In the recent semantic literature on the mass/count distinction it has been claimed that mass nouns, count nouns and plurals correspond to algebraic structures (cf. for instance Link 1983, Krifka 1986, Lønning 1987, Landman 1989, Gillon 1992, Chierchia 1995 and Schwarzschild 1996). In 2.1.3.1 I will introduce the notion of complete join semi-lattice, which will allow us to define reference properties such as cumulative and quantized reference. Then, in 2.1.3.2 the distinctions between mass nouns, count nouns and plurals will be discussed. The status of mass nouns is a matter of debate. According to Bunt (1985) and Landman (1989, 1991), mass nouns correspond to structures which do not contain minimal parts. There is no defined smallest part in the denotation of a noun such as water, and, from a linguistic point of view, they argue, the same holds for nouns such as *furniture*. Chierchia (1995), on the other hand, assumes that there is no structural difference between the domain of denotation of a count plural, such as *chairs* and the mass noun *furniture*. He argues that the structures corresponding to mass nouns contain minimal parts, and mass nouns are in this respect identical to plurals. I will give some arguments for an intermediate point of view. The Bunt/Landman way of looking at mass nouns seems correct for nouns such as *water*, but Chierchia's approach is more appropriate for collective nouns such as *furniture*. The discussion will be based in part on data from Mandarin Chinese. This language, which is often said to comprise mass nouns only, will be argued to have a lexical distinction between 'count mass nouns' or collectives and 'mass mass nouns'.

2.1.3.1 Join semi-lattices

An example of a join semi-lattice is given in (14):[7]
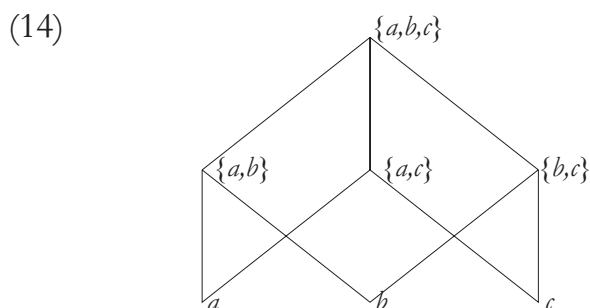
(14)

The diagram in (14) represents a set, which is ordered by the *part of*-relation. The members of the set are *a*, *b*, *c*, {*a,b*}, {*a,c*}, {*b,c*} and {*a,b,c*}. If we interpret the upward lines in the diagram in (14) as 'is part of' we can see that the diagram encodes the following information: *a* is part of {*a,b*} and {*a,c*}; *b* is part of {*a,b*} and {*b,c*}; *c* is part of {*a,c*} and {*b,c*} and {*a,b*}, {*a,c*} and {*b,c*} are each part of {*a,b,c*}. The part of relation is a TRANSITIVE relation, which means that *a*, *b* and *c* are part of {*a,b,c*} as well. As we know that *a* is part of {*a,b*} and {*a,b*} is a part of {*a,b,c*} we can derive that *a* is part of {*a,b,c*} by transitivity of the *part of*-relation. The same obtains, *mutatis mutandis*, for *b* and *c*. The *part of*-relation is defined as a REFLEXIVE relation. For every member of the set *A* the *part of*-relation holds between that element and itself. The third property of the *part of*-relation is ASYMMETRY. Asymmetry holds if for any *x* and *y* that are members of a set *A*, and if *x* is part of *y* and *y* is a part of *x*, *x* and *y* must be identical. As the diagram shows there are no two different elements in *A* that are ordered in such a way that the first is part of the second and the second part of the first, which means that asymmetry holds. A relation which has the three properties reflexivity, transitivity and asymmetry is called a partial ordering.[8] The elements *a*, *b* and *c* are the minimal elements of the set, also known as the ATOMS.

  Given a partially ordered set, or poset, we can define the operations JOIN and MEET. Given a poset $<A, \leq>$ the join of two elements $a \in A$ and $b \in A$, $a \vee b$ is defined as the minimal element for which $a \leq a \vee b$ and $b \leq a \vee b$ both hold. Hence for every $c \in A$ such that $c \leq a$ and $c \leq b$, we know that $c \leq a \vee b$. Applying this to the example in (14) we find that the join of *a* and *b* is {*a,b*}, the join of {*a,b*} and *c* is {*a,b,c*}, the join of {*a,b*} and {*a,b,c*} is {*a,b,c*} etc. The operation meet is the reverse of join. Thus the meet of *a* and *b*, $a \wedge b$, is the maximal element for which both $a \wedge b \leq a$ and $a \wedge b \leq b$ hold. For every $c \in A$ such that $a \leq c$ and $b \leq c$, $a \wedge b \leq c$ as well. In the structure in (14) the meet of *a* and *b* is undefined, the meet of {*a,b*} and *a* is *a* etc.

  A structure is closed under a certain operation if the result of applying the operation to any pair of elements in the structure is an element in the structure as well. The structure in (14) is closed under join. If you take two arbitrary elements in *A* you will find the join of these elements in *A* as well. A lattice is a poset $<A, \leq>$ which is closed under meet and join. The structure in (14) is not closed under meet, given that the operation meet is not defined for the pairs *a* and *b*, *b* and *c* and *a* and *c*. This is so because the structure does not contain a zero element which would be the meet of these pairs. A structure which fails to be a lattice because it is not closed under

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[8]   The ordering is partial, as not all elements are ordered with respect to each other. *a*, *b* and *c*, for instance, are not ordered with respect to each other by the *part of*-relation.

meet but which is closed under the join operation is called a join semi-lattice.

At this point we can turn back to nouns. The type of structure in (14) has been proven to be useful to represent the extension of nouns. In this respect I will mostly follow Chierchia (1995), who builds on work by Link (1983) and Landman (1989,1991).[9] Singular count nouns, Chierchia states, have as their extension a set of singularities. The extension of a singular count noun such as *table* corresponds to the set of singular tables in the domain of denotation. The plural count noun *tables* corresponds to the set of pluralities that can be formed on the basis of the singular tables. Chierchia illustrates this by (15) (his (21)):

$$
(15) \qquad \text{PL}(table_w) \begin{bmatrix} \{a,b,c\} \\ \\ \{a,b\} \quad \{a,c\} \quad \{b,c\} \end{bmatrix}
$$

$$
\text{PL} \qquad\qquad
$$

$$
table_w \qquad \begin{bmatrix} a & b & c \end{bmatrix}
$$

Assume *a*, *b*, and *c* are the only tables in the domain in a given world *w*. The plural morpheme triggers the operation PL, which yields a set of pluralities, formed on the basis of the extension of the singular form. The set of pluralities of singular tables forms the extension of the plural form *tables*. Putting the two together, we get a join semi-lattice, the atoms of which correspond to the elements of the set of singularities.

The more controversial part of Chierchia's proposal concerns mass nouns. According to Landman (1989, 1991) the extension of mass nouns corresponds to a join semi-lattice which does not have minimal parts. There is no set of atoms representing the smallest entities which fall into the extension of the noun. This corresponds to the homogeneity hypothesis defended by Bunt (1985). A predicate has homogeneous reference if it is both cumulative and divisive. Cumulative reference has been mentioned above (a formal definition will be given below). Mass nouns such as *tea* have cumulative reference because if the liquid in my cup is tea and the liquid in the teapot is tea, and I put the two together, the result is still tea as well. In case divisivity holds, given a part which falls into the extension of a predicate *P*, any subpart of this part will fall into the extension of *P* as well.

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[9] The original Linkian structure was a lattice (or more precisely a complete Boolean Algebra, which is a specific type of lattice), and included a zero element. Landman has proposed that this element should be removed, mainly for reasons of elegancy. This issue is not relevant here. See Landman (1991:302) for discussion.

If there is tea in my cup, and I drink half of it, the liquid in the cup is still tea.

Bunt's claim that mass nouns have homogeneous reference is clearly not intended to be a claim about the ontological properties of objects referred to by mass nouns. This distinction between the linguistic and the ontological properties of mass objects is justified, Bunt argues, because nothing in the linguistic use of mass nouns indicates a commitment on the part of the speaker to the existence of minimal parts (Bunt 1985:45). From an ontological point of view we do not want to say that mass objects do not have minimal parts, but as we do not find any reflection of this partitioning in language, this should be accounted for in the linguistic representation of mass nouns. Bunt formulates the HOMOGENEOUS REFERENCE HYPOTHESIS as follows:

> Mass-nouns refer to entities as having a part-whole structure without singling out any particular parts and without making any commitments concerning the existence of minimal parts.
>
> Bunt (1985:46)

Bunt's homogeneous reference hypothesis pertains not only to substance denoting mass nouns such as *tea* and *water*, but also to collective nouns such as *furniture*.

