

ON THE SEMANTIC CONTENT OF NOUN PHRASES

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This paper defines a selective set of semantic notions of noun phrases and explores their lexical realisation in Mandarin Chinese. A metalanguage \mathcal{L} is constructed to facilitate the definitions. The novel aspect of \mathcal{L} is the incorporation into the set of model-theoretic concepts two pragmatic notions, *speaker's ground* and *common ground*, formalised in terms of the modal operators \diamond_{gs} and \diamond_{cs} , along with the pragmatic functor f . \mathcal{L} makes it possible for noun phrases to be defined in a unitary way, taking into consideration both the truth-theoretic and the pragmatic aspects of their semantic content. When the proposed definitions are applied to the study of Chinese noun phrases, it is argued that there is no particular definiteness/specificity constraint on subjects or BA objects in Chinese, contrary to the claims made in the current literature. It is also argued that, contrary to the observations made by Cheng & Huang (1996), both unselective binding and E-type pronoun readings are available for a pronoun in the consequent clause of a Chinese conditional, depending on the interpretation of the indefinite in the antecedent clause. Finally, a dynamic interpretation program in current frameworks of dynamic and procedural semantics is outlined as prospects for further investigation.

1. Semantic Typology of NPs and Their Definitions

In this section, we formulate a set of working definitions for the semantic notions of noun phrases. We will make use of an extended version of first-order logic, incorporating some basic concepts in model-theoretic semantics and cognition-oriented pragmatics. To avoid circularity, no definitions should contain notions that are yet to be defined.

1.1. The Metalanguage

We start by establishing the metalanguage of definition, which we call the language \mathcal{L} .¹

The Language \mathcal{L}

The Referential Properties of Noun Phrases

A. The Syntax of \mathcal{L}

A.1. Basic Expressions:

- A.1.1. Individual variables: x, y, x_1, x_2, \dots and individual constants: c_1, c_2, \dots ;
- A.1.2. One-place predicate variables: X, Y, X_1, X_2, \dots and one-place predicate constants: P_1, P_2, \dots ;
- A.1.3. Logical connectives $\rightarrow, \leftrightarrow, \wedge, \vee, \neg$, and quantifiers \forall and \exists ;
- A.1.4. The λ -operator and the equivalence sign $=$;
- A.1.5. The pragmatic functor f ;
- A.1.6. The modal operator \diamond , and the non-standard modal operators \diamond_{gs} , and \diamond_{gc} .

A.2. Composite Expressions:

- A.2.1. t is an individual term if it is either an individual variable or an individual constant;
- A.2.2. Γ is a one-place predicate if it is either a one-place predicate variable or a one-place predicate constant;
- A.2.3. $f(\Gamma)$ is an individual term if f is a pragmatic functor and Γ a one-place predicate;
- A.2.4. $\lambda\alpha\varphi$ is a λ -expression if α is a variable and φ is a formula containing at least one occurrence of α ;
- A.2.5. $\Gamma(t)$ is a wff. if t is an individual term and Γ is a one-place predicate;
- A.2.6. $t_1 = t_2$ is a wff. if both t_1 and t_2 are individual terms.
- A.2.7. If both φ and ψ are wffs., then $\varphi \rightarrow \psi, \varphi \leftrightarrow \psi, \varphi \wedge \psi, \varphi \vee \psi$, and $\neg\varphi$ are wffs;
- A.2.8. If x is an individual variable and φ is a formula containing at least one occurrence of x , then $\forall x\varphi, \exists x\varphi$ are wffs;
- A.2.9. If φ is a wff., then $\diamond\varphi, \diamond_{gs}\varphi$, and $\diamond_{gc}\varphi$ are wffs.

A.3. Conventions

- A.3.1. A.1.1. - A.1.4. are to be understood in standard ways, with each category being assigned a relevant type.
- A.3.2. The pragmatic functor f is of type $\langle\langle e, t \rangle, e\rangle$, being a mapping function from $\mathcal{P}(U)$ into U , i.e. from the power set constructed out of the subsets of the domain U of \mathcal{L} 's model into the domain U . Put in an informal way, f signifies a process by which the language user makes use of the set corresponding to N' (the denotation of the common noun) to single out some individual in the domain as the referent of the concerned NP.
- A.3.3. \diamond is to be understood in the standard way. \diamond_{gs} and \diamond_{gc} are to be defined in the

semantics of \mathcal{L} .

