# 11 COMMON NOUNS: A CONTRASTIVE ANALYSIS OF CHINESE AND ENGLISH

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## 11.1. Introduction

In chapter 1, especially section 1.3, we implicitly developed a theory of common nouns that covers both their predicational meaning and their meaning as kind-referring expressions. Here I will try to put together some of the results relating to the syntax and semantics of common nouns, and give an outline of a formal theory which encompasses the aspects that are relevant to our subject with respect to two typologically different languages, English and Chinese. The goal of this small contribution is quite modest, mainly for reasons of space and perspicuity.

I will assume an intensional semantic representation language with a set of possible worlds I and a sorted universe A, whose structure will be developed in the course of the chapter. I assume explicit quantification over possible worlds, for which I use the variable i, typically written as a subscript. For entities of the universe, I will use variables x,y,z, etc.

## 11.2. The Chinese Case

I will start with Chinese, as common noun constructions are more transparent in this classifier language than they are in English. Take as an example the noun *xíong* 'bear'. It can refer to (a) the kind *Ursus* or (b) some specimens of this kind. There is also a measure construction which applies to (c) a specified number of realizations of *Ursus*. And finally, there are two classifier constructions containing *xíong* which apply to a specified number of (d) individual specimens of *Ursus* or (e) subspecies of *Ursus*. (In the glosses, ASP stands for 'aspect' and CL for 'classifier'.)

(1) a. xíong júe zhǒng le
bear vanish kind ASP — 'The bear is extinct.'

b. wǒ kànjiàn xíong le
I see bear ASP — 'I saw (some) bears.'

c. sān qún xíong
three herds bear — 'three herds of bears'





d. sān zhī xíong
three CL bear — 'three bears' (objects)

e. sān zhǒng xíong
three CL bear — 'three bears' (species)

We assume that the bare noun *xíong* is basically a name of the kind *Ursus*, and that the other uses have to be derived from that (cf. also Dölling 1992, who discusses sort shifts of this type in general). One reason to take the kind-referring use in (1a) as basic is that it seems that every language which allows for bare NPs at all uses them as expressions referring to kinds (see Gerstner-Link 1988). Furthermore, kinds seem to be ontologically prior to specimens; if we want to call some real object a bear, we have to relate this object to the kind *Ursus*, whereas it is not necessary to have some real specimens in mind in order to talk about the kind *Ursus*. Let us represent the syntactic category of kind names by N; as kind names can be used as NPs, we have to assume a syntactic rule NP → N, where the interpretation stays the same—that is, the corresponding semantic rule is $[\![[_{NP}[_N\alpha]]]\!] = [\![[_N\alpha]]\!]$. Assuming that *Ursus* denotes an element of the universe A of the sort of kinds, we have the following syntactic and semantic derivation:

(2) $[_N$ xíong$]$, **Ursus**
|
$[_{NP}$ xíong$]$, **Ursus**

The indefinite, or predicative, use of a bare NP in (1b) can be derived from the definite use by an operator which takes a kind and yields a predicate applying to specimens or subspecies of this kind. In chapter 1, we have introduced the realization relation **R** and the taxonomic relation **T**. In our intensional framework, **R** and **T** will depend on a possible world i. In general, if k is a kind, then $\lambda x.\mathbf{R}_i(x,k)$ applies to specimens or individual sums of specimens of k in world i, and $\lambda x.\mathbf{T}_i(x,k)$ applies to subspecies or individual sums of subspecies of k in world i. (If we think that an individual necessarily belongs to the kind(s) it belongs to, then $\mathbf{R}_i(x,k)$ means that x belongs to k and furthermore exists in i, and similarly for the subspecies relation.) We can conflate these two relations by defining a relation **RT** as follows: $\mathbf{RT}_i(x,y) \leftrightarrow \mathbf{R}_i(x,y) \vee \mathbf{T}_i(x,y)$. To derive the predicative use of a bare noun, I assume the same syntactic rule as above, NP → N, but now with the corresponding semantic rule $[\![[_{NP}[_N\alpha]]]\!] = \lambda i\lambda x.\mathbf{RT}_i(x,[\![[_N\alpha]]\!])$, which gives us the property of being a specimen or a subspecies, or an individual sum of specimens or subspecies, of the kind $[\![[_N\alpha]]\!]$.

(3) $[_{N}$xíong], **Ursus**

$|$

$[_{NP}$xíong], $\lambda i\lambda x.\mathbf{RT}_i(x,\mathbf{Ursus})$

The property $\lambda i\lambda x.\mathbf{RT}(x,\mathbf{Ursus})$ applies to single bears or collections consisting of bears, and to single bear species or collections consisting of bear species.