Chierchia, to the contrary, argues that all nouns have minimal parts in their extension, including typical mass nouns such as *water*. The structure corresponding to a mass noun is hence an atomic join semi-lattice, as the one in (14). He illustrates his point of view mostly by examples of the *furniture* type. His 'inherent plurality hypothesis' generalizes over mass nouns such as *water* and collective mass nouns such as *furniture* as well.

> A mass noun simply denotes a set of ordinary individuals, *plus* all the pluralities of such individuals. For example "change" denotes, roughly, single coins and the possible sets of pluralities of coins. This view is an "atomistic" one: we are committed to claim that for each mass noun there are minimal objects of that kind, just like for count nouns, even if the size of these minimal parts may be vague.
>
> Chierchia (1995:2)

In what follows I will argue that the class of mass nouns should not be viewed as a single homogeneous class. There are two types. On the one hand, the 'mass mass nouns', which seem to have homogeneous reference, in accordance with the Bunt/Landman approach, and on the other the 'count mass nouns', or collectives, which have minimal parts. Mass mass nouns are mass from a syntactic point of view (no Number morphology, incompatibility with cardinals etc.) and from a semantic point of view (no minimal parts), while the count mass nouns are mass from a syntactic point of view only, and not from a semantic point of view.

Count mass nouns have a structure similar to the one adopted for plurals. Contrary to plurals they are not formed on the basis of a singular form representing a set of singularities. I will start out the argument by a discussion of some Mandarin Chinese facts. In Mandarin Chinese all nouns have the distributional characteristics of mass nouns. In this language there are clear signs that there is a class of 'mass' nouns for which we must assume that they lexically provide us with a criterion for counting. The next step will be to show that there are reasons to assume a similar distinction in languages such as English, and that this exactly corresponds to the distinction between real mass nouns such as *water* and collectives such as *furniture*.

The point of view which I will defend is not necessarily in conflict with Chierchia's approach. The minimal parts introduced by mass nouns may be vague, he states, whereas the minimal parts in count nouns are singled out in the lexicon. Given this formulation, Chierchia's analysis can accommodate the existence of two semantically distinct classes of mass nouns, one with 'vague minimal parts', and the other with lexically determined ones. I am not sure whether structures with vague minimal parts and structures without minimal parts make different empirical predictions, and will not take a principled position in this semantic debate.

2.1.3.2 Traces of the mass/count distinction in Chinese

Mandarin Chinese is a so-called numeral classifier language. In numeral classifier languages all nouns behave syntactically as mass nouns. We can draw this conclusion, in the first place, because there is no real plural morphology in Chinese (cf. Iljic 1994). A bare singular form can be used both for a singular and for a plural:

(16)   shu
         book(s)

In the second place, when a Chinese noun is combined with a cardinal numeral, a classifier has to be inserted. In non-classifier languages count nouns can directly combine with cardinals, as in *three books*. In (17) the classifier *ben* $\text{CL}_{\text{volume}}$ is inserted between the cardinal *san* 'three' and the noun *shu* 'book':

(17)   san-*(**ben**)   shu
         three-(CL$_{volume}$)   book

In the history of Chinese, the disappearance of Number morphology

correlates with the emergence of the generalized classifier system (cf. Peyraube 1995). Most numeral classifier languages lack the opposition between singular and plural, as has been observed by Sanches (1971), cited in Greenberg (1972).

Chinese nouns resemble mass nouns in non-classifier languages, as mass nouns are not marked for plural and need the presence of a classifier (*kilo*, *box*, *bottle*) when they are combined with cardinal numerals. The similarities between Chinese nouns and mass nouns have, not surprisingly, led to the view that all nouns in Chinese are mass nouns and that individuation is in fact introduced by classifiers (cf. Sharvy 1978). More recently Muromatsu (1995) has worked out this idea for Japanese. According to Muromatsu there is no lexical difference between mass and count nouns in the lexicon. Nouns have a mass or count interpretation depending on the syntactic structure in which they occur. In the context of non-individual classifiers such as *kilo* and *box*, which function as a measure, nouns are mass. Individual classifiers, such as *ben* 'CL_{volume}' in (17), individuate the noun as they add form to the otherwise unstructured mass. Universally, individual classifiers are usually associated with shapes, as noted in Greenberg (1972). In Muromatsu's view the classifier introduces shape in an otherwise formless mass. In the following discussion it will become clear that also in numeral classifier languages such as Chinese, there is a distinction between nouns which provide us with minimal parts and nouns which do not. As we will see, there are individual classifiers which do not individualize, but depend on the presence of a structure with minimal parts.[10]

Let us first reflect a little more on how minimal parts and number agreement interact in the context of 'real' count nouns in languages such as English and Dutch. The plural ending in *the books* indicates that there is more than one book. It does not give information about what unit could be considered to be a singular book, and therefore we know that this information must somehow be present in the denotation of the count noun *book*. In other words, we know the plurality of what we are talking about when we use a plural. Similarly, when we use *one N* or *another N*, we know what unit is intended. For instance, *one cup* cannot be used to refer to the ear of the cup. As *one* only indicates that we are dealing with one unit, the information about what counts as a unit must be present in the singular

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[10]   Cf. Cheng & Sybesma (1996), who, on a par with Muromatsu (1995), make a distinction between individual classifiers and measure phrases or non-individual classifiers, which they call 'massifiers'. Contrary to Muromatsu they assume that the individualization is present in the denotation of certain nouns. Individual classifiers only combine with 'count nouns', which correspond to my count mass nouns, and enter in a different syntactic structure than the massifiers. I will reach the conclusion that the mass/count distinction plays a role in Chinese on independent grounds, and will not take into account eventual syntactic differences between massifiers and classifiers.

noun. In order to show that Chinese has count nouns, i.e. nouns with minimal parts in their denotation, we have to look at elements that force us to count units, but that do not tell us what the units are.

The Chinese classifier *ge*, which in fact corresponds to something close to *unit*, is similar to the category Number in this respect. Many individual classifiers contain information about how the partitioning is made. For instance, the classifier *ben* 'CL$_{volume}$' signals that we are talking about book-volumes. Other classifiers give information about shape (*zhi* 'CL$_{branch}$' indicates that the object is long and thin and it selects *bi* 'pen' and *jian* 'arrow'; *mian* 'CL$_{surface}$' selects nouns such as *qi* 'flag' and *jingzi* 'mirror'). The classifier *ge*, however, does not convey such information. Therefore we expect that in the context of this classifiers the choice of what counts as a unit can only be made on the basis of the denotation of the noun, or, alternatively, as with mass nouns shifted to a count interpretation (*a beer)*, on the basis of convention or context.

This is in fact what seems to happen. The classifier *ge* tends to replace more specific classifiers. Next to (18a), where the classifier *ben* 'CL$_{volume}$' is used, (18b) with *ge* 'CL$_{unit}$' is possible:

(18)   a.   san-**ben**   shu
            three-CL$_{volume}$ book
       b.   san-**ge**   shu
            three-CL$_{unit}$ book
            'three books'

However, *ge* 'CL$_{unit}$' cannot replace just any classifier. As Rygaloff (1973:73) notes, the classifier *ge*, though it is the most general and most frequent classifier, cannot be used with mass terms, unless these terms can also be conceived of as count terms (e.g. *a fish* versus *fish*). This is a clear indication that semantically the mass/count distinction, including shifting processes, exists in Chinese as well.[11] The classifier *ge* does not give any information about the unit we are looking for. In this respect there is no difference between *ge* and number morphology. Neither *ge* nor number morphology conveys any information about what counts as a unit. Hence the noun must contain this information.[12]

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[11]   It is possible to use *ge* in the context of the mass noun *pi-jiu* 'beer' when mass-to-count shift has applied. *yi-ge pi-jiu* can be used for 'a serving of beer' (Rint Sybesma, p.c.). This is of course similar to the English pair *beer/a beer*, which results from mass to count shift.