B. The Semantics of \mathcal{L}

- B.1. The model of the language \mathcal{L} is $M = \langle W, I, G, U, \langle, F \rangle$;
- B.1.1. W is a set of possible worlds;
- B.1.2. I is a set of instants ordered by the relation \langle .
- B.1.3. G is a set of background knowledge possessed by language users, in which the set of the knowledge of the speaker is G_s ($G_s \subseteq G$), that of the hearer is G_h ($G_h \subseteq G$), and the set of knowledge shared by the speaker and the hearer is G_c ($G_c = G_s \cap G_h$);
- B.1.4. U is the domain of entities;
- B.1.5. F is the value assignment function to the non-logical constants in \mathcal{L} . To the individual constants, F assigns entities in U as values. To the one-place predicate constants, F assigns subsets of U as values.
- B.1.6. In addition to M , there is the variable assignment function σ .
- B.2. A given expression Φ in \mathcal{L} is assigned a value by the semantics of \mathcal{L} with reference to the model M , some possible world w , some moment in time i , some background knowledge g , and some variable assignment function σ , written as $[\Phi]^{M, w, i, g, \sigma}$.
- B.2.1. If α is a variable, then $[\alpha]^{M, w, i, g, \sigma} = \sigma(\alpha)$;
- B.2.2. If α is a constant, then $[\alpha]^{M, w, i, g, \sigma} = F(\alpha)$;
- B.2.3. If f is a pragmatic functor and Γ a one-place predicate, then

$$[f(\Gamma)]^{M, w, i, g, \sigma} = [f]^{M, w, i, g, \sigma}([\Gamma]^{M, w, i, g, \sigma})$$
 Not defined, if Γ is the translation of the N in generic NPs;²

$$= \begin{cases} \text{Some entity in } U, \text{ otherwise.} \end{cases}$$
- B.2.4. If α is an individual variable and φ is a formula, then $[\lambda\alpha\varphi]^{M, w, i, g, \sigma}$ is a function h such that for any $u \in U$, $h(u) = [\varphi]^{M, w, i, g, \sigma[u/\alpha]}$;
- B.2.5. If α is a predicate variable and φ is a formula, then $[\lambda\alpha\varphi]^{M, w, i, g, \sigma}$ is a function h such that for any $A \subseteq U$, $h(A) = [\varphi]^{M, w, i, g, \sigma[A/\alpha]}$;
- B.2.6. If t is an individual term and Γ is a one-place predicate, then

$$[\Gamma(t)]^{M, w, i, g, \sigma} = 1 \text{ iff. } [t]^{M, w, i, g, \sigma} \in [\Gamma]^{M, w, i, g, \sigma};$$
- B.2.7. If both t_1 and t_2 are individual terms, then $[t_1 = t_2]^{M, w, i, g, \sigma} = 1$ iff

$$[t_1]^{M, w, i, g, \sigma}$$
 is identical to $[t_2]^{M, w, i, g, \sigma}$;
- B.2.8. If both φ and χ are wffs., then $[\neg\varphi]$, $[\varphi \rightarrow \chi]$, $[\varphi \leftrightarrow \chi]$, $[\varphi \wedge \chi]$, and

$[\varphi \vee \chi]$ are to be defined in standard ways.

B.2.9. If x is an individual variable and φ is a formula, then $[\forall x\varphi]$ and $[\exists x\varphi]$ are to be defined in standard ways.

B.2.10. If φ is a formula, then

$[\diamond\varphi]^{M, w, i, g, \sigma} = 1$ iff, there is some $w', w' \in W$, such that $[\varphi]^{M, w', i, g, \sigma} = 1$;

$[\diamond_{g_s}\varphi]^{M, w, i, g, \sigma} = 1$ iff, there is some $g_s, g_s \in G_s$, such that $[\varphi]^{M, w, i, g_s, \sigma} = 1$;

$[\diamond_{g_c}\varphi]^{M, w, i, g, \sigma} = 1$ iff, there is some $g_c, g_c \in G_c$, such that $[\varphi]^{M, w, i, g_c, \sigma} = 1$.

1.2. Notes on the Metalanguage

In this sub-section, we give the motivation for introducing some of the non-logical symbols in the language \mathcal{L} .

The language \mathcal{L} is a formal language incorporating pragmatic factors and specially designed modal operators. The design of the language adopts the multiple co-ordinate approach, making reference not only to possible worlds and time but also to the background knowledge of language users. It is therefore backed by an extended version of possible world semantics.

POSSIBLE WORLD is already a familiar concept in formal semantics. We want to make a further distinction here between the *ACTUAL WORLD* and other *POSSIBLE WORLDS*. The *ACTUAL WORLD* is the world that the communicators inhabit at the time of communication. *POSSIBLE WORLDS* are any extensional worlds that are likely to exist. The *ACTUAL WORLD* is just one of the *POSSIBLE WORLDS*, but drawing the distinction will do better work for our definitions. We can thus either refer to *POSSIBLE WORLDS* generally, i.e. w_p , or to the *ACTUAL WORLD* in particular, i.e. w_a . In the definitions provided in 1.4, whenever a formula is preceded by the modal operator \diamond , we are making reference to some possible world w_p . If no modal operators are introduced, we are simply making reference to the actual world w_a .