For the measure phrase construction (1c) we can assume two syntactic rules: (i) MP $\rightarrow$ Num M (where MP stands for 'measure phrase', Num for 'number word', and M for 'measure word'), and (ii) NP $\rightarrow$ MP N. The corresponding semantic rule is functional application; we have $[\![[_{MP}[_{Num}\alpha][_{M}\beta]]]\!] = [\![[_{M}\beta]]\!]([\![[_{Num}\alpha]]\!])$ and $[\![[_{NP}[_{MP}\alpha][_{N}\beta]]]\!] = [\![[_{MP}\alpha]]\!]([\![[_{N}\beta]]\!])$. To treat a measure word like *qún* 'herd' we have to assume a function **herd** which for each possible world i, when applied to a (complex) object, yields the number of herds this object consists of; for example, when applied to an object which consists of three herds of animals, it yields the value 3. A natural way to treat measure words like 'herd', 'pound', 'liter', etc., is by additive measure functions (cf. ter Meulen 1980, Krifka 1989). For example, it holds that if $\mathbf{herd}_i(x) = n$ and $\mathbf{herd}_i(y) = m$, and x and y do not overlap—that is, have no common part—then $\mathbf{herd}_i(x\oplus y) = n + m$, where '$\oplus$' is sum formation of individuals and '+' is arithmetic addition. For example, if x are two herds and y are three herds, and x and y do not overlap, then x and y together are five herds. The rules specified so far allow us to derive a phrase like (1c) in the following way:

(4) $[_{M}$qún], $\lambda n\lambda y\lambda i\lambda x[\mathbf{RT}_i(x,y)\ \&\ \mathbf{herd}_i(x)=n]$

$\quad$ $[_{Num}$sān], **3**

$[_{MP}$sān qún], $\lambda y\lambda i\lambda x[\mathbf{RT}_i(x,y)\ \&\ \mathbf{herd}_i(x)=3]$

$\quad$ $[_{N}$xíong], **Ursus**

$[_{NP}$sān qún (de) xíong], $\lambda i\lambda x[\mathbf{RT}_i(x,\mathbf{Ursus})\ \&\ \mathbf{herd}_i(x)=3]$

If we assume that $\mathbf{herd}_i$ is applicable only to objects and not to kinds, then this predicate applies to objects consisting of three herds of bears. That is, we might replace **RT** by **R** without change of meaning.

The classifier construction (1d) can be treated similarly, with the exception that the measure function now is dependent upon the head noun. So we assume a special operator which, for each possible world, takes a kind and yields a measure function that measures the number of specimens of that kind. Let us call this operator **OU** (for 'object unit'). For example, if x consists of three individual bears, then $\mathbf{OU}_i(\mathbf{Ursus})(x)=\mathbf{3}$; in general, $\mathbf{OU}_i$ (k) will be an additive measure function. Example (1d), then, will be derived as follows:



(5) $[_{M}$zhī], $\lambda n\lambda y\lambda i\lambda x[\mathbf{RT}_i(x,y)\ \&\ \mathbf{OU}_i(y)(x)=n]$

$\quad$ $[_{Num}$sān], **3**

$[_{MP}$sān zhī], $\lambda y\lambda i\lambda x[\mathbf{RT}_i(x,y)\ \&\ \mathbf{OU}_i(y)(x)=3]$

$\quad$ $[_{N}$xíong], **Ursus**

$[_{NP}$sān zhī xíong], $\lambda i\lambda x[\mathbf{RT}_i(x,\mathbf{Ursus})\ \&\ \mathbf{OU}_i(\mathbf{Ursus})(x)=3]$

As before, we might replace **RT** by **R**, as $\mathbf{OU}_i(\mathbf{Ursus})$ applies to objects only. It might be considered more appropriate to have the simple realization relation **R** instead of **RT**; I took **RT** for reasons of generality. One could, furthermore, think of getting rid of **RT** altogether by a postulate like $\mathbf{OU}_i(y)(x) = n \rightarrow \mathbf{R}_i(x,y)$. However, I want to distinguish between a qualitative criterion of application and a quantitative criterion of application for predicates. The operator **OU** could reasonably be interpreted in such a way that it yields the same measure function for, say, bears and cats, that is, $\mathbf{OU}_i(\mathbf{Ursus}) = \mathbf{OU}_i(\mathbf{Felis})$; in both cases the unit is derived from the notion of a biological organism and may be identified with $\mathbf{OU}_i(\mathbf{animal})$. Then the other component of the operator, the **RT** relation, matters, insofar as it qualitatively distinguishes between bears and cats.