[12]   The existence of a neutral individual classifier which is not associated to a specific form is not restricted to Chinese. For instance, in Kana, a numeral classifier language spoken in Nigeria, the most general classifier is *kà*, which is originally the word for 'mother' and which is used with a great variety of nouns, including the ones corresponding to 'father', 'school',

Note that the argument I am making here goes only in one direction. If a noun can be combined with *ge* it must have a count structure, but I do not make an explicit claim about nouns that cannot be combined with *ge*. Take, for instance, the word *shu* 'book', which used to be incompatible with *ge*. There are two ways one can look at the change: on the one hand it could be the case that first *shu* was a mass noun, and because it became a count noun the classifier *ge* became possible. It might be the case as well that *ge* could be extended to be used with *shu* because *shu* had a count structure already. I will show below that the latter option has to be preferred given that certain nouns which cannot be combined with *ge* have count properties on the basis of other tests.

One of these other tests, and a second argument in favour of the existence of 'count' nouns in Chinese, is compatibility with classifiers such as *da* 'dozen', and *qun* 'crowd; flock'. These classifiers belong to a group of elements which involve some sort of counting, or pluralization. Chao (1968) calls these elements 'group measures', and defines them as elements which are 'semantically [...] used for a group or collection of individuals'. In the examples in (19), we see that *da* 'dozen' and *qun* 'flock' directly combine with the noun, which shows that they function as classifiers, not as cardinal numerals. The classifier *pi*, which must be inserted in order to combine the noun *ma* 'horse' with a cardinal numeral, has to be omitted:

(19)   a.   yi-da   (*pi)   bai-ma[13]
            one-CL$_{dozen}$ *(*CL$_{horse}$)   *white-horse*
            'a dozen of white horses'
       b.   yi-qun   (*pi)   ma
            one-CL$_{flock}$ *(*CL$_{horse}$)   *horse*
            'a flock of horses'

The classifiers *da* CL$_{dozen}$ and *qun* CL$_{flock}$ are similar to plural morphology in the sense that they indicate that there is a plurality of individuals, while they do not indicate themselves what counts as an individual. This information must be provided by the noun, suggesting that the noun *ma* provides us with a criterion for counting. Interestingly, for most speakers the classifier *pi* cannot be replaced by *ge*. Yet, the noun *ma* acts like a 'count' noun in the example in (19). This shows that compatibility with *ge* is a diagnostic for the

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'axe' and 'alligator' (cf. Ikoro 1994 for details about the Kana classifier system). A similar process has been observed in Vietnamese by Thomson (1965), cited in Greenberg (1972).

[13]   Without the adjective *bai* 'white', the sentence is not acceptable, whether the classifier is present or not. This might have to do with a tendency to avoid monosyllabic words, though this cannot be a full explanation of the problem as the presence of *bai* is not necessary in (19b) (Lisa Cheng, p.c.).

presence of count structure, while incompatibility with *ge* does not necessarily indicate that a noun is a real mass noun.

A further sign of the existence of a mass/count distinction in Chinese might be the distribution of the suffixes *–zi* and *–tou*. According to Rygaloff (1973:62) the suffix *–zi* is a marker of non-compositionality for count nouns. By this he means that the affix is found on the stem of a count noun which is not part of a compound. So there is *fángzi* 'house' next to *píngfáng* 'bungalow' (lit. 'flat-house') and *yuánzi* 'garden' next to *gōngyuán* 'public garden'. In *fángzi* 'house' and *yuánzi* 'garden' the suffix is necessary, but with other nouns, such as *dāo(zi)* 'knife', it is optional. There are at least two counterexamples to the claim that we are dealing with a suffix that selects a count noun here, and these are *shāzi* 'sand' and *mòzi* 'foam' (Rint Sybesma, p.c.). However, one could argue that these are count nouns in Chinese, and correspond to 'grain of sand' and 'bubble', respectively. The suffix might perhaps be analysed as a diminutive marker (Rint Sybesma, p.c.). If this analysis is correct the count properties of *–zi* could be related to the count properties of the Dutch diminutive suffix *–tje* (cf. (13) above). Next to *–zi* there is another marker of non-compositionality, *–tou*, which is only used with mass nouns. We find *-tou* in *mùtou* 'wood' but not in the composed *sōngmù* 'fir-wood' (Rygaloff 1973:62).

All nouns in Chinese have the syntactic distribution of mass nouns, as they cannot directly combine with cardinal numerals (cf. section 2.1.1 above). On the basis of the evidence presented in this section a semantic distinction between two types of syntactic mass nouns can be made. 'Mass mass nouns' do not provide us with a criterion for counting and 'count mass nouns' do. In Chinese these two types of nouns reflect an instance of the mass/count distinction. The necessity of a classifier in the context of numerals does not indicate that there are no minimal parts present in the denotation of a noun, as there are classifiers such as *ge* 'CL$_{unit}$'. As this classifier does not contain any information about what counts as a 'unit', its use depends on the presence of minimal parts in the denotation of the noun it combines with. The classifier *ge* 'CL$_{unit}$' is very similar to Number morphology. Both depend on the presence of minimal parts in the domain of denotation of the noun. They indicate the presence of countable units but do not give information about what the units are. In chapter 7 I will argue that the classifier *ge* 'CL$_{unit}$' and Number are both grammatical markers of the presence of minimal parts. Cardinal numerals need the presence of a syntactic marker of countability, which can be either a classifier or Number morphology. The reason they cannot combine with a count mass noun is not that the noun does not provide a criterion for counting, but that the presence of minimal parts needs to be signalled by a syntactic marker. As the count mass nouns do not bear Number morphology, the only way to mark the presence of minimal parts is through insertion of a

classifier. The main difference between count mass nouns and real count nouns can hence be seen as the impossibility versus the possibility to accommodate Number morphology.

Real mass nouns, or mass mass nouns cannot be combined with the classifier *ge* 'CL$_{unit}$' unless mass-to-count shift has taken place. These mass mass nouns seem to correspond to the Bunt/Landman type of structure without minimal parts, while count mass nouns do have minimal parts, and could be assigned the structure Chierchia proposes for mass nouns.

2.1.3.3 *Furniture*-nouns

The existence of count mass nouns is not restricted to classifier languages. There is evidence that certain mass nouns in non-classifier languages do provide us with linguistically significant minimal parts in the domain of their denotation, even if Number morphology does not have access to them. The argument is similar to the one used for the Chinese cases. If a classifier does not provide any information about what to choose as a unit, and given a noun combined with that classifier we know exactly what unit to choose, the semantic structure corresponding to the noun must contain minimal parts.

Classifiers such as *piece* are so general that we can safely presume that they give us no clue as to what unit they pick. These classifiers allow us to make an interesting distinction between two classes of mass nouns. In the context of certain mass nouns, the partitioning is arbitrary, whereas it is perfectly clear how the partitioning has to be made in the context of other mass nouns. Consider the examples in (20), in which the general classifier *piece* and the analogous Dutch *stuk* are combined with the mass noun *cheese/kaas*:

(20)   a.   a piece of cheese
      b.   een   stuk   kaas
          a   *piece* *cheese*

There are no real conditions on how the partitioning should be made. Therefore, the following statement is true:

(21)   a piece of a piece of cheese is a piece of cheese

Many mass nouns pattern like *cheese*: *wood*, *glass*, *plastic*, etc. The inference in (19) cannot be made, however, for all mass nouns that can be combined with the classifier *piece*. Consider the examples in (22):

(22) a. a piece of furniture/silverware   *[English]*
      b. een stuk vee/   meubilair/ bagage/   gereedschap *[Dutch]*
          a piece   cattle/ furniture/ luggage/   tool

In the context of the nouns in (22) we know exactly and unambiguously what is meant by *a piece of N*, and instead of the inference in (21) we can make the inference in (23):

(23)   a piece of a piece of furniture is **not** a piece of furniture

The leg of a chair is not a piece of furniture, though it is a piece of a piece of furniture. Very general classifiers are in this respect similar to Number morphology. The word *piece* tells us that we have to subdivide in units. It does not say anything about what these units are. Similarly, plural number signals the presence of minimal parts, and does not give information about what these parts are.

