

MANDARIN CHINESE NP de:
A COMPARATIVE STUDY OF CURRENT GRAMMATICAL THEORIES

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To My Parents

獻
給
爸
媽

前言

本書的前身是筆者民國七十六年(一九八七)的康乃爾大學博士學位論文。全文完成於七十五年(一九八六)。由論文完成到修訂付梓的期間，筆者除曾在美短暫從事機器翻譯的研究外，由七十六年春起即在中央研究院歷史語言研究所服務。

側身於研究院的學術殿堂，除慶幸自己有濡沫前輩大師的機會，並竊喜能享受得天獨厚的研究環境外，更是兢兢業業，只怕自己不成熟的努力，達不到師友期望的標準。而今所裡的編輯委員會同意由歷史語言研究所出版我的第一本書，只能看成是前輩師長對後輩的厚愛。

本書除局部修訂外，大致保留我博士論文的形式，因此本書的完成仍要歸功於筆者在康乃爾大學的論文指導教授們，除了在英文致謝詞中提起外，我仍要在此特別感謝主要指導教授 Sally McConnel-Ginet 在學術上及在生活上的引導與啓迪；論文指導小組的其他成員中 Louis Mangione 教授亦師亦友，特別他是指導教授中唯一的漢語語法學者，費力最多。我從 Gennaro Chierchia 教授學習的時間雖然只有一年，論文語意方面受他的影響卻最大，在所謂「名物化」現象的處理上，基本上是遵循他的理論。

至於內容的修訂，要感謝歷史語言所提供的良好研究環境，更要感謝所長丁邦新老師及二組前後兩任主任，李壬癸先生及龔煌城先生促成我到所服務的機會。

這本專刊版和論文原文一項重要的分別在漢字拼音。本書採用教育部新近公布的國語注音符號第二式，而原稿採用國外語言學界通用的拼音系統。至於實質內容的修訂，特別要感謝專刊的審查人提供了詳盡切要的意見。另外，印地安納大學語言學會 (Indiana University Linguistics Club, IULC) 在一九八八年以 "Cliticization and Type-Lifting: A Unified Account of Mandarin NP de," 這個題目發行了筆者博士論文的前四章(引言到第三章)。印大語言學會的審查者針對這部份提出了中肯的改正意見。這些部份在本書中也採用了。因此筆者也要特別向這位審查者道謝。清華大學語言學研究所的研究生許玉玲，胡祖櫻，陳苑蓓都曾協助校稿；特別是陳苑蓓編成了索引，在此一併致謝。本書修改與完稿曾得國科會「中文語句剖析的語法模式」計劃(NSC 77-0408-E001-01)之部份補助。

由標題可看出本書起初的意圖甚遠大，然筆者志大才疏，處理的問題多有不夠周全之處。何況語法理論的演進，在這兩年內又有新的面貌。筆者這兩年內雖另有論文衍申或補正本書中的部份論題，但由於與全書結構不能配合，並未在修訂時納入。本書以這樣的面貌出現，最大的目的是盼望及時提供一些新的理論訊息。書中疏漏之處，筆者除自負文責之外，更以獻曝的心情，等待語言學界的先進大家指正。

黃居仁

于南港中央研究院

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To all the faculty members of the department of modern languages and linguistics at Cornell I want to express my gratitude to their teaching and support. Carol Rosen chaired the advisory committee during my first year of study. She piloted me through the first year as a graduate student in a foreign country and helped me set the course of my study. She also provided helpful comments on my later work. Linda Waugh taught me the basics of linguistics. John McCoy had been a helpful committee member for two years before his retirement from Cornell. For their comments, discussion, or teaching, I would also like to thank Nicholas Bodman, John Bowers, Jim Gair, Wayne Harbert, C.-T. James Huang, Barbara Lust, and Tsu-lin Mei, though they may not agree with me on all issues. C.-T. James Huang ought to be credited for renewing interests in Chinese linguistics in the field, and for proposing insightful solutions, which in turn, were stimuli to my study. Two outside faculty members who taught me different perspectives when they were visiting Cornell are Roger Higgins and Marie-Claude Paris.

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For introducing me to linguistics and thus influencing my decision to study it, I thank the professors who taught me linguistics in Taiwan. They are Heng-hsiung Jeng, Kuang Mei, and Pang-Hsin Ting.

I am grateful to the linguistics communities of Cornell and Stanford for providing nourishment for my development as a linguist. My special thanks belong to Yung-O Big, who generously shared her experience as a graduate student in Chinese linguistics at Cornell, to Ileana Comorovsky, who TAed my first syntax course and shared many viewpoints concerning general linguistics, to Akira Ishikawa, who provided most helpful discussion and assistance at Stanford, and to Chih-Chen Jane Tang, who carefully read and helpfully discussed the whole dissertation. I also want to express special thanks to the following people: Joel and Sarah Fagan, Cliff and Linda Flamm, Nyr Indictor, Christiane Laeuffer, Claire Lennon, Elizabeth Leung, Peggy and Stuart Milliken, Der-Hwa Rau, Veneeta Srivastav, Lily Su, Chao-fen Sun, and Jin-Yan Tiong. For those whose names I fail to mention, a reassuring fact is that the only reason why their names are left out is simply because there are too many people I am indebted to.

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None of the people mentioned is responsible for errors and mistakes in this dissertation. The responsibility is mine.

November 1988 POSTSCRIPT

It has been two years since I finished and submitted my Cornell dissertation in late 1986. The duration of two years is often enough to outdate linguistic theories, not to mention analyses of a particular language. In addition, previous insufficiencies have also been discovered. In this Institute of History and Philology Special Publication (IHPSP) Edition, however, I in essence adhered to the original format and analyses of my dissertation. There are three reasons to do so. First, I have come to believe, as observed by a reviewer of IULC, that the type of the issues I want to address in the latter part of this book are better dealt with in works of paper-length. Indeed I have written several papers dealing with the same set of data with sharper focus and with recent theoretical developments incorporated. Second, although my recent works mentioned above, namely Huang (1987), Huang (1988a) and Huang (1988b), are ostensibly based on the latter part of my dissertation, they have evolved to the extent that it will be difficult to incorporate them without alternating the structure and nature of the original work. Last, consideration of timely publication also prevents extensive re-writing.

The first four chapters of this book (Introduction through chapter 3), with a shortened introduction chapter and an added preface, are distributed by IULC under the title 'Cliticization and Type-Lifting: A Unified Account of Mandarin NP de.' In the preface, I suggested, citing Sheu (1987) and Sun (1988), that a typological study of cliticization in Sino-Tibetan languages should yield interesting theoretical implications. Textual alternations made in the IULC version are followed here. One thing worth mentioning is that this IHPSP edition differs from both the IULC edition and my original 1987 dissertation in that it adopts the Mandarin Phonetic Symbols II (MPS II) recently developed and officially adopted in R.O.C.

For the publication of this book, I am grateful to Dr. Pang-hsin Ting and the publication committee of the Institute of History and Philology. I thank the secretary of the committee, Dr. Yi-tien Hsing, for taking care of the details concerning reviewing and publication. The anonymous reviewers of IULC are acknowledged for making helpful comments and suggestions. I am indebted to a reviewer of the Institute of History and Philology Special Publications for painstakingly correcting all the typographic mistakes in my manuscript. I would also like to thank Professor T-C. Charles Tang for his comments. Contribution of the following people are acknowledged. Wan-Pei Chen, Zu-Ing Hu and Yu-Ling Shiu helped proofreading the first four chapters. In addition, Wan-Pei Chen compiled the index. The remaining errors are my own responsibility. Preparation of this publishable version was supported by the National Science Council of the R. O. C. (grant number NSC 77-0408-E0001-01).

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INTRODUCTION

I. A Chinese Perspective

Mandarin Chinese de is very likely the most often used and most versatile form in the language.¹ Dougherty (1964) records 3,013 occurrences of de in a scientific text of 85,785 morphemes, which comes to about 3.5% of the text.² Taking into consideration the fact that the size of the lexicon of Chinese is generally considered to be on the order of 10,000, the frequent use of de is certainly worth noting.

The pervasive usages of de seems persistent through the history of Mandarin Chinese. For instance, in Zu Tang Ji, the analects of Zen buddhist masters from the early tenth century and one of the earliest record of colloquial Chinese,³ the following

¹ Throughout this thesis, I will use the underlined form de both to refer to individual occurrences and as a generic name for all the different morphemes taking the same phonological form /de/. For the different types of de proposed in previous studies, I will introduce labels whenever necessary, usually when the proposed study is discussed. For example, de_a refers to the first group of des in Zhu (1961). For my own analysis, I will always use capital letters with mnemonic subscripts. For instance, DE_{CW} refers to the des as cliticized words. Explanatory notes will be given when confusion could occur.

² The topic of the text Dougherty (1964) examined is on biochemistry. One should be cautioned against taking this number as a general truth with regard to spoken Chinese since written scientific Chinese, as expected, uses a rather different style. According to a recent computational count based on 879,300 samples of newspapers and other comparatively more colloquial texts, reported in Seun (1986), de is the most frequently used word and accounts for 6.8965% of the words counted. Taking the methodology of both Dougherty (1964) and Seun (1986) into consideration, the latter should yield a more accurate result.

³ The preface of Zu Tang Ji is dated at 952 AD, and the book was compiled over a period before then.

uses of de are found.⁴ I will underline the relevant phrases where de occurs.⁵

(1) Relative Clauses

a. VP de NP(as a subject)

(1.156,14)⁶

你去東邊仔細看石頭上坐底僧

ni chiu dung bian tzishi kan shrtou shang tzuo de seng
you go east side carefully look stone up sit DE monk

'Go to the east and look carefully at the monk who sits on the rock.'

b. V de NP(as an object)

(4.059,11)

兼不是老僧說底事

jian bu shr lauseng shuo de shr
also NEG BE old-monk say DE event/matter

'Neither is it the thing that I (=the old monk) said.'

(2) Appositional Clauses

(3.072,07)

師與大王說古今

shr yu da wang shuo gu jin
master with great king say ancient contemporary

成人立德底事

cheng ren li de de shr
become human establish virtue DE event/matter

'The master told the great king stories of old and new about building characters and establishing virtues.'

⁴ I am using the version of Zu Tang Ji published by the Chinese Publishing Company in Japan in 1974. For concordance, I am using Yanagida (1980).

⁵ The Chinese writing system leads to a little complication in this case. The character used for the morpheme de in Zu Tang Ji was 底, different from the character 的 commonly used nowadays. They are phonologically similar. In addition, such evidence as the identical grammatical functions and the fact that 底 is still used as a variant of 的 by some speakers leads to the conclusion that they are the same morpheme. For this reason, example sentences from Zu Tang Ji will be given in characters first, followed by modern Mandarin pronunciations. Please also take note that the syntax of tenth century Chinese is different from modern Mandarin. I deliberately choose examples closer to Mandarin for easy explication.

⁶ The numbers in the parentheses stand for the (volume, page,line) numbers of the quotation in Zu Tang Ji.

(3) 'Headless Relative'

(2.137,06)

僧云即是人人盡有底

seng yun jishr ren-ren jin you de
monk say then-BE everybody all have DE

'The monk said that it is exactly what everyone has.'

(4) A Marker of an Adjective

(2.101,06)

大地面上炒炒底舖砂相似

dadi mian shang chauchau de pusa shiangsz
ground surface up fry-fry DE spread-sand similar

'(玩's) like the frying-hot sands on the ground.'

(5) A Marker of an Adverb

(4.136,09)

裴相公有一日微微底不安

Pei shianggung you yi r weiwei de buan
Pei gentleman have one day slightly DE NEG-ease

'One day, Gentleman Pei was slightly uneasy.'

(6) shr ... de Construction⁷

(5.056,12)

这箇是为大家底

jeige shr wei dajia de
this BE for all-people DE

'This IS FOR EVERYBODY.'

The citations in 1-6 show that de has long been used in many different constructions, including various relative clauses, NPs modified by adjectival phrases, adverbial phrases, and appositional clauses. One way to describe the versatility of de in both ancient Chinese and modern Mandarin is to assign different grammatical functions to the morpheme. Chao (1968), for example, lists some twenty-five uses of de. The simple morpheme de is often referred to with an atheoretical term 'particle,' such as in Chao (1968), Li and Thompson (1981), etc. It is also said to be a nominalizer in Paris (1979), a marker of NP modification in Ross (1983), a genitive case marker in Li and Thompson (1981), an appositional phrase marker in Li and Thompson (1981), an adverbial marker in Zhu (1961), a presuppositional particle in Chu (1983), a relative clause marker in Li and Thompson (1981), a complementizer in J. Huang (1982), a marker of past time in

⁷ This is a focus construction. I use capitalization to indicate focus.

Dragunov (1958), and a morpheme with null grammatical content inserted at PF in J. Huang (1982).⁸

From a historical point of view, a synchronic analysis which assigns many different functions to de invites important questions. Such an analysis basically allows de to be many ways ambiguous. It is known that modern de can be traced back to at least two sources in pre-Qin (ca. 200-1000 B.C.) Chinese.⁹ The two sources are [np X 者] and [np X 之 NP], two different morphemes with different phonological values and different written forms.¹⁰ It is known that the written language is often more conservative than the spoken language in the sense that written forms often survive phonological changes. English night/knight is a good example. Phonological changes make the pairs homophones, but the different written forms persist to indicate that they are two different morphemes. Given the prominent role and the nearly sacred status assigned to the written language in Chinese, it is very unlikely that the identical written form is adopted if the two uses belong to two different morphemes. Furthermore, comparing 1-6 with the modern Mandarin data which will be introduced in Chapter 1, it can be shown that all the major grammatical functions of de in Modern Mandarin emerged in Ancient Chinese more than one thousand years ago,¹¹ with several marked functions missing: including the possessive subject construction and the possessive object construction.¹² Again, if the different uses of de are treated as a group of homophones with different grammatical functions, it

⁸ To avoid possible confusion, I will refer to C.-T. James Huang as J. Huang and Chu-Ren Huang as C. Huang in bibliographic citations throughout this dissertation.

⁹ My attention was brought to this fact by notes from a lecture given by Tsu-lin Mei and in a conversation with Louis Mangione.

¹⁰ The modern Mandarin romanization (in MPS II) of the two characters are je and jr. Except in compounds and idioms, neither is now used in spoken Mandarin.

¹¹ I am adopting the convention of referring to the pre-Qin (before 200 B.C.) Chinese as Archaic Chinese and post-Qin classical Chinese (including the language of Zu Tang Ji) as Ancient Chinese. Another widely followed convention is to refer to them as Old Chinese and Middle Chinese respectively.

¹² There is also evidence showing that the grammatical functions of de did not change much in the period between the tenth century and now. The same range of uses was described in the study of Chinese by seventeenth and eighteenth century occidental grammarians. See Hermann (1982.ch.1) for details.

is very unlikely that historical changes not only did not disambiguate the language but also added further ambiguity to it. One would expect that the new functions are added because they match generalizations of the other uses of de. Thus, historical consideration suggests that there should be a general schema which accounts for at least most of the uses of de.

From a synchronic point of view, de is intriguing not only for its versatility. It is more intriguing in that despite the fact that native speakers' intuition suggests that de demonstrates one coherent phenomenon, various attempts to give a uniform account to de were not satisfactory. Several efforts to present a coherent formal analysis of de will be discussed in this dissertation. I will also show that with an independent cliticization module, a uniform morpho-syntactic account of des occurring in NPs can be given, and with Chierchia's (1984, 1985) IL* and Partee's (in preparation) type-shifting mechanisms presupposed, a uniform semantic account of the same des can be given. These results also have implications for how different components of a grammatical theory should be organized.

II. A Theoretical Perspective

The past ten years have been rather productive years for linguistics as far as new syntactic theories are concerned. Government and Binding theories (GB), Generalized Phrase Structure Grammar (GPSG), Lexical-Functional Grammar (LFG), and Relational Grammar (RG), among others, came to prominence within the last ten years and went through rather vigorous revisions and development in the past five years. The semantic theory drawn from Montague Grammar, originated a little earlier, has in the meantime become the standard of linguistic semantics. Along with the different theories, the field also produced a fair number of universals proposed in various frameworks. During this period of fast growth of linguistic theories, however, in-depth studies of specific languages seem to be lagging behind. This, I think, is partly due to the influence of the single-minded pursuit of universals within the dominant syntactic theory--GB. That is, natural language data are studied not to understand the language *per se*, but to illustrate a particular universal proposed. Fortunately, with universals in mind, linguists are no longer contented with studies of one favorite language, for instance, English. Unfortunately, since theoretical universals are the main concern, it is desirable to support one's claims with data from as many languages as possible, while it is deemed at best irrelevant to study other 'uninteresting' aspects of the languages involved. This results in extensive citations, which are often sketchy, of data from different languages. The lack of in-depth studies and the abundance of one-liners as studies of the more exotic languages are often very misleading and do little to contribute to our knowledge of those languages. On the other hand, since there are so many competing new theories with fast

growing literatures and increasingly more interesting topics to be dealt with in each theory, many theorists are too busy doing their own favorite theory to try out other theories. The belief that there is one best theory is shared by most linguists, but not which theory it is. As a result, camps are made and scarcely anyone crosses the line. In short, recent studies in linguistics tend to be theory-dominant, with each study dominated by one theory.

What is wrong with such a scenario? Of course, there is nothing wrong with doing research exclusively in one theory. One can hardly expect a theory to grow without doing so. But consider the fact that, regardless of which theory is being employed, linguists are, supposedly, dealing with the same natural language data corpus. It doesn't matter whether there exists the best theory as it is at this moment or even which theory is the best among the existing ones. There ought to be problems easier to solve in one theory than the others, a probable analysis tried and failed in one theory and thus needs not be bothered with in other theories, ideas originated in one theory and yet can be implemented in other theories with equal or even better effects. By drawing sharp lines between theories, we are dividing our limited asset. Linguists who ignore theories other than their favorite deny themselves large chunks of the state of arts. It may be appropriate to quote an old Chinese fable here. A father summoned his four quarrelling sons and asked them to snap a pair of chopsticks; each of them did it easily. He then put four pairs of chopsticks together and asked the sons to try again. None could do it. Admittedly, none of the existing theories is perfect. The study of linguistics may receive a considerable boost if the best parts of different theories can be integrated. My suggestion is that such an integration cannot be done before a carefully worked out contrastive study of different theories. Such studies should be both in-depth and extensive and which would bring up the best of the theories. In addition, such studies may try to implement ideas from different theories to solve problems in the others.

A possible objection to my suggestion is that each existing theory has reached such a degree of sophistication that very few, if any, can grasp enough knowledge of each theory in order to integrate them. What can be done then? Is it necessary to wait for a genius to emerge and unify the theories? I don't think so. It does not take a genius to find some common grounds for the theories, to learn lessons from other theories, and to adopt ideas from different theories. Refraining from doing so now would allow the difference between different theories to grow sharper and sharper, thereby making integration in the future more and more difficult. I am no genius and my failure to include RG in my study shows my ignorance of that theory. Nevertheless, I believe my effort to apply different theories to the study of Mandarin Chinese would not only enhance our under-

standing of the formal features of the Chinese language but also bring up the advantages and disadvantages of different theories and shed light on what mechanisms could be useful in an integrated theory.

One last point worth mentioning is that I may seem to be more critical of the dominant theory than of the others. This is exactly how the study should be done. One of the greatest danger in all scientific studies is to take the whole content of a dominant theory for granted and thus unknowingly commit mistakes. GB is one of the theories but is mentioned often enough to students as the standard theory to merit this caution.

I will be dealing with four major frameworks. Among them, Montague Grammar is a system of formal semantics, which, in a slightly revised form, is compatible with both GPSG and LFG. For readers who may not be familiar enough with any of these theories, the following bibliography may be useful. For a comprehensive introduction to three of the theories: GB, GPSG, and LFG, see Sells (1986). A good, though somewhat out-dated, introduction to GB is Radford (1981), the most important primary sources are, of course, Chomsky (1981, 1982). For studies of Chinese in GB, J. Huang (1982b) is the most extensive; J. Huang (1982a) is shorter and more readily available. For GPSG, Gazdar and Pullum (1982) is both an explication of the original motivations of this non-transformational framework and an introduction to some of its basic mechanisms. Sag et al. (1985) includes a good short introduction to the current state of the theory. Gazdar et al. (1985) is undoubtedly the primary source. For GPSG studies of Chinese, C. Huang (1986a) is a good starting point. For LFG, Bresnan (1978) introduces the idea that the lexicon is the appropriate place to account for many grammatical phenomena which were accounted for by transformations, and Kaplan and Bresnan (1982) is the best introduction around, which is included in Bresnan (1982a), the primary source of the theory. C. Huang (1985b) and Huang and Mangione (1985) are two LFG studies on Chinese. For Montague Semantics, Dowty et al. (1981) is the standard introduction. More specifically, for the version I am adopting, IL*, see Chierchia (1982b, 1985). Mangione (1982) is so far the most detailed Montague semantic work I know of on Chinese. For Relational Grammar, which I will not discuss, Perlmutter (1983) and Perlmutter and Rosen (1984) give good samples of works.

III. The Structure of this Book

The body of this book is divided into six chapters. The first three chapters provide general schemas which account for the morphology, syntax, and semantics of the Mandarin de occurring in an NP. The last two chapters are detailed studies of one special construction, the possessive objects, in different theories. I hope the studies in the first three chapters not

only present a clear picture of the Chinese language but also suggest what kind of linguistic theories can best capture the features of Chinese and therefore are most likely to be a candidate of a universal theory of linguistics. The study in the last two chapters focuses on the applicability of specific features of different theories to an idiosyncratic construction. I expect the breadth and the depth of this dissertation to bring up interesting contrasts and implications. The content of these five chapters is listed as the following. The first chapter is an overview of all the different uses of de. A typology and brief discussions on des not occurring in an NP are given so that DE_{np} can be concentrated on in the remaining chapters. In the second chapter, a study of the morpho-syntactic features of DE_{np} shows that it is an NP clitic marking the head of a complex NP. The analysis of DE_{np} supports the arguments that a separate module accounts for cliticization and suggests a special feature for this module. The third chapter outlines the semantic structure for Chinese in IL* and gives a uniform semantic analysis to all the different DE_{np} -constructions. The next two chapters deal with possessive objects. Relevant data and possible analyses in three different frameworks are given in chapter 4, and contrasts of different theories based on the analyses in chapter 5. Chapter 6, the last chapter, is the conclusion.

CHAPTER 1

A MORPHOLOGICAL OVERVIEW

This chapter gives a summary of the various uses of de derived from the accounts given in Zhu (1961) and Chao (1968). A brief sketch of their accounts is given to help build a general picture. Both descriptive accounts not only illustrate the versatility of this simple phonological string /de/ but also demonstrate how complex a typology of different des would result if only one syntactic or morphological test is employed. Following the sketch of their accounts, there will be analyses of two syntactically simple des. These two des are different from the NP clitic de, which will be the focus of this work. The NP clitic encompasses several different uses assigned in the descriptive accounts. Based on the analyses of the two des in this chapter and studies on the NP clitic de in later chapters, a more rigorously defined and much simpler typology of different des concludes this chapter.

I. Chao's (1968) Account¹

Chao (1968:289-300) classifies different uses of de according to their distribution in different structures. He differentiates structures by identifying the unmarked grammatical categories of the elements which co-occur with de. The following three major syntactic environments are introduced to distinguish the different des occurring in them. They are nominal expressions with a nominal head, nominalized expressions without a nominal head, and adverbial expressions.²

(1) Chao's (1968) classifications of the uses of de³

a. Noun-headed Nominal Expressions: X de N

- i) Sanbai de shu
Sanbai DE book
'Sanbai's book'

¹ Chao (1968) uses the Gwoyeu Romatzyh (National Romanization) he developed earlier instead of the Mandarin Phonetic Symbols II (MPS II) adopted in this book. I have changed the romanization in his examples to MPS II for uniformity.

² Please take notice that Chao (1968) does not use phrasal notations. Therefore N here stands for a nominal category without specifying whether the category is lexical, i.e., noun, or phrasal, i.e., NP or some intermediate nominal constituents.

³ The sentences and translations here are mostly Chao's (1968), with only a few minor revisions, for example, ta is translated as 's/he' instead of simply 'he.'

- ii) mafan de shrching
troublesome DE business
'troublesome business'
 - iii) wo shie de shin
I write DE letter
'The letter I wrote'
- b. Headless Nominal Expressions: X de
- i) tzoutian lai de
yesterday come DE
'the one who came yesterday'
 - ii) yau fan de
ask food DE
'beggar'
 - iii) ni kan ni sa de
you look you spill DE
'You look at what you have spilled.'
- c. Adverbial Expressions: X de V
- i) hau-hau de tzuo
good-good DE do
'do it properly and well'
 - ii) buju de hai bing
NEG-stop DE suffer sick
'constantly troubled with sickness'
 - iii) yi-jiu-yi-jiu de jieshr
one-sentence-one-sentence DE explain
'explain sentence by sentence'

Except for the so-called extent adverbial construction, which he discusses in a separate section, Chao's (1968) list of the uses of de is almost exhaustive. There are twenty-one different constructions listed. Since the main objective of Chao's (1968) study is to describe the language, it is hardly surprising that some of his classifications are not syntactically significant. For example, Chao (1968:292) has N de Adj as a separate syntactic environment for the occurrences of de, such as in wo de chiung I-DE-poor 'my being poor.' This seems to be a case of categorial shift, or type shift, where a lexical adjective chiung 'poor' is turned into a noun. In syntax, this should just be another instance of the paradigm N de N. Nevertheless, the three major syntactic paradigms, which I summarize above with the three schemas X de N, X de, and X de V in the examples, are the three cases that any study of de has to account for.

II. Zhu's (1961) Account

According to Zhu (1961), occurrences of de can be divided into three groups, with the third group being further divided into three different lexical entries. Unlike Chao (1968), the primary test he uses is comparing the grammatical function of a string with de attached with that of the same string without de

attached. Zhu's (1961) classification is exemplified here in 2-4.⁴

- (2) de_a
 neige ren tzuo de di shang
 that person sit DE ground up
 'That man is sitting on the ground.'
- (3) de_b
 a. kan-de-jian=ma⁵
 look-DE-see-MA
 'Can (you) see?'
 b. ta kan de yanjin tung
 s/he look DE eye ache
 'He watched to the extent that his eyes ached.'
- (4) a. de_{c1}: Adv+de = Adv
 Wang Shiansheng guyi-de chrdau
 Wang Mr. intentionally-DE late-arrive
 'Mr. Wang intentionally arrived late.'
 b. de_{c2}: AA+de = Adj/Adv
 i) Sanbai manman-de shing-le-guo-lai
 Sanbai slow-slow-DE wake-LE-over-come
 'Sanbai slowly woke up.'
 ii) pingguo jr tiantian-de, hen hauchr
 apple juice sweet-sweet-DE very good-eat
 'Apple juice is sweet and delicious.'
 c. de_{c3} (in a NP)
 jungguo hua de wenfa
 China language DE grammar
 'A Grammar of Spoken Chinese' [The title of Chao (1968)]

de_a can be identified by its alternation with the two words tzai 'at' and dau 'to.' For example, the following sentence is grammatically and semantically equivalent to 2.

⁴ Zhu (1961) gives no label for the first two groups, while he labels the three lexical items of the third group with a subscribed Chinese character 的. The labels de_a, de_b, de_{c1}, de_{c2}, and de_{c3} are adopted here to facilitate discussion.

Also take note that Zhu treats des in nominal and nominalized expressions in a separate article. Since the treatment in that article does not differ significantly from the treatment of Chao's (1968) quoted in this chapter, I will not discuss the article here.

⁵ Following the standard notation in the literature on clitics, I use the sign '=' here for cliticization, as opposed to '-' for affixation.

- (5) neige ren tzuoz tzai di shang
 that person sit at ground up
 'That man is sitting on the ground.'

de_p occurs in a complex predicate between two verbal categories. Zhu (1961) establishes the distinction between de_p and the three different de_C's with the contrast in meaning between the following two sentences.

- (6)a. jeige bi neige hau de duo
 this compare that good DE_{C2} much
 'This one is much better than that one.'
 b. hau de duo, huai de shau
 good DE_{C3} much bad DE_{C3} few
 '(There are) many good ones and few bad ones.'

The sentences in 6 clearly show that the grammatical function of de_p is different from that of de_C. What I would like to argue is that there are actually two different de's in Zhu's de_p: the one is the potential affix -de- exemplified by 3a and discussed later in this chapter, the other is a verb phrase clitic in the so-called extent adverbial construction exemplified by 3b and discussed in Huang and Mangione (1985).

Zhu's (1961) de_{C1} is an optional marker of adverbs. It seems to have almost no grammatical function. 7, for instance, is the counterpart of 4a without de and is synonymous to 4a. The de in 4 also does not seem to play any pragmatic role. A focus or emphasis in these sentences would typically be marked by either stress or intonation.

- (7) Wang Shiansheng guyi chrdau
 Wang Mr. intentionally late-arrive
 'Mr. Wang arrived late intentionally.'

de_{C2} is attached to reduplicated adjectives, represented by AA in our example. AA is a special form of adverb in Chinese. Many adjectives, such as man 'slow,' can be reduplicated to derive adverbs, such as man-man 'slowly.'⁶ The interesting fact is that the derived adverb AA acts just like any regular adverb,

⁶ L. Mangione (p.c.) points out to me that man 'slow' can also function as adverbial without reduplication, such as in (i). However, man in this case is not the prototypical adverb describing an action. It indicates that the sentence is an order, an advice, or a wish-well. The semantic difference suggests that it should be a separate lexical entry. kuai has a similar though less pervasive usage.

- (i) (nin) man chr
 you(deferential) slow eat
 'Please eat slowly.' OR [by a host] 'Enjoy your meal.'

while the form AA-de derived from AA occurs in both positions occupied by adverbs and adjectives. Zhu (1961) observes this contrast and argues that de_{C1} and de_{C2} are two different de's.

Lastly, de_{C3} occurs in a complex noun phrase between various pre-head categories and the final head. I will argue that de_{C3} is actually a NP clitic and give a detailed formal analysis in chapter II.

III. de as a Cliticized Word

Zhu's (1961) and Chao's (1968) accounts of de make one wonder if it is really necessary to posit so many different des in the lexicon and whether generalizations can be made about the different des. I will show that the number of lexical entries under de can be reduced from Chao's (1968) over twenty to no more than five. I will also argue that the few lexical entries work at different grammatical levels, i.e. in different modules, thus avoid complicated interactions between different des. In this section, I will begin my study of des with a de which has very limited occurrences. This de, a cliticized word, would be accounted for straightforwardly in a rather specific module.

Cliticized words, which are sometimes called simple clitics, are a class of morphemes which are phonologically attached to neighboring words and have other properties of clitics but which are identical in meaning and syntactic functions to independent words alternating with them in the same position. Thus, cliticized words are like prototypical clitics except that they are constrained by the syntactic rules the language imposes on their word counterparts.

Zhu's de_a has no lexical tone, cannot be stressed, and is phonologically dependent on the preceding word. All these phonological features suggest that it is a clitic.