The classifier construction (1e) is similar to the classifier construction (1c), with the exception that the classifier *zhǒng* does not contain a measure function for specimens, but a measure function for subspecies. Let **KU** ('kind unit') be a function which, for each possible world, when applied to a kind, yields a measure function for the number of subspecies of that kind; for example, if x consists of three bear species (say, the polar bear, the grizzly, and the panda), then $\mathbf{KU}_i(\mathbf{Ursus})(x)=\mathbf{3}$. We get the following derivation for (1e):

(6) $[_{M}$zhǒng], $\lambda n\lambda y\lambda i\lambda x[\mathbf{RT}_i(x,y)\ \&\ \mathbf{KU}_i(y)(x)=n]$

$\quad$ $[_{Num}$sān], **3**

$[_{MP}$sān zhǒng], $\lambda y\lambda i\lambda x[\mathbf{RT}_i(x,y)\ \&\ \mathbf{KU}_i(y)(x)=3]$

$\quad$ $[_{N}$xíong], **Ursus**

$[_{NP}$sān zhǒng xíong], $\lambda i\lambda x[\mathbf{RT}_i(x,\mathbf{Ursus})\ \&\ \mathbf{KU}_i(\mathbf{Ursus})(x)=3]$

In this case, **RT** may be replaced by **T**.

We have assumed so far that the head noun in classifier constructions refers to a kind. Things are a little bit more complicated when it comes to noun phrases which are modified by adjuncts like adjectives or relative clauses. In Chinese, an adjunct can be either in front of the head noun or in front of the classifier phrase, as the following minimal pair shows (taken from Henne, Rongen, and Hansen 1977, 269; SUB marks a subordinating particle):

(7) a. nèi wèi [chuān lán yīfu de] xiānsheng
that CL wear blue clothing SUB gentleman
'that gentleman, who is wearing blue clothes'
b. [chuān lán yīfu de] nèi wèi xiānsheng
wear blue clothing SUB that CL gentleman
'that gentleman who is wearing blue clothes'

According to Henne et al., the adjunct is 'descriptive' in the first case (which can be rendered as an appositive relative clause in English) and 'restrictive' in the second case. In the second case, the adjunct can be treated as a modifier of a predicative noun. In the first case, however, the adjunct must be treated as a modifier of a kind-referring noun, as it is only the application of the classifier phrase by which an object-referring noun is derived. Thus we have to assume that not only *xiānsheng* 'gentleman', but also *chuān lán yīfu de xiānsheng* 'gentleman wearing blue clothes', refers to a kind.

One possible analysis is to introduce a notion that is more general than that of a kind. So far, kinds were considered to be abstract entities that are well established in the background knowledge of speaker and hearer and can be referred to by definite NPs like *the bear*, which were in the extension of kind predicates like *be extinct* or *be a mammal*, and which were organized in taxonomic hierarchies. Let us now assume a new type of entities, *concepts*. Similar to kinds, concepts are abstract entities related to real objects. However, they need not be well established, but could be construed from scratch. Furthermore, concepts may stand in a subconcept relation (as, e.g., a gentleman wearing blue clothes is a gentleman), but not necessarily in a taxonomic relation (it is not a subspecies of gentleman). Something like this distinction was developed by Pelletier and Schubert (1989, 382), who assumed both 'conventional' kinds (our kinds) and 'formal' kinds (our concepts). To keep our terminology constant, we will use 'kind' as usual in the restricted sense (referring to conventional kinds), but we will assume that kinds form a subset of the more comprehensive sets of concepts. Let **KIND** be the set of kinds and **CONCEPT** the set of concepts; then we have **KIND** $\subseteq$ **CONCEPT**.



We can handle cases like (7a) by assuming that an adnominal modifier, like *lǎo* 'old', can be combined not only with a nominal predicate, but also with the name of a concept, like *xíong*, which yields another concept, like *lǎo xíong* 'old bear', which in turn can be part of a classifier expression, like *sān zhī lǎo xíong* 'three old bears'. In this case, the first concept, but not the second one, is a kind.

How should we integrate the relations **R** and **T** into this enlarged framework? First of all, we need a relation which connects an object with a concept. This relation can be thought of as a generalization of **R**. So let us redefine **R** as a relation between objects and concepts in general: For every possible world i, $\mathbf{R}_i \subseteq \mathbf{OBJECT} \times \mathbf{CONCEPT}$, where **OBJECT** is the set of objects. Second, assume a relation **S**, the *subconcept relation*. It is a two-place relation-in-intension between concepts: for each possible world i, $\mathbf{S}_i \subseteq \mathbf{CONCEPT} \times \mathbf{CONCEPT}$. The relations **R** und **S** are related insofar as every object which belongs to a concept belongs to its superconcepts as well; for example, every old bear is a bear. Therefore we should assume, as a general rule, $\mathbf{R}_i(x,y)$ & $\mathbf{S}_i(y,z) \rightarrow \mathbf{R}_i(x,z)$. Finally, we can think of our taxonomic relation **T** as being the subconcept relation **S** restricted to **KIND**, that is, $\mathbf{T}_i(x,y) \leftrightarrow x \in \mathbf{KIND}$ & $\mathbf{S}_i(x,y)$. For example, the grizzly is a taxonomic subspecies of the bear because it is a subconcept of it and because both the grizzly and the bear are kinds.