The relation between countability and *piece* in the context of *furniture*-nouns is strengthened by the following observation. In Dutch, the classifier *stuk* 'piece' can be used to replace a null count noun in answering a question. In that case we find the form *stuks* 'piece+GEN' as is shown in (24):[14]

(24)   Hoeveel boeken   neem je   mee? twee *stuks/*stukken*
            how-many books   take you   with? two piece+GEN/pieces
            'How many books do you take? Two'

When we replace the count plural *boeken* 'books' by the mass noun *kaas* 'cheese', the classifier must have the plural form *stukken*:

(25)   Hoeveel kaas   heb je   gegeten? twee *stukken/*stuks*
            how-much cheese   have you   eaten?   two pieces/piece+GEN
            'How much cheese did you eat? Two pieces'

There is a strong tendency to use the count form *stuks* when *furniture*-nouns are combined with cardinals:

(26)   drie stuks/#stukken   vee; vijf stuks/#?stukken   bagage
            three piece+GEN/pieces   cattle five piece+GEN/pieces luggage

In this respect the *furniture*-nouns pattern with the plurals, not with the mass

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[14] In Dutch, classifiers do not always take plural in the context of a cardinal (>1). There are several distinctions related to the presence or absence of plural on the classifier, to which I will come back in chapter 7.

nouns, which can be understood if we adopt the idea that mass nouns of the *furniture*-type correspond to structures containing minimal parts.

Furniture-nouns are extensively discussed by Chierchia in his defence of the idea that mass nouns have minimal parts. I fully agree with him as far as *furniture*-nouns are concerned, given the evidence presented in this section. However, there is a difference between these nouns and nouns such as *water*, *ice* and *mud*, for which it is at best unclear what the minimal parts are.

In relation to the previous section we can conclude that the Chinese count mass nouns correspond to collective nouns of the *furniture*-type in non-classifier languages. In what follows I will use both of the terms **count mass noun** and **collective mass noun** to refer to this class of nouns.

2.1.3.4 Back to structures

The different structures we adopted so far for count singulars, count plurals, mass mass nouns and count mass nouns are recapitulated in table 1:

type of noun	examples	domain of denotation
count singulars	*table*	set of singularities: a, b, c etc.
plurals	*tables*	the set of pluralities formed on the basis of the set of singularities which constitute the extension of the corresponding singular form: $\{a,b\}$, $\{a,c\}$, $\{b,c\}$, $\{a,b,c\}$ etc.
count mass nouns (collective)	*furniture*; Mandarin *shu* 'book' (cf. (18))	set of atoms and the corresponding set of pluralities: a, b, c, $\{a,b\}$, $\{a,c\}$, $\{b,c\}$, $\{a,b,c\}$ etc.
mass mass nouns (non collective)	*water*	portions of matter, ordered with respect to each other by the *part of*-relation

<div align="right">TABLE 1</div>

Given this classification there is no relation between the presence of minimal parts and the syntactic mass or count status of the noun, as determined on the basis of the distributional tests in section 2.1.1. Syntactic

count nouns must provide us a criterion for counting, as they combine with Number morphology, which never introduces count structure but depends on count structure. Syntactic mass nouns, however, can be semantically mass and semantically count. A subset of the classifiers (Cheng & Sybesma's 1997a massifiers) introduces minimal parts that are not part of the denotation of the noun. In *two litres of water*, *litres* indicates what we are counting, and hence we do not need information about which units we count in the denotation of the noun *water*. A number of very general classifiers, however, do not provide this information. Chinese *ge* 'CL$_{unit}$' for instance, used in *san-ge shu* 'three CL$_{unit}$ book', implies that we are counting units, but not what these units are, and as a consequence, these units must be present in the denotation of the noun *shu* 'book'. This means that the difference between syntactic mass nouns and syntactic count nouns is not that only the latter provide us with a criterion for counting. Syntactic count nouns **must** provide us with a criterion for counting, while syntactic mass nouns **may** do so. The presence of minimal parts in the denotation of a noun is not the criterion on the basis of which nouns are divided into syntactic mass and count nouns. This view seems to be in accordance with the result of language acquisition experiments. Gathercole (1986) reports that children are hardly influenced by the physical properties of the referents of nouns when acquiring the mass/count distinction, whereas grammatical properties (availability of plural, compatibility with *another*) plays a crucial role. The different syntactic behaviour of the two types of semantic count nouns in the context of quantifying elements and the relation between Number marking and classifiers will be discussed in chapter 7.

In numeral classifier languages all nouns that are semantically count, and contain specific minimal parts in their domain of denotation, are syntactically mass, and fall into the category of count mass nouns or collectives. I will reserve the term count noun, which is used by Rygaloff (1972) and Cheng & Sybesma (1997a) for what I call count mass nouns, for those nouns that are count from a syntactic point of view.

The domains of denotation of the two types of mass nouns and of the plurals constitute a join semi-lattice, ordered by the *part of*-relation. Singular count nouns are exceptional in this respect. The different singular objects that form the set which corresponds to their extension cannot be ordered with respect to each other by the *part of*-relation. Following Chierchia (1995), plural is seen as an operation which makes the sets of pluralities available, and these sets, in turn, can be ordered with respect to each other, and form a join semi-lattice.

We have seen in section 2.1.1 that plurals and mass terms share the property of cumulative reference. Cumulative reference is formally defined as in (27) (cf. Krifka 1992):

(27) $\forall P \ (CUM(P) \leftrightarrow \forall x,y[P(x) \ \& \ P(y) \rightarrow P(x \vee y)]$
            (the predicate P has cumulative reference)

The formula in (27) states that a predicate has cumulative reference if and only if for every x and y that have the property P, the join of x and y has the property P. A predicate whose domain of denotation is defined as a join semi-lattice has this property by default. In section 1.1 it was shown that the property holds in fact for both mass nouns and plurals. Given that a chair and a table are both furniture, the plural object they form together is furniture as well, and if the animals in one camp are horses, and the animals in an other as well, they are all horses. Singular count nouns, whose domain does not form a join semi-lattice, do not have cumulative reference.[15]

Atomic reference is the property of a predicate P which says that given $P(x)$, there is a proper part of x which is a P-atom. The definitions of atom and atomic reference are given in (28) (cf. Krifka 1992):

(28)   a. $\forall x,P[ATOM(x,P) \leftrightarrow P(x) \ \& \ \neg\exists y[y < x \ \& \ P(y)]]$
            (x is a P-atom)
        b. $\forall P[ATM(P) \leftrightarrow \forall x[P(x) \rightarrow \exists y[y \leq x \ \& \ ATOM(y,P)]]]$
            (the predicate P has atomic reference)

The mass mass nouns do not have atomic reference, unless we adopt the existence of vague atoms, in accordance with Chierchia. Plurals, count singulars and count mass nouns all constitute atomic predicates.

Given the assumption that singular count terms denote a set of singularities, count singulars can be distinguished from count plurals and both types of mass nouns by the property of quantized reference, which is defined by Krifka (1992) as follows:

(29) $\forall P \ (QUAN(P) \leftrightarrow \forall x,y[P(x) \ \& \ P(y) \rightarrow \neg(y < x)]$
            (the predicate P has quantized reference)

Take again the count singular noun *table*. An object which is a table does not contain a proper part which qualifies as a table itself. Quantized predicates are necessarily atomic. If P is a quantized predicate and x is a member of P, x is a P-atom by definition, and hence P is atomic. Mass nouns and plurals do not have quantized reference, but quantified nouns often do. Take for instance *two tables*. There is no proper part of two tables which qualifies as two tables as well. The same obtains for *a cup of tea*, *a kilo of oysters* etc. The Q *two* and the classifier constructions *a cup* and *a kilo* can

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[15]   Unless there is only one element in their domain of denotation (cf. Krifka 1992 for discussion). I will disregard these cases here.

be seen as expressions which turn a predicate which has cumulative reference into a predicate with quantized reference.

In the preceding sections we have discussed the semantic structures corresponding to count singulars, plurals and mass nouns. I have argued that there is a distinction between two types of mass nouns, only one of which provides us with minimal parts. The two types of mass nouns and plurals correspond to structures which introduce a join semi-lattice, and have cumulative reference. The denotation corresponds to a set of singularities, which are not ordered with respect to each other by the *part of*-relation, and as a result count singulars have quantized reference.