- (8)a. bie diao de shuei li chiu le
 don't fall DE water inside go PERF⁷

'Don't fall into the water.'

- b. *bie diao de je shuei li chiu le
 don't fall DE PROGRESSIVE water inside go PERF

The sentences in 8 illustrate that de_a closes off affixation. Assuming an interface between syntax and morphology such that cliticization comes after all syntactic operations and therefore cannot interact with other syntactic operations or morphological operations located in the lexicon, disallowing any

⁷ I will use PERF as a gloss for the perfective aspect marker -le from here on.

affixes to be attached externally to it would be one of the defining features of a clitic.⁸ Thus 8b, a sentence with the progressive aspect marker je affixed to de_a, is ungrammatical.

On the other hand, de_a does not behave like a typical clitic because it occurs only between a verb and a locative noun phrase. This could be explained if it is a cliticized word instead of a prototypical clitic. A strong case for this can be made with the pairs of sentences in 9 and 10.

- (9)a. (=2) neige ren tzuο de di shang
 that person sit DE ground up
 'That man is sitting on the ground.'
- b. (=5) neige ren tzuο tzai di shang
 that person sit at ground up
 'That man is sitting on the ground.'
- (10)a. (=8a) bie diau de shuei li chiu le
 don't fall DE water inside go LE
 'Don't fall into the water.'
- b. bie diau dau shuei li chiu le
 don't fall reach water inside go LE
 'Don't fall into the water.'

9a is synonymous with 9b, and 10a with 10b. In either case de_a seems to act as a filler for the prepositions tzai 'at', or dau 'to', as suggested in Chao (1968:226).⁹ Another way to look at it is that they are the reduced forms of the alternating words. Their restricted distribution can be explained by the fact that they are reduced forms of words and therefore are subject to the same syntactic restrictions their word counterparts are subject to.¹⁰

⁸ This is the position assumed in Zwicky (1985) and Zwicky and Pullum (1983). Please see references there for works that deal directly with the interface of syntax and morphology.

⁹ Not all Chinese linguists treat morphemes like tzai and dau in similar contexts as prepositions. They are undoubtedly homophonous with and semantically related to the verbs tzai 'to be at' and dau 'to reach, to arrive.' Whether they are prepositions or parts of a compound verb does not affect my analysis.

¹⁰ Another possible argument for des to be reduced form of corresponding words, reminded to me by L. Mangione (p.c.), is that they seem to behave similarly with the words with respect to aspect markers. dau 'to reach' allows the affixation of the perfective aspect marker -le while tzai 'be at' doesn't, as illustrated by (i).

(i)a. * neige ren tzuο tzai le di shang
 that person sit at PERF ground up

The instances of de_a listed in Zhu (1961) and discussed above, namely the des alternating with tzai or dau, are not the only possible instances of des as cliticized words. At least two other uses of de discussed in Chao (1968:291) can also be analyzed as cliticized words.¹¹

- (11)a. er de er shr sz
two DE two BE four
'two and two is four.'
- b. er jia er shr sz¹²
two plus two BE four
'two and two is four.'
- (12)a. jei chang shi shr Jang Ping de Ming huang
this scene play BE Jang Ping DE Ming emperor
'In this play, Jang Ping is Emperor Ming.'
- b. jei chang shi shr Jang Ping dang/yan Ming huang
this scene play BE Jang Ping be/act Ming emperor
'In this play, Jang Ping is Emperor Ming.'

The alternation between the clitic-like de in 11a and 12a with the full words in 11b and 12b suggests that the des in 11 and 12 are two further instances of cliticized word. The fact that de_a alternates with no fewer than four morphological words gives one of the strongest arguments for treating it as a cliti-

- b. bie diau dau-le shuei li chiu le
don't fall reach-PERF water inside go LE
'Don't fall into the water.'

In (iia), the de counterpart of tzai, as expected, is ungrammatical. (iib), the counterpart of dau affixed with le, is much better. One caution, and the reason why this argument is presented in a footnote, is that native speakers' intuition is not that clear-cut with respect to the set of data. The tendency, though, is definitely there. The fact that (iib) is not as good can be explained by a general markedness principle against affixation to a unstressed word in Mandarin.

- (ii)a. * neige ren tzu de-le di shang
that person sit DE-PERF ground up
- b. ?? bie diau de-le shuei li chiu le
don't fall DE-PERF water inside go LE
'Don't fall into the water.'

¹¹ The examples I am giving here are not the same sentences Chao (1968) quotes.

¹² Another possible correspondence is to replace jia 'plus' with a conjunction 'and,' such as in (i).

- (i) er han/gen/he er shi si
two and two BE four
'two and two is four.'

cized word. It should be clear from the example sentences that the semantic content of de_a, though it may be meager, is an indispensable part of the meaning of the sentence. For example, in order to understand 11a, one has to recover from the string de the meaning of 'plus.' Treating de_a as either a word, an affix, or a prototypical clitic entails that an unique semantic translation would be given to each lexical entry of de_a. In other words, at least four lexical entries of de_a would have to be postulated without any phonological information to distinguish them. Any of the four lexical entries can then be freely inserted, while the semantically anomalous interpretations would have to be filtered out in a later stage. This analysis is inelegant and ad hoc.

Analyzing de_a as a cliticized word offers a way out of the stated problem. The surface string of phonemes /de/ stands for one of the full words. The lexical item inserted at an appropriate level is actually the word, with its full syntactic and semantic information. The lexically encoded phonological form of the word allows two values: the unmarked one is the full citation form, such as /tzai/ 'to be at,' and the other is the cliticized form /de/. That is, instead of assigning four or more lexical entries under the string of phonemes /de/, with each of them accidentally identical to another lexical word in the lexicon, we just assign /de/ as an alternative phonological representation to some of the existing lexical words. The phonological differences among these lexical items are 'neutralized' in the environment of cliticized words. In this way, the distribution of de_a and its semantic value, both identical to those of the word it alternates with, can be correctly represented. I will refer to all the occurrences of de as cliticized words as DE_{CW}.

With this analysis, the occurrences of de_{CW} are attributed to morphological idiosyncrasy and have nothing to do with the syntax. In both GPSG and LFG, appropriate representations in the lexicon will account for the data. 13b is the lexical entries of dau/de in LFG and 13a is the PS rule for all prepositional phrases.

- (13)a. PP --> P NP
 $\uparrow = \downarrow$ \uparrow OBJ = \downarrow
 b. dau/de: preposition, \uparrow PRED = 'REACH<(OBJ)>
 \uparrow OBJ LOC =_C +

In 13a, the preposition is marked by the functional equation $\uparrow = \downarrow$ to be the head of the PP, and the NP by the equation \uparrow OBJ = \downarrow to be the object of the preposition. In the lexical entry, I propose to represent the alternative morphological instantiations of the lexical item by a slash '/', between the two forms dau and de. A predicate-argument structure is assigned to the preposi-

tion and therefore to the PP.¹³ Last, the constraining equation $\uparrow \text{OBJ LOC} =_c +$ guarantees that the object of the preposition is a locative NP.

The GPSG representation, listed here as 14, does not differ in essence from the LFG representation.

- (14)a. PP --> H [101], NP [LOC +]
 b. dau/de

The ID rule 14b specifies that a preposition with a subcategorized frame numbered 101 would take a locative NP as an argument. In 14b, it is stipulated that the lexical prepositions involved in this rule include a preposition which has two alternative forms: dau and de.

Both GPSG and LFG representations capture the fact that the entry has two possible phonological instantiations, dau and de, and that it is a preposition subcategorized to take a locative noun phrase as an argument. In GB, where a lot of grammatical operations are defined structurally and the power of the lexicon is more restricted, such operations will most likely be carried out at PF. As mentioned above, a PF reduction rule will have to take some lexically determined morphemes (jia 'plus' but not jian 'minus,' nor chu 'divide') and reduce them to [de]. This rule would have to be ad hoc. The clear alternative is to enrich the power of the lexicon and have cliticized words accounted for there. I see no theory-internal reasons, except for the tradition of putting all phonologically relevant operations at PF, to prevent taking this step.

IV. de as an Affix

Two different des are possible morphological affixes. They are Zhu's (1961) de_{C1} and de_{C2} (roughly equivalent to Chao's (1968) adverbial expressions), and de_P (Chao's (1968) potential infix).

- (15)a. Sanbai feichang-de shihuan Libai de shr
 Sanbai extraordinarily like Li-Po DE poem
 b. Sanbai feichang shihuan Libai de shr
 Sanbai extraordinarily like Li-Po DE poem
 'Sanbai really likes Li-Po's poetry.'

¹³ Kaplan and Bresnan (1982) do not give detailed analysis to the f-structures of PPs as adjuncts. I assume that they would have to have predicate-argument structures. Their semantic types, however, would have to be different from a proposition. I assume that semantic translation rules assign correct types to them.

There is a subset of lexical adverbs in Mandarin Chinese for which de is an optional ending. In 15a and b, attaching de to the adverb feichang 'extraordinarily' or not does not affect the grammaticality or the meaning of the sentence, neither does it affect the grammatical category of the word feichang. Zhu (1961) observes that there are two other subsets of adverbs which de cannot be attached to. The first consists of monosyllabic adverbs, such as hen 'very' and chang 'often.' Another one is a small set of adverbs that includes yijing 'already,' mashang 'immediately,' sulai 'have-always-been,' ganghau 'just(i.e. happen to be at the same time),' and chiachiau 'coincidentally.'

- (16) wo shie wan le baugau mashang [*de] lai
 I write finish PERF report immediately come
 'I will come immediately after I finish my paper.'

- (17) Sanbai lai de shrhau Yunnian ganghau [*de] bu tzai
 Sanbai come DE time Yunnian just NEG be-at
 'At the time when Sanbai came, Yunnian happened to be away.'

One generalization can be made about the set of adverbs exemplified in 16 and 17 that do not allow de-affixation. They all involve comparing two reference points in time, with one preceding the other, such as yijing 'already,' adjacent to the other, such as mashang 'immediately,' coincident with each other, such as ganghau 'just' and chiachiau 'coincidentally,' or a constant state between two reference points, such as sulai 'have-always-been.' I will borrow a concept from the study of tense and aspect and refer to this set of adverbs as aspectual adverbs.

Although the adverbs which cannot have de attached can be characterized as monosyllabic adverbs and aspectual adverbs, the fact remains that the distribution of de with regard to adverbs cannot be determined by syntactic rules and therefore does show random gaps from a syntactic point of view. Such gaps suggest that the des under discussion are affixes.

One further piece of evidence to show that de_{C1} is an affix is that it forms a syntactic unit with the preceding word.

- (18)a. men huran-de kai-le
 door suddenly open-PERF
 'The door is suddenly opened.'
 b. huran-de, men kai-le
 suddenly door open-PERF
 'Suddenly, the door is opened.'

18b, though a little bit unnatural, is definitely grammatical.¹⁴ The possibility of the string huran-de 'suddenly' to be preposed, or to be slashed in GPSG terminology, shows that it is a syntactic unit. This suggests that de is not a clitic, since a clitic does not automatically form a syntactic unit with its host word.

Let me sum up the discussion above. The fact that de_a can bear no stress and can never occur in isolation means that it is not a word. Its forming a syntactic unit with its host word rules out the possibility that it is a clitic. The fact that both monosyllabic and aspectual adverbs cannot be attached with de shows that de_{c1}'s distribution shows random gaps and cannot be syntactically determined. The alternation between zero affix and de demonstrates morphological idiosyncrasy. These last two facts support the analysis that Zhu's (1961) de_{c1} is a morphological affix subcategorized to be affixed to a subset of adverbs.¹⁵ I will refer to this set of de as DE_{adv} from now on.

Sentences 19-22 demonstrate how Zhu's (1961) de_{c1} differs from his de_{c2}.

- (19) hau-hau-de nian shu
good-good-DE read book
'Study hard and well!'
- (20) hau-hau-de yi ben shu
good-good-DE one volume book
'such a nice book as this one'
- (21) Sanbai guyi-de da sheng nian shu
Sanbai intentionally big voice read book
'Sanbai read aloud intentionally.'

¹⁴ Most sentences with a preposed adverb affixed with de sound rather unnatural in spoken Mandarin, while they are often used in written Mandarin. I suspect there is a pragmatic explanation for not favoring Adv-de to occur in sentence initial position in spoken Mandarin. Such a word order gives a string of words [Adv de NP] at the beginning of the sentence, which falls in with the pattern of a complex NP marked by the NP clitic de, [XP de NP]. Speakers rarely use such a construction simply to avoid processing confusion.

¹⁵ What kind of affix DE_{adv} is remains somewhat puzzling. DE_{adv} is not an inflectional affix because it does not show any co-variance of number, person, gender, or case with any other element in the sentence. But it is not a typical derivational affix either because it does not change the meaning or the grammatical category of its host.

- (22) *guyi-de shr
intentionally event

According to Zhu (1961), de_{C2}, exemplified in 19 and 20, differs from de_{C1} in that AA-de_{C2} can occur in typical adjectival positions in addition to adverbial positions, while Adv-de_{C1} is limited to adverbial positions. 22 is ungrammatical because guyi-de 'intentionally,' an instance of Adv-de_{C1}, does not have an adjectival function.

- (23) ta shr guyi-de
s/he BE intentionally
'S/He (did that) intentionally.'

- (24) ta tzuotian hai shr hau-hau-de
s/he yesterday still BE good-good-DE
'S/He was still healthy and well yesterday.'

- (25) feichang-de shrchi
extraordinary era
'extraordinary era'

- (26) *man-man-de shrchi
slow-slow-DE era

23-26 show that Zhu's (1961) observation, though overall correct, is not without exceptions. In 24, AA-de_{C2} occurs in another typical adjectival position in Mandarin Chinese, namely as a matrix predicate after the BE verb shr. 23 shows that certain Adv-de_{C1}, guyi-de 'intentionally' in this case, also occur in the same position. 25 and 26 offer a vivid contrast. In 25, feichang-de 'extraordinarily,' as an Adv-de_{C1}, occupies a prenominal adjectival position, while manman-de 'slowly,' as an AA-de_{C2}, cannot. Zhu's (1961) study captures the tendency but fails to be a sweeping generalization about the grammar of the language.

23-26 give sufficient evidence to show that whether a lexical adverb affixed with de can also function as an adjective is a lexical idiosyncrasy. The phenomena cannot be determined by the history of morphological derivation or by morphological categories, as suggested in Zhu (1961). What is needed to account for the shift in grammatical categories between adverbs and adjectives is a mechanism of type shift controlled and operated in the lexicon.

With the idiosyncratic categorial shift between adverbs and adjectives attributed to a lexically controlled operation, it can be shown that Zhu's (1961) de_{C2} behaves exactly like DE_{adv}. 27a and 27b are synonymous.

- (27) a. ta manman-de shing lai le
s/he slowly wake come PERF
'S/He woke up slowly.'
- b. ta manman shing lai le
s/he slowly wake come PERF
'S/He woke up slowly.'
- c. manman-de ta shing lai le
slowly s/he wake come PERF
'Slowly, s/he woke up.'

Taking into account the fact that the derived adverbs AA can only occur in adverbial positions, de_{C2}, just like de_{C1}, is an optional ending for adverbs. 27c, parallel to 18b, illustrates that de_{C2} forms a syntactic unit with the derived adverb AA, and therefore is likely to be an affix, a proper part of a word. Both are exactly what have been shown to be the characteristics of DE_{adv}. And one can easily conclude that de_{C2} is nothing other than an instance of DE_{adv}.¹⁶

¹⁶ Louis Mangione (p.c.) points out that de can also be attached to phrasal categories to turn them into adverbials, which makes it look like a clitic. (i) and (ii) are the sentences given by him, and the others are my examples. J. Huang (p.c.) also makes similar observation.

- (i) fan yau [yi-kou-yi-kou]-(de) chr, shiching yau
rice want one-MOUTH-one-MOUTH-DE eat affairs want
[yi-jian-yi-jian]-(de) zuo
one-ITEM-one-ITEM-DE do
'As for rice, (you/one) must eat one mouthful at a time; and for affairs, (you/one) must take care of one at a time.'
- (ii) ...bu keyi [wu-genjiu]-(de) huszluanshiang
NEG can have-not-basis-DE Tartar-think-chaos-think
'(You/One) must not go off into wild fights of fancy without having any basis.'
- (iii) *ta [you-genjiu]-de yenshuo
s/he have-basis-DE speak/speech
[acceptable with the NP reading 'his well-founded speech']
- (iv) ta [yi-jiu hua ye bu shuo]-(de) diau tou
s/he one-sentence word also NEG say DE turn head
jiou tzou
then leave
'S/He, without saying a word, (abruptly) turned her/his head and left.'
- (v) ?ta [nannan-tz-yu]-de diau tou jiou tzou
s/he murmur-self-talk-DE turn head then leave
'S/He, murmuring to her/himself, (abruptly) turned her/his head and left.'
- (vi) *ta [tzji gen tzji shuo hua]-de diau tou jiou tzou
s/he self with self talk DE turn head then leave

The sentences (i), (ii), and (iv) show that, like the adverbial affixes discussed, the affixation of de with these phrases is

Another case of de as an affix is the potential infix discussed in Chao (1968: 452-4). Zhu (1961) does not distinguish this usage of de from the so-called extent adverbial construction and put them into one category: de_p. Zhu's (1961) position is supported by the fact that both constructions seem to share a syntactic schema [V de VP], as shown in 28.

(28)a. potential affix

Sanbai [kan de [dung jiaguwen]]
 Sanbai look DE understand shell-bone-writing
 'Sanbai can read the writing of oracle bones.'

b. extent adverbials

Sanbai [kan de [yanjing hen lei]]
 Sanbai look DE eye very tired
 'Sanbai's eyes are very tired from reading.'

In both 28a and b, the verb kan 'to look' is followed by what looks like a S' or a verb phrase dung jiaguwen 'understand oracle bone writings' and yanjing hen lei 'eyes are very tired' respectively. It does seem desirable to have a general schema to cover both constructions.

optional. The contrast between (ii) and (iii), and (v) and (vi) shows that there are arbitrary gaps between the des in discussion and their hosts. The contrast between (iv) and (v) suggests that there is a strict pragmatic constraint on the relationship between the adverbial phrase marked by de and the predicate it modifies. (iv) is a grammatical sentence, but (v) is somewhat awkward. The meaning of (v) and (vi) is roughly the same, while the adverbial phrase in (iii) differs from that in (ii) only in that it has no negation. Since this de can only be attached to a subset of phrases, which can neither be determined syntactically nor semantically, I will assume that they are marked as adverbials in the lexicon. That is, the attachment of this de depends on the lexical specification of certain phrases as adverbials rather than their phrasal structures. This would make it an affix rather than a clitic. In any case, the treatment of this seemingly phrasal affixation of de would not affect the account of the adverbial affix DE_{adv} because its affix-like, and unclitic-like, features cannot be disputed.

Also take notice that I treat the de in ...szde 'like-DE' differently. szde (but not de) can be affixed to any phrasal or clausal category to form an adverbial, such as in (vii). The morpheme szde is best analyzed as an enclitic, as suggested in Chao (1968). The string de involved here, though sharing the same written form with the other des, can only be treated as a segment (a syllable) of the clitic.

(vii) ta [shiauhai bu jian-le ma]-szde kuje
 s/he little-kid NEG see-PERF mom like-DE cry-PROGRESS
 'S/He is crying like a little kid who cannot find its mother.'

On the other hand, Chao's (1968) position is supported by data involving negation. In 19, bu is a portmanteau morpheme for both a negation marker and the potential infix de. In contrast, the negative counterpart for the extent adverbial sentence 28b retains de and place a separate negation morpheme de before the whole predicate, as in 30.

(29)a. (=28a)

Sanbai [kan de [dung jiaguwen]]
 Sanbai look DE understand shell-bone-writing
 'Sanbai can read the writing on oracle bones.'

b. Sanbai [kan bu [dung jiaguwen]]
 Sanbai look NEG/DE understand shell-bone-writing
 'Sanbai cannot read the writing of oracle bones.'

(30)a. (=28b)

Sanbai [kan de [yanjing hen lei]]
 Sanbai look DE eye very tired
 'Sanbai's eyes are very tired from reading.'

b. Sanbai [kan de [yanjing bu hen lei]]
 Sanbai look DE eye NEG very tired
 'Sanbai's eyes are not very tired from reading.'

In 29, the alternation between the potential affix de and its portmanteau negation form suggests that it is a morphological affix. The fact that it is not acceptable to construct a negation by inserting a negation marker bu after de, and the intuition that the NP jiaguwen 'oracle-bone writing' should be the object of the whole complex predicate kan-de-dung both argue for the analysis which treats -de- in 29 as an infix.

In this dissertation, I will adopt the infix analysis, with the understanding that an in-depth study of the so-called extent adverbial construction may produce arguments for a different analysis because of the parallelism observed in Zhu (1981). I will not discuss the extent adverbial construction in details. Readers are referred to Huang and Mangione (1985) for a preliminary analysis.¹⁷

V. A Typology of de

I have argued in this chapter that there are occurrences of de that can be analyzed as cliticized words and others affixes. I will argue in the next chapter that all the remaining occurrences of de in a NP fall in to one group: a noun phrase clitic DE_{NP}. I will also assume that all the remaining des occurring in

¹⁷ In Huang and Mangione (1985), we argue that the so-called 'adverbial' is actually the matrix predicate of the sentence. For analyses from a different point of view, please see Paris (1979) and J. Huang (1982b.Ch.2).

a VP are instantiations of a verb phrase clitic DE_{vp} . Based on these analyses and suggestions, the following typology of de can be constructed.

The chart in 31 gives a general picture of how I will analyze the different des in Mandarin Chinese.

(31) A Typology of de

	GRAMMATICAL CATEGORY	EXAMPLE
A. DE_{cw}	cliticized word	shu diau de shuei li chiu le book drop DE_{cw} water in go PERF 'The book dropped into the water.'
B. DE_{adv}	adverbial affix	ta jingchang-de chr dau s/he habitually- DE_{adv} late arrive 'S/He comes late habitually.'
C. DE_{pt}	verbal affix (potential infix)	Lida kan-de-dung jungwen Lida look- DE_{pt} -understand Chinese 'Lida can read Chinese.'
D. DE_{np}	noun phrase clitic	tzuotian lai de ren yesterday come DE_{np} person 'the person who came yesterday'
E. DE_{vp}	verb phrase clitic	ta ku de hen shangshin s/he cry DE_{vp} very hurt-heart 'S/He cried sadly.'

One thing I would like to point out before giving fully detailed analyses of all the categories is that this typology places different categories of de at different grammatical levels. Cliticized words, as argued above, are best accounted for with morphological idiosyncrasies represented in the lexicon. Affixes are governed by morphological rules. Clitics, as argued by Zwicky and Pullum (1983) and Klavans (1982), belong to a post or late syntactic level. The reason why the seemingly excessive function load of the simple string de does not cause any problem in the language can be partially explained by the fact that the different des are assigned to different grammatical categories and are dealt with at different levels of the grammar. Thus, no confusion can easily arise.

On the other hand, from a historical point of view, it has been proposed in historical linguistics that the unmarked direction of historical change is from full words to cliticized words to clitics, and finally, to affixes. The reason why the different uses of des remain stable through the past thousand

years, as remarked in the introduction, requires explanation. I would like to suggest that the reason might be because a morpheme of the identical value /de/ functions at the stages of the unmarked route of diachronically change and therefore blocked the change. For example, because there is already a de as clitic in the language, another clitic de derived from a cliticized word would create ambiguity and confusion. This may also help explain why DE_{np} is a very stable lexical item while Zwicky (1985) suggests that clitics are the marked case. Thus, the typology I am proposing for different des not only greatly reduces the complexity of the analyses of des but also suggests possible explanations to the high function load of the phonological string and the diachronical stability of it.

CHAPTER 2
DE AS A NP CLITIC: THE MORPHOLOGY AND SYNTAX OF DE_{np}

I. DE_{np}: the Data

The function of Mandarin Chinese de in a NP (DE_{np} hereafter) covers a wide range of corresponding English constructions. Based on such correspondences, linguists studying Chinese have assigned a number of functions to DE_{np}.¹ The following examples in 1-4 cover most of these functions, though they by no means exhaust all the proposed analyses.² The NPs with DE_{np} are underlined.³

(1) Marker of a possessive phrase

Yunniang shr Sanbai de taitai
Yunniang COPULA Sanbai DE_{np} wife
'Yunniang is Sanbai's wife.'

(2) Marker of an adjectival or modifying phrase

a. ta bu shihuan bai de fangtz
s/he NEG like white DE_{np} house
'S/he doesn't like white houses.'

b. juoshang de shu shr janjeng yu heping
desk-top DE_{np} book COPULA war CONJ peace
'The book on the desk is "War and Peace."'

¹ The works I draw upon here include Chao (1968), Chu (1983), Li and Thompson (1981), and Zhu (1961). Their works, though elucidating aspects of the grammatical behaviors of de, are for the most part overlapping classificatory descriptions. Therefore, no specific citation will be given here in this synopsis of the related facts. Nevertheless, it is worth mentioning that I have benefited from the insights in their works.

² Two of the omissions are the so-called possessive subjects discussed in C. Huang (1985b) and possessive objects discussed in detail in chapters 4 and 5.

³ L. Mangione (p.c.) points out that [Adj de N] can also be treated as a relative clause construction. I have mentioned that adjectives can occur alone as predicates without copulas in Chinese, hence it is not obvious that the phrases [V de N] and [Adj de N] should be treated differently. I am simply following the traditional classification here. It will be clear from my account that [Adj de N] is grammatically identical to other relative clause constructions.

(3) Relative clause marker

tzuotian lai de ren shr Sanbai
 yesterday come DE_{NP} person COPULA Sanbai
 'The person who came yesterday was Sanbai.'

(4) Appositional phrase marker

- a. wo tingshuo-le taikungsuo bauja de shr
 I hear-say-PERF space-shuttle explode DE_{NP} matter
 'I have heard of (the event of) the explosion of the Space Shuttle.'
- b. shiauhai-tz tzuei shihuan ting pilipala de yu sheng
 small-child most like hear pilipala DE_{NP} rain sound
 'Small kids like to listen to the "pilipala" sound of rain most.'

The puzzle here is whether the des in the six sentences above are instantiations of the same morpheme. If they are not, we would have more than four homophones occurring in similar constructions, not counting the des occurring in VPs and in the so-called cleft sentences. If the des above are indeed the same, the problem becomes how to come up with a unified formal analysis which gives DE_{NP} a single grammatical meaning.

In this chapter, I will argue that all the listed occurrences of des in an NP belong to one lexical item: an NP clitic marking the head of that construction. I will first show that DE_{NP} is a morphological clitic and then give a formal syntactic analysis of NPs with DE_{NP}.

II. DE_{NP} Is a Clitic

Criteria to test clitic-hood are discussed in Zwicky (1985), Zwicky and Pullum (1983), Klavans (1982), and, specifically for Chinese, in C. Huang (1985a). I will follow these established criteria and adopt the basic strategy of proving a certain morpheme to be a clitic by showing that it is neither a word nor an affix.⁴

⁴ Arnold Zwicky (p. c.) pointed out to me the possibility of having one other group of clitics, namely, cliticized words (or simple clitics). One way to identify cliticized words is by the characteristic that they alternate in the same position with regular morphological words. Neither DE_{NP} nor the Chinese sentential clitics discussed in C. Huang (1985) occupy the same position as other independent words; therefore they cannot be cliticized words. A separate group of des which do behave like cliticized words were discussed in chapter 1.

- (5)a. tzuotian lai-le=de ren jintian you lai-le
 yesterday come-PERF=DE_{np} person today again come-PERF
 'Those who had come yesterday came again today.'
 b. *tzuotian lai=de-le ren jintian you lai-le
 yesterday come=DE_{np}-PERF person today again come-PERF

DE_{np} cannot be a word. Unlike all Chinese words, it doesn't have an inherent contour tone, always bears a neutral tone, cannot be stressed, and, as exemplified by 5, never allows any affixes to be attached to it.⁵ Syntactically, it also lacks word-like behaviors such as occurring in isolation and allowing word order alternation with other words.

On the other hand, the feature of being phonologically attached to the preceding element calls for careful examination of whether DE_{np} is a clitic or an affix, since attachment to other elements is a characteristic shared by both categories. I will show that this attachment is cliticization rather than morphological affixation.

First of all, affixes select the grammatical categories of their host words, while clitics do not. Clitics are attached, as argued by Klavans (1984), to a phrasal category; therefore they do not select the word immediately preceding them, as long as the phrasal category satisfies the subcategorization requirement imposed by the lexical entry of the clitic. Affixes, on the other hand, are subcategorized to be attached to a host word of a certain grammatical category.

- (6)=1 Yunnianɡ shr Sanbai de taitai
 Yunnianɡ COPULA Sanbai DE_{np} wife
 'Yunnianɡ is Sanbai's wife.'
 (7)=2a ta bu shihuan bai de fangtz
 s/he NEG like white DE_{np} house
 'S/he doesn't like white houses.'
 (8)=2b juoshang de shu shr janjeng yu heping
 desk-top DE_{np} book COPULA war CONJ peace
 'The book on the desk is "War and Peace."
 (9)=3 tzuotian lai de ren shr Sanbai
 yesterday come DE_{np} person COPULA Sanbai
 'The person who came yesterday was Sanbai.'

⁵ The plural suffix for human nouns -men provides another example. Personal nouns can be pluralized by affixing -men, such as in shiuesheng/shiuesheng-men 'student/ students'. yaufande beg-meal-de 'beggar' is a personal noun but *yaufande-men is ungrammatical.

- (10) shietz kuai de ren jan pianyi
 write-character fast DE_{np} person occupy advantage
 'Those who write fast have things in their favor.'

DE_{np} is attached to a noun in 6, an adjective in 7,⁶ a postposition in 8,⁷ a verb in 9, and an adverbial in 10. These sentences show that DE_{np} can be attached to almost any grammatical category and that it behaves more like a clitic.

⁶ All Chinese 'adjectives' can function as predicates without a copula. In this sense, they are only a sub-set of verbs. Chao (1968.675) calls them 'intransitive quality verbs' and Li and Thompson (1981.38) simply refer to them as 'adjectival verbs.' But others, such as J. Huang (lecture), argue for having 'adjective' as a separate grammatical category in Chinese. Although I do not believe it is necessary to have an independent grammatical category 'adjective,' the term is used here as a convenient term to refer to that particular set of words.