We also have to integrate the sum operation $\oplus$ and the operations **OU** and **KU** into this framework. As for the sum operation, we assume that $\oplus$ is a join operation in **OBJECT, KIND,** and **CONCEPT;** that is, $\langle\mathbf{OBJECT},\oplus\rangle$, $\langle\mathbf{KIND},\oplus\rangle$, and $\langle\mathbf{CONCEPT},\oplus\rangle$ each are join semilattices (cf. Link 1983). Now, we can assume that **R** is closed under sum formation for kinds; that is: $y \in \mathbf{KIND}$ & $\mathbf{R}_i(x,y)$ & $\mathbf{R}_i(x',y) \rightarrow \mathbf{R}_i(x \oplus x',y)$. For example, if Yogi and Petz are realizations of **Ursus**, then so is their sum. This is not true for concepts in general; for example, it does not hold for the concept **three bears,** as the sum of two objects which are three bears normally are not three bears. Similarly, we can assume that **T** is closed under sum formation; that is: $\mathbf{T}_i(x,y)$ & $\mathbf{T}_i(x',y) \rightarrow \mathbf{T}_i(x \oplus x',y)$. For example, if the grizzly and the polar bear stand in the subspecies relation to *Ursus*, then the sum of the grizzly and the polar bear stand in the subspecies relation to *Ursus* as well. Furthermore, we can assume that **R** and **S** (and hence, **T**) are even more tightly related to $\oplus$ by claiming: $\mathbf{R}_i(x,y)$ & $\mathbf{R}_i(x',y') \rightarrow \mathbf{R}_i(x \oplus x',y \oplus y')$ and similarly: $\mathbf{S}_i(x,y)$ & $\mathbf{S}_i(x',y') \rightarrow \mathbf{S}_i(x \oplus x', y \oplus y')$. For example, if Simba realizes **Leo** and Yogi realizes **Ursus,** then Simba and Yogi together realize **Leo** and **Ursus** together.

The operator **OU** can also be integrated into the new framework. We have defined **OU** as a function which, relative to a kind, maps an object to a number. However, if we want to stick to our reconstruction of classifier constructions in Chinese and bear in mind that a classifier phrase can be applied to a non-kind concept like **old bear,** we have to assume that **OU** must be specified relative to concepts. Technically, it should be a function from **CONCEPT** to functions from **OBJECT** to numbers. As the object units stay the same with subconcepts (e.g., three old bears are three bears), we should assume that **OU** does not change for subconcepts: $\mathbf{OU}_i(x)(y) = n \;\&\; \mathbf{S}_i(z,x) \rightarrow \mathbf{OU}_i(z)(y) = n$.

To handle adnominal modifications like the modification of the kind-denoting *xíong* by the adjective *lǎo,* we have to introduce an operator which yields, for a given predicate, the concept whose realizations are the entities to which the predicate applies. Let us call this operator $\sigma$, following Parsons (1970). It is defined as follows: If P is a property of objects, then $\sigma(P)$ refers to that concept which has the objects in the extension of P as its realizations. That is, $\sigma(P) = \iota y \forall i \forall x[\mathbf{RT}_i(x,y) \leftrightarrow P_i(x)]$. I assume that concepts are as fine-grained as object properties; that is, for each pair of object properties P,Q, if $P \neq Q$, then $\sigma(P) \neq \sigma(Q)$. To avoid running into Russell's paradox, I simply restrict this condition to properties that apply to objects. There are more general and perhaps adequate solutions to this problem (cf., e.g., Turner 1983).

An adjective like *lǎo,* as a concept modifier, can now be interpreted as $\lambda y.\sigma(\lambda i \lambda x[\mathbf{old.for}_i(x,y) \;\&\; \mathbf{RT}_i(x,y)])$, where $\mathbf{old.for}_i(x,y)$ says that the object x is old for, or with respect to, the concept y in world i (that is, compared to other objects in that concept). Let us write for '$\sigma(\lambda i \lambda x[\mathbf{old.for}_i(x,y) \;\&\; \mathbf{RT}_i(x,y))$' simply '$\mathbf{old}(y)$'. Let us assume, as a syntactic rule, $N \rightarrow AP\ N$, where AP is the category of adjective phrases. The corresponding semantic rule is functional application, $[\![ [_N[_{AP}\alpha][_N\beta]] ]\!] = [\![ [_{AP}\alpha] ]\!]([\![ [_N\beta] ]\!])$. As an example derivation, consider the following:

(8) $[_{MP}$ sān zhī$]$, $\lambda y \lambda i \lambda x \mathbf{RT}_i(x,y) \;\&\; \mathbf{OU}_i(y)(x) = \mathbf{3}]$