2.1.4 Quantity and thematic structure

In the chapters to follow, I will assume that the reference properties of nouns are encoded by a position in their thematic grid. In the introduction I cited some ideas of Zwarts (1992), who assumes that gradable adjectives contain a thematic position, the *g*-position, or *grade*-position. In *so/too/more intelligent*, the *g*-position of the scalar adjective *intelligent* is saturated by the elements *so*, *too* and *more*. Whereas *so* and *too* are only used in the context of adjectives, *more* can also be combined with nouns and verbs, as in the examples in (30):

(30)   a.   more tables, more tea
       b.   John danced more than Peter

Taking as point of departure Zwarts' (1992) approach to adjectival degree modification, the relation between *more* and *intelligent* constitutes a theta relation: *more* saturates the *g*-position in the grid of *intelligent* (cf. also Corver 1997). At this point one can interpret the data in (30) in either of two ways. A first possibility is to assume that there are two different forms *more*, one of which is a degree modifier and is interpreted through saturation of the *g*-position in a scalar adjective, and the other a quantifier which is interpreted by a different mechanism. Such an approach does not imply that the relation between *more* and an NP or *more* and a VP is established by means of theta theory. Alternatively, one can assume that there is only one *more*, which is always interpreted in the same way, and always saturates a theta position in the grid of the phrase it modifies.

The second approach is more general, and therefore has to be preferred to the first. In chapter 4 it will become clear that *more* is not an isolated case, which makes a general approach even more desirable. English *less*, French *trop* 'too (much)', *plus* 'more' and *moins* 'less' and Dutch *minder* 'less' are other examples of DQs which are found in combination with adjectives,

NPs and VPs. A third possibility, which is equally general as the second, would be to assume that theta theory is not involved in either the relation between *more* and an NP/VP nor in the relation between *more* and an adjective. I take the existing analyses of degree modification in the adjectival system in terms of theta theory as my point of departure. An investigation of other possible formalisms that might render the relation between *more* and the phrase it modifies goes beyond the scope of this thesis.

Concentrating on NPs for the time being (I will turn to VPs in 2.2 below), *more* in (30a) modifies the quantity of books and tea, respectively. Following the idea that *more* is always interpreted as an element which saturates a theta role in the grid of the phrase it modifies, I propose that quantity is represented in the thematic grid of an NP, and I call the corresponding position *q*-position, where *q* stands for quantity.

Gradable adjectives are compatible with *more* because they contain a position introducing a scale, with respect to which *more* can be defined given an appropriate context. In the preceding section we have seen that the domains of denotation of mass nouns and plurals can be ordered in a join semi-lattice, while the domain of denotation of count singulars was argued to be a set of singularities, not ordered with respect to each other by the *part of*-relation. A join semi-lattice corresponds to the scale on the basis of which *more* can be defined, while the unordered set of singularities do not define a scale. In fact, *more* combines with plurals and mass nouns, and not with count singulars, unless count-to-mass shift has taken place. We can form *more tables* and *more tea*, but not *#more table*. Hence the presence of a scalar *q*-position depends on the cumulative reference property of the predicate.

The *q*-position cannot be identified with the *g*-position in scalar adjectives. The presence of a *g*-position is independent of the reference properties of the adjective, while a scalar *q*-position depends on cumulative reference of the predicate. In chapters 5 and 6 it will be shown that the distinction between *g* and *q* plays a role in determining the selectional properties of quantifiers and degree modifiers.

The presence of the scalar *q*-position cannot be the mere effect of cumulative reference of a predicate. Adjectives, for instance, can have cumulative reference, but do not contain a *q*-position. Take for instance the adjective *purple*. This adjective has cumulative reference: if John's marbles are purple and Peter's marbles are purple, the marbles of John and Peter together are purple as well. However by stating that Peter's marbles are more purple than John's, we cannot mean to say that Peter has more purple marbles than John. In *more purple*, *more* modifies the *g*-position in the scalar adjective *purple*, which is independent of quantity or cumulative reference. This illustrates that in the context of an adjective we do not have access to a *q*-position corresponding to the quantity of individuals or objects that has

the property denoted by the adjective. The reason why *more purple* cannot mean the same as *more purple objects* seems to be that the notion of quantity and the presence of a *q*-position is related to reference. Nouns are referential expressions and as such contain an *r*-position (cf. Williams 1981). I assume that the *q*-position is associated with this *r*-position, and therefore present in nouns and not in adjectives. The presence of a *q*-position in the noun depends on the presence of the *r*-position. The association of the *q*-position with the *r*-position is descriptive, and I will neither formalize the relation nor theoretically account for it.

I will assume that contrary to the *g*-position, which is scalar by definition, the *q*-position is not inherently scalar. Singular NPs which contain a *r*-position are assumed to contain a non-scalar *q*-position in accordance with their quantized reference. Plural formation should be seen as an operation which changes the properties of the *q*-position. According to Chierchia's account of the plural (cf. (15)), the plural morpheme changes the denotation of a singular count noun in such a way that the extension of the singular (a set of singularities) is replaced by the set of pluralities that can be formed on the basis of these singularities. I assume that from a syntactic point of view adding a plural morpheme changes the properties of the *q*-position in the noun, and makes the *q* scalar.

Summarizing, I proposed that mass nouns and plurals contain a scalar *q*-position, while singular count nouns contain a non-scalar *q*-position. Contrary to the *g*-position found in scalar adjectives, the *q*-position depends on the reference properties of the phrase in which it is contained. In rest of this thesis the notion of *q*-position will be used and further developed.

2.1.5 Concluding remarks

So far the mass/count distinction has been discussed with reference to nouns. In 2.1.1 I summarized the most important distributional differences between mass nouns, count singulars and plurals. In 2.1.2 mass-to-count and count-to-mass shifts were discussed, on the basis of which I concluded that the mass/count distinction is lexical in nature. The semantic structure corresponding to the different types of nouns was discussed in section 2.1.3. Following Chierchia I assume that count singulars denote singular objects, on the basis of which the plural can be computed. I argued that there are two distinct classes of mass nouns. The count mass nouns have minimal parts in their domain of denotation, contrary to the view of Bunt (1985) and Landman (1989, 1991), and the mass mass nouns do not (or if they do, they are 'vague'; cf. Chierchia 1995). Count mass nouns differ from real count nouns because the former cover the domain of denotation of the singular and the plural count noun, having both singular and plural objects in their

domain of denotation. Count singulars correspond to a set of singularities, and as a result they do not have cumulative reference and do not define a scale. In 2.1.4 I introduced the notion of *q*-position. The *q*-position is a thematic position which represents part of the reference properties of mass nouns and count nouns in the syntactic structure. Plurals and mass nouns contain a scalar *q*-position, and count singulars a non-scalar one.

In the next section we will turn to verbs, and compare their mass/count properties, including the presence of scalar and non-scalar *q*-positions, with the mass/count properties of nouns.

2.2   Mass and count in the verbal system

The nominal mass/count distinction has often been compared to aspectual properties of verb phrases (cf. Allen 1966, Mourelatos 1978, Bach 1986 and Krifka 1986, 1992). An example is given in (31):

(31)   a.   Mary drew a circle
        b.   Mary drew

The event depicted by the sentence in (31a) is bounded. The end point is specified and corresponds to the moment the circle was drawn on the paper. In (31b) the event is unbounded, the end of Mary's drawing is not specified. Bounded VPs are similar to count nouns, and unbounded VPs to mass nouns.

In this section I will compare the mass/count distinction in the nominal system and aspectual properties of VPs. Section 2.2.1 will concentrate on the traditional aspectual classes in relation to mass and count. In 2.2.2 I will test the presence of minimal parts in verbal predicates in different ways, and discuss the status of plural and Number in the verbal system. Plural turns out to be far less obvious a category in the verbal system than in the context of nouns. In 2.2.3 an important fact about the verbal mass count distinction will be highlighted, which is the influence of the reference properties of arguments on the reference properties of the VP as a whole. Section 2.2.4 treats the corresponding semantic structures, including a discussion of their representation in thematic structure and in section 2.2.5 I will compare the nominal shifting processes discussed in section 2.1.3 above to mass-to-count and count-to-mass shifts in the verbal domain.