⁷ There are still controversies over whether there are postpositions in Chinese. Both Li (1985) and J. Huang (lecture), citing sentences such as juo shang you yi ben shu table-top-have-one-MEASURE-book 'There is a book on the table,' argue that the so-called postpositions such as shang 'top' here are actually nominal elements. Thus, juo shang 'table-top' would be roughly translated as 'the top of the table.' The advantages of this analysis include that such phrases can no longer be counterexamples to the phrase structure constraint proposed in J. Huang (1982), assuming that shang instead of juo is the head of the NP, and that phrases such as tzai juo shang 'at-table-top' could be analyzed as simple prepositional phrases. There are, however, also difficulties. The phrase Sanbai fang shu de juo shang Sanbai-put-book-DE-table-top means 'on the table where Sanbai put the book(s),' but not 'the top-of-the-table where Sanbai put the book(s).' For example, one cannot say jei ge juo shang, nei ge juo shang, dou shr Sanbai fang shu de juo shang this-table-top, that-table-top, all-BE-Snabai-put-book-DE-table-top. This fact suggests that shang has the (postposition-like) property of combining with the whole preceding (complex) noun phrase, while juo shang lacks the NP property of being the head NP of a de-construction. There also do not seem to be enough arguments for shang's being the head of the (alleged) NP juo shang. de can never be inserted between juo and shang and shang can never occur alone. In addition, L. Mangione (p.c.) observes that shang can only occur as a noun in certain frozen expressions, as in shang you tiantang, shia you Su Hang 'Up there, there is a heaven, and down here (we) have Su-zhou and Hang-zhou.' The fact suggests that the nominal usage of shang is restricted and has to be lexically specified.

Morphologically, DE_{np} is also dissimilar to affixes, exemplified by 11 and 12, in that there is no arbitrary gap between DE_{np} and its host words and DE_{np} does not show morphological idiosyncrasy in its combination with host words.

- (11) tz: nominal suffix
 a. ya-tz duck-TZ 'duck'
 b. hau-tz mouse-TZ 'mouse'

- (12)a. mau 'cat'
 b. *mau-tz cat-TZ

Chinese nominal affixes in 11 and 12 illustrate arbitrary gaps between affixes and host words; i.e., host words to which the affix cannot be attached are not predictable by grammatical rules, as in 12b. In contrast, I can think of no case where DE_{np} is barred from being attached to a word without syntactic or morphological explanation. DE_{np} differs from affixes in that its phonological value never changes, such as the -s/-z contrast of English plural. That is, it has neither homomorphs nor suppletive forms. Both facts, again, suggest that DE_{np} is not an affix.

Last, DE_{np} is also different from affixes in that it does not form a syntactic unit with the host-word it is attached to. Like typical clitics, it forms a syntactic unit with its host-phrase. Sentences 13-14, intended topicalized variants of 3(=9), test syntactic units with topicalization.⁸

- (13) *lai=de, tzuotian e ren shr Sanbai
 come= DE_{np} yesterday person COPULA Sanbai
- (14) *de ren, tzuotian lai e shr Sanbai
 DE_{np} person yesterday come COPULA Sanbai
- (15)a. Sanbai bu shihuan tzuotian lai=de ren
 Sanbai NEG like yesterday come= DE_{np} person
 'Sanbai doesn't like those who came yesterday.'
 b. *tzuotian lai=de, Sanbai bu shihuan e ren
 yesterday come= DE_{np} Sanbai NEG like person

The fact that topicalization cannot involve a string consisting of de together with either the host word or the word following it shows that DE_{np} neither forms a syntactic unit with its host word, nor with the following word. Another piece of evidence to show that DE_{np} does not form a morphological word with the host word involves the fact that clitics can be attached to an affix, but affixes cannot be attached to a clitic.

⁸ Note again that I am using the sign '=' here for cliticization, as opposed to '-' for affixation.

- (16)a. tzuotian lai-guo=de ren
 yesterday come-PERF=DE_{np} person
 'the person who came yesterday'
 b. *tzuotian lai=de-le ren
- (17)a. Sanbai shoushang na-je=de shu
 Sanbai hand-top hold-CONTINUOUS-DE_{np} book
 'the book which Sanbai is holding in his hands'
 b. *Sanbai shoushang na=de-je shu
 Sanbai hand-top hold-CONTINUOUS-DE_{np} book

If DE_{np} is a clitic, it is by definition attached to an appropriate phrasal category, regardless of whether there is an affix attached to the host word or not. In both 16a and 17a, attaching the morpheme de after an affix is allowed. On the other hand, an affix is subcategorized to be attached to a word. If DE_{np} is a clitic, it forms a syntactic unit with the whole phrase rather than the immediately preceding word.⁹ That is, DE_{np} does not form a morphological unit with lai 'come' in 16, neither does it form a morphological unit with na 'hold' in 17. Since neither of the strings lai-de and na-de forms a morphological word (which would have to be a verb in this case) affixes le and je cannot be attached to them, as exemplified by 16b and 17b.

Thus, subcategorization facts, morphological characteristics, and syntactic tests all converge, pointing towards the conclusion that DE_{np} is not an affix. DE_{np} is neither a word nor an affix. By elimination, it has to be a clitic, a 'syntactic affixation' as defined in Klavans (1982).

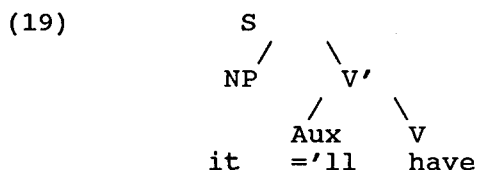
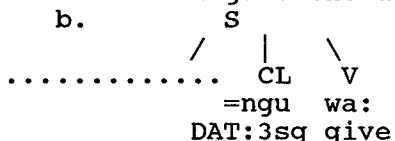
III. A Parameter Representation of the Clitic Features of DE_{np}

In this section, the three parameters proposed in Klavans (1985) are adopted to give a formal description of the distribution of DE_{np}. Parameter 1 (P1: Domain) and Parameter 2 (P2: Precedence) are syntactic parameters describing the configuration of cliticization. A clitic can be attached either before or after (P2) the initial or final element (P1) of the host phrase. The phonological parameter P3 specifies where the liaison occurs: the clitic is an enclitic if the liaison joins the clitic to the preceding word, or a proclitic if it is phonologically attached to the following word. Since the direction of liaison does not necessarily coincide with the direction of syntactic attachment, P2 and P3 are independently motivated and can interact to derive different types of clitics, as illustrated by Kwakwala and

⁹ In two special cases, when the clitic is an enclitic attaching to the final element of a phrase and when it is a proclitic attaching to the initial element of the phrase, it also marks the boundary of a phrase rather than a word.

Nganhcara clitics. The Nganhcara data, discussed in Klavans (1982:77-78), are given here as 18.¹⁰

- (18)a. nhila pama-ng nhingu pukpe-wu ku?a ngu=wa:
 he:NOM man-ERG him:DAT child-DAT dog give=DAT:3sg
 'The man gave the dog to the child.'

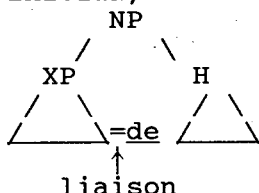


In 18a, the string preceding the clitic ngu 'DAT:3sg' can have different word orders. Four other word orders are actually possible with 18a, which allows the subject clitic phonologically attached to five different words, while the position of the clitic and the verb remains the same. The subject clitic is syntactically dependent on the verb and yet is phonologically attached to the category immediately preceding it. A more familiar case is the English auxiliary will cited in 19.¹¹ The auxiliary forms a syntactic unit with the verb while it can be cliticized to the subject. Similarly, DE_{np} phonologically 'leans' towards the preceding word and is a clear case of enclitic. However, two alternative sets of values for P1 and P2 can both adequately describe the position of DE_{np} . They give the two different structures in 20b and 21b.

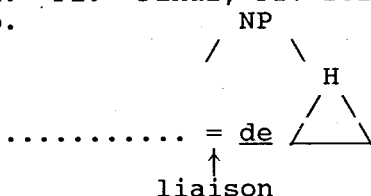
¹⁰ Take note that I use /nh/ to stand for a dental nasal and /ng/ to stand for a velar nasal.

¹¹ Whether an auxiliary forms a phrasal category with the following verb phrase or not has been a source of controversy for years. More recent studies, however, tend to analyze the auxiliary as part of the predicative phrase. The most salient case is GB, where an auxiliary is the bearer of INFL, which in turn is the head of the INFL phrase it constructs together with a VP. The example is cited for illustrative purpose without claiming an analysis for the auxiliary system of English. A less controversial case, pointed out to me by Sally McConnell-Ginet (p.c.), is BE verbs in English. The BE verbs are part of the predicates, but are attached to the subject when contracted, such as I'm and he's.

- (20)a. P1: Initial, P2: After, P3: Enclitic
b.



- (21)a. P1: Final, P2: Before, P3: Enclitic
b.



In 20b, the direction of liaison indicates the direction of syntactic attachment. Two analyses seem to suggest a scenario like 20b, even though they do not state it explicitly and they do not analyze DE_{np} as a clitic.¹² Kitagawa and Ross (1982) and Ross (1983) analyze DE_{np} as a marker of prenominal modification, and Paris (1979) analyzes it as a nominalizer. These two analyses make quite different claims, and yet they agree with each other on assigning a leftward syntactic function to DE_{np} . Kitagawa and Ross (1982) and Ross (1983) have DE_{np} marking the left-hand category as a prenominal modifier, while Paris (1979) has DE_{np} nominalizing the category preceding it. Translated into the framework I am pursuing now, their analyses would have given the set of parameter values in 20a to DE_{np} , were they to analyze DE_{np} as a clitic.

- (22)=7 Marker of a possessive phrase
Yunniang shr Sanbai de taitai
Yunniang COPULA Sanbai DE_{np} wife
'Yunniang is Sanbai's wife.'

- (23)=2a Marker of an adjectival phrase
ta bu shihuan bai de fangttz
s/he NEG like white DE_{np} house
'S/he doesn't like white houses.'

¹² As a matter of fact, the transformational rule proposed in Kitagawa and Ross (1982) to insert de as well as a similar rule applicable in PF suggested in J. Huang (1982:57) treat de as if it is an independent though grammatically vacuous word. Please see discussion of these rules in the later part of this chapter.

(24)=9 Relative clause marker

tzuotian lai de ren shr Sanbai
 yesterday come DE_{np} person COPULA Sanbai
 'The person who came yesterday was Sanbai.'

(25)=4b Appositional phrase marker

shiauhai-tz tzuei shihuan ting pilipala de yu sheng
 small-child most like hear pilipala DE_{np} rain sound
 'Small kids like to listen to the "pilipala" sound of rain
 most.'

The problem with analyses like 20 is that they fail to give the desired generalizations. Let us adopt an analysis along the line of Kitagawa and Ross (1982) for the sake of argument. 22-25 give us a good idea about how diversified the meaning of the string u=de in a NP [u=de H] can be, if u=de is treated as a syntactic unit at all.¹³ In Montague semantics, the co-occurrences of different categories are governed by their semantic types. In general, categories of type $\langle x, y \rangle$ can combine with categories of type $\langle x \rangle$ to yield a category of type $\langle y \rangle$. This theory can be used to predict the undetermined semantic type of categories. For instance, if a category a combines with a category b to form a category represented by the string ab, a is of the type $\langle x \rangle$, and ab is of the type $\langle x, y \rangle$, then b has to be of the type $\langle x, \langle x, y \rangle \rangle$, the only type of categories which combine with type $\langle x \rangle$ categories to yield categories of type $\langle x, y \rangle$. In the present case, NPs have the type of $\langle \langle e, t \rangle, t \rangle$, and therefore the strings u=de in 22-25 should have a semantic type of $\langle \langle e, t \rangle, \langle \langle e, t \rangle, t \rangle \rangle$. The u's in these sentences have the type of $\langle \langle e, t \rangle, t \rangle$, $\langle \langle e, t \rangle, \langle \langle e, t \rangle, t \rangle \rangle$, t , and $\langle \langle e, t \rangle, t \rangle$ respectively.¹⁴ In order to map the whole string to the same type, DE_{np} must have at least three different types.

Moreover, although the semantic types of the strings u=de in 26 seem to be identical, their meanings differ from one another.

- (26)a. nungchang de niou
 farm DE_{np} cattle
 'cattle on a farm'
 b. Jangsan de chian
 Jangsan DE_{np} money
 'Jangsan's money'

¹³ H is a shorthand for head. This notation will be used hereafter.

¹⁴ Montague does not treat onomatopoeic words like 'pilipala' in 25. I assume that they are names of sounds, and therefore are terms (T).

- c. bushiougang de chatz
 stainless-steel DE_{np} fork
 'Stainless forks'

In this analysis, DE_{np} will have to map from a NP denoting a location, 'the farm,' to the set of entities located in the farm in 26a, from a NP denoting an individual to the set of entities belonging to that individual in 26b, and from a material to the set of entities made from that material in 26c. A rule in syntax like 20 will make it very difficult, if not impossible, to maintain the homomorphism between syntax and semantics and give DE_{np} a uniform translation. A theory of semantic type-shifting, such as the one suggested in Partee (forthcoming) may offer a solution. In any case, there does not seem to be a unified way to treat DE_{np} simply as marking the lefthand side string of a prenominal modifier. It also seem to be an over-simplification to state that the function of all the different strings preceding DE_{np} can be generalized under the term of nominal modifier, as claimed in Ross (1983). Under this analysis, a genitive NP, an adjectival phrase, a relative clause, and an appositional clause have the same status as a modifier of the head NP, which seems to obscure the important semantic and syntactic differences among them.

Most crucially, the following set of sentences suggest that the function of DE_{np} is something other than marking the preceding string as a modifier.

- (27)a. wo tingshuo-le taikungsuo bauja de shr
 I hear-say-PERF space-shuttle explode DE_{np} matter
 'I have heard of (the event of) the explosion of the Space Shuttle.'
- b. *wo tingshuo-le taikungsuo bauja shr
 I hear-say-PERF space-shuttle explode matter
- (28)a. wo tingshuo-le taikungsuo bauja de
 I hear-say-PERF space-shuttle explode DE_{np}
 nejian shr
 that-item matter
 'I have heard of (the event of) the explosion of the Space Shuttle.'
- b. wo tingshuo-le taikungsuo bauja nejian shr
 I hear-say-PERF space-shuttle explode that-item matter
 'I have heard of (the event of) the explosion of the Space Shuttle.'

27 and 28 show that with the identical appositional clause, omitting DE_{np} changes 27b into an ungrammatical sentence, while this omission does not affect the grammaticality of 28a and b. Since the only difference between the 27 and 28 sentences is the head NP, it can be deduced that the syntactic functions of DE_{np} interact with the head NP rather than the preceding categories.

29 and 30 represent another type of sentence which falls into the general syntactic schema of DE_{np} . There does not seem to be any reason to treat such sentences differently.

(29) Possessive Subjects (PSUBJ)¹⁵

Ma Yo-Yo de datichin la de hen hau
Yo-Yo Ma DE_{np} cello play DE_{vp} very well
'Yo-Yo Ma plays cello very well.'

(30) Possessive Objects (POBJ)¹⁶

Sanbai bu huei chr Yunniang de tsu
Sanbai NEG will eat Yunniang DE_{np} vinegar
'Sanbai won't be jealous of Yunniang.'

In 29, the head of the PSUBJ is actually the object of the embedded predicate la 'play,' and the NP preceding DE_{np} is the subject. In 30, the head NP of the POBJ is part of the idiom chunk, and the NP preceding the NP clitic is the oblique object of the predicate. Since detailed studies of these two constructions will be given in chapters 5 and 4, it suffices for the moment to observe that no theory would call a subject a modifier of the object, or an oblique object a modifier of a part of the predicate. On the other hand, it can be shown that an overall generalization could be achieved if the syntactic function of DE_{np} applies to the right-hand category instead.

Only one category occurs to the right of DE_{np} in its host phrase: the head NP. An elegant way to capture this fact is to posit that DE_{np} , though phonologically dependent on the preceding category, functions to mark the following category as the head of the complex NP. This analysis is formally represented with the parameters set like 21a, repeated here as 31.

(31)=21a P1: Final, P2: Before, P3: Enclitic

With this analysis, the difficulties for 20b, where the direction of phonological liaison coincides with syntactic attachment can be solved, and more explanatory adequacy can be achieved.

First, defining the function of DE_{np} as marking the head of a complex NP does not force the preceding categories to be of like or identical syntactic type, and therefore allows the preceding categories to vary. As a matter of fact, this analysis

¹⁵ I called this construction 'pseudo-possessive NPs' in C. Huang (1986b). The term 'possessive subjects' is used here to contrast with the term 'possessive objects'.

¹⁶ This term was first used in Chao (1968) to refer to the second NP in the construction. I am altering the term a little in using it to refer to the whole construction.

implies that the pre-head categories can belong to different types. If there were only one type of phrase allowed to occur before the head, the head should be easily identifiable without any marker. In this case, the function of DE_{np} would be at best redundant. Thus we avoid the pitfall of trying to give the pre-head categories a general characterization.

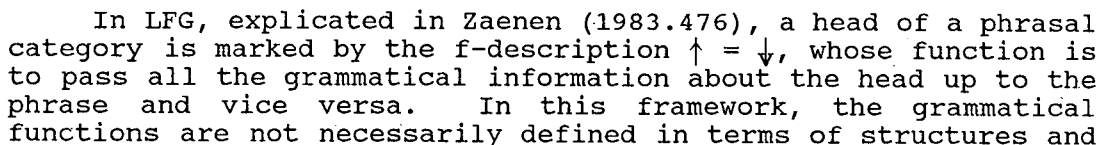
Second, the semantics also fits in better with 31. With DE_{np} as a marker of 'modifiers,' as suggested by Kitagawa and Ross (1982), one would expect that DE_{np} is translated as a function which maps the assigned type of the category it is attached to to the type of a NP modifier. This strategy results in assigning DE_{np} multiple types, as shown above. How to filter out the translations which assign a wrong type of DE_{np} is going to be a problem. On the other hand, when DE_{np} is analyzed as a head marker whose function is purely syntactic, it is very plausible to assign DE_{np} a semantic function which does not change the semantic type of a head NP. The problem with the different semantic types assigned to the categories preceding DE_{np} has to be solved with a theory of semantic type shift. But we can now attribute the type-shifting phenomenon to the syntactic structure rather than trying to assign multiple complex types to DE_{np} to combine with the translation of the head and the remaining part of the NP. More specifically, the type-shifting rules can be tied in with the phrase structure rule generating the structure [_{NP} X de H]. A schema can be written to shift the type of X such that it will always combine with the head to give a NP meaning. Such a schema will be proposed in the next chapter.

Third, the solution to the puzzle posed by the set of sentences in 27-28 depends crucially on analyzing DE_{np} as marking the head and thus imposes type constraint on the head NP. The relevant noun phrases are repeated here as 32.

- (32)a. taikungsuo bauja de shr
 space-shuttle explode DE_{np} matter
 b. * taikungsuo bauja shr
 space-shuttle explode matter
 c. taikungsuo bauja de neijian shr
 space-shuttle explode DE_{np} that-item matter
 d. taikungsuo bauja neijian shr
 space-shuttle explode that-item matter
 '(the event of) the explosion of the space-shuttle'

A natural hypothesis is to impose a constraint on the possible types of heads in this construction. It will be shown in the next chapter that the constraint is that the head NP must have a type of a common noun, i.e. <e, t>. Following Partee and Rooth (1983), I assume the strategy that an NP is always assigned the simplest type, i.e., the type of the lowest order, unless a different type is required by the structure. In this case, the

Fourth, for POBJ, the notion of head also offers a possible generalization otherwise unavailable. Two facts are crucial here: that a predicative phrase (a verb phrase in most cases) is the head of a sentence and that the NP₂ in a POBJ construction is part of a discontinuous idiom chunk which is the predicate of the sentence. These two facts suggest that NP₂ is part of the predicate and should be treated as its head. In fact, the LFG analysis I will be proposing represents this nicely.



17 Louis Mangione (p.c.) makes the observation that some instances of shr 'matter, event' do occur alone in argument positions. These occurrences of shr seem to be restricted to idiomatic usages. More specifically, these occurrences of shr seem to form complex predicates with the preceding verbs, instead of filling argument positions. For instance, shr in you shr have+matter 'be busy, on business', jau shr look for+ matter 'to look for a job,' or 'to look for trouble', tzuo shr make+matter 'to work (on a job)', and chu shr 'to have an accident, to get into trouble' cannot be topicalized and cannot be questioned except in echo questions. Thus these instances do not contradict my claim that shr 'matter, event' cannot occur alone.

categories. The POBJ noun phrase functions as a head of the predicate¹⁸ since it is annotated with the rule $\uparrow = \downarrow$ and the NP₂ is the head of the POBJ phrase.¹⁹ Thus, the proposed analysis of DE_{NP} functioning as a marker of the head of the complex NP also accounts for one exceptional case of POBJ.²⁰

The last piece of evidence involves written rather than spoken language. The following clause is written by Lu Xun and quoted in Chao (1968:292).

- (34) yinwei tsung nei limian kanjian-le bei-yapoje
 because from that inside see-PERF oppressed
 de shanliang de linghuen, de shinsuan,
 DE_{NP} benevolent DE_{NP} soul DE_{NP} heart-sour
 de jengja
 DE_{NP} struggle
 'Because from there, one saw the oppressed ones' good
 soul, 's bitter(ness), 's struggl(ing)....'

34 stands out in that all the occurrences of DE_{NP} in this coordination construction, instead of being attached to the preceding element, are syntactically attached to the head of the complex NP. In spoken Mandarin and unmarked cases of written Mandarin, such coordination would be expressed with just one de attached to the pre-head host, instead of to all the coordinated NP heads. 35 is such an example.²¹

¹⁸ Note that the lexical verb is also a head of the predicate. Justifications of multiple-head constructions are beyond the scope of this dissertation. It suffices to observe that natural language data does call for multiple-head constructions.

¹⁹ As will be shown in chapters 4 and 5, the second NP in a POBJ construction is part of the idiom chunk, which is a one-place predicate. If the semantic translation of the predicate is lexically encoded in the second NP, it would be assigned the translation of a function mapping individuals to propositions, i.e. of type $\langle e, t \rangle$, the same type as that of a common noun. Thus, in formal semantic terms, the account of the POBJ construction also fits the general schema for the DE_{NP}-construction.

²⁰ PSUBJ seems to be the only problematic case for this generalization. Although one can conceivably argue that the second NP in a PSUBJ construction is part of the VP and thus is part of the head of the sentence, there does not seem to be a way to represent this formally.

²¹ Take note that I am using a context different from that of 34 to avoid the 'bookish' style.

- (35) jeige shiueshiau de shiaujang, lasoshr, shiuesheng
 this school DE_{NP} president teacher student
 'the president, teachers, and students of this school'

It is true that 34 differs from the standard spoken Mandarin, but it is also true that readers understand and at least tolerate the style. Chao (1968), acknowledging that this is an exceptional case, presents the string as an acceptable one. The grammar has to account for or at least accommodate the severing of the liaison between the NP clitic and the host word that precedes it. With an analysis in which de marks a prenominal modifier, both the phonological liaison and the syntactic function of DE_{NP} would be obliterated at the same time, thus leaving no overt mark of the assigned syntactic structure. A stylistic rule which contradicts the 'core' grammar of syntax and phonology in such an obvious way is unlikely to be accepted. With my proposal that DE_{NP} syntactically marks the NP head and phonologically depends on the preceding word, however, 34 could be explained simply as the author's attempt to make the direction of phonological attachment conform to the direction of syntactic marking. Changing phonological features being one of the alternatives readily available to writers, the account is natural and adequate.

Thus, even though both the parameter values of 20 and 21 describe the distribution of DE_{NP} adequately, independent evidence supports the 'F1=Final, P2=Before, and P3=Enclitic' representation, where the direction of syntactic marking and phonological attachment differ. The semantics, the POBJ data, the contrast between NPs with and without demonstratives in relevant constructions, and the possibility of attaching DE_{NP} to the head NP in writing all support the analysis where the syntactic function of DE_{NP} is treated as marking the head of that complex NP construction.

IV. Analyses of DE_{NP} in a Cliticization Module

If cliticization is defined as 'syntactic affixation,' as in Klavans (1982), and assumed to be post-syntactic, as in Zwicky and Pullum (1983), then it must have access to syntactic information. One way to represent this in the grammar is Zwicky's (1983) proposal to place clitics in a separate post-syntax module. Among other arguments for cliticization's being an independent module between syntax and phonology, Zwicky (1983) observes that there are many instances of syntactic rules bleeding or feeding cliticization, while no cliticization rule is known to bleed or feed syntactic rules. Data from Chinese clitics supports his observation. In 36 and 37, ma and ne are sentential clitics marking yes-no questions and content questions respectively.

- (36)a. Sanbai tzuotian lai-le=ma
 Sanbai yesterday come-PERF=MA
 'Did Sanbai come yesterday?'
 b. ni tingshuo Sanbai tzuotian lai-le=ma
 you hear-say Sanbai yesterday come-PERF=MA
 'Have you heard that Sanbai came yesterday?'
 [impossible reading: 'You have heard whether Sanbai came yesterday or not']
- (37)a. Sanbai shenme shrhoulai=ne
 Sanbai what time come=NE
 'When is Sanbai coming?'
 b. ta gausu Sanbai shenme shrhoulai=ne
 s/he tell Sanbai what time come=NE
 'When does s/he tell Sanbai to come?'
 [impossible reading: 'S/he tells Sanbai when to come.']

36a and 37a show that the two sentential clitics in Mandarin Chinese take the absolute sentence-final position and mark the type of the sentence. 36b and 37b also show that the two clitics ma and ne cannot be embedded. That is, they are not only positioned finally but also always have scope over the whole sentence. Another way to look at it is that the embedding PS rule bleeds the cliticization rule for ma and ne. This fact suggests that Mandarin cliticization rules, for ma and ne at least, are post-syntactic.

A rule bled by a syntactic rule need not be post-syntactic. It could also be a late syntactic rule according to the traditional transformational grammar point of view that syntax consists of a set of ordered rules. Such a rule could also result from the interaction of grammatical features in theories such as GPSG and LFG. For example, Feature Cooccurrence Restrictions in GPSG state specifically which feature pairs cannot co-occur. The introduction of one feature would 'bleed' a rule which requires the other feature. One fact common to the phrase structure rules of all generative grammars, however, makes it very difficult to capture the above data in syntax. One of the basic assumptions about PS rules in most versions of generative grammars is that nodes such as S, S', and NP are recursive nodes. This formal feature allows a set of context-free PS rules to generate strings of indefinite length, which Chomsky (1965) points out to be a characteristics of natural languages.²² If sentential clitics ma and ne are treated in syntax and generated with the PS rule 38, there would be no easy way to prevent the S' from being embedded.

²² A familiar example is the possibility of relativizing an indefinite number of clauses, such as the subject NP in The apple picked by the man named Jack who loves a woman named Jill whose house is situated by the orchard which...is sour.

(38) $S' \rightarrow S', CL_S$

A simple solution is to postulate a different node which dominates an optional sentential clitic and a head but is not recursive, such as the S^* in 39.

(39) $S^* \rightarrow S' (CL_S)$

Simple as it is, I do not think such a PS rule is well-motivated. Assuming any version of the X-bar Theory, which most current syntactic theories do, the node S^* would equal a certain bar level of S . The bar level of S^* has to be higher than one because it dominates S' and does not allow recursion. The problem is that it is stipulated in the X-bar Theory that only maximal projections of certain categories, such as N , V and S , are recursive. If S' is recursive, there is no reason why a higher bar level represented by S^* , say S'' , is not recursive. This defeats the original goal of positing S^* . One could conceivably invent a separate category T for the S^* in 39, but I do not see how such a move can be sanctioned.²³ Thus a phrase structure account of the Chinese sentential clitic data does not seem to be feasible.

I have just used the sentential clitic data to illustrate that clitics cannot be adequately accounted for with plain PS rules and to suggest that a separate post-syntactic module is called for. I assume that the NP clitic DE_{np} will also operate in this module and proceed to discuss its analysis.

In the tradition within GB, de is usually introduced by an insertion rule. The rule could be a syntactic rule, such as in Kitagawa and Ross (1982),²⁴ or in PF, such as in J. Huang (1982b). The rule in 40 is that proposed in Kitagawa and Ross (1982:24). They posit that the rule is obligatory for Mandarin Chinese with MOD standing for the marker of modifiers de.

(40) $[_{np} X NP] \rightarrow [_{np} X MOD NP]$

²³ Another problem is that there are other sentential clitics in Chinese, such as the new-state -le discussed in Li and Thompson (1981), which do occur in embedded clauses. A node different from S^* and a separate category of sentential clitics would have to be postulated if 39 is adopted.

²⁴ It is not clear from Kitagawa and Ross (1982) where the insertion rule is placed in their grammar. The parallelism between their treatment of the rule and transformational rules in classical TG, though, does suggest that they consider it as a syntactic rule, which is also the unmarked case in the literature.

In addition to the problem of correct semantic representations discussed above, other problems with this analysis are caused by the claimed obligatoriness of the rule. Recall that in current theories, a syntactic rule allows no exceptions unless they are ruled out by independently motivated principles. Exceptions to 40 can be easily found, such as 41, where no de is inserted even though there are several environments which fit the description of the rule 40.

- (41) jinkou mingpai gauji sz chenshan
 imported famous-brand high-class silk shirt
 'imported brand-name high-class silk shirt'

To the extent that Kitagawa and Ross (1982) assert that the MOD-insertion rule is obligatory for Mandarin Chinese, they wrongly predict that 41 cannot be generated by the grammar. As a matter of fact, the phrase is at best awkward when de occurs in all the four possible positions after the modifiers.²⁵

An even more dramatic counterexample to Kitagawa and Ross's (1982) rule comes from the following contrast between Chinese and Japanese.²⁶

- (42)a. (Japanese) reopon no Taroo
 b. (Mandarin) * shrbau de Tailang
 leopon (leopard-lion) Taroo
 'Taroo the leopon'

²⁵ The most natural strings in this case are the one without any de in 41 and with only one de after either of the first two modifiers, exemplified in (i). The phenomenon is certainly semantically and pragmatically determined. I will not go into details here. For the purpose of the current discussion, it suffices to note that the MOD-insertion analysis cannot account for the data.

- (i)a. jinkou de mingpai gauji sz chenshan
 b. jinkou mingpai de gauji sz chenshan
 imported famous-brand high-class silk shirt
 'imported brand-name high-class silk shirt'

²⁶ Thanks to Ann Matsumoto for the Japanese data of 43. 42 is from Ishikawa (1984:52). For some pragmatic reason, the phrase without de is acceptable in 42b but not in 43b. That is, it is OK to say shrbaui tailang 'Tailang the leopon' (cp. shiaulu banbi 'Bambi the deer puppy' and renyuan taishan 'Tarzan the Apeman'), but not *laushr Songben 'Matsumoto the teacher.' The fact that all the acceptable phrases presented are of foreign origin suggests that they are influenced by translation. The critical point, however, is that native speakers accept these NPs but not the counterparts with des, such as *shiaulu de banbi and *renyuan de taishan.