$[_N$ xíong$]$, **Ursus**

$[_{AP}$ lǎo$]$, **old**

$[_N$ lǎo xíong$]$, **old(Ursus)**

$[_{NP}$ sān zhī lǎo xíong$]$,
$\lambda i \lambda x[\mathbf{RT}_i(x,\mathbf{old(Ursus)}) \;\&\; \mathbf{OU}_i(\mathbf{old(Ursus)})(x) = \mathbf{3}]$

This semantic representation can be clarified a bit. We know that **old(Ursus)** is a subconcept of **Ursus,** which again is a subconcept of **Animal,** and as $\mathbf{OU}_i$



is closed under subconcepts, it follows that $\mathbf{OU}_i(\mathbf{old(Ursus)}) = \mathbf{OU}_i(\mathbf{Animal})$. This gives us the translation $\lambda i \lambda x[\mathbf{RT}_i(x,\mathbf{old(Ursus)}) \;\&\; \mathbf{OU}_i(\mathbf{Ursus})(x) = \mathbf{3}]$. Furthermore, the relation **RT** is distributive and $\mathbf{OU}_i(\mathbf{Animal})$ is additive, that is, $\mathbf{OU}_i(\mathbf{Animal})(x) = \mathbf{3}$ means that x is the sum of three mutually distinct objects $x_1$, $x_2$, $x_3$, for each of which holds $\mathbf{OU}_i(\mathbf{Animal})(xi) = \mathbf{1}$. Hence we can represent (8) as follows:

(9) $\lambda i \lambda x \exists x_1,x_2,x_3[x = x_1 \oplus x_2 \oplus x_3 \;\&\; x_1 \neq x_2 \;\&\; x_2 \neq x_3 \;\&\; x_1 \neq x_3 \;\&$
$\mathbf{RT}_i(x_1,\mathbf{old(Ursus)}) \;\&\; \mathbf{OU}_i(\mathbf{Animal})(x_1) = 1 \;\&$
$\mathbf{RT}_i(x_2,\mathbf{old(Ursus)}) \;\&\; \mathbf{OU}_i(\mathbf{Animal})(x_2) = 1 \;\&$
$\mathbf{RT}_i(x_3,\mathbf{old(Ursus)}) \;\&\; \mathbf{OU}_i(\mathbf{Animal})(x_3) = 1]$

This is an example for a case with a narrow-scope adnominal modifier. Wide-scope adnominal modifiers, such as in (7b), can be treated as property modifiers. One possible analysis is the following:

(10) $[_{NP}$ sān zhī xíong$]$, $\lambda i \lambda x[\mathbf{RT}_i(x,\mathbf{Ursus}) \;\&\; \mathbf{OU}_i(\mathbf{Ursus})(x) = \mathbf{3}]$

$[_{AP}$ lǎo$]$, $\lambda P \lambda i \lambda x[P_i(x) \;\&\; \mathbf{old.for}_i(\sigma(P),x)]$

$[_{NP}$ lǎo sān zhī xíong$]$,
$\lambda i \lambda x[\mathbf{RT}_i(x,\mathbf{Ursus})\ \mathbf{OU}_i(\mathbf{Ursus})(x) = \mathbf{3} \;\&$
$\mathbf{old.for}(\sigma(\lambda i \lambda x[\mathbf{RT}_i(x,\mathbf{Ursus}) \;\&\; \mathbf{OU}_i(\mathbf{Ursus})(x) = \mathbf{3}]),x)]$

The resulting property applies to objects that consist of three bears and that are old for the concept **three.bears**. As above, we assume that adjective denotations like **old.for** are distributive. Furthermore, it seems plausible that the change from the concept **Ursus** to the concept **three.bears** in the first argument does not matter: if an object is old as a bear, then it should be old for three bears as well. Thus we would get the same meaning as under (8).

This does not explain the 'descriptive' vs. 'restrictive' distinction observed above. I think that this distinction can only be captured in a semantic model of dynamic interpretation. In the descriptive case, we can assume that the context already provides some concept, and that the nominal modifier just gives additional information about it. In this case, then, the head noun cannot be taken as the name of the kind, but refers to some subconcept. Only in the restrictive case do we construct a new property. I will not work out a formal analysis for this distinction here, but note that the analysis given so far seems promising in one point: It is well known that proper names can only have descriptive relative clauses (e.g., *Xiaoxiao, who is, by the way, only three years old, . . .*). Now, we did analyze the head noun of the classifier construction as the name of a kind, and hence we should expect that an attribute is interpreted as descriptive in case it applies directly to the head noun.