2.2.1   Aspectual classes in terms of mass and count

Verb phrases are usually classified in four aspectual categories, first

proposed by Vendler (1957), and further developed in for instance Verkuyl (1972) and Dowty (1979). Vendler proposes the following basic categories of verbs, or more accurately verb phrases: STATES, ACTIVITIES, ACCOMPLISHMENTS and ACHIEVEMENTS.

A first distinction can be made on the basis of boundedness, which sets apart states (*to hate*) and activities (*to run*) from accomplishments (*to run a mile*) and achievements (*to recognize*). States and activities are unbounded. They share the property of being compatible with durative adverbials of the form *for a certain time*. They last for an unbounded period of time that can be specified by the *for*-adverbial:

(32)   a.   John hated Peter for four years
       b.   John swam for an hour

Accomplishments (*to run a mile*) and achievements (*to recognize*) cannot be used with a *for*-adverbial, in accordance with their bounded nature. Achievements are momentary; the moment they begin defines their endpoint as well. Accomplishments can be combined with *in*-adverbials such as *in five minutes*, and the momentary achievements combine with phrases such as *at that moment*:

(33)   a.   Mary ran a mile in five minutes/*for five minutes
       b.   At that moment John recognized Peter
       c.   *John recognized Peter for two minutes

The second criterion Vendler uses to establish his four classes is compatibility with the progressive. States and achievements are strange when used in the progressive, while activities and accomplishments are fine:

(34)   a.   ??John is hating/recognizing Peter
       b.   Mary is running (a mile)

Compatibility with the progressive depends on whether the verb denotes a process going on in time. States and achievements do not meet this criterion, though for different reasons, while activities and accomplishments do. I will leave the distinctions based on the progressive mostly aside and concentrate on the first distinction, which is similar to the mass/count distinction.

Though not stating this explicitly, Vendler indicates that activities have cumulative reference whereas accomplishments have quantized reference.

> If it is true that someone has been running for half an hour, then it must be true that
> he has been running for every period within that half hour. But even if it is true that a
> runner has run a mile in four minutes, it cannot be true that he has run a mile in any
> period which is a real part of that time [...].
>
> <div align="right">Vendler (1967:101)</div>

Activities share the cumulative reference property with mass nouns and plurals, and the same could be said about states.[16] Accomplishments and achievements are similar to count singulars as they have quantized reference.

2.2.2 Plurality and minimal parts

In this section I will investigate to what extent we can determine the presence of minimal parts in verb denotations, which is related to the role of plural in the verbal system.

A famous test to distinguish activities and accomplishments is the so-called IMPERFECTIVE PARADOX (cf. Dowty 1979). The examples in (35) show that for an activity, but not for an accomplishment we can conclude on the basis that John V-*ed* that he has V-*ed*:

(35)   a.   Sue is running $\rightarrow$ Sue has run
       b.   Sue is running a mile $\nrightarrow$ Sue has run a mile

I will use the imperfective paradox as a test to see whether or not a verbal predicate contains minimal parts that we have access to from a linguistic point of view. The difference between the sentences in (35) can be explained in terms of the absence versus the presence of minimal parts. Under the assumption that the activity *running* does not impose any minimal parts, at least not ones that play a linguistic role, we expect that as soon as Sue is running, we will be able to say that she has run, referring to the running she has done. The predicate *to run a mile* introduces a minimal event. This event is not over yet during the time Sue is running a mile, and hence the implication does not hold. This makes activities such as *to run* similar to the mass mass nouns (*water*), and reinforces the suggestion that accomplishments such as *to run a mile* resemble count singulars (*table*).

The question arises whether there are also verbal counterparts of collective mass nouns (*furniture*) and/or plurals (*tables*). The answer to the first question seems to be positive. Take for instance a verb such as *to jump*. If I say *John jumped* he can have made one single jump or several ones. *To*

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[16] It will turn out in chapter 6 that with respect to quantifiers stage-level states (*in the garden*) are similar to other mass verbal predicates, while individual-level predicates such as the psych verbs have different properties, and should not be seen as mass.

jump is different in this respect from *to run*. *John ran* is not ambiguous in the same way as *John jumped*. The difference between the two verb phrases can be illustrated through the way they are interpreted in combination with cardinal count adverbials:

(36) a. John jumped once
      b. John ran once

In (36a) John made a single jump, while in (36b) there has been a single running event, the size of which is undetermined. The singular and plural readings of *to jump* are not distinguished by morphological singular or plural markers, which suggests that *to jump* is not similar to a count noun (*table/tables*) but to a count mass noun or collective (*furniture*). Other 'collective' verbs behaving on a par with *to jump* are *to knock*, *to step*, *to hop* etc.

   The presence of minimal parts in the verb *to jump* can also be shown on the basis of the imperfective paradox:

(37)   John is jumping ↛ John has jumped

The sentence *John is jumping* can refer to an event in which John jumped once, or one in which he jumped repeatedly. In case John makes a long jump and he is halfway through his seven metres, *John is jumping* is true, but *John has jumped* is not, which demonstrates that there is no entailment in (37). On the basis of the (36) and (37) we can see that *to jump*, contrary to *to run*, contains a criterion for counting. We can conclude that *to jump* can be seen as a verbal counterpart count mass nouns such as *furniture* and while *to run* is similar to mass mass nouns such as *water*.

   Translating the collective verb *to hop* into Dutch demonstrates a distinction which is similar to the one between collectives and plurals in the nominal system. *To hop* can be translated as either *huppen* or as *huppelen*. The former corresponds to its English counterpart in that it can be used independently of the number of hops. *Huppelen*, however, implies a plurality of hops.

(38) a. Piet   hupte   de stoep   op
      b. Piet   huppelde de stoep   op
          Piet   hopped   the side-walk on
          'Piet hopped onto the sidewalk'

Only (38a) can be used in case there was only one hop. The form *huppelen*, which is derived from *huppen* by addition of the morpheme *–el*, resembles plural nouns in some respects but not in others.

   A first difference is that in the nominal system a plural is formed on the

basis of a singular: on the basis of the singular *table* we make the plural *tables*. There does not seem to be a singular verb form at the basis of *huppelen*, but rather a collective, as *huppelen* is morphologically derived from *huppen* 'to hop' by addition of the morpheme *–el*, which itself covers both singular and plural interpretation on a par with *to jump*.

A second difference between the plural morpheme in the nominal system and the morpheme *–el* is the following. Whereas plural applies almost without exception to singular nouns, it is only occasionally possible to add *–el* to a verb. Next to *springen* 'to jump' there is no **springelen*, nor do we find **hupselen* next to *hupsen* 'to hop'. Moreover, there are cases where a verb containing the *–el* morpheme does not necessarily imply some sort of a plurality. The verb *duikelen* 'to make somersaults', derived from *duiken* 'to dive', is an example. Next to the core meaning 'to make somersaults', which seems plural, the verb can be used in contexts where there is no reason to assume any plurality whatsoever. In *Jan duikelde van zijn fiets* 'John fell of his bike' and *de koers duikelde naar beneden* 'the exchange rate nose-dived down' have no more of a plural interpretation than their English translations.[17]

Even though *huppelen* 'to hop' does have a plural flavour in all its occurrences, it does not seem to give access to the atomic hops. In this respect *huppelen* is different form *huppen*:[18]

(39)   a.   Jan maakte drie hupjes
              Jan made   three hops
              'Jan made three hops'
        b.   Jan huppelde drie keer
              Jan hopped   three times
              'Jan hopped (a bit) three times'
              not: 'Jan made three hops'
        c.   Jan hupte   drie keer
              Jan hopped   three times
              'Jan made three hops'

There is a nominal counterpart of (39b), which is given in (40) (Helen de Hoop, p.c.):

(40)   Jan maakte drie   huppeltjes
              Jan made   three   series-of-hops

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[17]   Helen de Hoop observes that this 'singular' use of *duikelen* can be compared to plural noun forms that denote singular objects, such as *trousers* and *glasses*.

[18]   The diminutive form *hupjes* is used because the non-diminutive *hup* in the sense of 'hop' sounds odd.