- (43)a. (Japanese) Sensee no Matsumoto-san
 b. (Mandarin) * laushr de Sungben
 teacher Matsumoto
 'Matsumoto the teacher'

The strongest motivation for Kitagawa and Ross's (1982) rule 40 is that the MOD-insertion rule is universal. Since it is claimed that the de-insertion rule is obligatory in Mandarin Chinese, such a rule like the MOD-insertion rule would be a rule in the repertoire of universal grammar anyway. They argue that Japanese no can also be accounted for with a parallel no-insertion rule provided that it is supplemented by a more restricted no-deletion rule to account for the non-occurrence of no in some environments. The fact that two genetically unrelated languages utilize the same rule then presents a case for a universal MOD-insertion rule. In short, the scenario they present makes the prediction that de should occur in every Chinese environment where no occurs in corresponding Japanese environments. Contrary to the expectation, 42 and 43 have an identical structure of apposition where Japanese no occur while Chinese de is impossible.²⁷ The data suggests that a catch-all MOD-insertion rule fails to account for the Chinese language and cannot be universal.

The ungrammaticality of 42b and 43b also argues against relaxing the insertion rule 40 to an optional rule for Mandarin Chinese. The rule as it is stated in 40 would apply to 42b and 43b, optionally or obligatorily. But 42b and 43b do not take optional de. They simply do not allow any de to occur in the pre-head position. It is also fairly easy to show that the rule would apply to coordinated NPs. It only specifies that de is inserted in the environment [np X __ NP]. The rule applies when X is a NP to account for possessive NPs among others. But 44a is ungrammatical with the coordination reading, even though the structure of a coordinated NP 44b matches the structural description of 40.

- (44)a. * Jangsan de Lisz
 Jangsan DE_{np} Lisz
 b. [np [np Jangsan] [np Lisz]]
 'Jangsan and Lisz'

With the exception of scopal relations, transformations are usually presumed to be meaning preserving. Kitagawa and Ross's (1982) treatment of rule 40 as an insertion rule for an obligatory marker of modifiers does imply that the rule should have no semantic effect. As a consequence, the ungrammaticality of 44a

²⁷ As a matter of fact, phrases like 42b and 43b are telltale signs of a bad translation from Japanese to Chinese. The semantic rules which rule the two phrases out will be discussed in the next chapter.

cannot be attributed to the semantic effect of the rule. Thus, the insertion rule 40, either as an optional rule or an obligatory rule, makes wrong predictions about the Chinese data.

An alternative strategy within the broad framework of the Revised Extended Standard Theory is to shift the rule to PF and to posit that it is optional. J. Huang (1982b:57) seems to take this position.²⁸ His rule is quoted here as 45.

(45) [np XP N] --> 1 de 2
 1 2

One thing worth bearing in mind is that 45 is a rule following other restructuring rules at PF in J. Huang (1982b). His restructuring rules are capable of destroying syntactic structures and making constituents at PF out of non-constituents in the Surface-Structure.²⁹ Such a rule over-generates ungrammatical strings. For instance, the structure of a double-object construction 46a has two adjacent NPs. J. Huang's (1982b) restructuring rule forms a new NP with two adjacent NPs at PF. The two NPs in a double object construction would undergo this rule. Consequently, the newly formed NP fits the structural description of 45 and a de would be inserted. Thus the rule wrongly generates the ungrammatical 46b.

²⁸ J. Huang (1982b) proposes the rule discussed here as a PF rule, but he does not clearly state whether he regards the rule as an optional one or an obligatory one. His observation in a footnote that the des are required in some positions and not in other positions does suggest that he is treating the rule as an optional one.

²⁹ J. Huang (1982b) proposes 45 to account for PSUBJ sentences like (ia).

(i)a. [s [np ta de toufa] [vp li de hen hau]]
 s/he DENP hair cut DENP very good
 b. [s ta [vp toufa_i [vp li t_i de hen hau]]]
 s/he hair cut DENP very good
 'He cuts hair very well.'

Following J. Huang's (1982) postulation that (ia) be derived from the topicalized sentence (ib), at least two steps must be assumed. First, the NP toufa 'hair' has to be taken from the VP and be restructured to form a NP with ta 's/he.' Second, de is inserted in the NP with rule 45. The data show that the ability to alter syntactic structures is an essential part of his analysis.

- (46)a. Jangsan gei Lisz shu
 Jangsan give Lisz book
 'Jangsan gave Lisz books.'
 b. *Jangsan gei Lisz de shu
 Jangsan give Lisz DE_{np} book

In any case, 45 still fails to rule out 42b, 43b, and 44. That is, the optional rule predicts that the phrases with de should be acceptable, but they are not. The rule would also fail to capture the contrast in 47.

- (47)a. hèn guei de shu
 very expensive DE_{np} book
 'a very expensive book'
 b. *hèn guei shu
 very expensive book

In 47a, de is obligatory. The string without de, 47b, is ungrammatical. Treating 45 as optional does allow the NPs without de to be generated but fails to exclude 47b.

Another problem with the rule is the structural description. Readers may have noticed that the environments given for de in Kitagawa and Ross (1982) and J. Huang (1982b) are totally different. Kitagawa and Ross (1982) give the environment [_{np} X NP] and J. Huang (1982b) gives the environment [_{np} XP N]. They cannot both be right. In Kitagawa and Ross's (1982) rule, it is not clear whether the X is a string variable or a categorical variable. I will assume that it is a categorical variable, since X as a string variable would cause the rule to over-generate. This is illustrated by 48. If X is a string variable, it would be able to stand for any string, regardless of whether it is a constituent or not.

- (48)a. [_{np} Yunnianq de gege jiejie]
 Yunnianq DE_{np} elder-brother elder-sister
 'Yunnianq's elder brothers and sisters'
 b. [_{np} Yunnianq de gege de jiejie]
 Yunnianq DE_{np} elder-brother DE_{np} elder-sister
 'the elder sisters of Yunnianq's elder brother
 [a reading unrelated to 48a]'

48a is a complex NP, with the coordinated NP gege jiejie 'elder brothers and sisters' being the head. jiejie 'elder sisters' is a NP occurring at the end of that NP. The string variable X could stand for the string Yunnianq de gege, which is not a constituent in 48, and therefore allows the rule to generate 48b. As a result, one would expect 48b to be synonymous to 48a. But the examples show that the only possible reading 48b has is different from that of 48a. Thus treating X as a string variable wrongly generates the string 48b for the 48a reading.

The assumption that X is a categorial variable brings both rules closer as far as the pre-de category is concerned. I have shown that both rules are too general since they would both wrongly introduce a de in an NP coordination, exemplified by 44. They would also wrongly introduce a de between a demonstrative and a nominal head, as in 49.

- (49)a. * neiben de Jungwen shu
 that-volume DE_{NP} Chinese book
 b. neiben Jungwen shu
 that-volume Chinese book
 'that Chinese book'

The contrast between 49a and 49b shows that de cannot occur between a demonstrative and a nominal head. Neither rule discussed can capture this fact.

J. Huang's (1982b) stipulation that the constituent after de is a lexical noun does somewhat reflect the fact that it does not have the prototypical NP translation of an individual; it is, however, syntactically problematic. 50 illustrates the point.

- (50) jingjuang de neiben shu
 hardcovered DE_{NP} that-volume book
 'that hardcover book'

The string neiben shu 'that book' in 50 can hardly be characterized as a lexical noun, yet de occurs and the rule 45 should have applied. Though I will show in the next chapter that the nominal head in a DE_{NP} construction is more restricted than just any ordinary NP, it is nevertheless clear that it cannot be a lexical noun. Thus J. Huang (1982b) basically gives the wrong environment for de in his insertion rule. Both the rule 45 and 40 fail to account for the data.

So far I have shown that the NP clitic data can neither be captured by plain PS rules nor by syntactic or PF insertion rules. I will now try to give an adequate account. But let me first summarize the relevant data, i.e. the distribution of DE_{NP} in various structures. According to Fan (1958), noun phrases modified by adjectives can occur in the structures given in 51. Take note that Fan (1958) uses A, N, etc. to refer to grammatical categories without specifying whether they are phrasal categories or lexical ones. Also, by X he refers to demonstratives, measures, and adverbials but not to a null string. 51 gives all the structures he lists as possible, and some of the most important ungrammatical structures he discusses.³⁰

³⁰ I have slightly modified Fan's (1981) chart. He arranges it according to whether the head nominal contains de or not, while I arrange it according to whether there is a de in the

(51) Noun Phrases modified by Adjectival phrases

	A. NP with <u>de</u>	B. NP without <u>de</u>
1	(X A) <u>de</u> N	* (X A) N
2	A <u>de</u> (X N)	* A (X N)
3	AA <u>de</u> N	* AA N
4	A' <u>de</u> (AN)	A' (A N)
5	* (A <u>de</u> N) N'	(A N) N'
6	* (A N) (A' <u>de</u> N')	(A N) (A' N')

One row of the above chart can be easily explained. In Chapter 1, I have argued that the de which occurs after a reduplicated adjective, represented here as AA in row 3, is an affix. The reason why the structure *[AA N] is not acceptable is simply because the affix of the derived adjective is missing.³¹

The contrasts in rows 5 and 6 shed light on the rule governing the distribution of DE_{np}. 52 gives actual examples for row 5 and 53 for row 6.

- (52)a. * (A de N) N'
 * [np ching de hua] tszchi
 bluish-green DE_{np} flower china-vessel
 b. (A N) N'
 [np ching hua] tszchi
 bluish-green flower china-vessel
 'blue-flower china (a treasured style of Ming Dynasty antique)'
- (53)a. * (A N) (A' de N')
 * [np shi tzuei] [np tsz de chahu]
 slender mouth china DE_{np} teapot
 b. (A N) (A' N')
 [np shi tzuei] [np tsz chahu]
 slender mouth china teapot
 'a china teapot with a slender mouth'

whole string. I also fill in the ungrammatical structures for contrast.

³¹ Recall that even though the string AA-de can function either as an adverb or an adjective, AA without de can only be an adverb.

The ungrammatical 52a and 53a have one thing in common: they both have a DE_{np} occurring in a NP immediately dominated by another NP. This fact is intriguing because [Adj de NP] is an acceptable structure and both strings ching de hua 'blue flower,' and tsz de chahu 'china teapot' are grammatical. Furthermore, it is also grammatical to concatenate two NPs with the first one modifying the next one, such as 53b. The rule excluding 52a and 53a from the language would have to refer to more grammatical information than these simple structures. The last two sets of sentences, corresponding to 52 and 53 respectively, should bring out the nature of this rule.³²

- (54)a. [np ching hua] de tszchi
 bluish-green flower DE_{np} china-vessel
 b. ?[np ching de hua] de tszchi
 bluish-green DE_{np} flower DE_{np} china-vessel
 'blue-flower china'
- (55)a. [np shi tzuei] de [np tsz chahu]
 slender mouth DE_{np} china teapot
 b. [np shi tzuei] de [np tsz de chahu]
 slender mouth DE_{np} china DE_{np} teapot
 c. ?[np shi de tzuei] de [np tsz de chahu]
 slender DE_{np} mouth DE_{np} china DE_{np} teapot
 'a china teapot with a slender mouth'

Throughout all the NPs in 54 and 55, there is a DE_{np} occurring before the head of the matrix NP. 54b, 55b, and 55c show that the existence of that DE_{np} seems to sanction the occurrences of other instances of DE_{nps} in the lower NPs where the occurrences of DE_{np} were ruled out in 52 and 53. This fact is informally stated in 56.

- (56) A complex NP in a matrix NP cannot be marked by DE_{np} unless the head of the matrix NP containing it is also marked by a DE_{np} .

56 correctly describes the contrasts of row 5 and 6 of the chart in 51. In 5A of the chart, N', the head of the whole NP, is not marked by DE_{np} while a more deeply embedded NP is. This construction contradicts 56 and is predicted to be out, as exemplified by 52a. In contrast, 5B is allowed because neither the matrix NP nor the lower NP is marked by DE_{np} . Similarly, N', which is the head of the head of the whole NP in 6A, is marked by DE_{np} but the matrix head is not; therefore it cannot be admitted by the grammar, as shown by 45. Construction 6B, exemplified by

³² The strings in 54 and 55 are listed in order of descending naturalness. Thus I put a question mark before 54b and 55c respectively not because I think they are not well-formed but because they are quite unnatural.

53b, is accepted because neither the matrix head nor the embedded heads are marked; 56 allows such a possibility. Row 4 of the chart is also satisfactorily accounted for by 56. In either [Adj' [Adj NP]] or [Adj' de [Adj NP]], [Adj NP] is the head of the whole noun phrase, and it could be either marked or not marked by DE_{NP} according to 56. Both 1A and 2A fit the description of 56. The NP of [[X Adj] de NP] in 1A, and the [X NP] of [[Adj de [X NP]] in 2A are both heads of the matrix NP and are predicted to allow DE_{NP} to occur. 1B and 2B will have to be ruled out by independent principles.³³

³³ Construction 2B, exemplified by (i), will be ruled out semantically.

- (i) *[np [adj hau] [np neiben shu]]
 good that-volume book

I will argue in the next chapter that there are two possible semantic types for Mandarin adjectives. One is type <e,p> which maps individuals to propositions, and the other is <<e,p>,<e,p>> which maps common nouns to common nouns. neiben shu 'that book' is an individual of type <e>, therefore the first translation of the adjective would be chosen. However, the translation yields a proposition, an incorrect type for a noun phrase.

Construction 1B, exemplified by (ii)a, could be accounted for if a specific constraint on the phrase structure rules is adopted.

- (ii)a. *[np [ap hen] [np hau shu]]
 very good book
 b. ?[np [ap hen hau] shu]]
 very good book
 c. [np [ap hen hau] de [np shu]]
 very good DE_{NP} book
 'very good book(s)'

A priori, there is no reason why a string like hen hau shu cannot be assigned the structure (ii)b, similar to the grammatical (ii)c, and be admitted by the grammar. However, the data show that such a reading is possible only when the head of the embedded NP is marked by DE_{NP}. If the structure of the string is (ii)a, an account for the ungrammaticality would be straightforward. That is, the degree adverb hen 'very' is subcategorized to take as argument an adjective; since hau shu 'good book' is a NP, it cannot be modified by hen. The only problem is how to block the structure (ii)b. I will assume that the structure of a complex NP in Mandarin Chinese, when not marked by DE_{NP}, is strictly right-branching. That is, no branching of the pre-head modifier is allowed unless the head is marked by DE_{NP}. This assumption seems to correctly predict the data. In (iii), the logical possibility of having all the words but the last one forming a phrasal category modifying the final head is not available unless the head is marked by DE_{NP}, as shown by the contrast between (iii)a and (iii)b. Without DE_{NP}, only the strict right-branching reading of (iii)c is possible. Such a

56 also applies to instances of DE_{np} s not discussed in Fan (1958). Recall that I have presented appositional clauses, relative clauses, and possessive NPs as other types of instantiations of DE_{np} in addition to adjectival phrases. It is well documented that for possessive NPs, DE_{np} is optional when the head is a kinship term or other familiar terms, such as jia 'home,' or gungsz 'company'. What I would like to assume here is that the instances where DE_{np} is optional are the unmarked cases and follow the description of 56, and that instances where DE_{np} is required are the marked cases. The requirement in these cases is probably motivated by the fact that the possessive NP readings can be easily confused with the appositional phrases if not marked by DE_{np} .

The structure for appositional phrases is simply [NP NP], as in wusheng guangung martial+saint Guangung 'Guangung the Martial Saint'. This structure is identical to that of a possessive NP, the only difference being that DE_{np} cannot occur in an appositional phrase like this.³⁴ The contrast between Chinese and Japanese discussed earlier in the chapter can now be explained. Chinese reserves DE_{np} for possessive NPs when the structure of the complex NP is [NP NP] and leaves appositional phrases unmarked, whereas Japanese allows both constructions to be marked by no. DE_{np} is optional in phrases like wo fuchin 'my father' and tamen shiueshiau 'their school' because there is no possible appositional reading and therefore no possible confusion would be caused by omitting DE_{np} , i.e. wo 'I' cannot be appositional with fuchin 'father' and tamen 'they' cannot be appositional with shiueshiau '(the institution) school'.³⁵

default condition on phrase structure rules would require PS rules to be sensitive to the PS rule applied one level up. I don't have a formal account of this condition at this moment.

(iii)a. [[jinkou mingpai sz] de chenshan]

imported famous-brand silk DE_{np} shirt
'shirts made of imported brand-name silk'

b. *[[jinkou mingpai sz] chenshan]
imported famous-brand silk shirt

c. [jinkou [mingpai [sz [chenshan]]]]
imported famous-brand silk shirt
'imported famous brand-name silk shirt'

³⁴ I will argue in the next chapter that the so-called appositional phrases with DE_{np} I cited in the early part of this chapter are actually special cases of relative clauses.

³⁵ Louis Mangione (p.c.) points out to me that my hypothesis here cannot account for all the data and that the traditional account which states that 'inalienable' possessors can occur without de while the others cannot seems to account for the data better. Examples my analysis fails to account for are the

The contrast between appositional phrases and possessive NPs also supports my analysis that DE_{np} , in a direction opposite to its phonological attachment, syntactically marks the head of a complex NP. In the analysis that de is a marker of pre-nominal 'modifiers,' neither a possessor nor the first NP in an appositional NP is more of a modifier than the other; therefore the choice to mark a possessive NP but not an appositional NP with DE_{np} in Mandarin would be totally random. On the other hand, the possessee in a possessive NP is definitely the head of the construction, while neither NPs of an appositional NP can be said to be more of a head of that construction than the other one. Thus the account that DE_{np} marks the head of a complex NP correctly predicts that appositional NPs cannot be marked by DE_{np} and that a possessive NP can.

The so-called relative clause cases and the appositional clause cases share the structure [$_{np}$ S de NP]. It should be fairly straightforward that 56 predicts that DE_{np} is optional in both cases. In many cases they are. The head NP of an appositional clauses is optionally marked by DE_{np} except when semantic conditions make the marker obligatory. The pair of sentences 28, repeated here as 57, illustrates the optionality of DE_{np} .

- (57)a. wo tingshuo-le taikungsuo bauja de
 I hear-say-PERF space-shuttle explode DE_{np}
nejian shr
 that-item matter
 'I have heard of (the event of) the explosion of the Space Shuttle.'
- b. wo tingshuo-le taikungsuo bauja nejian shr
 I hear-say-PERF space-shuttle explode that-item matter
 'I have heard of (the event of) the explosion of the Space Shuttle.'

Even for the relative clause cases, where DE_{np} is generally considered to be obligatory, there are cases where DE_{np} is optional. In 58, the head NP is co-referential with the subject of the 'relativized' clause, while in 59 the head NP stands for the object.

- (58)a. shie luenwen neige ren
 write thesis that person
 b. shie luenwen de neige ren
 write thesis DE_{np} that person
 'the person who is writing a thesis'

ungrammatical *wo joutz I-table etc. where there is no possibility for apposition and yet the omission of de is not allowed. Both accounts have to resort to pragmatics.

- (59)a. * neige ren shie luenwen
 that person write thesis
 [grammatical with the declarative sentence
 reading 'That person is writing a thesis.']
- b. neige ren shie de luenwen
 that person write DE_{np} thesis
 'the thesis written by' that person'

The interesting contrast here is between the ungrammatical 59a and the grammatical 58a with the relative clause reading. The fact that both phrases in 58 are well-formed rules out the possibility that DE_{np} is obligatory in the environment. The only alternative is to follow the generalization of 56 that DE_{np} is optional in these cases and to rule 59a out with independently motivated principles. The pre-DE_{np} constituents are clauses with a NP gap and the heads are NPs in both cases, therefore neither constituent should affect any syntactic rule. To account for the exceptional 59a, I will borrow an idea from the observation made by Kitagawa and Ross (1982). They claim that their proposed marker of modifiers MOD is obligatory in Mandarin Chinese because the SVO word order does not supply enough information to mark the end of a pre-nominal 'modifier'. It is optional in Japanese because the SOV word order makes the MOD marker redundant in some cases. That is, a clause, a VP, and a modified NP all end with a NP in Mandarin, while V always signifies the end of a clause or a VP in Japanese. Usually, the syntactic structure is enough to identify the head NP of a complex NP in Japanese but not in Chinese. Thus no-deletion is introduced in Japanese to reduce redundancy. I have shown that their remark about the obligatoriness of de in Mandarin does not hold. Nevertheless, the above observation applies to a more limited case, namely phrases with relativized objects. The string in 59a is impossible as a relative clause, but it is well-formed as a sentence. In both cases, the surface word order of the string is [NP V NP]. In contrast, the word order of a relative clause with a relativized subject, as exemplified in 58, is [V NP NP], different from a declarative sentence.³⁶ If the head of an object relative clause is not obligatorily marked by DE_{np}, a string [NP V NP] would always have two ambiguous readings, one of a transitive declarative sentence and one of a corresponding object relative clause. This would be very confusing. It is conceivable that a pragmatic rule prevents the relative clause reading if DE_{np} is not present. On the other hand, since the word order of a subject relative clause does not cause ambiguity, both strings marked and unmarked by DE_{np} are acceptable. Thus I have shown that 56 also makes correct predictions about the distribution of DE_{np} in the so-

³⁶ This word order is the same as a ditransitive VP. But since ditransitive verbs are very few, I assume that knowledge of the lexical meaning of the verb alone is enough to prevent ambiguity.

called relative clause and appositional clause cases. The few isolated cases where DE_{np} seems to be obligatory, contrary to the prediction of 56, can be accounted for with other independently motivated principles. The semantic account for the appositional clauses is to be discussed in the next chapter, and the pragmatic account based on word order facts for relative clauses were just given.

The last two cases of DE_{np} are POBJ and PSUBJ. In both cases, DE_{np} occurs between two NPs to form a new NP. The syntactic structures of both constructions prevent the POBJ and PSUBJ NPs from being embedded; therefore, 56 predicts that DE_{np} is optional in both constructions since both positions belong to a highest NP.

(60) Possessive Object

- a. Ma Yo-yo de datichin la de hen hau
Yo-yo Ma DE_{np} cello pull DE_{vp} very well
- b. Ma Yo-yo datichin la de hen hau
Yo-yo Ma cello pull DE_{vp} very well
'Yo-yo Ma plays cello very well.'

(61) Possessive Object

- a. Sanbai sheng Lizi de chi
Sanbai give-birth Lizi DE_{np} air
- b. Sanbai sheng Lizi chi
Sanbai give-birth Lizi air
'Sanbai is angry at Lizi.'

Both pairs of sentences in 60 and 61 are grammatical. They show that DE_{np} is optional in both the PSUBJ and the POBJ constructions, confirming the prediction of 56.

In conclusion, my discussion shows that the distribution of all DE_{nps} : in adjectival phrases, in possessive phrases, in relative clauses, in appositional clauses, and in both POBJ and PSUBJ constructions can be captured by the interaction of several parochial rules with the informal statement 56. It is now time to represent formally the generalization informally described in 56.

To generate DE_{nps} according to the generalization of 56 locally without having to check two or more levels of structures at the same time, a mechanism with strict directionality which starts at the top of the tree is needed. The strict top-down direction is motivated by the discussion above which shows that DE_{np} can only occur in an embedded NP when the NP containing it is also marked by DE_{np} . The need to start from the top of the tree can be illustrated by the following examples.

- (62)a. hau de shiuesheng de sushe
 good DE_{np} student DE_{np} dormitory
 b. hau shiuesheng sushe
 good student dormitory
 c. (i) 'a dormitory for good students'
 (ii) 'a good dormitory for students'

- (63) hau shiuesheng de sushe
 good student DE_{np} dormitory
 'a dormitory for good students'

- (64) hau de shiuesheng sushe
 good DE_{np} student dormitory
 'a good dormitory for students'

Chao (1968) observes that both 62a and 62b are ambiguous but neither 63 nor 64 is. He tries to account for the disambiguating fact by suggesting that the function of DE_{np} is marking constituents. It is interesting, though, to find out exactly how the function is achieved. For the purpose of the present discussion, 63 would be a good example. If the function is simply marking constituents, there is no way to prevent it from marking constituents in the NP shiuesheng sushe 'student dormitory.' As a result, the string shiuesheng de sushe 'student dormitory' would be synonymous with shiuesheng sushe. If the whole NP is modified by an adjective hau 'good', the meaning of the resultative NP hau shiuesheng de sushe should be 'a good dormitory for students', a meaning shown to be impossible with 63. One way to prevent the above derivation and wrong semantic interpretation is to stipulate that the cliticization rule has to start from the top of the tree structure. Consequently, if there is only one DE_{np} in a matrix NP, it must mark the head of that matrix NP, not any of the embedded complex NP.

- (65)a. [np [np hau shiuesheng] de [np sushe]]
 good student DE_{np} dormitory
 b. * [np hau [np shiuesheng de sushe]]
 good student DE_{np} dormitory
 (66)a. [np hau de [np shiuesheng sushe]]
 good DE_{np} student dormitory
 b. * [np [np hau de shiuesheng] [np sushe]]
 good DE_{np} student dormitory

The structures in 65 and 66 represent the possible and impossible readings of 63 and 64 respectively. Both clearly show that the rule responsible for generating DE_{np} has to start applying from the top of the tree.

In addition to having the top of the tree as the initial position of application, the cliticization rule for DE_{np} has to be applied in one direction and cannot be reversed. It deter-

mines whether the head of the matrix NP is marked by DE_{np} or not. If it is marked, the rule can then go down the tree and determine whether to mark the head of a complex NP contained in the highest one. If the matrix head is not marked, no head of any lower level can be marked. Thus we can assume that this DE_{np} marking procedure stops whenever it decides not to mark a head. The procedure just described is reminiscent of the procedure in a top-down parser but very different from the mechanisms usually assumed in theoretical linguistics. Recent theories seem to agree that syntactic operations must be strictly local and that what happens at one level of tree structure should not affect the next level except through constrained local percolation of grammatical information. The procedure I describe here depends crucially on scanning a tree from top to bottom. Syntactic components in none of the current theories seem to allow this possibility. GB passes all grammatical information from lexical items up. GPSG and LFG both seem to allow grammatical information to be passed in either direction but disallow stipulating a uniform direction of the passing of grammatical information.³⁷ Since the syntactic components of current theories seem to be relatively well-motivated and there does not seem to be any independent motivation to assume that the top-down and strictly directional rules described apply in syntax, it is reasonable to posit that they are not syntactic rules. I have shown that the data described involves cliticization. Given the arguments for a separate module for cliticization in Zwicky (1983) and presented above, I propose that the DE_{np} rules just described belong to this special module. Since very few studies have been done to clarify exactly what kind of operation is allowed in the separate cliticization module conceived in Zwicky (1983), I hypothesize that the top-down scanning would be an operation specific to the cliticization module. This same operation not only enables the grammar to capture the rather idiosyncratic distribution of DE_{np} , but also allow a relatively straightforward account of the sentential clitics. That is, one can assume that the sentential cliticization of ma and ne is limited to one application. Since the operations in the cliticization module for Chinese are

³⁷ It is claimed in LFG that functional equations of a well-formed annotated c-structure would yield a unique f-structure solution no matter where the mapping procedures start. Thus, the lack of directionality of the passing of grammatical information is assumed. In GPSG, conventions governing feature percolation such as Foot Feature Principles and Head Feature Convention can be checked in either direction. That is, one can either check the foot features on a mother to see if they are correctly predicted by the Foot Feature Principles and the known Foot Features of all phrasal daughters or one can check the Foot Features on a phrasal daughter to see if they are incompatible with the predictions according to Foot Feature Principles and the known Foot Features on the mother.

proposed to be top-down and start from the top of the whole tree, these two sentential clitics can only occur at the absolute sentence-final position and can never be embedded.

V. Conclusion

In this chapter, I have studied the structures and functions of the morpheme de in noun phrases. I have argued, using well established criteria, that a de occurring in a complex noun phrase is actually a NP clitic DE_{np} . I have also argued that the parameter values deciding the position of the NP clitic should be P1: final, P2: after, and P3: enclitic and that the function of DE_{np} is to mark the head of a complex NP. Finally, citing the sentential clitic data, I support Zwicky's (1983) proposal that cliticization should be treated in a separate post-syntactic module. With data from both the sentential clitics and DE_{np} , I propose that the operations in this module for Chinese have characteristics very different from the well-known syntactic operations and obey strict directionality from top to bottom. This analysis accounts for NP constructions with DE_{np} much better than previous accounts which attribute the function of DE_{np} as marking the preceding categories. It is not clear at this moment whether the top-down and strictly directional feature is specific to the cliticization module for Mandarin Chinese or a universal to the cliticization module to all languages. I expect this feature to be at least a useful parameter. Future studies should shed more light on the feature of this module.

CHAPTER 3 THE SEMANTICS OF DE_{np}

In the last chapter, I argued for a structural description [$_{np}$ X DE_{np} NP] and a formal analysis in a cliticization module for complex NPs marked by DE_{np} . In this chapter, a formal semantic analysis of DE_{np} and related noun phrases will be provided. In the first two sections, I will begin with an introduction to Chierchia's (1982b, 1985) IL_* , the formal theory I am adopting, and preliminary studies of the internal semantic structures of nominal elements and verbal elements in Mandarin Chinese.

I. IL_* : A Semantics Without Complex Types

In Montague Semantics, categorial differences correspond to differences in semantic types. The category-type map assigns semantic types to different syntactic categories with a recursive definition based on how syntactic categories are defined in terms of primitives. A sentence is assigned the type $\langle t \rangle$, interpreted as a truth-value. A one-place predicate is assigned type $\langle e, t \rangle$, interpreted as a function from individuals to truth-value, which can also be represented as a set of individuals.¹ A noun phrase combines with a one-place predicate and forms a sentence: it is assigned the type $\langle \langle e, t \rangle, t \rangle$, interpreted as a function from expressions denoting things of type $\langle e, t \rangle$ to truth-values. Since a function mapping to two truth-values is in effect a characteristic function for the set consisting of all the elements in the domain the function maps to truth, one of the truth-value, the translation can also be considered as a set of sets of individuals. In general, an expression which takes an argument of type $\langle a \rangle$ to form an expression of type $\langle b \rangle$ would be assigned the type $\langle a, b \rangle$, and another category which takes an expression of type $\langle a, b \rangle$ and yields an expression of type $\langle a \rangle$ would be assigned the type $\langle \langle a, b \rangle, a \rangle$, and so on and so forth. There is no upper limit on the order of types. The type of a category depends solely on the type of categories it can combine with and the type of the larger category they form.

Parsons (1979) was among the first to point out difficulties with such a type theory which supposedly maintains a homomorphism between syntax and semantics by reflecting all categorial differences in syntax. His observation involves examples similar to the following.

¹ Notice that I am not taking intension into account. It is also worth mentioning that e stands for entities, or individuals in one sense.

- (1)a. John is ridiculous.
 b. To study linguistics without reading Chomsky is ridiculous.
 c. That linguists need not know logic is ridiculous.

With the recursive type theory, the predicate be ridiculous would be assigned at least three different types. In 1a, it is a one-place predicate taking a NP argument, and therefore would be assigned the type $\langle e, t \rangle$. In 1b, it takes a VP argument, of type $\langle e, t \rangle$, and therefore would be assigned the type $\langle \langle e, t \rangle, t \rangle$. Last, in 1c, it takes a sentence, of type $\langle t \rangle$; therefore it would get assigned the type $\langle t, t \rangle$. A problem arises immediately. Syntactically, all the different occurrences of is ridiculous are realizations of just one predicate, while the account assigns them at least three different semantic types. By assigning one single syntactic predicate to three different semantic types, the theory not only undermines the homomorphism claim, it also invites the question of how to account for the relationship between the three types. Parsons (1979) proposes a procedure to index types to lexical items and introduces the idea of floating types. His proposal successfully represents the multiple types needed to account for data like 1; however, it still fails to account for how the three different types of is ridiculous are related.² There are several proposed solutions to this problem. I will adopt the one proposed in Chierchia (1982b).