### 11.3. THE ENGLISH CASE

We have to distinguish between two kinds of common nouns in English: *mass nouns* and *count nouns*. Mass nouns are quite similar to Chinese nouns: they can occur (a) as names of kinds, (b) as indefinite predicates, and (c) in measure constructions. Furthermore, we have (d) taxonomic classifiers, and with a few mass nouns, like *cattle*, we also have (e) object classifiers:

(11) a. Wine contains alcohol.
b. Wine was spilled over the table.
c. Mary bought three bottles of wine.
d. John knows three sorts of wine.
e. The farmer owns thirty heads of cattle.

Mass nouns and mass noun constructions in English can be treated exactly like nouns in Chinese. Count nouns, however, are different. They do not need a classifier, but rather combine directly with a numeral. This difference can be captured in two ways—by assuming that either English numerals or English count nouns have a "built-in" classifier. So, a Chinese NP like *sān zhī xíong* and an English NP like *three bears* actually can mean the same—they rely on different syntactic means to arrive at the same semantic end (see also Sharvy 1978). However, there is at least one difference: whereas *sān zhī xíong* can only apply to collections of three individual bears, *three bears* can also apply to bear species, as in *sān zhǒng xīong*. That is, the measure function in numerals or count nouns is underspecified; it can be either **OU** or **KU**, object unit or kind unit. Let us therefore introduce an operator **OKU** ('object or kind unit'), which is defined as $\mathbf{OKU}_i(x)(y)=n \leftrightarrow \mathbf{OU}_i(x)(y)=n \vee \mathbf{KU}_i(x)(y)=n$. If we assume that the classifier is built into the number word, then we can derive the meaning of *three bears* as follows, using a syntactic rule NP $\rightarrow$ Num CN with the interpretation $[\![[_{NP}\,[_{Num}\alpha][_{CN}\beta]]]\!] = [\![[_{Num}\alpha]]\!]([\![[_{CN}\beta]]\!])$. We get derivations of the following kind:

(12) $[_{CN}$ bear], **Ursus**

$[_{Num}$ three], $\lambda y\lambda i\lambda x[\mathbf{RT}_i(x,y)\ \&\ \mathbf{OKU}_i(y)(x)=\mathbf{3}]$

$[_{NP}$ three bears], $\lambda i\lambda x[\mathbf{RT}_i(x,\mathbf{Ursus})\ \&\ \mathbf{OKU}_i(\mathbf{Ursus})(x)=\mathbf{3}]$



If, alternatively, we assume that the classifier is built into the noun *bears*, then the kind name *bear* is first transformed to a count noun *bear(s)* by a null operator. This count noun is relational, as it has a number argument; in the case of *bear(s)*, we have $\lambda n\lambda i\lambda x[\mathbf{RT}_i(x,\mathbf{Ursus})\ \&\ \mathbf{OKU}(\mathbf{Ursus})(x)=n]$. The number argument is saturated by the number word, here *three*, which has a simple interpretation, in our case **3**. It suffices to assume one syntactic category of nouns, N, for both mass nouns and count nouns, and a rule NP $\rightarrow$ Num N, with the semantics $[\![[_{NP}\,[_{Num}\alpha][_{N}\beta]]]\!] = [\![[_{N}\beta]]\!]([\![[_{Num}\alpha]]\!])$. This rule is prevented from applying to mass nouns, as their interpretation is not relational and cannot be applied to numbers. In this way we can encode in the semantic representation that only a specific class of nouns, the count nouns, can be combined with a numeral.

(13) $[_{N}$ bear], **Ursus**

$\phi$, $\lambda y\lambda n\lambda i\lambda x[\mathbf{RT}_i(x,y)\ \&\ \mathbf{OKU}_i(y)(x)=n]$ (count operator)

$[_{N}$ bear], $\lambda n\lambda i\lambda x[\mathbf{RT}_i(x,\mathbf{Ursus})\ \&\ \mathbf{OKU}_i(\mathbf{Ursus})(x)=n]$

$[_{Num}$ three], **3**

$[_{NP}$ three bears], $\lambda i\lambda x[\mathbf{RT}_i(x,\mathbf{Ursus})\ \&\ \mathbf{OKU}_i(\mathbf{Ursus})(x)=\mathbf{3}]$

Before I evaluate these two analyses, I want to make two comments which apply to both of them. First, the number of the noun changes in our representations from singular to plural without any change in the semantic representation. I think this is as it should be, as the selection of singular or plural forms seems to be a purely syntactic matter. In English, we have plural forms in cases which lack any semantic plurality (viz. *0 bears* or *1.0 bears*). And in many languages which have a singular/plural distinction, the singular is used with any number, for example in Turkish (viz. *üç elma* lit. 'three apple' = 'three apples' vs. **üç elmalar* 'three apple.PLURAL').

Second, the construction of **OKU** implies that *three bears* can be applied to entities consisting either of three object bears or of three bear species, but not to a complex object containing kinds and objects. This is adequate, as it would be rather strange to call the collection of the grizzly, the polar bear, and the bear Albert in the Edmonton zoo *three bears*.