The concept of *GROUND*, together with its complementary concept *FIGURE*, has long been a basic and pervasive notion in the study of perception in contemporary experimental psychology (e.g. Roberts 1993: 21 and fn.14). *GROUND* refers to the physical surroundings against which *FIGURE* as an object is being perceived (Rubin 1915). When introduced into linguistic analyses, *FIGURE* and *GROUND* are typically employed in the study of deixis (e.g. Hanks 1992; Roberts 1986, 1993, 1996). With the development of more elaborate accounts of deixis, the two notions have transcended their physical descriptions and have been substantiated with abstract linguistic features. Now *GROUND* can also be some linguistically defined background system (context, discourse, or grammatical constructions) relative to which *FIGURE* as a referent is identified (e.g. Talmy 1978; Wallace 1982). *FIGURE-GROUND* accounts of both the information structures of syntactic

constructions and the cognitive processes in the interpretation of deictic terms inevitably lead to the treatment of *FIGURE* and *GROUND* at an even more figurative level, as mental constructs or mentally represented constructs that are not exact mirrors of their material counterparts, be it physical or grammatical.³ In the spirit of the cognitive theory of relevance (Sperber & Wilson 1986/1995), we can now re-define *GROUND* as any given set of assumptions that constitute a cognitive context at the introduction of a new expression or utterance, which constitutes the *FIGURE*. *SPEAKER'S GROUND* is the given set of assumptions entertained by the speaker. *HEARER'S GROUND* is the given set of assumptions entertained in the mind of the hearer. *COMMON GROUND* is that given set of assumptions entertained by both the speaker and the hearer and it should be mutually manifest to the communicators that the assumptions are being thus entertained.⁴ Such is the nature of human communication that it is not necessary for us to single out the *HEARER'S GROUND* as a viable notion. We simply cannot talk about G_h without talking about G_s as well. That is to say, it is enough for us to use only two notions: G_c and G_s . According to the metalanguage \mathcal{L} , whenever a formula (of definition to be given) is preceded by the modal operator \diamond_{gs} or \diamond_{gc} , we are making reference to some $g_s \in G_s$, or to some $g_c \in G_c$.

The metalanguage \mathcal{L} presented here aims at being relatively self-sufficient. Not all the notions in the language will have a role to play in the definitions to be presented in 1.4.

1.3. Further Justifications

It is by no means a common practice to introduce pragmatic notions as primitives into the language of definition in formal semantics. Truth-theoretical semantics in the Montagovian tradition is extension-oriented and does not address the issue of mental representations, which falls within the realm of pragmatics.⁵ The necessity of introducing pragmatic notions into semantic definitions is driven by the phenomena under consideration. The semantic content of noun phrases involves three aspects: ontological, epistemic, and manner of referring (Roberts 1993), making it impossible for us to use a purely logical language of description to capture all the array of interpretations. This is tantamount to saying that the semantic content of at least some noun phrases is not purely logical.⁶ In fact, ever since Hawkins (1978), it has been widely acknowledged that issues such as definiteness and indefiniteness call for the marriage of semantics with pragmatics. Recent studies in formal semantics have merged insights in both areas, but a systematic definition of types of noun phrases in an explicit metalanguage with semantic and pragmatic notions is not yet available. What follows in Section 1.4 is to be viewed as an initial attempt of proper definition.

1.4. The Definitions

We now define the semantic notions of NPs in terms of \mathcal{L} .

A. REFERENTIAL NP

$\lambda X \exists x [N'(x) \wedge X(x) \wedge f(N') = x]$.

[There exists an entity x such that x belongs to the set denoted by N' and x belongs to the set denoted by the VP X , and the language user makes use of the set denoted by N' when referring to this entity. That is, an NP is referential when the N in the NP has a referent in w_a , i.e. when the expression can be identified with an entity⁷ in the *ACTUAL WORLD*.⁸ No particular assumption is made of G .]

B. ATTRIBUTIVE NP

$\lambda X \exists x [N'(x) \wedge P_1(x) \wedge \dots \wedge P_n(x) \wedge X(x) \wedge \diamond[f(N') = x]]$.

[An attributive NP denotes a number of properties such that whichever entity that satisfies them can be identified with the N . But in some circumstances, there may not be any entity in w_a that can be identified in this way. In that case, the N remains to be a set which can be materialised in some w_p .]

C. GENERIC NP

$\lambda X [\forall x [N'(x) \rightarrow X(x)] \wedge \neg \exists y [f(N') = y]]$

[A generic NP denotes a natural property, and it is not the case that the language user can make use of the set denoted by N' to derive an entity from it. That is, generics denote properties and are not reducible to single entities. In addition to what is captured by the definition, a generic NP can allow exceptions, i.e. although it is possible to have a generic proposition such as *A man has two kidneys*, exceptions are allowed, e.g. *There is a man who has only one kidney*. This is equivalent to saying that generics are defeasible. These are indications of the non-logical aspects of generic NPs in natural language.]

D. ARBITRARY NP

$\lambda X [N'(x) \rightarrow [X(x) \wedge \diamond[f(N') = x]]]$.