This sentence means roughly the same as the one in (39b), but what we see is that the *–el* morpheme is included in the noun. This suggests in fact that what counts as a minimal part in the verb *huppelen* has a plural interpretation itself. There is no means to specify the number of singular **hops** in case we use *huppelen*. We can conclude that there may be a resemblance between *–el* verbs and the nominal category plural, but there is certainly no straightforward correspondence.[19]

Other cases of iterative readings can be found for accomplishments and achievements:

(41)   a. Mary played the sonata all morning
          b. John ran across the street all afternoon

In (41) the durative time adverbials are possible because the singular event is iterated. One obvious condition is the possibility for the arguments of the verb to undergo the event more than once. There is in this respect a difference between writing a sonata and playing it. A sonata is written only once, while it can be played an indefinite number of times. So-called 'once-only' predicates, such as to write, cannot accommodate an iterative reading. Again the parallel with plural is not complete, as there is no morphological marking of the iterated reading. In the next chapter and in chapter 9 I will come back to iterated readings.

Number agreement and aspectual morphology on the verb cannot be seen as instantiating plural either, at least not in languages such as English or French. Plural agreement depends on the plurality of the noun, not on a plural event interpretation, which is illustrated by the French examples in (42):

(42)   a. **Les** enfants   **ont**   soulevé le piano
              the children PL *have* PL *lifted*   *the piano*

In (42a) the verb bears plural agreement morphology, but this does not imply that there must be a multiple event interpretation. The sentence can

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[19]   There are quite some African languages in which we find so-called pluractionals (cf. Newman 1980, Lasersohn 1995). The term pluractional is used for a morphologically marked group of verbs that are plural-like in nature. According to Gerhardt (1984:12) "[m]any languages of the Nigerian Middle Belt display plural [i.e. pluractional] verb roots, which indicate that the verbal action is characterized by one or another kind of multiplicity: it can happen habitually; it can be executed by a certain number of subjects; it can be applied to a certain number of objects; it can continue over a longer period of time; or it can be performed at different places." Further study on the interaction between pluractionals and plurals on the one hand and quantifying expressions on the other seems a promising research topic for gaining more understanding of the status of plural in the verbal domain. Thanks to Stefan Elders for drawing my attention to this phenomenon.

have a single event interpretation, corresponding to a situation in which a group of children lifts the piano together.

As for aspectual morphology, one can observe that both the perfective and the imperfective are independent of the singular or plural interpretation of the event even though imperfectives may trigger a plural-like interpretation, and perfective forms often correspond to singular events.[20] The French imperfect tense can be used for habituality, which, as in (43a), can have a plural flavour. (43b), however, shows that the habitual reading of the imperfect does not entail a plural interpretation, so that the imperfect marker on the verb cannot be seen as an exact parallel of the plural marker:

(43)   a.   Pendant l'été   les enfants   jouaient   dans le jardin
             during the summer   the children   played IMP *in the garden*
       b.   L'année dernière, Marie   vivait   à Paris
             the year last   Marie   lived IMP *in Paris*
             'Last year Marie lived in Paris'

The simple past tense often yields a singular interpretation. This tense is used to render the subsequent events that make up a story, as opposed to the imperfect, which gives the background information. The example in (44) shows that the simple past is not incompatible with a plural interpretation, though:

(44)   A partir de ce jour-là, elle vint   ici pendant
             to start of that day   she came PS *here during*
             une semaine, puis   elle disparut
             a week   then   she disappeared PS
             'From that day on, she came regularly for a week, then she disappeared'

The imperfect and the simple past introduce some sort of a mass/count distinction (cf. Hoepelman & Rohrer 1981, De Swart to appear). In the context of adverbials such as *three times*, normally the simple past tense is used. In the context of the imperfect these adverbials cannot be used, unless the sentence has a frequentative or habitual interpretation (cf. De Swart 1991:24). The imperfect, on the other hand, is the past tense form one has to use in the context of durative adverbials such as *depuis deux heures* 'since two o'clock; for two hours already'. I will briefly come back to this distinction below, as it plays a role in mass-to-count and count-to-mass shifting processes.

In the previous section it was shown that the distinction between activities

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[20]   Cf. Guéron (1995) for discussion on the relation between plural and imperfectivity.

(*to draw*) and states (*to love Mary*) on the one hand and accomplishments (*to draw a circle*) and achievements (*to recognize Mary*) on the other is quite similar to the mass/count distinction in the nominal system. In this section I investigated the presence of minimal parts in verbs and verb phrases in more detail. Both mass mass nouns and mass count nouns seem to have a close correlate in the verbal system. Verbs such as *to run* could be characterized as mass mass verbs whereas *to jump* and company are similar to the collective count mass nouns. Only for the latter category can the minimal parts be identified on linguistic grounds, as has been shown on the basis of the imperfective paradox and cardinal count adverbials. The verbal counterpart of plural nouns is not easily discerned. Certain verbs have plural-like features (Dutch *huppelen* 'to hop') and accomplishments and achievements, if not 'once-only' predicates, may have an iterated reading. I showed as well that Number and (im)perfective morphology on verbs functions differently than singular/plural morphology on nouns, and never unambiguously introduces plurality of events. It will be shown in chapter 7 that those quantifiers which are sensitive to the presence of singular or plural morphology only function as adnominal quantifiers, not as adverbial Qs. This is in accordance with the observation that there is no clear counterpart of Number morphology in the verbal system.

2.2.3   The role of arguments

In the nominal system the mass/count distinction is to a large extent a lexical matter. In the verbal system the mass count/distinction is, except for the collective verbs, mostly a matter of the verb phrase as a whole. This is actually one of the most striking differences when we compare the nominal and the verbal mass/count distinction. Starting out with a mass verb, addition of an argument makes the verb phrase count. Some examples, showing that simplex verbs are mass and can be made count by adding further arguments are given in (45):

(45)   a.   John drank for an hour/*in an hour
         a'. John drank his two beers in an hour/*for an hour
         b.   Sue drove for an hour/*in an hour
         b'. Sue drove Bill to the station in an hour/*for an hour
         c.   Pete drew for an hour/*in an hour
         c'. Pete drew the circle in an hour/*for an hour

Verkuyl (1972), who was the first to study the compositional nature of aspectual distinctions in detail, adds to this that it is not just the mere presence of an argument that makes a difference, but that the boundedness

properties of the verbal predicate depend also on the reference properties of the arguments (cf. also Verkuyl 1993). Replacing the direct internal arguments in (45), which have quantized reference, whith bare noun phrases, wich have cumulative reference, we are back to unbounded sentences:

(46)   a.   John drank *beer* for an hour
       b.   Sue drove children to the station for hours/all afternoon
       c.   Pete drew circles for an hour

The reference properties of the argument (quantized or cumulative) determine the reference properties of the VP. This phenomenon, which has been called *measuring out* by Tenny (1987, 1994), will be further discussed in the next chapter.

We can conclude that count categories play a much more important role at the lexical level in the nominal system. A count interpretation is often obtained at the phrasal level in the verbal system, and depends on the presence of a quantized nominal predicate.

2.2.4   Shifts

When comparing the nominal mass/count distinction to aspectual differences in the verbal system, Bach (1986) briefly discusses the verbal counterparts of the mass-to-count and count-to-mass shifting processes. In the nominal system the shift from count-to-mass yields a predictable result, while the shift from mass-to-count is rather idiosyncratic and depending on the situation and lexical properties of the noun (cf. section 2.1.2). According to Bach the verbal mass/count distinction is characterized by similar restrictions on shifting, though he does not substantiate his claim by many concrete examples. In what follows the verbal mass-to-count and count-to-mass shifts will be examined and it will be shown that in most cases the shifting processes resemble the ones found in the nominal system, though the verbal mass-to-count shift is not as much lexically restricted as the corresponding shift in the nominal domain.

Given any count noun denoting a physical object, it is possible to derive a mass term which denotes the substance the object is made of. For example, if we start with the count term *a fish*, and we put it in a mass context, we get a mass term *fish* which roughly denotes the substance a fish is made of.