Now let us discuss our two proposals. The second one, which works with relational count nouns, seems to be preferable at first sight, as we could derive a semantic notion of a count noun and have a simpler syntax (cf. Haider 1988).

However, there are problems with it. One is that many nouns can be used either as count nouns or mass nouns; it might be that this is even true for every noun (see, e.g., Ware 1975, Pelletier & Schubert 1989). So a sharp semantic distinction seems to be less preferable than a syntactic distinction that could be overridden by the syntactic context. Furthermore, if we want to transfer the treatment of adjectives as developed above for the Chinese case to the English case, so that the adjective may modify the kind name directly, we would have to assume for cases like *three old bears* that *old* is first applied to the kind name *bear*, and only then the count operator is applied to *old bear* to change it into a count noun. This would be a strange analysis insofar as the syntactic rule (combination of *old* with *bear*) would have scope over a lexical rule (application of the count operator). Finally, the analysis does not spare us a syntactic distinction between mass nouns and count nouns after all. One of the differences between mass nouns like *wine* and count nouns like *bear* is that the former can be used as names of kinds right away, whereas the latter need a definite article or pluralization to perform this task. The only reason for these operations seems to be syntactic: singular count nouns cannot be used as noun phrases. So we need to distinguish between mass nouns and count nouns anyway. While these are no knockdown arguments, they make the first analysis more plausible, and it is the analysis I will assume in what follows.

Let us now come to the rules for kind-referring NPs in English. A mass noun N can be used as a kind-referring NP directly via the rule NP $\rightarrow$ N, with $[\![ [_{NP}\ [_{N}\alpha]] ]\!] = [\![ [_{N}\alpha] ]\!]$. This is similar to the Chinese case. There is no such rule for count nouns. However, we have a rule NP $\rightarrow$ Det CN, with $[\![ [_{NP}\ [_{Det}\alpha][_{CN}\beta]] ]\!] = [\![ [_{Det}\alpha] ]\!]([\![ [_{CN}\beta] ]\!])$. We simply have to assume that the definite determiner *the* can be interpreted as the identity function $\lambda x.x$ if applied to a name (something we would need to do anyway for cases like *the Sudan*). Then we get, for the NP *the bear*, the meaning **Ursus:**

(14) $[_{CN}$ bear], **Ursus**

$[_{Det}$ the], $\lambda x.x$

$[_{NP}$ the bear], **Ursus**

The other way to arrive at a kind-referring noun is to transfer a singular count noun CN to a plural form CNp; as we can assume a syntactic rule NP $\rightarrow$ CNp which allows for bare plurals. We have seen that the most natural interpretation of a bare plural is the indefinite one—for example, bare plurals in nontopic positions tend to have this interpretation (see chapter 1, section 1.3.2). Therefore we should assume that the semantics of the rule NP $\rightarrow$ CNp yields a predicate. It can be seen as a special case of the rule NP $\rightarrow$ Num CN, where the actual number remains unspecified. One option is the interpretation rule $[\![ [_{NP}\ [_{CNp}\alpha]] ]\!] = \lambda x \exists n[\mathbf{RT}(x,[\![ [_{CNp}\alpha] ]\!]) \ \&\ \mathbf{OKU}([\![ [_{CNp}\alpha] ]\!])(x) = n]$, where we assume that a plural CNp is interpreted as a kind, just like the corresponding singular CN. One example derivation is given below; we get a predicate which applies to objects which realize the kind **Ursus** and which are any number of object units of **Ursus** (we tacitly assume n > 0).

(15) $[_{CNp}$ bears], **Ursus**

$[_{NP}$ bears], $\lambda i \lambda x \exists n[\mathbf{RT}_i(x,\mathbf{Ursus}) \ \&\ \mathbf{OKU}_i(\mathbf{Ursus})(x) = n]$

How can we derive the kind-referring interpretation from that? First of all, we note that our category NP is not necessarily maximal, as we have cases like *the bears* or *those three bears*, where the NPs *bears* or *three bears* are combined with additional determiners. There are different ways to treat this—for example, we could follow Abney (1987) and Haider (1988) and introduce a determiner phrase DP which governs an NP. Here, we just assume that rules like NP $\rightarrow$ DET NP are possible, where the embedded NP is indefinite and the embedding NP is definite. Then it becomes plausible to derive the kind-referring interpretation of an NP like *bears* by a syntactic rule like NP $\rightarrow$ NP and the corresponding semantic rule $[\![ [_{NP}\ [_{NP}\alpha]] ]\!] = \sigma([\![ [_{NP}\alpha] ]\!])$. We get derivations like the following:

(16) $[_{NP}$bears], $\lambda i \lambda x \exists n[\mathbf{RT}_i(x,\mathbf{Ursus}) \ \&\ \mathbf{OKU}_i(\mathbf{Ursus})(x) = n]$