[Given a set, we can derive an abstract individual x from it. The concept of arbitrary object is extensively discussed in Fine (1985), Meyer Viol (1995), and Jiang (1995). An arbitrary NP is an abstract individual representative of a set of individuals. It is not a generic NP because as an individual, it is not just a set of natural properties. It can be generalised from any group of individuals which does not have to be a well-defined set or a natural kind or genes. Crucially, it does not allow exceptions, i.e. it is non-defeasible. On the other hand, it is not a particular member of the set, not even a randomly picked-out one. For in that case, it would fail to be arbitrary. To quote an example from Fine (1985): you can talk about an arbitrary professor, but you can never have tea with him. Similarly, we can talk about an arbitrary triangle,

but we would not equate it to some actual triangle. In English, for example, an arbitrary NP can be realised in the form of *any N*, or *some N*, or *an N*. We want to indicate that sometimes, when using an arbitrary NP, even if the speaker is well aware of the individual members in the set and appears to be referring to a disjointed list of identifiable entities, s/he is nonetheless only concerned with an abstract individual, not a materialised one. An arbitrary NP is also different from a universally quantified NP in that the latter must exhaust all its members and is therefore conceptually plural, while the former is always singular in nature. Finally, an arbitrary NP is not the same as an attributive NP as the former presupposes the existence of a set of individuals while the latter only presupposes a set of properties. Although we simply use the free variable x to represent an arbitrary object, it is possible to revise the language \mathcal{L} so as to incorporate Fine's logical system containing arbitrary objects as an added type of individual terms.]

E. UNIQUE NP

$\lambda X[\exists x[N'(x) \wedge \forall y[N'(y) \leftrightarrow y = x] \wedge X(x)] \wedge \diamond[f(N') = x]]$.

[The first conjunct is the famous Russellian formulation of uniqueness (Russell 1905). The second conjunct tells us that uniqueness does not only apply to w_a . We can conceive equally well unique entities in w_p . Note the parallelism between our characterisation here and that of Chierchia (1995). Following Frege, Chierchia viewed *definites*⁹ as (partial) functions from properties into the unique object that satisfies them, if there is such an object. He then defined the concept with the ι -operator: $(\iota x\phi)^g = u$, where x is of type e and ϕ of type t and u is the unique object such that $(\phi)^{g[u/x]}$, else \perp . Chierchia's definition matches well with that of ours, except for the information conveyed by the ι -operator, which is a choice function. The major role of the ι -operator as a domain selector can be partially taken in our definition by adding other domain-restricting predicates as conjuncts of $X(x)$. The indexical function of the ι -operator is not our concern here.¹⁰]

F. SPECIFIC NP

$\lambda X[\exists x[N'(x) \wedge \forall y[N'(y) \leftrightarrow y = x] \wedge X(x)] \wedge \diamond_{g_s}[f(N') = x]]$.

[An NP with a specific reading denotes a singleton whose member is identified with the N with reference to some g_s . That is, such an NP describes the unique entity realised by the speaker. The notion of *specificity* is subject to many interpretations. Our definition here is based on the characterisation of Hawkins (1978), Cormack & Kempson (1991) and Roberts (1993) and is different from that of Fodor & Sag (1982), where a specific NP is simply equated to an existential NP with a wider scope over another operator.¹¹]

G. IDENTIFIABLE NP

$$\lambda X[\exists x[N'(x) \wedge \forall y[N'(y) \leftrightarrow y = x] \wedge X(x)] \wedge \diamond_{gc}[f(N') = x]]$$

[An NP denoting an identifiable entity denotes a singleton whose member is identified with the N with reference to some g_c . That is, such an NP describes the unique entity realised by both the speaker and the hearer.]

H. DEFINITENESS

[The notion of *definiteness* as a semantic notion has been used in different ways, sometimes equated to *uniqueness*, sometimes to *identifiability*, and sometimes mixed up with *specificity*, the last instance being prevalent in the literature of Chinese descriptive grammar. Hence the famous *definiteness effect* for Chinese subject NPs. Likewise, the notion of *indefiniteness* has been used in confusing ways, sometimes as a cover term of *specificity* and *non-specificity*, sometimes equated to *arbitrariness*, sometimes akin to *non-referentiality* (e.g. Lee (1986) for the last interpretation). To our understanding, *definiteness* and *indefiniteness* do not form a contrastive pair. Both are in fact cover terms, not primitive ones.]

At this stage, we are not ready to provide a characterisation of *deictic NPs* and *anaphoric NPs*. We suspect that some more technicalities are to be introduced into the metalanguage \mathcal{L} before such notions can be tackled. We are equally unprepared to provide detailed definitions for *plural NPs*.

There are some other notions that are purely logical, which can already be well defined in a logical language that do not make use of the notions such as G , W , and the related f . These include notions such as *existentiality*, which has been adequately defined in works such as Barwise & Cooper (1981) and Keenan (1987), *universality*, and *cardinality*.

In providing the definitions of noun phrases, we attempt to translate the natural language contents into their logical equivalents, which makes it possible to formulate a formal language system characterising the semantic properties of natural language. Every type of NP is translated into a λ -expression, which can be compositionally combined with the translated expressions of verb phrases to yield propositions, i.e. the logical representations of the meaning of natural language sentences.