Noticing the problems with type theory in Montague Semantics, Chierchia (1982b, 1985) takes a totally different approach from Parsons (1979). Instead of allowing complex types while trying to account for them systematically, he seeks to reduce them. His strategy is to formally represent an idea that can be traced back to Frege; namely, that every property, i.e. propositional function, has two modes of being. The syntactic counterpart of a propositional function can occur in predicate positions and take arguments. It can also occur in argument positions with an individual interpretation, i.e. as a name to refer to that propositional function. For example, the sentence To be ridiculous is ridiculous has two occurrences of to be ridiculous, one in the predicate mode and one in the individual mode. The sentence maintains that the state of being ridiculous has the property of being ridiculous. A consequence of adopting a Fregean point of view is that predicates occurring in argument positions can now simply be treated as singular terms of type $\langle e \rangle$, called the individual correlates of propositional functions in Chierchia (1985). In all the different sentences in 1, the predicates would be assigned a uniform type. The only mechanism needed in the grammar is one to map properties to their individual corre-

² Parsons (1979) is mentioned here to bring up the questions faced by a Montague style type theory. For more details concerning this topic, see Chierchia (1982a, 1985), and, of course, Parsons (1979).

lates. This is done in Chierchia (1985.422) with the nominalization operator n .

- (2) If β is an n -place predicative expression, $n\beta$ is a singular term.

With the semantic type of all arguments of propositional functions, in spite of their internal syntactic structures, reduced to one semantic type $\langle e \rangle$, the types for predicates can also be greatly simplified. Following the practice of intensionalizing the type of sentences directly, the type $\langle p \rangle$, for proposition, instead of $\langle t \rangle$ is assigned to sentences. A one-place predicate would be assigned the type $\langle e, p \rangle$, a two-place predicate would be assigned the type $\langle e, \langle e, p \rangle \rangle$, and so on. The only expressions of higher orders are adverbs and adjectives which map predicates to predicates. For instance, a sentential adverb would be assigned the type $\langle p, p \rangle$.³ Thus the semantic formalism Chierchia advocates is basically a second-order logic, with the higher order functional constants for modifiers, as compared to Montague's Intensional Logic (IL) which involves indefinitely many higher orders. Chierchia (1985) calls his system IL*.

In the following sections, I will apply IL* to Chinese data: more generally to all verbal elements and nominal elements, and more specifically to the DE_{np} -construction. I will show that the system nicely captures the semantic features and generalizations of the data discussed and that several predictions of IL* are borne out.

II. The Internal Semantic Structure of NPs and VPs in Mandarin Chinese

Unlike English and most Indo-European languages, Chinese verb phrase nominalization is neither syntactically nor morphologically marked. That is, the Chinese counterparts of English gerunds or to-infinitives do not bear any mark. Nor are common nouns and terms morphologically or syntactically flagged in Mandarin Chinese.⁴ One should think that the parallelism between

³ Notice that a proposition is a zero-place predicate.

⁴ Both Common Noun and Term are Montague Semantics terminology. Terms are, in Montague semantics, expressions denoting sets of properties of individuals, i.e. generalized quantifiers, such as John, the dog next door. In IL*, they are complex individuals (of type $\langle e \rangle$). Common nouns denote properties of individuals, such as man, dog. They are of type $\langle e, p \rangle$ in IL*, and $\langle e, t \rangle$ in Montague's IL. In English, a common noun cannot stand alone as a NP and a term is often differentiated from common nouns by the syntactic mark of articles or the morphological mark of plurality (i.e. bare plurals).

the two major categories is not a coincidence. I will show that the lack of mark is actually a reflection of the Fregean intuition. That is, NPs and VPs are both allowed to have two different types of denotations: the first a predicative meaning and the second the individual correlate of the first meaning. In addition, nominal elements are allowed to refer to kinds, like people, animals, and matter. I will also show that the change between the different types can be achieved with type-shifting mechanisms.

First, the sentences in 3 are Chinese data involving bare nominals. By bare nominals I refer to nominals not associated with any determiners or quantifying elements, i.e. demonstratives, classifiers, and quantifiers.

- (3)a. gou jiao le
 dog bark PERF
 i) 'The dog barked.' or 'The dogs barked.'
 ii) 'A dog barked.'
 iii) 'Dogs barked.'
 b. ta you yi jr gou
 s/he have one MEASURE dog
 'S/He has a dog.'

The sentences in 3 show that nominal elements in Chinese are neither marked for their semantic types nor for number. In 3a, gou 'dog' is a term, but it is a common noun in 3b. In either case, the Chinese words have identical morphology and no overt syntactic mark. Hence a bare nominal in Chinese would be assigned at least two possible types: the one of a common noun and the other of a term. The ambiguity of readings corresponding to the two types can be accounted for in several ways. One possible strategy to account for the semantics is to posit a quantifier which is not morphologically represented but precedes every bare nominal in syntax. This strategy is supported by the fact that Chinese bare nominals do have a 'generic' reading which would seemingly be best explained if the semantic representation of the phrases contains a universal quantifier. The sentence in 4 serves as an example.

- (4) gou shr dungwu
 dog BE animal
 'A dog is an animal.' or 'Dogs are animals.'

-
- (i)a. * Dog is faithful.
 b. A dog is a faithful animal.
 c. Dogs are faithful animals.

In semantic terms, (i)a is ungrammatical because a position requiring a term (the subject position) is occupied by a common noun, while in (i)b and (i)c, adding an article and pluralizing both turn a common noun into a term.

In 4, the proposition involves all members of the species. In other words, for 4 to be true, all dogs must be animals. It seems to be appropriate to translate the sentence, informally, as 'for all x, DOG' (x) --> ANIMAL' (x)'. However, this cannot be the optimal analysis because bare nominals in Chinese do not behave like a NP quantified by a single quantifier. In fact, not unlike English bare plurals, Chinese bare nominals have many interpretations uncharacteristic of quantified NPs. I will adopt tests from Carlson (1977) to show that their semantic distribution cannot be explained by morphologically null quantifiers and that a bare nominal is best treated as a name of a kind. One of the un-quantifier-like feature is exemplified by 5.

- (5) gou bi mau da
 dog compare cat big
 'Dogs are bigger than cats.'

gou 'dog' in 5 cannot be a 'generic' expression referring to all dogs, neither does mau refer to all cats. For instance, a Chihuahua is very likely no bigger than any cat, yet the fact that a Chihuahua is a dog does not necessarily falsify 5. 5 refers to the general case and could be informally translated as 'for most x (DOG' x) & for most y (CAT' y), x is bigger than y' with the quantifier 'most'.

- (6)⁵ gou jiao de wo tzuo-wan shuei bu-jau
 dog bark DE_{vp} I last-night sleep not-able
 'The dog(s) barked so hard that I could not fall asleep last night.'

Similarly, in 6, it does not take the whole species of dog to keep me awake, neither does it take most animals of the species to do it. One or two nasty ones are enough. In this case, the sentence seems to be best translated with an existential quantifier, with optional plurality.⁶ Thus, I have shown with 4-6 that if the bare nominals are to be translated with abstract quantifiers, there have to be at least three different translations. With the three quantifiers assigned to bare nominals lexically, three-way ambiguities should be expected. Contrary to this prediction, the three sentences seem to be unambiguous. Thus the abstract quantifier analysis would proliferate impossible readings.

⁵ Take note that the morpheme de occurring in the sentence is not the NP clitic DE_{NP} but a VP clitic mentioned in chapter 2 and discussed in C. Huang (1985b) and Huang and Mangione (1985).

⁶ Notice that I am not formally representing plurality because it is not grammatically marked in Chinese and can always be inferred from the context if necessary.

Moreover, adopting Carlson's tests (1977) again, it can be shown that Chinese bare nominals have characteristics atypical for quantified noun phrases. For instance, there are opacity-inducing predicates which allow certain quantifiers to have ambiguous readings, such as the English sentences in 7.

- (7) Tom wants to buy a book.
 a. (Exist x) (Book x & Tom wants Tom buy x)
 b. Tom wants [(Exist x) (Book x & Tom buy x)]

If Chinese bare nominals are translated as quantified terms, ambiguities due to the transparent/opaque contrast introduced by the predicate, similar to those in 7 a and b, should exist. But 8 has only one reading, the opaque reading corresponding to 7b.^{7c}

- (8) Shiao-Ming shiang mai shu
 Shiao-Ming want buy book
 'Shiao-Ming wants to buy book(s).'
 Shiao-Ming wants [(Exist x) (Book' x & Shiao-Ming buys x)]

The sentence in 8 shows that, unlike other quantified NPs, bare nominals are not sensitive to the transparent/opaque contrast.

⁷ With bare nominals which refer to certain occupations, positions etc., there do seem to be ambiguities, such as in (i).

- (i) Shiao-Ming xiang gen laushr shuohua
 Shiao-Ming want with teacher talk
 a. 'Shiao-Ming wants to talk to the teacher.'
 b. 'Shiao-Ming wants to talk to teacher(s).'

I think the pair of readings have nothing to do with opacity. They can be explained by the fact that respectable occupations are often used as proper names in Chinese. For example, a person is often addressed by the title associated with his or her position, such as jingli 'manager', juren 'chief executive', shiauzhang 'principal', even by people who are not affiliated with his or her organization. A child's parents, grand-parents, friends, etc. would refer to the teacher of that child as laushr 'teacher' in their conversation with and about the child and would address her or him as laushr even long after the child has graduated. The ambiguity in (i) is not caused by the transparent/opaque readings but by the proper name/bare NP usages of the lexical noun. This account nicely explains the lack of ambiguity in 8 because there is no proper name usage for the noun shu 'book'. In (i)a, laushr is used as a proper name, referring to a pragmatically determined teacher of Shiao-Ming. Similar, but less pervasive, usages exist for some English kinship terms, such as Father and Mother. Gennaro Chierchia points out to me that G. Carlson observes in his thesis that certain English bare plurals like children of mine exhibit the same feature.

Thus, 7-8 show that were Chinese bare nominals translated into a term including a quantifier, that quantifier stands out in not being affected by opacity-inducing predicates.⁸ This and the problem that assuming a covert quantifier would proliferate unattested readings are both introduced by the assumption that there is a null quantifier in the semantic representation of bare nominals. The straightforward way to solve the problem is of course to abandon the assumption. The question then remains of how the meaning of bare nominals should be analyzed. The answer to this question is suggested by the following two sets of examples.

- (9)a. sung-shu yue wang shanshang jang de yue da
 pine-mouse more toward mountain-up grow DE_{np} more big
 'Squirrels grow bigger as one goes further up into
 the mountains.'
- b.⁹ yi-jr sung-shu yue wang shanshang
 one-MEASURE pine-mouse more toward mountain-up
 jang de yue da
 grow DE_{np} more big
 '???A squirrel grows bigger as one goes further up into the
 mountains.'

9 illustrates a special scopal phenomenon. In 9a, regardless of whether the existential quantifier in the translation of yi-jr sungshu 'a squirrel' has a wide scope or a narrow scope reading, the sentence carries the strange interpretation of a squirrel capable of growing as one travels. On the other hand, there is a possible interpretation for 9a, which does not seem to be affected by the adverbial. An explanation for the contrast is that the individual variable in 9a is bound by a quantifier and thus the only possible reading is that the same squirrel grows as one goes up the mountain. The lack of such a strange interpretation shows that there is no quantifier binding the bare nominal. The 9a reading can be derived in the following way. The predicate in 9a applies to a kind in Link's (1983) and Chierchia's (1982a) terms, of individuals. That is, it applies collectively to some individuals which are squirrels. The proposition can not be true with regard to any single individual of the kind but is true when the collectivity of these individuals is considered. In other words, in 9a, size is considered as a shared feature of

⁸ I have discussed but one kind of scopal ambiguity. Quantification and scopal ambiguity are two areas needing detailed and in-depth study in Mandarin Chinese.

⁹ 9b is ambiguous between two readings. The other one, given here as (i), is perhaps more readily available.

(i) A squirrel grows bigger as it goes further up into the mountain.

the kind, while it is regarded as an attribute of an individual in 9b.

A second example which sheds light on the semantic analysis of bare nominals involves a predicate which takes kinds as arguments, as in 10.

- (10)a. neijung dungwu tzai hua-bei hen pubian
 that-kind animal at China-north very widespread
 'That kind of animal is widespread in Northern China.'
 b. ma tzai hua-bei hen pubian
 horse at China-north very widespread
 'Horses are widespread in Northern China.'
 c. *neijr ma tzai hua-bei hen pubian
 that-MEASURE horse at China-north very widespread

The verb pubian 'widespread', like the corresponding predicates observed by Carlson (1977), selects names of kinds as its arguments. In 10a, jung 'kind' is explicitly stated in the sentence and the sentence is grammatical; while the occurrence of an individual instead of a kind in 10c violates the selectional restriction and thus rules the sentence out. Similarly, the grammaticality of 10b leads to the conclusion that bare nominals stand for kinds. It is worth noting again that the propositions in 10a and b are true for the kind but do not make any sense when any single individual of the kind is the subject. Following Carlson's (1977) study of English bare plurals, I will argue that bare nominals in Mandarin Chinese should also be treated as names of kinds. Since bare plurals are names of kinds, they meet the selectional restriction of the predicate in 10. Since their being names of kinds precludes their being quantified expressions, the facts that sentences with bare nominals are not affected by opacity, that they do not manifest scopal ambiguity, and that they can only have a narrow scope are predicted. The only related fact needing explanation is the easy transition from the 'generic' reading to the individual reading to the name of kinds reading to the group reading. For a formal treatment which accounts for all the data, I will assume the account given in Chierchia (1982b). A brief sketch instead of a complete recounting of Chierchia's (1982b) analysis will be given.

Chierchia (1982b, 1985) argues that the name of kinds reading of bare plurals should be represented as the nominalization of the predicative (or the CN type) meaning of the nominal element. For example, the semantic translation of English horse is of type $\langle e, p \rangle$ in IL*. That is, it is a propositional function with its extension being the set that consists of all horses. The bare plural reading of a name of the horse-kind would be translated as an expression denoting the individual correlate of the propositional function denoted by the $\langle e, p \rangle$ type meaning derived with the nominalization functor n . In simplistic terms, the translation would be referring to the propositional functions

as individuals. This takes care of the 'generic' reading and the cases where bare nominals are an argument to predicates which select kinds. For the individual reading such as the 'A dog barked' for gou jiaule in 1, Chierchia (1982) proposes a predicate constant Re (for realize) which functions just like the relation R between kinds and instances proposed in Carlson (1977). The predicate constant maps kinds to instances which make up the kind. Last, for the 'most' reading as in 5 with the sentence gou bi mau da 'Dogs are larger than cats,' the kind interpretation would also provide an adequate formal representation. That is, when a kind is involved in a proposition, it is not automatic for the proposition to apply to each and every instance of the kind. What is true of a kind is by definition a general truth which applies to most but not necessary every instance of the kind. It is worth reiterating that I am not presenting a formal account of Chinese noun phrases here. Chierchia's (1982) account of English bare plurals is mentioned here to augment my description of the formal semantic features of bare nominals in Chinese and to suggest what mechanisms a formal account would require.¹⁰

Next, I will look at the semantic features of Chinese VPs, especially VP nominalization. The sentences in 11, 12 and 13 illustrate how nominalization of verb phrases work in Chinese. The verb phrases in question are underlined.

- (11) youjryuan de haitz dou yung diannau
 kindergarten DE_{np} child all use computer
 '(Even) children in kindergarten use computers.'

¹⁰ One caution is that the distribution of Chinese bare nominals is not identical to English bare plurals. In addition to number, anaphora also show that they differ. For instance, the referent of the pronoun and its bare plural antecedent is different in Because raccoons stole his food, Tom hates them. But the Chinese equivalent Yinwei wan-shiong tou-le tade shrwu, Jangsan bu-shihuan tamen is at best awkward because it strongly suggests that tamen refers to the raccoons which stole the food instead of the kind. I believe the difference is due to the difference of pronominalization rules in the two languages instead of the semantic features of nominal elements. Simplistically, it seems that English pronouns pick up 'syntactic' antecedents, i.e. them in the English sentence cited stands for the bare plural phrase raccoons and has the same range of possible denotations to be specified in the context. On the other hand, the Chinese pronoun tamen seems to pick up a 'discoursal' antecedent, i.e. it refers to whatever the antecedent wan-shiong 'raccoons' refers to in the context.

- (12) yung diannau hen fangbian
 use computer very convenient
 'It is very convenient to use computer.'
 or 'Using computers is very convenient.'
- (13) You shie ren bu shihuan yung diannau
 exist some person NEG like use computer
 'Some people don't like to use computer.'

In 12 the verb phrase yung diannau 'to use computer' occurs in the subject position and in 13 it occurs in the object position. Since there are neither syntactic nor morphological marks for nominalized VPs in Chinese (the string yung diannau is identical to the corresponding string functioning as a VP, exemplified in 11), the most natural way to account for 12 and 13 is that the nominalization operation proposed in Chierchia (1985) applies in Chinese and gets the same semantic translation without altering morphological features of the expressions.

Before going into the details of the formal semantic analysis I am proposing, an alternative syntactic approach adopted by many linguists working within the Government and Binding framework will be examined. The approach assumes that what I called a VP nominalization is actually a syntactic clause. These clause, finite or infinitival, have abstract and morphologically null pronouns as their subjects. Readers are referred to Chierchia (1983, 1985) for more detailed contrastive study of several different strategies in accounting for the theory of predication and nominalization, including the semantic nominalization approach and the syntactic null pronoun approach. In this chapter, I will restrict my study to relevant Chinese data and to the semantic predictions of the null pronoun hypothesis regarding these Chinese data.

- (14) chi tzshingche bi paubu kuai
 ride bicycle compare run fast
 'To ride a bicycle is faster than to run.'

In GB, it is typical to assign a null pronoun with arbitrary reference as the subject of the nominalized verb phrases. So far as semantics is concerned, whether the null pronoun is a PRO_{arb} or a pro_{arb} should not make any different prediction.¹¹ The

¹¹ A null pronoun is a PRO (big pro) in GB when it is not governed by INFL, and a pro (small pro) if it is. In other words, PRO occurs in infinitival clauses while pro occurs in finite clauses. The 'poverty' of morphology in Chinese makes it very difficult to implement this stipulation with real language data. For instance, chapter 5 of J. Huang (1982) maintains that the perfective marker -le is the instantiation of INFL and the absence of it in sentences like 14 suggests that there is a PRO.

standard semantic treatment of pronouns is to translate them into some sort of bound term-variables. Since both PRO and pro are pronouns, the standard treatment can be followed. Once the treatment is adopted, since semantically they are both term-variables, the morpho-syntactic distinction of PRO/pro would have no semantic consequence. 15 offers an informal semantic representation of 14.

- (15)a. FASTER-THAN' {[(RIDE' (BICYCLE')) (x_{arb})],
[RUN' (x_{arb})] }
b. FASTER-THAN' {[(RIDE' (BICYCLE')) (x_{arb})],
[RUN' (y_{arb})] }

In the treatment of arbitrary null pronouns, there are two possibilities. First, they might be translated with the same variable, i.e. stipulated as having the same referent, as in 15a. Otherwise, they may be free from each other, i.e. they may or may not share the same referent, as in 15b.¹² I will further assume that the arbitrary reference of the null pronoun in question is contextually determined.¹³ More specifically, null pronouns could have arbitrary reference only because there is no syntactically encoded information to determine the reference to bind them, thus they can arbitrarily pick up any referent like free variables in general. Under this assumption, any individual, as long as the occurrence of its representation does not violate any syntactic or semantic constraints, is a possible referent. The

Y. W. Zhang, in a term paper, takes the same example and maintains that -le is possible and therefore concludes that there should be a pro rather than a PRO in sentences like 14. What is clear is that -le cannot be identified with INFL because it occurs in obligatory controlled clauses which have been shown on other grounds to have the occurrences of PRO, such as in (i). Chapter 2 of Li (1985) also independently observes the data.

- (i) Lisz chiu'an Jangsan mai-le nei-ben shu
Lisz advise Jangsan buy-PERF that-volume book
'Lisz advised Jangsan to buy that book.'

¹² Even though the standard GB account seems to assume that the two null pronouns are bound by the same operator, I think it is worthwhile to investigate the cases where they can have different referents. It is clear that the sentence using drug is worse than drinking is not necessarily comparing the same person performing the two acts. To capture the fact that the sentence is a general truth with the possibility of different individuals acting as the subject of the two propositions, translating the pronouns with different variables needs to be considered.

¹³ Here, by contextual, I mean that it is either determined by rules in syntax, semantics, or pragmatics.

two free variable accounts in 15b faces obvious problems because it permits the following reading.

(16) John rides bicycle faster than Jim runs.

16 may well be false under many circumstances. For instance, John could be someone who hardly knows how to ride a bicycle and Jim could be a world-class jogger. Nevertheless, anyone who uses the sentence 14 is not responsible for the truth of the proposition it expresses under these circumstances. In other words, the stated case does not falsify 14. Thus 15b is not a good formal representation for 14.

15a does not fare much better either. Let us suppose that Jim is picked as the referent for both occurrences of the same variable in 15a and that he is another person who simply does not know how to ride a bicycle. Similar to the case just discussed, the 15a reading would be false under the supposed conditions and yet the truth of 14 doesn't seem to be affected by such a scenario.

One can of course resort to the fact that these circumstances seem to be pragmatically relevant to argue that real-world knowledge should intervene to prevent assigning wrong referents to the null arbitrary pronouns. Two points can be made against such an argument. First, by resorting to real-world knowledge, the null pronouns can no longer be said to have arbitrary reference because their reference is constrained by pre-determined principles. Second, sentences like 14 are meant to be general truths, while the account just sketched suggests otherwise. Incorporating real-world knowledge into the account, 14 would have to be formally represented as something like 17, with all the exceptions listed.

(17) '(FASTER-THAN' {[(RIDE' (BICYCLE')) (xarb)], [RUN' (xarb)] }
except when x = Jim, who is a world-class jogger but cannot
ride a bicycle, or when ..., or...'

17 cannot be right. The sentence is not a detailed description of the real-world knowledge concerning who rides bicycle faster than he or she runs, as 17. Instead, 14 seems to have a 'generic' reading which holds regardless of atypical cases.

An alternative, based on the fact that 14 seems to have a 'generic' reading, is to postulate that the translation of the null pronouns contains an inherent universal quantifier. 14, then, would be represented as 18.

(18) $\forall x$ (FASTER-THAN' {[(RIDE' (BICYCLE')) (x)],
[RUN' (x)] })

The formal representation of 18 states that for all x, it is faster for x to ride a bicycle than it is for him to run. Taking the famous jogger Jim for instance again, 17 can be easily falsified, while the proposition expressed by 14 does not seem to be affected. Actually, what 14 seems to mean is closer, though not identical, to the 'most' reading of bare nominals, i.e. gou bi mau da 'Dogs are bigger than cats' in 5.

Another type of sentence difficult for the null pronoun hypothesis to account for semantically is exemplified by 19.

- (19) wantsan chr huoji shr ganenjie de chuantung
 dinner eat turkey BE Thanksgiving DE_{np} tradition
 'To eat turkey for dinner is a Thanksgiving tradition.'

Similar to 14, 19 is a general truth. But chr huoji 'to eat turkey' in the sentence cannot refer to just any turkey-eating act, as would be suggested by the arbitrary null pronoun analysis. It refers specifically to Americans' eating turkey for Thanksgiving dinner. An American could possibly have turkey for dinner every day, and yet only one day in a year can he or she be said to be practicing a Thanksgiving tradition. On the other hand, an Afghan may by chance decide to have turkey for dinner on the fourth Thursday of November, yet no tradition of Thanksgiving can be said to be involved. For 19, only a sum of some of the highly restricted turkey-eating acts is relevant to the statement. This, again, is parallel to the usage of bare nominals. One example is ji sheng dan 'Chickens lay eggs.' For obvious reasons, ji 'chicken(s) & rooster(s)' here cannot refer to all the members of the species, nor can it even refer to most members of the species. Either interpretation would wrongly predict that the proposition should be false. For the sentence to be valid, which seems to be the case, ji can only refer to the group of egg-laying hens, which should be sheng dan de muji lay+egg+DE_{np}+then in Chinese. Thus the two types of Chinese data discussed not only show that the clausal analysis with null pronoun is semantically inadequate but also suggest that VP nominalization should be treated in semantics similarly to the 'kind' reading of bare nominals.

The last piece of evidence concerning the parallelism between VP nominalization and bare nominals involves predicates selecting kinds as arguments, as in 20.

- (20) chi ma tzai hua-bei hen pubian
 ride horse at China-north very widespread
 '(The exercise of) riding horses is widespread in
 Northern China.'

Recall 10b where the same predicate is applied to a bare nominal. Since the predicate selects kinds as its argument and the nominalized VP occurs here as an argument, the conclusion is that

a nominalized VP denotes a kind. Or, similar to a bare nominal, I will call it a name of kinds. This is supported by the following sentence, where a copula explicitly indicates that a VP nominalization equals a kind.

- (21) chr shr yi jung yishu
eat BE one kind art
'Eating is a (kind of) art.'

To sum up the above discussion, I have presented evidence to show the similarity between VP nominalizations and bare nominals and have argued that, like bare nominals, VP nominalization should be treated as names of kinds.¹⁴ The conclusion come as no surprise. In Chierchia's (1982b, 1984, 1985) account of English bare nominals and VP nominalization, the same functor n applies to both the type $\langle e, p \rangle$ meaning of a noun and a VP to yield the type $\langle e \rangle$ meaning of a name of a kind and the individual correlate for the VP respectively. I will examine the VP nominalization cases more carefully. A verb phrase, more specifically an intransitive VP in Montague's terms, denotes a propositional function, a function mapping entities to propositions. Its nominalization denotes the individual correlate of this function, a concept of Frege's formalized by Chierchia (1985). The nominalization 'names' the propositional function, the propositional function as an individual rather than a function. With a name of the propositional function, or a name of a kind as parallel to the bare nominal treatment, one gets the 'generic' reading, such as shiyān nǐ yǒu hǎi 'Smoking is harmful.' In cases like wǒ tāu yān shì yān 'I hate to smoke', the fact that the subject of the nominalized VP is controlled will be accounted for with a theory of Control.¹⁵ As for the so-called 'most' reading, nominalizations in sentences like chí mǎ bǐ zǒu lù kuài 'Riding a horse is faster than walking', can be treated as kinds like bare nominals. That is, it is not necessary for each and every member of the kind to satisfy a proposition for the kind to satisfy the same proposition. Thus, I have shown that not only does the same nominalization operation apply to both bare nominals and VPs, but the same mechanisms that account for the different readings of bare nominals also apply to VP nominalization.

¹⁴ For the obvious reason that VPs cannot usually be quantified, there is no example showing the features of VP nominalization regarding opacity, scopal ambiguity, etc. This should be regarded as an important argument against treating VP nominalizations in Mandarin Chinese as full-fledged nominal elements.

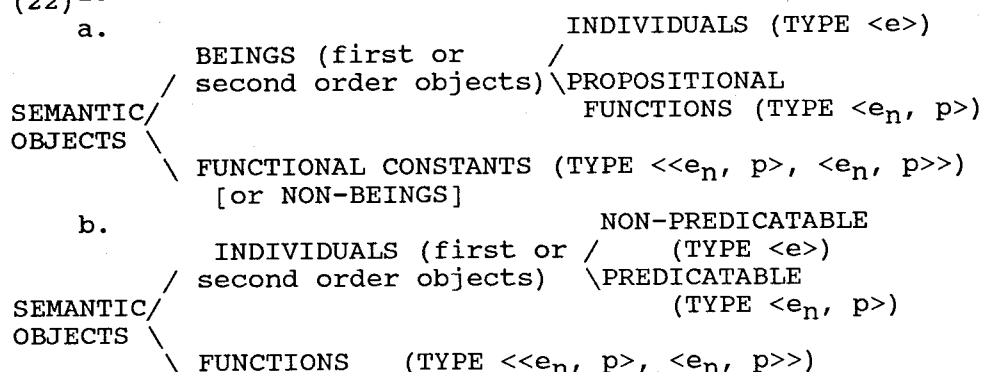
¹⁵ See Chierchia (1984) for the treatment of Control in this approach. Also see Dowty (1982) for discussion of recent theories of Control.

The fact that verbal elements and nominal elements share many different semantic features is significant for Mandarin Chinese and for the theories of nominalization in general. It has long been taken for granted that the lack of morphological distinctions between verbal and nominal categories is simply a manifestation of an 'impoverished' morphology of Chinese. This assumption, however, is flawed. I will show that the lack of morphological mark is but a reflection of the parallelism of their internal semantic structures. Since both categories are mapped to the same semantic types, <e,p> and <e>, and since they undergo the same semantic operations to derive the same range of meaning, morphological marks need not distinguish the two. In addition, Chinese marks neither the distinction between Common Nouns and Terms nor that between VP and VP nominalization overtly. This can be attributed to the Fregean intuition that they are two modes of beings. That is, the language puts emphasis on the fact that they are the same beings rather than the fact that they instantiate the two modes. The secondary division between the two modes is made by their syntactic and semantic environments while the primary division of non-beings from beings is morphologically significant, to be illustrated later with the morphological marks for adverbs. In contrast, we have English, in which the two modes are morphologically marked as gerunds and to-infinitives in verbal categories, and syntactically marked by determiners and quantifiers in nominal categories, with the only exception being bare plurals and mass nouns where the two modes are represented by the same morpheme. That is, the two modes are marked differently everywhere except for bare plurals, which gives the only hint that the two modes make up the larger category of beings.

The similarity between verbal and nominal elements in Chinese has another important implication for the theory of nominalization. That is, it offers strong support for Chierchia's type-shifting and individual correlate account. Chierchia (1982a, 1982b, 1984, and 1985) argues convincingly for treating both English VP nominalization and bare plurals with the nominalization operation ⁿ despite the markedly different morphology for the two grammatical categories. It is well-established that morphological marks often bear no semantic significance, grammatical gender being a good example. It is also well-known that semantic structures may dictate some morphological operations, the relation between a function/argument pair and agreement being an example. With this point in mind, I will re-examine Chierchia's IL*. In the formalism of IL*, the most basic division among semantic objects seems to be the one between beings and functional constants (or between individuals and functions in slightly different terms), with the former assigned first and second order types and the latter third order types. Beings correspond roughly to major categories in syntax, i.e. verbal or nominal categories. Functional constants roughly correspond to minor categories, i.e. adverbials and adjectiv-

als.¹⁶ The beings can be further divided into two modes: individuals and propositional functions. This is illustrated by the following two corresponding diagrams.¹⁷

(22)¹⁸



I have shown that shifts between the two modes of beings do not entail morphological changes. It should be interesting to find out what languages do with the contrast between beings and the third-order functional constants. In Chinese, though nominalization entails no morphological changes, adverbs can never undergo nominalization, as illustrated by 23.