$[_{NP}$bears], $\sigma(\lambda i \lambda x \exists n[\mathbf{RT}_i(x,\mathbf{Ursus}) \ \&\ \mathbf{OKU}_i(\mathbf{Ursus})(x) = n])$

$= \iota y \forall i \forall x[\exists n[\mathbf{RT}_i(x,\mathbf{Ursus}) \ \&\ \mathbf{OKU}_i(\mathbf{Ursus})(x) = n] \leftrightarrow \mathbf{RT}_i(x,y)]$

This concept should be identical to the kind **Ursus,** as any realization of **Ursus** will be in the extension of the predicate, and vice versa. Therefore the noun phrase *bears* may also refer to the kind **Ursus**. Note that the $\sigma$-operator may be applied to other predicates as well, for example to *three bears*, which I have rendered as $\lambda x[\mathbf{Rx}_i(x,\mathbf{Ursus}) \ \&\ \mathbf{OKU}_i(\mathbf{Ursus})(x) = 3]$. In this case, however, $\sigma(\lambda i \lambda x[\mathbf{RT}_i(x,\mathbf{Ursus}) \ \&\ \mathbf{OKU}_i(\mathbf{Ursus})(x) = 3]$ yields a concept which is not a kind. In the case at hand, this can be proved, as **R** is not closed under sum formation for this concept: If x and y are three bears, then their sum isn't three bears anymore. Thus, only those predicates which really correspond to a kind can be mapped to a kind by $\sigma$.

For adjectives, finally, we can assume that they can be combined either with N or with CN and CNp, that is, we have the rules N $\rightarrow$ AP N, CN $\rightarrow$ AP CN, and CNp $\rightarrow$ AP CNp. The interpretation is similar to the Chinese case.

## 11.4. KUNG-SUN LUNG'S PARADOX

Let us end this short comparison of common nouns in Chinese and in English with a remark on the famous paradox of the ancient Chinese logician Kung-sun Lung, who stated that the (Classical Chinese) sentence in (17) can be asserted—that is, it has a noncontradictory and even true reading, to the puzzlement of many interpreters (cf. Hansen 1983 for a discussion).

(17) pai ma fei ma
white horse not horse
'white horse is-not horse'

The theory of common nouns developed in this chapter, together with the genericity theory sketched in chapter 1, predicts that this sentence indeed has a noncontradictory and true reading, in addition to a contradictory one. We get the noncontradictory reading by the assumption that *pai ma* and *ma* can be taken as referring to concepts, and by taking *fei* as a negation of the relation **IS** (cf. section 1.3.5), which is reduced to simple identity if both arguments are kinds (cf. (17′a) below). This reading can be rendered as 'The (kind of the) white horse is not the (the kind of the) horse', which is of course true, for not every horse is necessarily white. By contrast, under the assumption that *pai ma* and *ma* are indefinite NPs and the sentence is a negated generic sentence, we get the contradictory reading, as every object which is a white horse will be an object that is a horse, given that *pai* is an intersective adjective (cf. (17′b)). This reading can be rendered as 'A white horse is not a horse'. I give the analysis with a narrow-scope negation; the wide-scope negation would yield an equally contradictory result. The **GEN**-operator is interpreted as a modal quantifier in this setting that binds the possible world variable i.

(17′) a. $\neg\,[\mathbf{IS}_i(\mathbf{white}(\mathbf{Caballus}),\mathbf{Caballus})]$
$= \sigma(\lambda i \lambda x[\mathbf{white}_i(x)\ \&\ \mathbf{RT}_i(x,\mathbf{Caballus})]) \neq \mathbf{Caballus}$
b. $\mathbf{GEN}[i,x;](\mathbf{IS}_i(x,\mathbf{white}(\mathbf{Caballus}));\ \neg\mathbf{IS}_i(x,\mathbf{Caballus}))$
$= \mathbf{GEN}[i,x;](\mathbf{RT}_i(x,\mathbf{white}(\mathbf{Caballus}));\ \neg\,\mathbf{RT}_i(x,\mathbf{Caballus}))$
$= \mathbf{GEN}[i,x;](\mathbf{white}_i(x)\ \&\ \mathbf{RT}_i(x,\mathbf{Caballus});\ \neg\mathbf{RT}_i(x,\mathbf{Caballus}))$

Thus it is essentially the lack of a clear distinction between kind-referring uses and predicative uses in Chinese that creates this paradox.



I have argued that in English, mass nouns show a similar nondistinctiveness between the kind-referring and the predicative reading as in Chinese. Consequently, we can capture Kung-sun Lung's paradox in English using mass nouns in examples like *White wine is not wine*, which arguably has both a contradictory and a noncontradictory reading.

This concludes our short discussion of two grammars—Chinese and English—which handle the basic noun phrase structure quite differently.