2. Indefinite NPs in Chinese

In this section we show that indefinite NPs can have various readings which are related to the concepts discussed in the previous section. After giving examples for these readings, we argue that there is no particular constraint on subjects or BA objects in Chinese, contrary to the claims made in the current literature, and explain why they often

give the impression that they must be at least specific. We also argue that, contrary to the views of Cheng & Huang (1996), both unselective binding and E-type pronoun readings are available for a pronoun in the consequent clause of a Chinese conditional, depending on the interpretation of the indefinite NP in the antecedent clause.

2.1. Varieties of Readings

We start by looking at a selected set of examples, which are extracted from a corpus containing contemporary writings. Although *universal, existential and anaphoric* NPs are not defined in Section 1, relevant examples are presented nevertheless to give a complete picture.¹²

- (1) a. *Yi ge tonghang* bu mingbai wo weishenme duo
 one CL colleague not understand I why more
jia yi ge xingrongci “duo ci”, zhuiwen dao...
 add one CL adjective more time chase-ask say
 ‘One colleague did not understand why I added one more adjective
 “many times.” He further asked...’
- b. *Yi wei junyi* yong tuoba lai-hui ca
 one CL army-doctor use mop back-&-forth sweep
diban-shang-de xue, zhihou you jijin
 wooden-floor-on-DE blood, after against squeeze-in
yi ge suliaotong-li.
 one CL plastic-barrel-inside
 ‘One army doctor used a mop to sweep the blood on the wooden floor back
 and forth, and then squeezed it into a plastic barrel.’
- c. *Yi tiao long* zheng-zai tian-shang fei.
 one CL dragon right-at sky-on fly
 ‘A dragon is flying in the sky.’

The indefinite subjects in (1) (all in italics) are interpreted as specific, i.e., a specific individual possesses the property or performed the action specified in the verb phrase. A specific NP can be referential but need not be. Though the indefinites in (1a, b) are referential, as they denote an entity in the real or actual world, the one in (1c) is not referential, since the entity denoted by *long* ‘dragon’ does not exist in the real world.

- (2) a. Shuozhen de, *yi ge ren* duonian chongfu yi jian
 say real DE one CL man many-year repeat one CL
 shi, na-pa zhe jian shi ji fu meili,

matter even this CL matter extremely have charm
 zong rang ren qiaoqiao chansheng yi zhong
 always let people gradually grow one CL
 nifan xinli.
 defying mentality

‘Frankly speaking, if a man keeps on doing one thing for many years, even if it is extremely attractive, it will always make him develop an adverse feeling towards it.’

- b. *Yi ge dao*, suan-bu-suan ni-de jia?
 one CL island count-not-count you-DE home
 ‘Does an island count as your home?’

- c. An huangjin yu renminbi bijia, yi ge
 according-to gold to RENMINBI exchange-rate one CL
 zi de gaofei 6000 yuan, zhen
 character get author’s-remuneration yuan really
 ke wei yi zi zhi qian jin.
 can say one character worthy thousand gold

‘According to the exchange rate of gold to RENMINBI, given that one character gets 6,000 yuan, we can really say that one character is worth a thousand tales of gold.’

The indefinite subjects (italicized) in (2) have the *any* reading which corresponds to the *arbitrary NP* definition. By employing an arbitrary NP reading, we are talking about a typical abstract entity, not a specific one. For example, in (2b) *an island* does not refer to any specific entity, so any entity can fit the expression as long as it is an island.

- (3) Zhe liang ge xitong-de danke xingcheng jizhi
 this two CL system-DE eggshell formation mechanism
 you benzhi qubie. *Yi ge* yu niaolei danke-de
 have essential difference one CL with bird eggshell-DE
 xingcheng jiben xiangtong; *yi ge* ze yu niaolei
 formation basically identical one CL whereas with bird-kind
 he xiandai paxinglei-de dou bu xiangtong.
 and modern reptile-kind-DE all not identical.

‘The eggshell formations of these two systems have essential differences. One basically has the same eggshell formation mechanism as the bird whereas the other has different formation mechanism from both birds and modern reptiles.’

The indefinite subjects in (3) are anaphoric, i.e., they refer to an entity which has

been introduced into the discourse previously. In the second and third sentences of (3), *yi ge* ‘one’ refers to one of the two *systems* introduced in the previous sentence.

- (4) a. Yiqian *yi wei you da zhihui-de zhanglao* chu-le *yi*
 before one CL have big wisdom-DE elder set-ASP one
ge wenti, dao rujin hai mei jie chulai.
 CL question till now still not solve come-out
 ‘A long time ago, a Buddhist sage put forth a puzzle, which remains
 unsolved.’
 (ASP = aspect marker)
- b. *Yi liang jipu ya si shimin-de shi, zai*
 one CL jeep crushdead civilian-DE matter at
renmen xinshang tou-xia nongzhong-de yinying.
 people mind-on throw-down strong-DE shadow
 ‘The news that a jeep killed a civilian cast a dark shadow on people’s mind.’
- c. *Shenzhi chuxian-le yi ge ren yici rengou baiwan*
 even appear-ASP one CL person once buy 1-million
yuan yishang-de zuigao jilu.
 dollar up-DE highest record
 ‘It even broke the record that one person bought more than one million yuan
 [stock].’