- (23) a. manman-(de) 'slowly'
 b. *manman-(de) hen hau
 slowly very good

23b shows that an adverb cannot occur in argument positions. In addition, another intriguing fact is that adverbs are the only category in Chinese which is morphologically marked on a regular basis.¹⁹ With the exception of the set of about ten aspectual adverbs mentioned in Chapter 1, all adverbs in Chinese are either

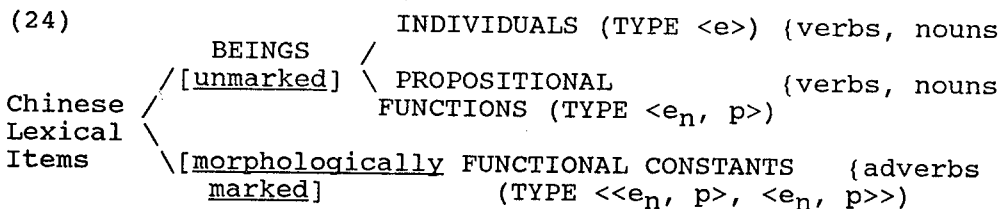
¹⁶ This includes prepositions if they are not used as predicates, like Chinese ta tzai jia s/he+be-at+home 'S/He is home', which would be treated as propositional functions.

¹⁷ Adopting a branching feature system along the same line as Gazdar and Pullum (1982), non-beings can be represented as the feature matrix [-BEING], individuals as [+BEING, +INDI], and propositional functions as [+BEING, -INDI].

¹⁸ The type $\langle e_n, p \rangle$ is the type assigned to n-place predicates. For instance, $\langle e_3, p \rangle$ stands for $\langle e, \langle e, \langle e, p \rangle \rangle \rangle$, the semantic type for a ditransitive verb.

¹⁹ A few nouns are marked by the suffix -tz, but the majority of them is unmarked.

marked by reduplication, by the affix -de, or by both, as exemplified by 23a. This suggests that adverbs are treated as a marked category in Chinese. The most natural explanation is that the morphology is reflecting the semantic fact that adverbs are the only category which has only higher order meanings. Referring back to the diagram 22, in IL*, the Being/Non-being distinction is the most basic one, and the Individuals/Propositional functions distinction is secondary.²⁰ This is reflected in the fact that the functional constants are the only higher order objects in this (non-standard) second-order logic, and that they are the only objects which cannot undergo the Fregean nominalization device. Chinese marks only one grammatical category morphologically, and the category happens to coincide with the semantic non-beings represented as third-order objects in IL*. I think it is no coincidence that Chinese marks the primary division among semantic objects. The Chinese morphological system, closely reflecting the theoretical semantic frame of 22, is given here as 24.



In English, since most grammatical categories are morphologically marked, there is really no way to tell which category is more marked than the other one. That is, the third order functional constants, instantiated as adverbs in the language, are not more clearly marked than the other grammatical categories. Furthermore, the nominalization device does not manifest morphological effects consistently either. Even though the individual correlates of the verbal predicates are marked differently from the predicates, corresponding common nouns and bare plurals do share the same forms. Of course the individual/propositional function distinction is well-founded without morphological manifestation. But the fact remains that neither

²⁰ Another possibility is to have a three-way distinction with none of the possible pairs being more basic. There is no decisive evidence for or against the hierarchy I adopt in 22, as compared to the three-way one. It is clear, however, that though the two modes of beings (or the predicatable and non-predicatable individuals) can be treated as one natural type, there is no apparent way to take one of the modes and classify it as the same type as the functional constants (or functions). This and the fact that binary hierarchies are often considered the unmarked ones are the motivations for assuming that the BEING/NON-BEING distinction is the basic one.

the basic Being/Non-being contrast nor the Individual/Propositional functions contrast is straightforwardly marked in English morphology.

I must caution that I am not claiming morphology should closely reflect semantics. On the contrary, morphology belongs to a separate module and should have its own characteristics. This is exactly why there are discrepancies between the English morphological system and the semantic structure as represented by IL*. However, morphology is where much grammatical information, syntactic or semantic, is encoded, and should carry certain clues to indicate semantic structures. What I am trying to show is that the Chinese morphological system seems to be more 'semantical' than the English one. English morphology is idiosyncratic so far as semantics is concerned because it does not reflect the formal hierarchy of IL*. Chinese morphology, though meager, marks only the first binary branching in the formal hierarchy of IL*. Further study may or may not reveal languages which mark both distinctions in IL* consistently. Nevertheless, the Chinese system strongly supports the existence of the primary distinction between Beings and Non-beings and also demonstrates one side of the Fregean intuition that individuals and propositional functions are two modes of beings, i.e. they belong to the same category of beings. Since the nominalization device cuts through two grammatical categories in most languages, the obvious way to morphologically represent the generalization that they undergo the same operation as a group is not to mark the two categories differently. This is exactly what Chinese does. Given Chierchia's theory which reduces types and captures cross-categorial generalizations, it would be a surprise if all languages mark the two categories overtly in morphology and thus obscure the cross-categorial generalizations.

Thus, I have argued in this section that IL* nicely captures Chinese data.²¹ I have also argued that, so far as semantics is concerned, English uses redundant marks to distinguish verbal elements from nominal elements. I will show in the following two sections how IL* and the Fregean nominalization device apply to the DE_{np}-constructions.

III. The Semantic Types of the DE_{np}-construction, and the Nominal Head

I have just shown that Chinese bare nominals, like English bare plurals, are names of kinds. Since both the bare nominals and complex NPs can occur as syntactic NPs, they are expected to have the same semantic type <e>. Complex NPs marked by DE_{np}

21 Even though I did not really discuss English data, it does seem to me that my arguments concerning VP nominalization also work with corresponding English data.

should also be kinds. This prediction is confirmed by the following data.

- (25)a. Sanbai mai *de* chenshan manjie dou you
 Sanbai buy *DE_{np}* shirt full-street all have
 ren chuan
 person wear
 'The (kind of) shirt(s) Sanbai bought is worn by people all over the places.'
- b. chuangwai changge *de* niau shr yijung yeying
 window-out sing *DE_{np}* bird BE one-kind nightingale
 'The birds singing outside the window belong(s) to a kind of nightingale.'
- (26)a. Sanbai mai *de* ma liang pi shr bai *de*
 Sanbai buy *DE_{np}* horse two CLASS BE white *DE_{np}*
 '(Of) the horses Sanbai bought, two are white.'
- b.²² Sanbai mai *de* ma ying-le yichang bisai
 Sanbai buy *DE_{np}* horse win-PERF one-CLASS race
 'The/A horse Sanbai bought won in a race.'

26a shows that the *DE_{np}*-construction can refer to plural individuals and 26b shows that it has both the definite and the indefinite readings. In 26b, depending on the context, the NP Sanbai mai de ma 'horse(s) Sanbai bought' could refer to a unspecified horse Sanbai purchased; in this case, 26b may elicit the question nei yipi 'Which one?' The phrase could also refer to a contextually determined horse, just as if it were being quantified by a definite article. 25a and b, on the other hand, illustrate the kind usages of NPs marked by *DE_{np}*. Both Sanbai mai de chenshan 'shirt(s) Sanbai bought' in 25a and Chuangwai changge de niau 'bird(s) singing outside the window' refer to the kind they belong to rather than the individuals themselves. Take 25a for example, people all over the places could not possibly be wearing the very same shirt Sanbai bought. They are simply wearing shirts of the same kind. Otherwise, neither 25a nor 25b would make any sense. The fact that complex NPs marked by *DE_{np}* denote kinds means that they should be expressions of type <e> and that the operations discussed in the last section apply to them. Namely, these <e> type expressions should also be able to denote individuals and groups of individuals belonging to the kind.

One formal feature that needs explication is how the different types of <e> readings are related to each other. There are at least three of them: the kinds, the ordinary individuals, and the collections of the ordinary individuals which belong to a single kind. It can be assumed that the 'kind' reading is assigned as a basic interpretation. But at least two strategies

22 The gloss CLASS stands for classifier.

have been adopted to account for the other readings. The first is proposed by Carlson (1977). He maintains that the ordinary individual reading should be treated as stages (or realizations) of the kind. For instance, the English Dogs bark would be assigned the translation ' $BARK'(d)'$ ', which means that it is a property of the dog kind to bark. Dogs barked (in my backyard last night), on the other hand, would be translated as ' $R(x,d) \ \& \ BARK'(x)'$ ', which means that there are some realizations of the dog kind (or stages of the dog kind) which barked.²³ The R functor, read as realization, will be introduced by the translation of certain verbs. Since Chinese bare nominals can have denotations ranging from singular individuals to a sum (collection) of these individuals, the realization functor would have to be defined on both singular individuals and collections of them (called sub-kinds). Another approach, adopted from Heim (1982), is to allow the $\langle e \rangle$ type meaning of bare nominals to stand for a complex entity. That is, the denotation of a $\langle e \rangle$ type expression is a complex entity which is 'true' of a kind, individuals of that kind, and sub-kinds of that kind. That is, internal structures similar to the ones proposed in Link (1983) are allowed for the type $\langle e \rangle$ translation. I will adopt the latter approach because I do not have evidence showing that the different readings of a term in Chinese are induced by the predicates rather than being an inherent feature of the nominal system. Either approaches would satisfactorily account for the data.

With the semantic type of the whole DE_{np} -construction decided, I will now try to determine the type of the nominal head of a DE_{np} -construction. In the last chapter, DE_{np} has been shown to mark the NP head of a complex NP; the allowed categories of the head have been shown to be more restricted than just any syntactic noun phrase. I will argue in this section that the restriction on the head NP marked by DE_{np} is a syntactic restriction that the head has to be of the type of a common noun.

As shown by 3, most Chinese nouns can occur alone as either a term or a common noun. But there are a few environments where some lexical items cannot occur alone as terms. I will take advantage of these special cases to show that the head after a DE_{np} has to be a common noun. Shr 'event', discussed with examples 29 and 30 of chapter 2, happens to be one of them and the so-called appositional clauses seem to be one of the environments.²⁴ The examples are repeated here as 27 and 28.

²³ Notice that I am ignoring tense and adverbials.

²⁴ See footnote 17 in Chapter 2 for discussion of apparent counterexamples. These apparent counterexamples can be accounted for as homographs of the shr 'event, matter' discussed here.

- (27)a. wo tingshuo-le taikungsuo bauja de shr
 I hear-say-PERF space-shuttle explode DE_{NP} matter
 'I have heard of (the event of) the explosion of the
 Space Shuttle.'
- b. *wo tingshuo-le taikungsuo bauja shr
 I hear-say-PERF space-shuttle explode matter
- (28)a. wo tingshuo-le taikungsuo bauja de
 I hear-say-PERF space-shuttle explode DE_{NP}
nejian shr
 that-item matter
 'I have heard of (the event of) the explosion of the
 Space Shuttle.'
- b. wo tingshuo-le taikungsuo bauja nejian shr
 I hear-say-PERF space-shuttle explode that-item matter
 'I have heard of (the event of) the explosion of the
 Space Shuttle.'

I have argued in the last section that Chinese bare nominals should have the type <e> and stand for kinds. However, there are reasons to believe that shr might be an exception. One very important phenomenon is that shr can never occur alone, certainly not in argument positions. It can co-occur with classifiers, such as yi jian shr 'one+item +matter 'one event'', or in a compound, such as shrching 'affair'. In other words, shr lacks the ability to independently refer to entities. I will assume that this fact is due to a lexical idiosyncrasy where a few nominal items such as shr are simply assigned the type <e,p> as its basic type.²⁵ With this assumption, the contrast between 27b and the other sentences can be explained. Following the hypothesis of type-shifting in Partee and Rooth (1983), I assume the strategy that an NP is always assigned the lowest type unless a different type is required by the structure. In unmarked cases, an NP, such as nei jian shr 'that event' would be assigned the type <e>. This would be the type required in a real appositional construction not marked by DE_{NP}, such as in 28b. shr belongs to one of the marked cases where a nominal element is assigned the type <e,p> such that classifiers and demonstratives can map it to the <e> type meaning and that it cannot occur alone as an argument. Since the lexically assigned type is the simplest type by the

²⁵ As far as compounds like shrching are considered, it is plausible that shr is not a word but just a morpheme. This fact brings up the possibility that the string shr 'event, matter' discussed is also a morpheme. In addition to the observation that it is very unlikely that the whole phrase taikungsuo bauja de shr 'the event of the explosion of the space shuttle' is a compound, phrases like yi jian shr also seem to suggest otherwise. Since quantifier phrases like yi jian 'one item' form a syntactic phrase, shr, which forms a NP with the quantifier phrase, also has to be a syntactic unit.

Partee and Rooth (1983) hypothesis, there is no type-shifting mechanism available to lower it to the simpler type <e>. Thus 27b is ruled out because the type of the noun shr does not meet the type requirement of an appositional structure. On the other hand, since shr does occur as the head of a DE_{NP}-construction in 27a, I will also assume that the position requires a type <e,p> argument. In contrast, even though the type of the phrase nei jian shr 'that event' in 28b is <e>, the type-shifting mechanism pred of Chierchia (1985) applies and raises the type of the NP. This is allowed by the Partee and Rooth hypothesis because the type is being raised from the lower basic type <e>. It is also worth mentioning that such a type-shift would be licensed by the requirement of the DE_{NP}-construction.

There are possible problematic cases, however, for the hypothesis that the head of a DE_{NP}-construction is of type <e,p>. Demonstratives are often considered to be deictic and their semantic function to map CNs to terms. With this presupposition, nei ben shu 'that book' in the following examples would have the type <e>.

- (29) jiou de nei ben shu
 old DE_{NP} that volume book
 'the old book'

- (30) * jiou nei ben shu
 old that volume book

The presupposition that nei ben shu is assigned the type <e> accounts for the ungrammaticality of 30 nicely. Adjectives are generally considered to map common nouns to common nouns. Since nei ben shu is a term, it cannot be modified by an adjective. In contrast, 29 is much more complex. The <e,p> hypothesis for the head of the DE_{NP}-construction does not seem to work here since nei ben shu seems to have the type <e>. The obvious alternative is to maintain that the DE_{NP}-construction is just another modification construction and therefore the adjective will be taking a common noun argument. This will not work with the presupposition nei ben shu has the type <e> either. 29 would have been ruled out under this hypothesis, just like 30. Recall that terms and common nouns are not morphologically marked in Mandarin, and therefore the identification of semantic types of NP often relies on syntactic structures. A priori, nei ben shu seems to have the type <e>, but there is really no firm evidence to show that it does in 29.

- (31)a. (=29) jiou de nei ben shu
 old DE_{NP} that volume book
 b. nei ben jiou (de) shu
 that volume old DE_{NP} book
 'that old book'

31a is grammatical and almost synonymous to 31b.²⁶ One way to account for it and to maintain a regular mapping between syntax and semantics is to posit that, following Partee and Rooth (1983) and Partee (forthcoming), there is a mechanism of type shift which allows the adjective and the demonstrative to combine in different orders with the head. The mechanism will be the same as the one accounting for 28a. It is worth reiterating that this type shift is signaled by the presence of DE_{np} , as illustrated by the contrast between 29 and 30, repeated here as 32.

- (32)a.(=29) jiou de nei ben shu
 old DE_{np} that volume book
 'that old book'
 b.(=30) * jiou nei ben shu
 old that volume book

The only difference between 32a and 32b is the presence of DE_{np} in 32a. If the type of neiben shu 'that book' remains unchanged as <e> in both phrases, both phrases should be ruled out. The acceptability of 32a, parallel to 28a, could be attributed to the DE_{np} -construction which motivates type shift to the type <e,p>. I assume that the strict restriction of DE_{np} on the head of the complex NP motivates a type shift.

Furthermore, a minute semantic difference between NPs with a pre- DE_{np} demonstrative, such as 31b, and NPs with a post- DE_{np} demonstrative, such as 31a, supports the analysis. Chao (1968:286) and other studies of Chinese observe that an adjectival phrase in a NP with a demonstrative occurring in a pre- DE_{np} position tends to be descriptive (non-restrictive) while an adjectival phrase in a NP with a demonstrative occurring in a post- DE_{np} position tends to be restrictive.²⁷ That is, with the NP nei ben jiou de shu that+volume +old+ DE_{np} +book, the more

²⁶ A discussion of the semantic difference between the two follows shortly.

²⁷ The data Chao (1968) cites and his translations are given here as (i). It is clear from his translation that there could be more than one neiwei shiansheng 'that gentleman' when it occurs after DE_{np} , and therefore it can not denote the contextually determined unique individual the English NP that gentleman denotes.

- (i)a. nei wei dai yanjing de shiansheng shr shei
 that CLASS wear eye-glass DE_{np} sir BE who
 'Who is that gentleman (who incidentally) is wearing
 glasses?'
 b. dai yanjing de nei wei shiansheng shr shei
 wear eye-glass DE_{np} that CLASS sir BE who
 'Who is that gentleman who is wearing glasses (not the
 one who is not wearing glasses)?'

precise translation should be 'that book, which is old', and with the NP jiou de nei ben shu, the translation should be 'book over there that is old'. A detailed formal analysis of the DE_{NP}-construction will not be given until later in this chapter. It suffices to remark at this point that the fact that the adjectival phrase in jiou de nei ben shu 'the book over there that is old' is restrictive means that the NP with a demonstrative nei ben shu 'book over there' could not independently determine its referent. This is contrary to the common belief that a demonstrative maps a CN to a term and contextually determines the referent. In other words, even though the data do not lead directly to the conclusion that the phrase nei ben shu 'book over there' is of type <e,p>, they do clearly show that the phrase does not denote entities and cannot be of type <e>.

The theory that the head of a complex NP marked by DE_{NP} has to be of the type <e,p> makes correct predictions concerning the behaviors of some nominal elements which always refer to individuals, or act as terms in Montague's terminology. These include both proper names and antecedentless personal pronouns, which are translated as individual variables in many versions of formal semantics. Because of their semantic properties, proper names and personal pronouns do not usually refer to a set of (or the properties of a set of) individuals, and therefore cannot be CNs. As expected, they cannot be the head of a DE_{NP} construction, exemplified in 33.

- (33)²⁸a. * tzuotian lai de Jangsan
 yesterday come DE_{NP} Jangsan
 b. * tzuotian lai de ta
 yesterday come DE_{NP} s/he

- (34)a. * pang de Jangsan
 fat DE_{NP} Jangsan
 b. * pang de ta
 fat DE_{NP} s/he

The phenomena in 33 and 34 have often been observed in descriptive works, such as Chao (1968:393) and Li and Thompson (1981:133). No satisfactory grammatical account, though, has been given of these data. The analysis that only CNs, i.e. nominals of type <e,p>, can occur following DE_{NP} as the head of the complex NP explains the facts nicely. Pronouns and proper

²⁸ The phrase is acceptable when there is more than one Jangsan and the speaker is trying to clarify which Jangsan is s/he referring to. But in this case the noun 'Jangsan' is used to refer to the set of individuals whose shared property is that they are all named as 'Jangsan.' This usage of the noun can no longer be regarded as a proper name. (cp. English the John who blinks before he speaks.) The same remark applies to 34a.

names are terms and do not allow type-shifting in unmarked cases, therefore 33 and 34 are ruled out because of type mismatch.²⁹

Thus I have shown with the distribution of DE_{np} in appositional phrases in 27-28 that the nominal heads in a DE_{np} construction after DE_{np} have to be common nouns. This account is supported by the fact that pronouns and proper names, two nominal elements with term readings only, cannot occur as heads of DE_{np} constructions.

IV. Translating DE_{np} as the Meet Operator

I proposed in the last section to assign the type of a common noun to the head following DE_{np}. This type will be formally represented as <e, p> in this thesis.³⁰ I also showed that most Chinese nominal elements can function either as terms or as common nouns, i.e. they may have types of both <e,p>, and <e>. Following Partee and Rooth's (1983) assumption that the lowest type is assigned lexically, the type <e> will be assigned to most Mandarin Chinese nouns, except those ones which cannot occur alone, such as shr 'event' discussed in the last chapter. With the semantic type of the head NP decided, I will proceed to give a formal analysis of the whole DE_{np}-construction.

One fact that needs to be determined with respect to the translation of the DE_{np}-construction is how the two phrasal categories--the post-DE_{np} head NP and the pre-DE_{np} phrase--interact with each other. I will try to determine the interaction between the two phrasal categories by comparing the DE_{np}-

²⁹ In formal theory, there is no clear reason why the type of pronouns and proper names cannot be shifted. In fact, Chao (1968:392) observes what he calls the 'emphatic' usage of pronouns. Phrases like kelian de wo 'poor me' are acceptable. The explanation may be that the adjectives are not modifying the head noun, i.e. they describe the feeling of the speaker rather than the properties of the head noun. But take note that phrases like meili de wo '*beautiful me' are out. The same thing happens to the Chinese counterparts of poor John and *beautiful John. Little John (of Robinhood) is acceptable, but John in the phrase is not used as a proper name, the two word string is. It may be argued that this is exactly a marked case of type-shifting where the <e,p> type meaning of John is really the characteristic function of the set of people named John. Louis Mangione observes that beautiful John is acceptable to some speakers, but not beautiful me. I do not have an account for the distinction right now.

³⁰ I am following the convention set by Chierchia (1985) in assigning the type <p> of a proposition, instead of the traditional <t> of truth-value, to a sentence.

constructions with their equivalents without DE_{np}. The following examples show systematic contrasts between DE_{np}-constructions and complex NPs without DE_{np}.

- (35)a. hung toufa
red hair
'red hair (of a redhead)'
b. hung de toufa
red DE_{np} hair
'the hair which is red'
- (36)a. Jungguo tsanting
China restaurant
'(a) Chinese restaurant'
b. Jungguo de tsanting
China DE_{np} restaurant
'restaurants in China'
- (37)a. tie wei
iron stomach
'iron stomach (of someone who eats without chewing)'
b. tie de wei
iron DE_{np} stomach
'a stomach/s which is/are made of iron.'

The a. phrases in 35-37 are NPs without DE_{np} and the b. phrases are the ones with DE_{np}. One generalization about them is that the b. phrases tend to have literal meanings while the a. phrases tend to have more idiosyncratic meanings. Of course, the hair of a redheaded person is not red (35a), a Chinese restaurant serves 'Chinese' food but does not necessarily have anything to do with China (36a), and a person who eats without chewing does not have an stomach made of iron (37a). In contrast, a person who has hung de toufa 'red-colored hair' probably had it dyed (35b), jungguo de tsanting 'restaurants which are Chinese' have to be situated in China (36b), and some one with a tie de wei 'iron stomach' is most likely a robot. Chao (1968: 287-8) observes similar phenomena and proposes that complex NPs without DE_{np} are lexicalized. The crucial evidence he presents is that hung hua 'red flower' is a name of a species of flowers. But, as observed in chapter 2 of Hermann (1982), hung hua can also be used to refer to any flower which is red. Other instances of complex NPs without DE_{np} which are not lexicalized are lan tian 'blue sky', and lau ren 'old men'. Thus, NPs without DE_{np} are not limited to lexicalized items. I will try to give an analysis capable of accounting for both cases later in the chapter.

Judging from the data being considered, it seems that the meaning of DE_{np}-constructions can be computed from the constituents of those NPs. In 35b, hung de toufa refers to something which has both the properties of being red and being hair. Similarly, jungguo de tsanting has both properties of being a

restaurant and being Chinese (in the narrowest sense of belonging to China), and tie de wei has both properties of being a stomach and being iron. The examples in 38-40 further illustrate this fact.³¹

- (38)a. ren-ren dou yung ren-tzau sz
 preson-person all use person-made silk
 'Everybody uses synthetic silk.'
 b.³² ??? ren-ren dou yung ren-tzau de sz
 person-person all use person-made DE_{np} silk
- (39)a. chian guohuei yiyuan
 former national-assembly delegate
 'a former congressman'
 b. * chian de guohuei yiyuan
 former DE_{np} national-assembly delegate
- (40)a. wei chau
 fake bill
 'fake money'
 b. * wei de chau
 fake DE_{np} bill

The meaning of a complex NP marked by DE_{np} seems to be literally the intersection of the meaning of the head and the pre-DE_{np} category. The contrast in phrases 38-40 strongly supports this point. None of the b. phrases in the examples is acceptable. The unacceptability must be accounted for semantically. In 38, synthetic silk is not silk. But if the meaning of the complex NP *rentzau de sz is the intersection of the two components, the entailment would be that it is silk. 38b is

³¹ Take note that (i) is grammatical.

(i) Jei shr renzau de sz, bu shr jen de sz
 this BE man-made DE_s silk NEG BE real DE_s silk
 'This is man-made silk, not real silk.'

The sentence in (i) involves the shr ... de focus construction. The de in this construction has been treated as a part of an integral construction with shr 'BE', such as in Tang (1981a), and Li and Thompson (1981:587-593). This de could either be accounted for as a sentential clitic as suggested in C. Huang (1985a), or as the DE_{np} in a headless DE_{np} phrase. Paris (1979) follows the second strategy. Further study is needed to decide between the two options.

³² Native speakers seem to prefer multi-syllabic words as a pre-DE_{np} categories. This can only be a tendency because phrases like hau de shu 'good books' are perfectly acceptable. The phrases 39b and 40b are markedly worse than 38b. The contrast might be caused by the weak constraint against monosyllabic modifiers.

semantically anomalous and therefore unacceptable. Similarly, a former congressman is not a congressman in 39 and fake money is not money in 40. Both contradict the entailment of the meaning of a NP marked by DE_{np} when it occurs in sentences, therefore neither *chian de quohuei yiyuan of 39b nor *wei de chau of 40b is acceptable.

Based on the contrast in meaning between DE_{np}-constructions and complex NPs not marked by DE_{np} in 35-37 and the ungrammaticality of the b. phrases in 38-40, the meaning of a string of DE_{np}-construction seems to be the sum of the meanings of the two phrasal categories. For example, tie de wei 'iron stomach' is an entity which is both made of iron and is a stomach. In order to get the intersective meaning, a straightforward way is to hypothesize that the DE_{np}-construction is translated with a meet operator. In addition to the intersective meaning, the fact that the post-DE_{np} category has the type $\langle e, p \rangle$ also fits in well with this hypothesis. Meet is not defined straightforwardly for singular terms, that is, it does not make sense to talk about the intersection of two individuals, say John and Bill. The meet operation for singular terms, if defined at all, will have to lift the individuals to higher order objects, such as propositional functions, and define meet on them. It is conceivable that the reason why the post-DE_{np} categories are constrained to expressions of type $\langle e, p \rangle$ is because it is the type required by the meet operator.

Assuming that the DE_{np}-construction is translated with a meet operator, the resultant type of the translation of the whole construction will be $\langle e, p \rangle$ because the type of the post-DE_{np} categories is $\langle e, p \rangle$ and it has to intersect with a category with the same type. But since a complex NP marked by DE_{np} occurs in argument positions, it must be assigned the type $\langle e \rangle$ of individuals, which is, intuitively, the type for noun phrases. There are at least two ways to map expression of type $\langle e, p \rangle$ to expressions of type $\langle e \rangle$. One is the nominalization operator just discussed, and the other is the iota functor discussed in Partee (1985, p.c.).³³ The iota functor can be formally defined as 35, in which P is a variable of type $\langle e, p \rangle$. Take note that the iota functor is a functor which maps a propositional function to a formula bound by the traditional operator named 'iota', represented as i here.³⁴

³³ Partee (p.c.) refers to a lecture, titled 'Syntactic Categories and Semantic Types,' given by Barbara Partee at Cornell in September, 1985.

³⁴ Because the type for the lambda operator is not available, I will use lam to represent it through out this dissertation.

(41) iota =def lamP ix [P (x)]

In other words, iota maps an input P to an output (ix [P (x)]). One group of NPs which seems to suggest that iota is the right functor for the DE_{np} -construction is the headless DE_{np} -constructions, exemplified in 42.³⁵

- (42)a. hung de
 red DE_{np}
 'the red one'
 b. tzuotian lai de
 yesterday come DE_{np}
 'the one/those who came yesterday'
 c. Lisz mai de
 Lisz buy DE_{np}
 'what Lisz bought'

The meanings of the phrases in 42 are clearly parallel to those of the wh-relative clauses in English. Borrowing the formal translation often given for English headless wh-relative clauses, the phrases in 42 can be tentatively given the IL* translations in 43.³⁶

- (43)a. ix [RED' (x)]
 b. ix [COME-YESTERDAY' (x)]
 c. ix [BUY' (LISZ') (x)]

To determine the semantic translation for DE_{np} , the translations in 43 can be compared with the translations of the categories without DE_{np} , given here as 44-46.

- (44)a. hung
 red
 'red'
 b. lamy RED' (y)
 (45)a. tzuotian lai
 yesterday come
 '... come yesterday'
 b. lamy COME-YESTERDAY' (y)

³⁵ It is somewhat misleading to call the construction headless DE_{np} -construction because the syntactic role of the morpheme /de/ seems to differ from that of the clitic DE_{np} . I will discuss the difference in the conclusion section.

³⁶ Take note that I am not translating the temporal adverb tzuotian 'yesterday' in 42b.

- (46)a. Lisz mai
 Lisz buy
 'Lisz bought ...'
 b. λ_{amy} [BUY' (y)] (LISZ')

One single semantic operator can map the translations in 44-46 to their counterparts in 43a-c. Applying *iota* to 44b, for instance, would yield 43a, demonstrated by the derivation in 47. Thus, semantically *iota* maps the semantic translation of a category to its counterpart marked by DE_{np} .

- (47) $\lambda_{iota} (\lambda_{amy} y \text{ RED' } (y))$ [from 44b]
 = $\lambda_{amP} ix [P (x)] (\lambda_{amy} \text{ RED' } (y))$ [Def., from 41]
 = $\lambda_{ix} (\lambda_{amy} \text{ RED' } (y)) (x)$ [λ_{am} -conversion]
 = $\lambda_{ix} (\text{RED' } (x))$ [λ_{am} -conversion]

There is, however, evidence showing that the *iota* translation does not get the right result. First, I have opened this section with sentences showing that complex NPs marked by DE_{np} have the same range of meaning as bare nominals. That is, they are also names of kinds. If they are translated with the *iota* operator, their meaning will be restricted to the definite reading, the reading equivalent to English NPs marked by *the*, contradictory to the known usages of the DE_{np} -constructions. Even more crucial evidence comes from the interaction between DE_{np} -constructions and quantifiers. The following sentence involves a universal quantifier.³⁷

- (48)a. tzuotian lai de ren dou tzou-le
 yesterday come DE_{np} person all go-PERF
 'All the people who came yesterday have already gone.'
 b. * $\forall x ((\lambda_{ix} [\text{PERSON' } (x) \ \& \ \text{COME-YESTERDAY } (x)]) \rightarrow \text{HAVE-GONE } (x))$

Translating the DE_{np} -construction with the *iota* operator, 48b would be the IL* translation for 48a. But 48b is not well-formed because the variable *x* is doubly bound by two functors, the universal quantifier and λ . Thus the *iota* translation wrongly predicts that 48a should be ruled out. To account for sentences like 48a, the *iota* translation cannot be adopted. Thus both the 'kinds' reading of DE_{np} -constructions and their interaction with quantifiers suggest that the DE_{np} -construction is better translated with the Fregean nominalization functor \bar{n} .