To see whether something similar exists in the verbal domain, we first have to know when a mass interpretation of a VP is triggered. In the nominal system, the mass interpretation of a singular count noun is triggered, for instance, if it is used as a bare noun. Singular count noun

phrases can be used as a bare noun only if count-to-mass shift takes place, as in *He ate fish*. In the previous section I alluded to the possibility that a verb put in the imperfect tense in French has mass properties because it is similar to a bare noun phrase. The progressive in English is similar in this respect to the French imperfect.[21] The interpretation shift brought about by the use of the progressive is illustrated in (47):

(47)　a.　John built a house
　　　　b.　John was building a house

The predicate in (47a) refers to a singular event. A subinterval of the interval corresponding to John's building of a house does not contain any parts which can be characterized as *John built a house*. When we put the verb in the progressive as in (47b), mass like behaviour shows up. If John was building a house during a certain time interval, he was building a house during subintervals of this time interval as well. As in the "object-to-substance" shift in the nominal system, the resulting meaning is predictable. The interpretation shifts from an event as a whole (the "object") to the activity that fills up the event space (the "substance"). This predicts that events which lack an internal temporal structure, as is the case for the punctual achievements, the count-to-mass shift is not possible, which is in correspondence with Vendler's observation that the progressive is not available for achievements. Achievements do not consist of temporal "stuff", and hence count-to-mass shift is blocked. This restriction on the verbal count-to-mass shift is similar to the one induced by the Universal Grinder. Only those nouns that can refer to physical objects, and hence consist of physical substance, can be ground.

　　When looking at mass-to-count shifts, we can discern some differences between the nominal and verbal domains next to the clear similarities. In the verbal domain the meaning of the mass predicate in a count context is mostly clear; it denotes a closed event consisting of that activity or process. In the nominal system, adding a cardinal numeral to a mass noun introduces the *piece of* N_{mass} reading, the *type of* N_{mass} reading, the *serving of* N_{mass} reading or an ungrammatical form depending on the noun. The example of Dutch *glas* 'glass' discussed in 2.1.2 illustrates this point very well. The word *glas* can denote certain objects made of glass ('drinking glass', 'chimney of an oil-lamp' or 'spectacle glass'), but not others (*een glas* 'a glass' cannot be used for a glass vase or a fragment of broken glass).

If we use a mass verbal predicate in the context of a cardinal count adverbial (*n times*), we get *n* bounded events. The sentence *John swam three times* states that there are three swimming events by John. There are no lexical idiosyncrasies of the sort we find in the nominal domain. If we add a cardinal count adverbial, we always get the bounded event reading. Restrictions as the ones found for the count use of the Dutch mass noun *glas* 'glass' are not found for verbs, as can be shown on the basis of the verb *to swim*. The sentence *John swam once last week* is appropriate in the context of all sorts of possible swimming events. Whether John was swimming on his back or on his breast, whether it was in a tropical swimming paradise or in the North Sea and whether he is a good or a bad swimmer is of no importance. We cannot use the word *glas* 'glass' for a glass vase, but we can say *John swam once last week* independently of the kind of swimming event John was involved in. This shows that mass-to-count shifts in the nominal domain are subject to lexical restrictions in a way the verbal mass-to-count shifts are not.

The contrast between the nominal shift and the verbal shift is actually not so amazing, given the different dimensions that play a role for mass and count. Objects can be shaped in a whole array of different forms, as they function in a three dimensional space. The choice of form in the verbal domain, which is organized on the basis of the time axis, is more restricted.

There are some mass-to-count shifts which do have a lexical component. In the previous section the compositional nature of many count predicates was discussed. I mentioned the fact that accomplishments are often formed out of an activity verb and a nominal argument which has quantized reference. There are a few cases of mass-to-count shift which seem to involve insertion of an implicit argument. Consider for instance (48) (cf. Dowty 1979):

(48)   John ate in ten minutes

The presence of the *in*-phrase forces a bounded interpretation which can be obtained if *to eat* is understood as *to eat a meal*. In the next chapter I will argue that the sentence in (48) contains an empty phrase corresponding to *a meal*, which is licensed by the verb *to eat*. The mass-to-count shift is not a lexical operation in this case, but a syntactic one, even though the licensing of the empty argument is in fact a lexical property of the verb. I argued in 2.1.2 that shifts in the nominal system are lexical operations on word meanings.

In this section count-to-mass and mass-to-count shifts in the verbal system have been compared to their nominal counterparts. The nominal count-to-mass shift has a close parallel in the verbal domain, while mass-to-count shifts seem to yield a more predictable meaning in the verbal system.

Cases such as *to eat* are similar to nominal mass-to-count shifts in the sense that they are lexically determined, but, whereas the mass-to-count shift in the nominal system is a lexical operation on the noun, the verbal mass-to-count shift does not seem to affect the verb *to eat* at the lexical level.

2.2.5 The structure of mass and count verbal predicates

Bach (1986) proposes in an article entitled 'The algebra of events' that the domain of events should be modeled after the domain of objects, to formally express the relation between bounded events and count objects on the one hand, and unbounded processes (≈ Vendler's activities) and stuff on the other. Alongside the domain of objects, he proposes the existence of a domain of eventualities which is ordered in a complete Boolean algebra.[22] Similar ideas have been developed by Krifka (1986, 1992). The *part of-*relation in the domain of events is defined in terms of temporal intervals (for a formal account, see Krifka 1992). An event *e1* is part of *e2* if the interval corresponding to *e1* is part of the interval corresponding to *e2*. This allows us to order events in a join semi-lattice structure as in (12), ordered by the *part of-*relation.

Given the structural properties of the domain of events we can define properties such as cumulative reference, quantized reference and atomic reference for event predicates as well, thus accounting for the similarities we found between the nominal and the verbal systems.

Krifka (1992) concentrates on the measuring out phenomenon. He derives measuring out from the reference properties of the verb and its arguments, and the relation between the verb and its arguments. If the relation between an argument and a verb obeys certain semantic restrictions, the reference properties of the argument determine the reference properties of the verbal predicate as a whole. I will not discuss Krifka's analysis in any detail here.

In 2.1.3 I proposed that the thematic grid of nouns contains a *q*-position. This position reflects the reference properties of the noun, and is associated with the *r*-position. Given the similar structures for the domain of events, it seems fair to assume that there is a *q*-position associated with the *e*-position in the grid of a verb as well. Again I will not determine the precise nature of this association. It is important to realize, however, that the *q*-position in a VP is an expression of the reference properties of the event, and not of, for instance, the subject. *They ran a lot* does not imply that there were many people who ran, but that there was a lot of running taking place.

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[22] In accordance with Link's original proposal, Bach assumes that the domain of eventualities contains the zero element, i.e. instead of a join semi-lattice he starts out with a Boolean algebra. This is not of any importance for the discussion in this chapter.

The idea that VPs contain a *q*-position is in accordance with the observation that verb phrases can be combined with quantifying expressions such as *more*, as in *John works more than Sue*, on a par with *more tables*. Recall that the motivation for postulating a *q*-position in NPs is the desire to have a uniform syntax for expressions such as *more*, which combine with adjectives, NPs and VPs alike. Following analyses of degree modifiers in the adjectival system, I will treat the relation between degree expressions such as *more* and the phrase they modify as a theta relation. The analysis of degree quantifiers such as *more* presented below will make use of the presence of the *q*-position in the NP and the VP. The *q*-position will also play a crucial role in the analysis of 'measuring out' that I will develop in the next chapter.

2.3   Conclusions

In this chapter I discussed the mass/count distinction in the nominal and verbal systems. Mass and count properties of nouns match aspectual properties of verbal predicates to a certain extent. In both domains reference properties such as cumulative reference, quantized reference and atomic reference play a role, which can be accounted for through structural properties of the domain of objects and the domain of events. I proposed that these properties are reflected in syntax by the presence of a *q*-position, which can be either scalar, reflecting the scale introduced by the join semi-lattice structure, or non-scalar. Singular expressions do not have a scalar structure, and hence contain a non-scalar *q*-position.

The nominal mass/count distinction is mostly a lexical phenomenon. The status of a noun is given in the lexicon, and shifts take place in the lexicon as well. As for the verbal mass count distinction, only part of the mass/count properties play a role at the lexical level. I argued that there is a difference between mass mass verbs (*to run*) and count mass verbs (*to jump*) in the lexicon, which is comparable to the distinction between mass mass nouns and count mass nouns. In both cases the predicates have cumulative reference, but whereas the count mass expressions have lexically determined minimal parts, the mass mass expressions do not. There is no clear parallel in the verbal system to the nominal singular/plural opposition in the verbal system, even though there are several phenomena that come close. In spite of the lexical distinctions between verbs, the verbal mass/count distinction is largely a syntactic phenomenon. It is not the verb alone which determines the mass or count status of the VP given that arguments may influence the mass/count properties of the VP. This phenomenon is the subject matter of the next chapter.