Unlike (1), the indefinite subjects in (4) are existential in the sense that there is an individual who has the property specified in the verb phrase. The emphasis is not on a particular one or a typical one, but on the fact that there *exists* at least one. If there are two such instances, the assertion still holds. The indefinite NPs thus interpreted have similar meaning to the indefinite objects after the existential verb *you* ‘have’ in the *existential sentences* in Chinese.

- (5) a. *Cong falu shang jiang, yi ge zhongguo gongmin*
 from law on speak one CL Chinese citizen
cong yi chusheng jiu xiangyou gongminquan le.
 from once born then have citizenshipSFP.
 ‘According to the Law, a Chinese citizen, once born, will have the Chinese
 citizenship.’ (SFP = sentence final particle)
- b. *Yi ge ren you yi ge ren-de mingyun.*
 one CL person have one CL person-DE fate
 ‘A person has his/her own fate.’
- c. *An xiongyali youguan falu guiding, yi ge*

according-to Hungary relevant law stipulation one CL
youxian gongsi-de gudong zuiduo bu chaoguo shi
 limited company-DE stock-holder at-most not exceed ten
 ren.
 person
 ‘According to Hungarian Law, a limited company can have at most ten
 stock holders.’

The indefinite subjects in (5) have the universal reading, since they focus on each and every individual, not on a typical one or a specific one. So the quantification ranges over all the individuals denoted by the noun phrase.

- (6) a. *Yuan-li-de shushu a’yi kai hui qian*
 compound-inside-DE uncle aunts attend meeting before
zong yao chang “yi ge ren you dongmai
 always would sing one CL person have artery
jinmai...”
 vein...’
 ‘Uncles and aunts in the compound would sing before a meeting: a person
 has artery and vein...’
- b. *Yi ge ren you liang zhi shou.*
 one CL person have two CL hand
 ‘A person has two hands.’
- c. *Yi ge zhuozi you si tiao tui.*
 one CL table have four CL leg
 ‘A table has four legs.’

The indefinite subjects in (6) are generic. Our understanding about generic NPs is that they must be of a natural kind, and the property specified in the VP must be a natural property of the NP in question. Otherwise, it is not generic. Thus, a generic NP differs from an attributive NP in the sense that the latter only possesses some property, but the property is not necessarily the natural property of the NP.

- (7) a. *Yi ge jingu kexue ziyou de guojia yiding hui*
 one CL constrain science freedom DE country certainly will
 miwang.
 doom
 ‘A country that constrains the freedom of science is bound to be doomed.’
- b. *Yi ge jichu houshi, you zhengzai chong-zhen-xiong-feng*

- one CL base rich also right-at again-restore-ambition
de da chengshi *qushi shi gewai yinrenzhumu de.*
 DE big city indeed be extremely eye-catching SFP
 ‘A big city that has a resourceful foundation and is also restoring its strength
 is extremely eye-catching.’
- c. *Yi ge dai yanjing de ren sha-le Li Xiaojie.*
 one CL wear glass DE person kill-ASP Li Miss
 ‘A person wearing glasses killed Miss Li.’

The indefinite subjects in (7) can have an attributive reading, since they do not necessarily refer to an entity. It is also possible that they do not refer to any entities at all.¹³ That is, for sentences like (7c), there might be no murderer at all. For example, although people believe that Li Xiaojie is murdered, but the fact might be that she was killed by a truck accidentally, and thus the murderer does not exist. In this sense, an attributive NP is different from a generic NP, since the latter will always have a referent, the natural kind. Even if they both have a referent, a generic NP requires the property in question be a natural property of the NP, while an attributive NP does not enforce such a constraint, namely that any property is possible with an attributive NP.

Note that the elements modifying the head noun in the subject further restricts the membership qualification. The more the modification, the smaller the extension and the clearer the intension. That is, the number of entities that satisfy the description will be smaller in an attributive NP. Even though the set is getting smaller, it is not necessarily true that the noun phrase denotes a specific entity. This suggests that to say that with more modification an NP becomes more specific is not appropriate, since an NP with modification need not be specific at all. The correct assertion should be that the more the modification, the clearer the meaning. As an attributive NP may not always have an entity to refer to, it can simply describe a set of properties sometimes.

So far we have demonstrated, with examples (1)-(7), that an indefinite subject can be interpreted as *specific, referential, arbitrary, universal, existential, generic, anaphoric*, and/or *attributive*, respectively. This entails that there is no particular constraint on subjects in Chinese. In particular, the claim that subjects must be at least specific is not correct in Chinese. Therefore, our position is that indefinites simply introduce a variable, and their interpretation depends on the context they happen to be in, following the proposals made in Kamp (1981), Heim (1982), and Gabbay & Kempson (1992b).