I have suggested that the DE_{np} -construction should be translated with both a nominalization functor and a *meet* operator, but have not yet specified how they interact and how the operators are translated from the phrase or DE_{np} . The question

³⁷ I will use the symbol $\&$ for the functor *and* throughout this thesis because the symbol \wedge is not available.

can be addressed in different ways. Again, headless DE_{np} -constructions prove to be crucial. It has been observed in various works, such as Fan (1958), that while the heads in a DE_{np} -construction can be omitted, the nominal heads of complex NPs not marked by DE_{np} cannot. This phenomenon is illustrated by 49.

- (49)a. hung (de) pingguo tzuei hauchr
 red DE_{np} apple most good-eat
 'Red apples are most delicious.'
 b. hung de tzuei hauchr
 red DE_{np} most good-eat
 'The red ones are most delicious.'
 c. ???hung tzuei hauchr
 red most good-eat
 '???Red(ness) is most delicious.'

In 49a, DE_{np} is optional. Given the right context, 49b would be synonymous to 49a, while 49c is semantically anomalous and at best marginally acceptable. Previous treatments have simply stipulated constraints on deletion, but there is a nice and clear-cut formal semantic account which not only describes but explains these facts. It is uncontroversial that only individuals can occur as the subject arguments of propositions in IL*. If DE_{np} is translated as the Fregean nominalizer and meet is structurally encoded, since there is both DE_{np} and the pre- DE_{np} phrase in 49b, the prediction would be that 49b should have a nominalization reading, i.e. a 'kind' reading similar to the anomalous 49c. The prediction is wrong. On the other hand, it could be assumed that DE_{np} is translated as meet and the nominalization operation is structurally encoded. That is, the meet functor forces an $\langle e, p \rangle$ type meaning on the DE_{np} -construction, while the nominalization device brings the type back to $\langle e \rangle$ of individuals. The meaning of 49b can be nicely captured by this assumption. hung de 'red one(s)' can refer to any contextually specified thing(s) that is/are red. Since the meet operator takes two arguments, the presence of DE_{np} , the lexical instantiation of the meet operator, implies a pragmatically determined argument. In 49c, no DE_{np} exists, and therefore no pragmatically determined argument can be inferred; hence the headless relative reading is not possible.³⁸ I would also like to point out that

³⁸ Alternatively, one could follow the strategy adopted in Categorical Grammar and Montague Semantics and simply stipulate that the semantic translation for a DE_{np} -construction [$_{np}$ P de Q] is $^n\{[\lambda_{mx}P(x)] \text{ meet } [\lambda_{mx}Q(x)]\}$. This stipulation would do the job except that it would not account for the contrast between 49b and c. That is, since DE_{np} itself is not given a translation, the anomaly of 49c can no longer be attributed to the absence of meet which is encoded by DE_{np} .

Another possibility is, of course, nominalization without

this translation nicely reflects the morpho-syntactic account of cliticization of DE_{NP}. Recall that the domain of cliticization for DE_{NP} is the whole matrix NP. According to the theory of cliticization as formulated by Klavans (1982), it is the structure of the complex NP, but not the nominal head which licenses the occurrences of the clitic DE_{NP}. As a consequence, following the hypothesis that there is a homomorphism between syntax and semantics, meet, the translation for DE_{NP}, would have to be applied at the NP level. The prediction seems to be borne out.

Thus I have resolved two more aspects of the translation of the DE_{NP}-construction. I have shown that the post-DE_{NP} category has to be of type <e,p>. The parallelism between the semantics of the DE_{NP}-construction and conjoined constructions leads to my postulating that DE_{NP} be translated as a meet operator. This translation conjoins the translation of the pre-DE_{NP} category and the post-DE_{NP} category. The headless DE_{NP}-construction will be the restricted case where there is only one type <e,p> constituent present. DE_{NP} as a meet operator forces the second argument of the meet operation to be pragmatically determined. Together with the nominalization device incorporated into the structure, this translation would account for all the complex NPs marked by DE_{NP} with strings of different syntactic categories occurring before DE_{NP}. I will illustrate how this uniform semantic account takes care of the seemingly diversified syntactic structures.

V. IL* Translations for NPs Marked by DE_{NP}

Since I argued that the head of a complex NP with DE_{NP} is restricted to nominal elements of the type <e,p>, translating DE_{NP} as the meet operator implies that the pre-DE_{NP} category should be of the same type <e,p>. The first section of this chapter demonstrates that the type <e,p> is assigned to a verb phrase and a predicative adjectival phrase because they both take a subject argument (of type <e>) to form a proposition. Two more cases: the relative clauses with object gaps and the appositional clauses, are apparently problematical but turn out to be naturally translated with the same type <e,p>. Special translation is required for certain DE_{NP}-constructions with the pre-DE_{NP}

adding any morphological mark, which occurs very often in Chinese. hung is a noun in shiyang de hung ling ren tautzuei sunset+DE_{NP}+red+make+people+intoxicate 'the redness of a sunset intoxicates.' The translation of hung in this case would be a direct application of the nominalization functor to the type <e,p> adjectival meaning. 49c is anomalous with the redness reading and does not have the 'red one' reading. Both facts could be easily captured if the nominalization functor can be structurally encoded while the meet operator has to be represented by DE_{NP}.

category being an NP. This will be given in the next section. I will give analyses of the more typical cases first and start with the semantic account for a complex NP with the pre-DE_{np} category being an adjective or an adjectival phrase. The lexically assigned type for an adjective in Mandarin Chinese should be <e,p>, like all predicates, because an adjective can occur alone as a predicate without copula, exemplified by 50.³⁹

- (50) yisejia de fengjing hen piauliang
 Ithaca DE_{np} scenery very beautiful
 'The scenery in Ithaca is very beautiful.'

Following Chierchia's (1985) system that assigns the type <e> to any argument position and the standard treatment that an adverb maps categories of the type of adjectives to the same type, the adjective piauliang 'beautiful' would have to be assigned the type <e,p>. Recall that the two phrasal categories of a DE_{np}-construction are semantically conjoined by a meet operator and that the head of the DE_{np}-construction has to be of the type <e,p>. Consequently, the pre-DE_{np} category would also have to be of the type <e,p> to be an acceptable input to the semantic translation rule. It is well-motivated to assign the type <e,p> to all adjectives in Mandarin Chinese, and therefore the lexical type of an adjective can be applied to the construction without further stipulation.

- (51) hauchr de jungguotsai
 delicious DE_{np} Chinese-dish
 'delicious Chinese food'

- (52) IL Translation for 51
- | | <u>lexical item</u> | <u>semantic type</u> | <u>IL translation</u> |
|----|----------------------------------|----------------------|---------------------------------|
| a. | <u>hauchr</u> | <e,p> | <u>lamx</u> (DELICIOUS' (x)) |
| b. | <u>jungguotsai</u> ⁴⁰ | <e,p> | <u>lamx</u> (CHINESE-FOOD' (x)) |

³⁹ Li and Thompson (1980) refer to the so-called adjectives in Mandarin Chinese 'qualitative stative verbs'. See footnote 4 in Chapter 2 of this thesis for a discussion of the status of adjectives in Mandarin Chinese.

In these sentences, hen 'very' co-occurs with an adjective functioning as a predicate. Dropping hen will not rule the phrase out outright. It will, however, make the phrase sound archaic and bookish. The phenomenon seems to be controlled by a pragmatic rule.

⁴⁰ Take note that, following the hypothesis concerning type-raising and lexically assigned meaning discussed in the last section, the assigned lexical meaning of jungguo tsai 'Chinese food' would be of type <e>, and it would be raised to type <e,p> because of the requirement of the DE_{np}-construction. For simplicity, I will give the <e,p> type translation directly.

- c. de [DE_{np}] meet
 d. hauchr de jungguotsai
 = ⁿ(lamx (DELICIOUS' (x))) meet
 (lamx (CHINESE-FOOD' (x))) [from 52a, b and c]
 = ⁿ[lamx ((DELICIOUS' (x)) & CHINESE-FOOD' (x))]

The translation 52 indicates that the phrase hauchr de jungguotsai refers to the individual correlate of the intersection of the two propositional functions: be delicious and be Chinese food. In other words, it denotes the kind of entity which satisfies both predicates. This is exactly what the Mandarin Chinese phrase means.

The other group with a pre-DE_{np} category of type <e,p> is usually treated as consisting of relative clauses with subject gaps, such as 53.

- (53) shiue yuyanshiue de ren
 study linguistics DE_{np} person
 'people who study linguistics'

I propose that the structure of 53 is a complex NP with a pre-DE_{np} verb phrase rather than a relative clause with an extracted subject. The subject/object asymmetry involving resumptive pronouns in Mandarin Chinese favors accounting for the construction without a gap. No resumptive pronoun can occur in the subject position, while such forms are allowed in object position, as exemplified by 54.⁴¹

- (54)a. * ta shihuan Jangsan de neige ren
 s/he like Jangsan DE_{np} that person
 b. ? Jangsan shihuan ta de neige ren
 Jangsan like s/he DE_{np} that person
 'The person who Jangsan likes.'

Even though sentence 54b is grammatical, the supposed relative clause counterpart 54a is not. The examples can be nicely explained if resumptive pronouns are regarded as fillers of gaps and subject gaps are disallowed in Chinese.

There are also theory-internal motivations for postulating that no subject gaps occur in Mandarin Chinese. Several versions of constraints in different frameworks achieve pretty much the same effect captured by the left-branch constraint proposed in transformational grammar. For example, the lexical head constraint on metarules in GPSG states that no metarule can

⁴¹ Xu and Langendoen (1985) offer a more detailed discussion of gaps in Chinese. Also take note that some speakers do not accept resumptive pronouns at all and many others feel that they are awkward.

apply to an ID statement unless it contains a lexical head. Since the ID statement introducing subject NPs in Mandarin contains only phrasal categories, it is governed by the constraint. For the current discussion, it suffices to know that the constraint rules out the occurrence of the feature [SLASH], the feature which accounts for a gap in the theory. Applications of corresponding left-branching constraints in other theories would also block the extraction of a subject in Mandarin Chinese.

Besides the two considerations just mentioned, the deciding factor in treating the pre-DE_{np} category in question as a VP rather than a clause with a subject gap is semantic simplicity. Positing a gap entails that variable and more complex translation procedures would have to be introduced, as demonstrated by my translation of the object gaps later in this section. But the same result can be achieved with a simple VP translation. Even though there is no knock-down argument showing that there is no subject gap, there is also no evidence I know of supporting the existence of such a gap. I will adopt the non-gap analysis. But bear in mind that the same translation can be achieved with a gap analysis.

Without a gap, the pre-DE_{np} category in 53 is simply a VP, and should be assigned the type $\langle e, p \rangle$, exactly the type required by the DE_{np}-construction. This treatment would yield 55 as the IL translation for 53.

(55)a. IL* Translation for 53

<u>lexical items</u>	<u>type</u>	<u>translation</u>
<u>shiue</u>	$\langle e, \langle e, p \rangle \rangle$	<u>lamx lamy</u> [[STUDY' (x)](y)]
<u>yuyanshiue</u>	$\langle e \rangle$	LINGUISTICS'
<u>de</u> [DE _{np}]		<u>meet</u>
<u>ren</u>	$\langle e, p \rangle$	<u>lamy</u> (PERSON' (y))
b. <u>shiue yuyanshiue</u>	$\langle e, p \rangle$	<u>lamy</u> (STUDY' (LINGUISTICS'))(y) [from 55a]
c. <u>shiue yuyanshiue de ren</u>	$\langle e, p \rangle$	
= $n((\text{lamy}(\text{PERSON}'(y))) \text{meet}$		
$(\text{lamy}(\text{STUDY}'(\text{LINGUISTICS}'))(y)))$		[from 55a and b]
= $n(\text{lamy}[(\text{PERSON}'(y)) \& (\text{STUDY}'(\text{LINGUISTICS}'))(y)])$		

The translation of 55c refers to the individual correlate of the intersection of two propositional functions: to be a human being and to study linguistics. That is, it denotes the kind of individuals which satisfy the two propositional functions: they are the kind which are both human beings and study linguistics.⁴²

⁴² Notice that this translation is different from nominalization applied to the zero-place predicate People study linguistics as in the English That people (do) study linguistics surprised him greatly. This is a name referring to the propositional function as an individual rather than to the individual

As described above, the translation is a result of applying nominalization to the meet of the translation of two $\langle e, p \rangle$ type phrases. Thus I have shown that for two groups of NPs marked by DE_{NP}, i.e. those with pre-DE_{NP} categories of an adjectival phrase and a verb phrase, both the pre-DE_{NP} categories and the heads after DE_{NP} are of the type $\langle e, p \rangle$. Since I have proposed that DE_{NP} should be translated as an meet operator, it will take as argument the translation of the two categories of type $\langle e, p \rangle$ and return their intersection. This type $\langle e, p \rangle$ translation would then be mapped to type $\langle e \rangle$ by the nominalization device. I have also shown that these translations give correct representations of the meaning of the NPs studied.

I will now study two groups of NPs with DE_{NP} which do not seem to allow the possibility of having a semantic type of $\langle e, p \rangle$. They are object relative clauses and appositional clauses. The first case to be studied is the object relative clause, exemplified by 56.

- (56) wo pengjian e de ren
 I meet e DE_{NP} person
 'The person I met'

Two facts make it necessary to propose a gap for object relative clauses. First, as demonstrated by 54b, resumptive pronouns can occur in object position. This fact suggests that there is a real gap in the object position. Second, a sentence missing an object would combine with a NP to form a proposition, and therefore it might be possible to assign type $\langle e, p \rangle$ to it. However, assuming Dowty's (1982) definition of grammatical relations, the last NP to combine with a predicate would be the subject and the next to last one to combine with it would be the object. If the pre-DE_{NP} category of 56 is assigned the type $\langle e, p \rangle$, the head would be the last argument to be combined with the predicate and would, by Dowty's definition, be the subject. But word order and other semantic clues indicate that the head stands for the object of the relative clause. Thus it is reasonable to assume a real gap in the object relative clauses in Mandarin Chinese. As a consequence, the pre-DE_{NP} strings cannot be simply assigned the type $\langle e, p \rangle$, unlike the other cases of NPs marked by DE_{NP} discussed so far.

In the previous discussion, I have shown that the semantic translation of the head of a DE_{NP}-construction cannot be taken as an argument to fill in the gap in any position in a clause because its type is $\langle e, p \rangle$ instead of the required $\langle e \rangle$. In the last paragraph, however, I have also argued that there must be a gap in an object relative clause involving DE_{NP}. The problem is, of course, how to reconcile these two seemingly conflicting

involved in that function.

statements. It is clear that the translation of the head can never be applied to the gap. There is no way to avoid the type clash since no categories can be instantiated with two different types at the same time. A reasonable alternative seems to be to fill in the semantic translation with a filler other than the nominal head to allow the resultant translation to be an argument of the meet operator incorporated in the semantic representation of the DE_{np} -construction. Thus, the type mismatch prevents the pre- DE_{np} and the post- DE_{np} categories from forming a function/argument pair, but it is still possible for them to be assigned an identical type such that they would both be arguments of the meet operator. There exists one semantic translation which would do the job. I will borrow an idea originally proposed in the treatment of unbounded dependency in GPSG (Gazdar et al. 1985.229-236).

In GPSG, a 'gaped' category is represented as A/B with B standing for the gap. In its semantics, a general schema would assign the translation ' $\lambda_{amv}^B [A/B' (v^B)]'$ ', with v^B being a variable of the same type as B. This schema can be illustrated by the following example.

- (57)a. NP VP/NP
 b. $\lambda_{am} v^{NP} [[VP/NP' (v^{NP})] (NP')]$

57a gives the syntactic rule and 57b the semantic rule. To facilitate discussion, let us take 57 to be the phrase Jim likes in the sentence Kim, Tim says Jim likes. The category VP/NP stands for the verb in the surface string, and its translation would simply be a two-place predicate ' $\lambda_{amx} \lambda_{amy} [(Like'(x)) (y)]'$ '. A general semantic schema stipulates that the translation for a slashed category VP/NP is " $VP/NP' (v^{NP})$ ". It turns out to be ' $\lambda_{amx} [like' (v^{NP})] (x)'$ ' in this case. Under normal conditions, a simple functional application with the NP sister would yield ' $like' (v^{NP}) (JIM)'$ ', a proposition. However, since there is an unbound variable in the translation and a NP argument not yet incorporated, it is not an appropriate translation of the sentence. This problem is solved in GPSG by another semantic translation schema, which relies crucially on foot features. Functional application would be assigned as the semantic translation in unmarked cases. When a foot feature is present, however, the translation is a little bit different. The categorial value of the foot feature would be the type of a variable bound by λ_{am} , which is introduced to the translation by the schema. Instead of the translation of ' $FUNCTION' (ARGUMENT)'$ ', the translation would be ' $\lambda_{amv} (FUNCTION' (ARGUMENT))'$ ' with the type of the variable being the type assigned to the categorial value of the feature. Simplistically, one can imagine λ_{amv} as the translation for the foot feature. The reason why foot features play a critical role is that there are three foot features in the theory: RE (for relative clauses), SLASH, and WH, which exhaust the types of long-distance dependencies. Because of the involvement of foot

features, this marked translation would apply to all levels of unbounded dependencies and to them only. Because of the percolation of features, the foot feature is required to be present at every intermediate level between the bottom of the dependencies where the 'gap' is and the top where the 'extracted' category is. This allows the general schema to apply at all levels and to preserve the variable with the right reading. At the top of the dependency where the percolation of the feature is terminated, according to the definition and translation schema in Gazdar et al. (1985), a different translation would apply, and replace the variable with the appropriate category.⁴³ In the following analysis, a similar account with the same general semantic translation schema will be applied in Chinese.

First, since I am following the IL* convention that all arguments are assigned the type $\langle e \rangle$, the semantic translation of the gap would simply be a variable x . Second, I adopt the GPSG translation schemas.⁴⁴ Also take note that I will put most discussion and explanation in footnotes to avoid separating the formulas.

(58)a. wo pengjian e
I meet e

b. <u>lexical item</u>	<u>type</u>	<u>translation</u>
i) <u>wo</u>	$\langle e \rangle$	I'
ii) <u>pengjian</u>	$\langle e, \langle e, p \rangle \rangle$	$\text{lam}_x \text{ lam}_y [(\text{MEET}' (x)) (y)]$
iii) ⁴⁵ e	$\langle e, e \rangle$	$\text{lam}_{x_0} (x_0)$

⁴³ Obviously, the brief sketch here is not enough to really demonstrate how the semantics of long-distance dependencies works in GPSG. Interested readers are referred to chapters 7 and 10 of Gazdar et al. (1985) for details.

⁴⁴ Notice that I am ignoring the internal structures of the translation for the pronoun wo 'I'. That is, I am not specifying any information about the person, number, or other features of the pronoun.

⁴⁵ The translation of any NP is of type $\langle e \rangle$. But the NP gap, syntactically represented as NP[SLASH NP], would be translated as $\text{lam}_x x$ according to the schema mentioned. Because of the foot feature, lam is introduced. The introduced lam -operator binds a variable of the same syntactic category as the categorial value of the feature. For instance, the variable introduced here is of the type of a NP.

Thus, I have shown that a relative clause with an object gap, though needing a special translation to introduce the gap, does not differ from other complex NPs with DE_{np} with respect to semantic analysis. The same translation meet for DE_{np} and the same nominalization operation apply.

The last group of complex NPs with DE_{np} to be studied is the group consisting of the so-called appositional clauses. For instance, the NP in 60 has a full clause followed by a nominal head marked by DE_{np}.

- (60) meiguo-yuyanshiuehuei chiunian kai huei de difang
 LSA last-year hold meeting DE_{np} place
 'the place where LSA held its meeting last year'

In the current study, a full clause would be assigned the type <p>, and the head would be assigned the type <e,p>. Since their types do not match, the meet operator cannot apply and thus 60 would be wrongly predicted to be semantically anomalous. Before jumping to the conclusion that phrases like 60 are exceptions to the proposed account, I think it is worthwhile to reconsider the assumption that phrases like 60 consist of an appositional clause and a nominal head. One observation is that the variety of nominal elements allowed as the head of this construction is extremely limited. Among the thousands of nouns in Chinese, only shr 'event', difang 'place', shrhau 'time', and several other semantically closely related ones like shinwen 'news', are allowed. 61-63 give some more grammatical examples.

- (61) yuyanshiue fashiang de difang
 Linguistics originate DE_{np} place
 'the place where linguistics originated'
- (62) yuyanshiue fashiang de shrhau
 Linguistics originate DE_{np} time
 'the time when linguistics originated'
- (63) yuyanshiuejia de le jiang de shinwen/shr
 linguist get PERF prize DE_{np} news/event
 'the news/event that linguists won a prize'

In contrast to the grammatical 61-63, it is impossible to have any personal nouns or nouns referring to anything other than time, location, or event as the head of the so-called appositional clauses. This constraint is very intriguing for two reasons. First, it is semantically based and cannot be captured in syntax; therefore it would be impossible to postulate a general appositional schema while ruling out all the impossible cases by a syntactic constraint. Second, the fact that only nominal elements referring to time, location, and event are allowed is theoretically relevant. Time and location are the two inherent

parameters for describing any event.⁴⁸ Furthermore, it can be shown that the other group of nouns refers to the type of events. Event-type nouns allowed in the position include shr for plain event, shinwen for 'news', shiaushi for 'information', and yiwai for 'incident'. Types of event supply categorical information concerning the event and could potentially be another epistemological primitive. Since they are inherent concepts not always explicitly expressed in a sentence, it is conceivable that they should be treated as optional arguments. These arguments differ from other prototypical arguments like a subject and an object in not being syntactically or lexically encoded. They will be assumed to be unexpressed inherent arguments which would be introduced by type-shifting mechanisms triggered by type mismatches.

A functor similar to the CAUSE functor proposed by David Dowty and discussed in Chierchia (1985) will be proposed to account for the cases where the type of a category is raised one level to allow an additional argument. I will call the functor ETL for Event/Time/Location. A proposition, the semantic translation of a sentence, is of the type $\langle p \rangle$. Applying the operator ETL to a category of the type $\langle p \rangle$ will yield a category of the type $\langle e, p \rangle$, exactly the type needed for the pre-DE_{np} categories to be an input to the meet operator.

(64) ETL =_{def} lamP lamx [P & AT' (x)(P)]

In 64 AT' is a relation between a proposition and its spatio-temporal location or its event-type. In other words, AT' (x)(P) can be translated as P occurs at x or P is a x-type event. Semantic import of such a proposal clearly merits much more detailed study. My chief concern here, however, is to make sure that the informal definition 64 of the functor ETL does allow a uniform account of DE_{np}-constructions. Further studies of the epistemological primitives may make it possible to make one uniform definition, or it may turn out that three separate definitions are required for the three types of nouns.⁴⁹ The definition guarantees that only common nouns of the correct

⁴⁸ Situation semantics, for example, takes time-space location as one of the primitives in formally representing the semantics of natural languages. Time and location are also central to possible world semantics.

⁴⁹ Gennaro Chierchia suggests to me that the Time and Location arguments may be PP gaps instead. In this case, the event type would be the only suppressed inherent argument. This hypothesis seems to be supported by the fact that time and location phrases are, often though not always, introduced by tzai 'be-at' in Chinese. I will leave this issue open because whether tzai is a preposition or not is still debatable.

(65) * meiguo-yuyanshiuehuei chiunian kai huei de haitz
 LSA last-year hold meeting DE_{np} child

Another important assumption concerning the functor ETL is that its application is triggered by both the meet operator encoded in the structure of the DE_{np} -construction by DE_{np} itself and the presence of a nominal head of the right type. This assumption is necessitated by the fact that there are no headless counterparts for this group of DE_{np} -constructions, illustrated by 66.

66 is observed by Tang (1981a.147). There is a straightforward semantic account for its ungrammaticality. The meet operator, the semantic translation of DE_{np} , conjoins two arguments of type $\langle e, p \rangle$. Since the clause tamen kaihuei 'they held a meeting' in 66 is of type $\langle p \rangle$, it cannot be an argument of meet and there is no possible translation. 66 is semantically ruled out. However, the proposed ETL functor could complicate the account. If ETL were to be allowed to apply, it would turn the clause into an expression of type $\langle e, p \rangle$, exactly the type required to combine with DE_{np} . One way to prevent the application of ETL without invoking an ad hoc constraint is to restrict the occurrence of the ETL functor to the DE_{np} -construction. Adopting the rule-to-rule convention generally followed in Montague Semantics, the semantic rule can be set up such that the restriction follows without further stipulation. That is, the ETL functor will be

mentioned in the semantic translation rule for the DE_{np} -construction only. The functor simply does not occur in the semantic translation rules of other constructions and therefore will not apply. Following this convention, the syntax-semantics rule pairs of the so-called headless DE_{np} phrases and the DE_{np} -construction are given as 67 and 68 respectively.

- (67) a. [$_{np}$ XP-de]
 b. $n[(XP') \text{ meet } P]$, where P is a contextually determined
 <e,p> type variable.
- (68) a. [XP de=NP]
 b. i) $n[XP' \ \& \ NP']$
 or ii) $n[ETL(XP') \ \& \ NP']$

The (a) rules in 67 and 68 are the syntactic structures and the (b) rules are the corresponding semantic rules. 67b is straightforward, it stipulates that the translation of the so-called headless DE_{np} phrases is simply the result of applying the nominalization operator to the meet of the translation of the pre- DE_{np} phrase and a contextually determined property P. In 68, the unmarked semantic translation is the result of applying nominalization to the meet of the translation of the two phrasal categories. The marked semantic translation would be the result of applying iota to the meet of the translation of the head NP and the result of the application of ETL to the pre- DE_{np} category. I leave the details of how to choose between the two translations open. It is worth mentioning, though, that in the type-driven semantics proposed in Sag and Klein (1982) and discussed in chapter 5 of Gazdar et al. (1985), the semantic type of the two constituents specified in 68a would determine the appropriate translation. More specifically, when the pre- DE_{np} category is of the type <e,p>, the i) translation will be chosen because the semantic types of the constituents match the requirements of the rule; on the other hand, ii) would be chosen when the semantic type of the pre- DE_{np} category is <p>. ⁵⁰

With the semantic rules spelled out, the semantic translation for 60 will be given in 69-71. ⁵¹

⁵⁰ Another alternative is to have the 68bii translation being lexically attached to the appropriate types of nouns. How this could be done depends on the theory one chooses and awaits further study.

⁵¹ Take note that I am ignoring details concerning the translation of the adverbials here.

- (69) a. meiguo-yuyanshiuehuei chiunian kai huei
 LSA last-year hold meeting
 'LSA held a meeting last year.'
 b. Type: <p>
 c. IL* Translation: LAST-YEAR' (HOLD-MEETING' (LSA'))

(70) Apply ETL to 69c

- a. Type: <e,p>
 b. IL* Translation:
 ETL (LAST-YEAR' (HOLD-MEETING' (LSA')))
 = lamx [[[LAST-YEAR' (HOLD-MEETING' (LSA'))]] &
 [AT' (x) (LAST-YEAR' (HOLD-MEETING' (LSA')))]]

(71) meiguo-yuyanshiuehuei chiunian kai huei de difang
 =60 LSA last-year hold meeting DE_{np} place
 'the place where LSA held its meeting last year'

- a. i) meiguo-yuyanshiuehuei chiunian kai huei [from 70]
 = lamx [[[LAST-YEAR' (HOLD-MEETING' (LSA'))]] &
 [AT' (x) (LAST-YEAR' (HOLD-MEETING' (LSA')))]]
 ii) difang = lamx (PLACE' (x))
 iii) de [DE_{np}] = meet
 b. Translation for 60 [from 71a]
 = ⁿ[lamx [[[LAST-YEAR' (HOLD-MEETING' (LSA'))]] &
 [AT' (x) (LAST-YEAR' (HOLD-MEETING' (LSA')))]]
 meet [lamx (PLACE' (x))]]
 = ⁿ[lamx [[[LAST-YEAR' (HOLD-MEETING' (LSA'))]] &
 [AT' (x) (LAST-YEAR' (HOLD-MEETING' (LSA')))]]
 & [PLACE' (x)]]]

Because of the type mismatch, the translation of the pre-DE_{np} clause in 60 will take the raised type represented in 70 instead of the regularly derived type represented in 69. The translation in 71 can be verbally expressed as instances of the kind of entities which belong to the intersection of the set of places and the set of the allowed unexpressed arguments of the proposition that LSA held a meeting last year. In other words, it refers to the individual which is the place where the LSA meeting took place last year. Similar to all the other cases discussed, the nominalization operator maps the meet of the translation of the two phrasal categories to individuals.

Thus, I have shown with all the different syntactic categories occurring in the pre-DE_{np} position that DE_{np} can be simply translated as the functor meet and that all the different pre-DE_{np} categories can be translated by an IL representation of the type <e,p>. I have also shown that with these two steps, correct semantic representations can be assigned to the complex NPs marked by DE_{np}.

VI. Clarification of Some Possible Problems

Two sub-groups of the DE_{np} -construction pose possible problems for the semantic account just proposed. They are possessive NPs and those with non-intersective adjectives occurring as the pre- DE_{np} categories. Complex NPs without DE_{np} are also not accounted for yet. These are the three topics to be covered in this section.

In the last section, I have provided a general schema for the semantic analysis of complex NPs marked by DE_{np} , but I did not give any formal analysis of complex NPs not marked by DE_{np} . I have, however, observed that the meaning of a complex NP without DE_{np} very often cannot be derived directly from the meanings of the two constituents. Furthermore, I also remarked on exceptions where the meaning of some complex NPs not marked by DE_{np} seems to be derivable from the meanings of the two constituents in much the same way as the DE_{np} -construction. The only way to account for the semantics of all the NPs not marked by DE_{np} uniformly, I think, is to propose that the meanings of the pre-Head categories are lexically determined functions from common noun meanings to common noun meanings. This is not a novel idea since the meaning of adjectival phrases is often postulated to be of the type $\langle CN, CN \rangle$ anyway. The advantage of this account is that it accommodates handily both the cases where the meaning seems to be compositional and the cases where it does not seem to be so. This can be illustrated with examples 72-73.