From the sentences in (1)-(7), we also see that it is a very subtle matter for one to differentiate the readings an NP can have, and it is also possible that the same NP can have different readings, depending on the emphasis of the sentence and the intention of the speaker. The following sentences exemplify this point.

- (8) a. *Ruguo yi ge bu hui shuo zhongwen de ren*
 if one CL not know say Chinese DE person
pengdao ni, ni cai ta hui yong shenme yuyan
 meet you you guess he will use what language
gen ni shuohua.
 with you talk
 ‘If a person who does not speak Chinese meets you, guess what language s/he will use to talk to you.’
- b. *Ruguo yi ge you qian ren xiang quqin, ni*
 if one CL have money person want marry you
cai ta hui qu shenmeyang de ren.
 guess he will marry what-kind DE person
 ‘Guess it, if a rich person wants to get married, what kind of person would s/he like to marry?’

The indefinite subjects (italicized) in (8) can have three readings: *arbitrary*, *existential*, and *specific*, depending on where the stress is and the intention of the speaker. For example, if the speaker has someone in mind, then the subjects are to be interpreted as specific. If the stress is on the number, then we have the arbitrary reading, just like the indefinite subject in (9) below. Otherwise, the existential reading is intended.

- (9) *Yi ge ren ban bu dong, liang ge ren jiu keyi le.*
 one CL person lift not move two CL person then can SFP
 ‘One person cannot lift [it], but two can.’

Sentences (8) and (9) also suggest that *focus* plays a role in the interpretation of NPs. When focus is placed differently, the meaning of the sentence in question will also be different.

Similar arguments can be extended to the BA construction. We do not think that there is a specificity constraint on the BA object. It is perfectly possible to have a non-specific NP in the object position of BA, as shown below.

- (10) a. *Ba yi ge guanjian-de lingjian shang cuo le shi*
 BA one CL crucial-DE part put wrong ASP be
yi xiang zhongda de zeren shigu, suoyi ni yao
 one CL grave-DE duty accident so you must
feichang xiaoxin.
 very careful
 ‘Putting an essential part wrong is a severe accident, so you must be very careful.’

- b. Ruguo ba yi ge *guanjian-de* *lingjian* shang cuo
 if BA one CL crucial-DE part put wrong
 le, jiu che ta de zhi.
 ASP then remove he DE post
 ‘If one installs an essential part wrong, then s/he will be removed from his/her post.’

The indefinite NP objects in (10) can have either an existential or an arbitrary reading. Note that neither reading is specific; actually they are both non-specific. Sentences like (10) suggest that it is not correct to say that there is a specificity constraint on the BA objects in Chinese.

2.2. Why Indefinite Subjects Tend to Be Specific?

Then the question is why people have the impression that they are dealing with a specific reading when they encounter an indefinite functioning as the subject or the BA object. We think the reason is that most of the indefinite subjects that the informants have been consulted with are matrix subjects and the sentences in question often describe particular events. This means that it is most likely that we will have an existential or specific reading. Since all the event sentences are anchored to a particular time or location, the existential reading in such a case will be a specific reading, too. What we are saying is that an existential reading will become a specific reading if the indefinite subject appears in a situation which is anchored in time and/or location. Hence the impression that the indefinite subjects are specific, so are the BA objects.

2.3. Relevance to Unselective Binding and E-type Pronouns

Since an indefinite in a conditional sentence can have non-specific and non-existential readings, it is not appropriate to say that conditionals like (8) can only license *E-type pronouns* for the third person pronoun in the consequent clause but not *bound pronouns* (cf. Cheng and Huang 1996). It seems to be the case that when the indefinite is interpreted as arbitrary, we will have *unselective binding* reading for the third person pronoun (in italic) in the consequent clause, i.e., the pronoun is interpreted as bound by the same operator that binds its antecedent. Since the pronoun co-varies with the indefinite in arbitrary reading, it is very difficult to say that the pronoun is interpreted as an E-type pronoun.

Even the only unselective binding case identified in Cheng and Huang (1996) can have an E-type pronoun interpretation, as exemplified below: The first *shei* ‘who’ is existentially bound, so the second *shei* can only be an E-type pronoun.

- (11) a. Hai shuo zai zhengge XiangShan, zhao bu dao liang pian
 also say at whole find not out two CL
 wanquan xiangtong-de hongye, shei zhaodao-le, shei jiu
 exactly same-DE maple-leave who find-ASP who then
 shi zui xingfu-de ren.
 be most happy-DE man
 ‘[He] also said that at Mt. Xiang Shan, one cannot find two mapple leaves
 exactly the same. If anyone finds one [OR: If *there is anyone* who does find
 one], s/he will be the happiest person.’
- b. Renmen shuo shei ban-le cuoshi shei jiu de
 people say who do-ASP something-wrong who then must
- wei ziji de cuowu xingwei fuchu daijia.
 for self DE wrong behavior pay price
 ‘People say that, if anyone does something wrong [OR: if *there is someone*
 who does something wrong], then s/he must pay for it.’

Although the unselective binding reading in (11a), i.e., the first *shei* interpreted as an arbitrary NP, is prominent, it is not difficult to imagine a situation in which we can say that if there exists a person who finds it, s/he will be the luckiest person. In this case, the first *shei* will be bound by an existential operator, so the second one has to be interpreted as an E-type pronoun, which is not directly bound by an operator which directly binds the first *shei*, but is related to the variable introduced by the first *shei*. In this E-type interpretation, the second *shei* is interpreted as *the x (introduced by the first shei) that finds the two same maple leaves*. Actually, this is a sense very strong in our intuition. The second *shei* in sentences like (11) is highly dependent on the first one, i.e., it has a reading like the *x* that *P* (*P* is the property denoted by the verb phrase in the first clause). This is the E-type pronoun reading for the second *shei*. Hence we conclude that both E-type pronoun reading and unselective binding reading are possible with sentences like (8) and (11).

3. Prospects

Given the definitions of NPs and their distribution, we take a brief look at the extent to which NPs can be adequately interpreted in some current versions of dynamic semantics such as File Change Semantics (Heim 1982), Discourse Representation Theory (e.g. Kamp 1981, Kamp & Reyle 1993; FraCas 1994 - 96; Chierchia 1995), and Labelled Deductive Systems for Natural Language (Gabbay & Kempson 1992a, b; Jiang 1995; Kempson 1996). One approach is to project all NPs as metavariables,¹⁴ with their underdetermined lexical

forms providing some minimal information on their semantic content. The metavariables get themselves instantiated in the procedural process of semantic interpretation, which also takes account of syntactic distributions (as being reflected by the time a variable is introduced and the state of the “construction site” it is plugged into). The detailed treatments cannot be attempted here. Nevertheless, we can envisage the prospect of constructing a network of semantic indices and specify the ways for their introduction into the proposition under construction and the necessary conditions for a variable to be instantiated by a particular index. Certain clusters of indices will lead to particular semantic content of an NP as defined in Section 1. Certain combinations of indices are made to be impossible, as they will lead to contradictory properties, violating the definitions. Take, for example, a variable in the subject position in a Chinese sentence. It should be enriched into a generic NP if it is anchored to a generic event as specified by the form and content of the predicate. On the other hand, it can be instantiated as either specific or arbitrary if it is in a conditional clause. And it should be indexed as specific if the predicate is about accomplishment and/or related to some specific instants in time. This line of approach may be particularly promising for Chinese, in which types of NPs, like other categories, are seldom accompanied with distinct grammatical markers and the content of NPs are specified by consulting all the available information, grammatical or contextual. Much more work is needed before convincing results can be obtained.

Notes

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¹ For a general introduction to the logical and semantic underpinnings related to the technical terms used here, cf. Cann (1993), Chierchia & McConnell-Ginet (1990), Dowty et al. (1981), Jiang & Pan (fcmng), and Zou (1995).

² Cf. The definition of the generic NP in 1.3.

³ See Ungerer & Schmid (1996: Chapter Four) for an introduction to the notions of *figure* and *ground* and their applications and extensions in linguistics.

⁴ Cf. Sperber & Wilson (1986/95) for arguments in favour of the notion of *mutual manifestness* against the notion of *mutual knowledge*.

⁵ Cf. Kempson (1996) for a survey.

⁶ In the sense of Lappin (1995). In Barwise & Cooper (1981), it was pointed out that

even quantifiers are not necessarily logical symbols.

⁷ Note that to say that an expression can be identified to an entity in a world is not equivalent to saying that an expression denotes an identifiable entity. The latter makes claims on the state of the *COMMON GROUND*, as shown in later discussions.

⁸ A distinction is drawn in some works (e.g. Yule 1996) between a *referring expression* RE and the *referential use of a referring expression* (the latter abbreviated as *referential*). In Yule's system, not all REs have identifiable physical referents., but the referential use of an RE does. REs also include attributive uses which may not exist in the *ACTUAL WORLD*. In our system here, we make no use of the term *referring expressions* and our notion of *referentiality* is equivalent to the *referential use* of an RE in the sense of Yule (1996).

⁹ We found that *definites* are sometimes simply defined as *uniqueness* and sometimes as other types of NPs in the current literature.

¹⁰ It can thus be observed that the notion of *definites* as defined in Chierchia (1995) entails three other notions: uniqueness, attributiveness, and deixis.

¹¹ The semantic definition of $En|$ (1991) seems to us to be a definition of *identifiability*.

¹² The analysis presented here can be compared to some other detailed discussions, e.g. Chen (1991), Duanmu (1988), Sanui (1993), Xu (1995) and other papers included in this volume.

¹³ In Zhu (1987), it was observed that in Chinese riddles, the subjects are usually attributive.

¹⁴ Cf. Heim (1982), Gabbay & Kempson (1992b), Reinhart (1995), Winter (1995) and Jiang (1995) for linguistic treatments, and Leisenring (1969), Fine (1985), de Queiroz & Gabbay (1995) and Meyer Viol (1995) for logical investigations. The works in DRT also introduce NPs as some form of variables: *discourse referents*, to be later related to more specific content.

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