- (72)a. lau pengyou
old friend
'old friends (friends from old times or friends
you have known for a long time)'
- b. lau de pengyou
old DE_{np} friend
'friends who are old'
- (73)a. dushu ren
read-book/study person
'an intellectual'
- b. dushu de ren
read-book/study DE_{np} person
'the people who are reading books'
or 'the people who are studying'

72 gives NPs with a pre-Head adjective and 73 with a verb phrase. It is obvious that the meanings of both 72a and 73a, as opposed to 72b and 73b, are not compositional. With an analysis of the meaning of the pre-Head is a lexically determined function, it is fairly straightforward to assign a semantic translation for the word lau 'old' to map the meaning of pengyou 'friend' to the meaning of lau pengyou 'old buddies', and of ren 'person' to dushu ren 'intellectuals'. Such an account is supported by the systematic contrast among complex NPs with lau

'old' being the first morpheme. For those unmarked by DE_{NP}, the meaning, though not directly related to the meaning of something's being old of age, roughly relate the head noun to the 'good old times'. On the other hand, when the NP is marked by DE_{NP}, the meaning is always the intersection of the meanings of the pre-DE_{NP} and the post-DE_{NP} categories. For instance, a lau banfa 'old method' is a method one has been using for quite a while and perhaps has grown to be used to, while a lau de banfa is one which is aged, probably out of date; a lau jangquan 'old commander' is a person who used to be one's superior, while a lau de jangquan 'old commander' is a commander who is old. The contrast shows that the same functional translation of lau 'old' applies to all instances of it in NPs not marked by DE_{NP}. For the examples where the meaning of the complex NPs seems to be compositional, such as in 74-75, a lexically determined function analysis would also yield the correct translation.

- (74)a. jiou shietz
 b. jiou de shietz
 old DE_{NP} shoes
 'old shoes'

- (75)a. pang lauban
 b. pang de lauban
 fat DE_{NP} boss
 'a fat boss'

A priori, there is no reason to rule out a meaning for the pre-Head category whose function applies to yield a result identical to the translation of DE_{NP}-construction. Furthermore, the fact that only a few lexical items, such as jiou 'old' and pang 'fat', allow this possibility supports the analysis that their meanings are lexically encoded. Thus I have shown that analyzing the pre-Head categories in a NP unmarked by DE_{NP} as translated by lexically determined functions from common nouns to common nouns can account for all the cases of the complex NPs.

Second, non-intersective adjectives can be further divided into two groups. The first group includes adjectives such as alleged which map a property (a propositional function) to another property (and very often to the property whose extension is included in the complement set of the extension of the original property). Logical entailments of propositions involving these properties are the best discussed and most interesting characteristics of the group. NPs like the English a former congressman pose a potential problem for the analysis that DE_{NP}-constructions be translated with a meet operator. A former congressman is not a congressman. Since my account of DE_{NP}-construction with a meet operator results in a meaning of intersecting sets of the two constituents, the Chinese counterpart of chian de guohuei yiyuan (cp. 76b), if acceptable, would wrongly entail that the individual referred to is a congressman. Thus

this analysis predicts that NPs with such adjectives as pre-DE_{NP} categories are simply unacceptable, as exemplified in the b. phrases of 44-46, repeated here as 76.

- (76)a. ??? ren-tzau de sz
 man-made DE_{NP} silk
 b. * chian de guohuei yiyuan
 former DE_{NP} national-assembly delegate
 c. * wei de Chau
 fake DE_{NP} bill

There are cases, unlike 76, where an adjective has a semantic feature similar to former but still can occur in a DE_{NP}-construction. 77 offers some examples.

- (77)a. chian-ren de laushr
 last-term DE_{NP} teacher
 'the teacher(s) who taught before (the ones who are
 teaching now)'
 b. chian-ren de yiyuan
 last-term DE_{NP} assemblyman
 'the assemblyman who served during the last term'
 c. *chian-ren de shiuesheng
 last-term DE_{NP} student
 d. ???chian-ren de gungyou
 last-term DE_{NP} janitor

Closer examination of 77, however, shows that the semantic entailments contributed by the Chinese adjectives in 77 differ from those contributed by the English adjectives like former. People who used to be teachers before are not necessarily not teachers by profession now, and an assemblyman who served during the last term can still be an assemblyman if re-elected. The reading that 77a is referring to people who are no longer teachers now and that 77b is referring to someone who is no longer an assemblyman contradicts the predicted logical entailments. The apparent contradiction, however, can be explained by the very different meanings assigned to these two lexical nouns in Chinese. In Chinese culture, once a teacher, always a teacher. The same attitude applies to many other socially respectable positions. Not unlike addressing Jimmy Carter as 'Mr. President' after his term expired, such usages can hardly be regarded as entailing that the person referred to has the property of currently having the occupation he or she is addressed with. Such an account is strongly supported by the unacceptability of 77c and 77d. There is no syntactic or morphological reasons to assign different categories to the nouns shiuesheng 'student' and laushr 'teacher', but 77c is clearly out while 77a is good. The fact that 77d sounds marginal also supports the pragmatically determined meaning of these nouns. In theory, a janitor should be a position no less respected than an assemblyman in modern society. In practice, however, there is still a

sociological hierarchy. Hence 77d can only be used cynically. With lexical meanings different from their English counterparts, 77a and b are only seeming problems.

The remaining non-intersective adjectives consist of counterparts of English good, bad, tall, fat, etc. which cannot be represented as a set without referring to pragmatic principles in determining the set membership. For instance, criteria for determining a good car are very different from those for a good plant, and criteria for determining a good plant in Africa are different from those in the States. There is simply no absolute 'goodness'. Since I have incorporated a meet operator into the translation of a DE_{np} -construction, a consequence is that the meaning of the matrix NP should be the intersection of the two constituents, contradicting what is known about the non-intersective adjectives. Consider the following examples.

- (78)a. hen gau de motiandalou
 very tall/high DE_{np} skyscraper
 'very tall skyscrapers'
 b. $N\{\text{lamx} [\text{TALL}'(x) \ \& \ \text{SKYSCRAPER} (x)]\}$
- (79)a. hen gau de shiuesheng
 very tall/high DE_{np} student
 'very tall students'
 b. $N\{\text{lamx} [\text{TALL}'(x) \ \& \ \text{STUDENT} (x)]\}$

Clearly, there is no way to define the meaning of gau as a set of tall or high individuals such that both its intersection with the set of skyscrapers and with the set of students give the correct interpretation for the phrase 78a and 79a. An entity whose height is tall for a student would undoubtedly be short for a skyscraper. One way to solve the problem is proposed in Siegel (1976). Her account incorporates a variable over properties, which is contextually specified, in the translation of non-intersective adjectives. Chierchia (1982b.344.T9) formalizes the proposal as a translation rule in his IL*.⁵²

Adopting Siegel's proposal and a formulation very similar to Chierchia's (1982b), I will assume that non-intersective adjectives are lexically assigned two different meanings: one is the $\langle\langle e, p \rangle, \langle e, p \rangle\rangle$ type meaning which maps common nouns to common nouns, and the other incorporates that meaning and a propositional function type meaning. Assume that the $\langle\langle e, p \rangle, \langle e, p \rangle\rangle$ type translation of gau is TALL' , the second translation for the same lexical item would be the following.

⁵² Chierchia's (1982b) T9 was given in an earlier version of IL*.

(i) If $\alpha \in P_{IV/CN}$ and $\beta \in P_{CN/CN}$ then $F_4(\alpha, \beta)$ translates as $\text{lamx}_{\alpha}'(\wedge \beta' (P_i))(x)$.

(80) TALL'(P')

Since TALL' is a function from properties to properties, the translation in 80 is a propositional function of type $\langle e, p \rangle$, i.e. a one-place predicate. This would be exactly the type needed in a predicative position, for instance, as the pre-DE_{NP} category or the matrix predicate of a sentence. In general, a non-intersective adjective in Chinese A would have a predicative meaning corresponding to its non-predicative $\langle \langle e, p \rangle, \langle e, p \rangle \rangle$ type meaning, derived by the redundancy rule informally presented as 81.

- (81) If A is a non-intersective adjective of the type $\langle \langle e, p \rangle, \langle e, p \rangle \rangle$, then it is translated as either A' or A'(P'), where P is a variable of the type $\langle e, p \rangle$.

Given the redundancy rule 81, the translation for 78a and 79a will be 82a and b instead of 78b and 79b.⁵³

- (82)a. $n[(\text{TALL}'(P'))(x) \ \& \ \text{SKYSCRAPER}(x)]$
 b. $n[(\text{TALL}'(P'))(x) \ \& \ \text{STUDENT}(x)]$

The translations in 82 do not have the problem of having to define absolute 'tallness'. The translation of 82a denotes an individual or individuals which are both tall for a contextually specified property and are skyscrapers; the translation of 82b denotes an individual or individuals which are both tall for a contextually specified property and are students. With the translation schema, an interpretation rule to assign the property occurring as the second argument of the meet operation as the value of the variable can be easily written. Alternatively, one can also expect a pragmatic rule to pick up the value of the variable. In this case, since the property represented by the second constituent of the DE_{NP}-construction is the only property type expression present in the string, it is expected to be picked. I will not commit myself to either approach since to

⁵³ The group of non-intersective adjectives like alleged are apparent problems for this account. According to 81, the NP *chian de guohui yiyuan former+DE_{NP}+ congressman will be given the following alternative translation: ' $n[\text{FORMER}'(P) \ \& \ P]$ '. It seems that the translation would entail that the phrase denotes a congressman, but only seemingly so. Recall that the noun guohui yiyuan 'congressman', by virtue of being a respectable position, could be used to refer to any one who has been congressman at least once. chian-ren de yiyuan 'the assemblyman who served during the last term' of 77b, for instance, is acceptable. The distinction between *chian de guohui yiyuan and chian-ren de guohui yiyuan, it seems to me, has to be either lexical or phonological. One possible, though ad hoc, way to represent the distinction is to mark lexical items like chian 'former' or wei 'fake' such that they do not undergo the translation rule 81.

choose between them calls for much broader consideration of pragmatics. In either way, 82 would yield the following translations.

- (83)a. $n\{\text{lamx}[(\text{TALL}'(\text{SKYSCRAPER}'))(x) \ \& \ \text{SKYSCRAPER}(x)]\}$
 b. $n\{\text{lamx}[(\text{TALL}'(\text{STUDENT}'))(x) \ \& \ \text{STUDENT}(x)]\}$

The translations in 83 are adequate. In 82b the translation STUDENT' occurs in both side of the intersection. This seemingly redundant representation is supported by the well-motivated translation schema for DE_{np}-constructions and the translation of DE_{np} as a meet operator. Instances of the so-called 'headless relatives' with de support this argument.

- (84)a. huai de bu yau chian
 bad DE NEG want money
 'The bad ones are free.'

In 84, huai de 'bad ones' can refer to cars, books, chickens, or any imaginable commodity, depending on the context. Again, because of the non-intersective nature of the adjective, there cannot be any set representing all bad individuals; and therefore there is no entity as the individual correlate corresponding to the <e,p> type meaning of huai 'bad'. However, the redundancy rule I just proposed to allow non-intersective adjectives a second translation would yield the desirable translation for the underlined NP.

- (85)a. huai 'bad' BAD'(P')
 b. huai de 'bad ones' $n[\text{BAD}'(P') \ \& \ P']$

Instead of the translation 'lamx BAD'(x)', which would pick the individual mode of being bad, I will assign the translation 85b to the phrase huai de. The propositional function variable P would have to pick up its value from the context and this is exactly the way the phrase is used and understood in Mandarin Chinese. Thus, I have shown that my account for the non-intersective adjectives in Mandarin Chinese not only is compatible with the general translation schema of the DE_{np}-construction but it also gives the only correct translation for the 'headless relatives'.

The last, and the most intriguing, case involves possessive NPs. It is evident that with possessive NPs, the meaning of the complex NP is not the intersection of the two constituents.

- (86)a. Lisz de shu
 Lisz DE_{np} book
 b. $n\{\text{lamx}[\text{LISZ}'(x) \ \& \ \text{BOOK}'(x)]\}$

Following the translation schema for the DE_{np}-construction, 86b would be assigned as the IL* translation for the NP 86a. But it

gives the wrong interpretation. 86b, if it does denote anything, denotes an individual which is both Lisz and a book. To solve the problem, the translation of Lisz in this construction must denote something other than the individual, or the property set of that single individual. A possible solution can be given along the line of the account just given of non-intersective adjectives. Similar to the case with the non-intersective adjectives and all other DE_{np} -constructions, possessive NPs also have their headless counterparts, such as the underlined NP in 87.

- (87) Lisz de hen hau
 Lisz DE_{np} very good
 'Lisz's is/are very good.'

The referent of the underlined NP depends a lot on context. It could refer to books if the topic is authors, a lover if the topic is romance, or theories if the topic is linguistics. It is possible that there is a unique set of all entities belong to Lisz such that the meet operator represented by DE_{np} can intersect with another contextually specified set to derive its individual denotation. Of course the set may be very difficult to define, as the relation between a person and his boss, as in Lisz de lauban 'Lisz's boss', is very different from the relation between him and his pen, as in Lisz de bi 'Lisz's pen', and neither relation seems even remotely similar to the relation between one and one's fault, as in Lisz de cuo 'Lisz's fault'. This phenomenon calls for closer scrutiny of possessive NPs as a DE_{np} -construction. As could be seen from 88, even when the property of the referent is specified, the relation has to be inferred from the context.

- (88) Lisz de shu diau-le
 Lisz DE_{np} book drop-PERF
 'Lisz's book(s) is/are dropped down.'

In 88, there are numerous possible relations between Lisz and the book mentioned. Given the sentence, it could state that the book being dropped is a property of Lisz, a book checked out from the library by Lisz, a book Lisz is carrying as a porter, a book written by Lisz, or on Lisz, among others. The phrase can refer to any book designated to be related to Lisz by any imaginable convention in context. In short, the relation simply has to be inferred from the context with little help from the text. Taking this fact into consideration, I propose to incorporate a variable ranging over two-place predicates (or relations) into the translation of possessive NPs.⁵⁴

⁵⁴ Baxter (1984) proposed an account for Mandarin Chinese in which contextual relevance is formally represented. I am not adopting his analysis here because it accounts for only NPs

- (89) If a in a DE_{np}-construction [a de NP] is of type <e>, the translation of a is $\lambda x R'(x)(a')$, where R is a type <e,<e,p>> variable specified in the context, and x is a type <e> variable.

With the translation rule in 89, both the possessive NPs with and without heads can be translated. One example for each case follows.

- (90) Lisz de 'Lisz's'
 = $n[\lambda x R'(x)(Lisz) \text{ meet } P']$
 = $n[\lambda x R'(x)(Lisz') \ \& \ P']$
- (91) Lisz de shu 'Lisz's book'
 = $n[\lambda x R'(x)(Lisz') \text{ meet } \lambda x \text{ BOOK}'(x)]$
 = $n[\lambda x (R'(x)(Lisz') \text{ meet } \text{BOOK}'(x))]$
 = $n[\lambda x R'(x)(Lisz') \ \& \ \text{BOOK}'(x)]$

The translation in 91 denotes an individual or individuals which are books and have a contextually determined relation with Lisz. The translation in 90 denotes an individual or individuals which are contextually specified and are in a contextually specified relation with Lisz. In both cases, the translation correctly represents the Chinese meaning and how the referents of the phrases are determined.⁵⁵

occurring in subject positions and leaves NPs in other positions unaccounted for.

I should also point out that both Sally McConnell-Ginet and Gennaro Chierchia mentioned to me that Partee proposes a similar account. However, I have not been able to find the reference.

⁵⁵ J. Huang (p.c.), citing wo de Chomsky de shu 'my Chomsky's book (=my copy of the book written by Chomsky)', suggests that there is a syntactic hierarchy which determines the order of pre-DE_{np} NPs. He also suggests that a possessor always comes first and the agent stays as close to the head as possible. Though a hierarchy does exist, it seems to me that it cannot be characterized in pure syntactic or thematic terms. For instance, Jangsan de liwu 'Zhangsan's present' could be either a present given to Zhangsan or by Zhangsan. Parallel to J. Huang's example, but with slightly different meanings is Lyons de Chomsky de shu, which can mean either the book on Chomsky written by Lyons or Lyons's copy of a book written by Chomsky. With the first meaning, agency does not determine the position of the NP. Another set of interesting data is Ma Yo-Yo de Ba Ha de shietzouchiu 'Yo-Yo Ma's (rendition) of Bach's concerto', which cannot be *Ba Ha de Ma Yo-Yo de shietzouchiu. However, one can only say Lutoslawski de Paganini de biantzouchiu (=variation) 'Lutoslawski's variation on a theme of Paganini' but not *Paganini de Lutoslawski de biantzouchiu. In the Yo-Yo Ma/Bach example,

Before concluding the discussion of DE_{np} , I will briefly discuss three apparent problems for the proposed account. They are proper nouns occurring as the head of a DE_{np} -construction, the co-occurrence of quantifiers with DE_{np} -construction, and special usages of certain measure words in this construction, such as san kuai chian de piau three+Measure+dollar+ticket 'a ticket of three dollars'.⁵⁶

First, for the proper nouns occurring as the head of a complex NP after DE_{np} , the problem is that proper names stands for individuals and thus it is semantically anomalous to assign type $\langle e, p \rangle$ reading to them.

- (92)a. dai fu tsung jiun de Hua Mu-Lan
 substitute father join army DE_{np} Hua Mu-Lan
 'the heroine Hua Mu-Lan who joined the army in place of
 her (drafted) father (who was old and sick)'
 b. da nau tiangung de Suen Wu-Kung
 big disturb heaven-palace DE_{np} Suen Wu-Kung
 'the (Monkey King) Suen Wu-Kung who made a mess of
 the heavenly court'

In both 92a and b, it could be shown that the pre- DE_{np} category uniquely identifies the proper noun occurring as the head of that construction. That is, Hua Mu-Lan is always known as the heroine who joined the army in place of her sick father and Suen Wu-Kung is always known as the Monkey King who messed up the court of the Heaven Emperor. In the appropriate context, the type $\langle e, p \rangle$ meaning assigned to either the pre- DE_{np} or the post- DE_{np} category will be the same singleton set. Thus the nominalization of the meet of the two sets will be the same individual which is referred to by the proper name. The restriction that the proper nouns as head of DE_{np} -constructions co-occur with pre- DE_{np} categories representing uniquely identifiable properties poses no

agenthood applies to either NP; while in the Chinese translation of the latter pair, Lutoslawski is definitely the agent while Paganini is not (the variation is written by Lutoslawski). The set of data suggests that such a hierarchy is lexically determined and dependent on pragmatics. The lexical meaning of the head noun determines the relationship between it and the closest pre- DE_{np} nominal element. In most cases an agent-like or theme-like role is assigned. For biantzouchiu 'variation', however, the most relevant information is what the variation is on, thus the closest NP represents that information (instead of the agent of the head). Instead of a clearcut syntactic rule, we need representations of real world knowledge in order to faithfully capture such an hierarchy.

⁵⁶ All these three groups of apparent problems were pointed out to me by Louis Mangione.

problem for the current account.⁵⁷ My translation simply offers a way to express the fact that two descriptions uniquely pick up the same individual as their referent. My postulation that proper nouns do not usually occur as the heads of DE_{NP}-constructions because they cannot undergo type-lifting, however, cannot be maintained. Such a postulation seems to be desirable not only for proper nouns but also for pronouns. I can only observe that the set of data discussed here is conventionalized and may deserve special treatment.

For quantified phrases like 93, the question is how to quantify kinds. But the question does not arise because the kind reading is assigned to bare nominals without quantifying elements only. Recall that the DE_{NP} construction has a type <e,p> after the application of meet. The nominalization operator will apply only when the NP occurs in an argument position and no other operations apply to map the category to type <e>. In other words, the phrases ai shu de ren 'people who love books' in 93a and tzuotian lai de ren 'people who came yesterday' in 93b are the equivalent of Common Nouns and are quantifiable elements. Depending on how quantifiers are treated in IL*, we may want the quantifier in 93 to operate on type <e,p> translations to map them to type <e>, parallel to what will be done to account for every in every dog.

- (93)a. meige ai shu de ren
 every love book DE_{NP} person
 'everyone who loves book'
 b. sange tzuotian lai de ren
 three yesterday come DE_{NP} person
 'three of the people who came yesterday'

Last, for the occurrence of measure words in DE_{NP}-constructions, the problem is how to intersect measures with mass in the formal representation.

- (94)a. san kuai chian de piau
 three MEASURE money DE_{NP} ticket
 'a three-dollar ticket/tickets'
 b. wu gungjin de rou
 five kilogram DE_{NP} meat
 'five kilogram meat'

- (95) *san jr de niou
 three MEASURE DE_{NP} cattle

⁵⁷ Take note that in shiandai de Hua Mu-Lan 'modern Hua Mu-Lan', Hua Mu-Lan is no longer a proper name., it refers to heroic women in general. Even for phrases like aiku de Shiau-Ming, 'Shiau-Ming, who loves to cry' my feeling is that in the context, Shiau-Ming is identified with the property of loving to cry.

The fact that clearly countable nouns, such as 95, are not acceptable in this construction suggests that the contrast may have something to do with more sophisticated classifications of nominal elements. Since a detailed study of Chinese nouns is beyond the scope of the current study, I will simply leave this problem unsolved.

VII. Conclusion

In this chapter, I used Chierchia's IL* for translating Chinese and showed that IL* permits us to capture many generalizations in Mandarin Chinese. The most important one is the parallelism between the semantic structures of verbal elements and of nominal elements. I showed that Chierchia's (1985) nominalization operator n applies in Chinese to both verbal elements and nominal elements, mapping properties to their individual correlates. I also showed that, unlike the English data Chierchia (1983, 1985) studied, where VP nominalization is marked and NP nominalization unmarked, the nominalization operation is not morphologically marked for either verbal or nominal elements in Chinese. Since the same semantic nominalization device accounts for the type-shifting of both nominal and verbal elements, the prediction is that, without being affected by other components of the grammar, the type-shifting should not be marked differently in the two grammatical categories. Neither verbs as predicates and their nominalization counterparts nor the kind reading and the CN reading of nouns are morphologically marked in Chinese. The Chinese data confirm the prediction, and therefore support the claim that nominalization is one uniform semantic phenomenon for both verbal and nominal elements.

Another fact supporting this uniform formal account of nominalization involves adverbs. In IL*, adverbs are the only second-order elements. Since the nominalization operator applies to first order predicates only, it cannot apply to adverbs.⁵⁸ This prediction is confirmed by Chinese and English data. I showed that Chinese adverbs not only do not undergo nominalization, but they are also the only category consistently marked by morphological marks. I take this as evidence that Chinese morphologically marks the primary Being/Non-being distinction in IL*. I also argue that the lack of morphological mark to distinguish nominal and verbal elements in Chinese actually reflects the Fregean intuition captured in IL* that both categories instantiate the same two modes of beings. Thus, the formal features of Chierchia's IL* are nicely represented in Mandarin Chinese.

⁵⁸ The nominalization operator does apply to all adjectives in Chinese because their predicative usages give them the <e,p> type first-order meaning.

Armed with the proof that IL* captures the parallelism of the semantics of verbal and nominal elements in Chinese nicely, I was able to give a uniform semantic analysis to the DE_{np}-construction. Adopting the type-shifting theories explicated in Partee and Rooth (1983), Rooth and Partee (1983), and Partee (in preparation), I argued that the constraint on the head of the DE_{np}-construction is that it must be a common noun, of the type $\langle e, p \rangle$ in IL*. It was also shown that all pre-DE_{np} categories, nominal, verbal, adjectival, or clausal, can shift to type $\langle e, p \rangle$. I showed that DE_{np} could be translated as the meet operator. In addition, I argued that DE_{np}-constructions should be translated with an inherent nominalization operator, which applies to the meet of the two constituents of the DE_{np}-constructions. With the two proposed general semantic schema, I provided semantic translations for all the DE_{np}-constructions.

It is worth mentioning that the uniform translation with meet and the nominalization operator I give to the DE_{np}-construction echoes the uniform account as a 'nominalizer' given to the morpheme de by Paris (1979). Paris showed convincingly that most pre-de categories are nominal.⁵⁹ But since there are nominal categories occurring in the pre-DE_{np} positions, the nominalization defined traditionally as mapping elements of different categories to elements of nominal category does not apply. With the Fregean nominalization device proposed by Chierchia, a general semantic account is achieved. In this sense, I formally capture the generalization Paris (1979) tries to capture with the general concept of a 'nominalizer'.

In the last section, semantic accounts for complex NPs without DE_{np} are given with the translation that the modifier is a function of type $\langle \langle e, p \rangle, \langle e, p \rangle \rangle$. Potential problems with the general schema for DE_{np}-construction with iota and meet are also discussed. The non-intersective adjectives are accounted for by incorporating a propositional function variable *P*, whose value would be contextually specified, into their translations. The translation applies to all predicative positions, including in a DE_{np}-construction and any predicate position. Last, possessive NPs are accounted for by incorporating a contextually determined relation *R* into the translation.

⁵⁹ Chapter 1 of Paris (1979) makes the extension that the 'nominalizer' account also applies to the so-called extent-adverbial constructions, i.e. constructions with what I called a VP clitic, such as in Lisz nian de hen lei 'Lisz is tired from studying.' I have reservations about this extension because there is no clear evidence that tests of noun-hood apply to this construction. The meaning of these constructions also differs greatly from that of complex NPs marked by DE_{np}.

Two interesting questions remain. The first involves a special feature of my account. Careful readers may have noticed that for the nominal head of the DE_{np} -constructions, the basic semantic type is $\langle e \rangle$, but it has to be raised to type $\langle e, p \rangle$ by the pred operator to undergo meet, and is then lowered to type $\langle e \rangle$ again by the nominalization functor. Is this flip-flop of semantic types well-motivated? The answer is yes. I have mentioned that meet is not usually defined for individuals. When individuals are involved in meet, they will simply have to be raised to higher types by some mechanism. What Chinese does is to partially encode the formal procedure of defining meet for individuals by imposing a structural constraint that the post- DE_{np} head be of type $\langle e, p \rangle$. It is also worth mentioning that it is this complex type-shifting procedure which guarantees that the DE_{np} -construction is translated as the complex entity which allows both kind and ordinary individual readings. If the type of the head remains as $\langle e \rangle$, instead of being raised to $\langle e, p \rangle$ as required by the constraint, it would have been taken as an argument by the translation of the predicative pre- DE_{np} category. When nominalization applies later, it would turn the clause (the zero-place predicate) into its individual correlate, a 'name' for that proposition, instead of what is intended. This fact that the complex translation procedure does yield the intended meaning supports the move.

The other interesting question that arises from my account is whether the homomorphism between syntax and semantics is an attainable goal. The analyses I gave to non-intersective adjectives and to possessive NPs seem to suggest otherwise. Although compositionality was maintained, special translations had to be given to special groups of the DE_{np} -constructions. The status of possessive NPs as a somewhat marked semantic category is even more intriguing. This may not be a coincidence. I have shown that the possessive NP construction is used to express a wide range of loosely related relations. Also recall the possessive object and possessive subject constructions, which are certainly both syntactically and semantically marked. I would like to suggest that the reason why the possessive construction is chosen for the marked constructions is precisely because that the possessive construction represents a set of loosely defined constructions whose semantic translations differ from the typical DE_{np} -constructions. That these semantic translation procedures are marked is supported by discussion of the possessive object construction in Huang (1987) and Huang (1988).

CHAPTER 4
POSSESSIVE OBJECTS: PART I
ANALYSES

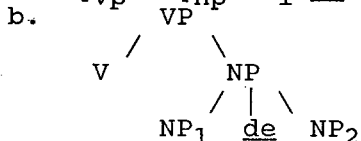
One of the special usages of DE_{np} , briefly mentioned in Chapter 2, is in a possessive object NP construction (POBJ). By POBJ I refer to the string of $[NP_1 DE_{np} NP_2]$ occupying the object position of a sentence, with an interpretation different from that of a regular possessive NP.¹ The name comes from the fact that the surface string of this construction is identical to that of a possessive NP. The same surface string occurring in a subject position, referred to as possessive subjects in this thesis, has very different grammatical functions, which will not be discussed in this thesis.

- (1) Sanbai tsunglai bu chr Yunniang de tsu
 Sanbai from-the-beginning NEG eat Yunniang DE_{np} vinegar
 a. 'Sanbai has never been jealous of Yunniang.'
 b. 'Sanbai never eats Yunniang's vinegar.'
- (2) Sanbai tsunglai bu chr tsu
 Sanbai from-the-beginning NEG eat vinegar
 a. 'Sanbai has never been jealous.'
 b. 'Sanbai never uses vinegar.'

Two facts lead to the conclusion that 1a and 2a are instances of idiom chunks. The first is the ambiguity demonstrated in 1 and 2. The difference in meaning between 1a and 2a and their genitive NP counterparts in 1b and 2b cannot be accounted for solely by structural differences. The second fact is that the 1a and 2a interpretations cannot be determined compositionally. That is, no formal semantics can arrive at the meaning 'be jealous of' of chr tsu by combining the meaning of the two components chr 'eat' and tsu 'vinegar.' The POBJ noun phrase, underlined in 1, is even more intriguing in that the extra argument NP_1 interrupts the string of the idiom chunk and occurs between the verb and the NP of the idiom chunk. The result is a dilemma. The meaning of an idiom chunk cannot be broken down and therefore has to be encoded as an integral unit in the grammar, but the introduction of NP_1 renders the components of the idiom chunk structurally discontinuous and difficult to interpret as a unit.

¹ It should be clear from the discussion in previous chapters that the string $[NP DE_{np} NP]$ has a range of meaning much wider than that of a possessive noun phrase. I retain the term 'possessive' because this is how the construction studied here is referred to in the literature.

(3)a. [vp V [np NP₁ de NP₂]]



On the other hand, there are reasons to believe that the string [NP₁ de NP₂] is a constituent. First, in sentence 4, the whole string is topicalized and the sentence retains the ambiguous readings of a POBJ construction and a real possessive NP.²

- (4) Jeijung ren de tsu ni bu neng chr
 this-kind person DE_{np} vinegar you NEG may eat
 a. 'You shouldn't be jealous of such people.'
 b. 'You shouldn't use the vinegar of such people.'

(5) A general schema for all NPs with de: [np XP de=N']

It is widely accepted that only constituents can be topicalized. Thus 4 shows that the string [NP₁ de NP₂] is a constituent both in a POBJ and as a possessive NP. Second, the schema proposed for all complex NPs marked by DE_{np} in Mandarin Chinese in Chapter 2, repeated here as 5, describes the string nicely. If the string [NP₁ de NP₂] is not a constituent, the occurrence of de in POBJ has to be idiosyncratically characterized as different from the other de's. This does not seem to be a happy solution. Native speakers' intuitions do not differentiate this construction from ordinary possessive NPs. The constituent structure 3 is the structure shared by the two readings exemplified in 1. Another dilemma arises here. The above evidence points to assigning identical constituent structures to POBJ and real possessive NPs, even though it is clear that the POBJ reading is so different from the usual possessive reading that it cannot be accounted for pragmatically. Like all idioms, this

² Notice that when there is an adverbial within the phrase, it has to remain in its post-verbal position. I have no formal account for the contrast in (i) and (ii) yet. It is also worth mentioning that even though a few speakers do not accept 4 outright, they do accept it when an appropriate context, e.g. contrast, is given. The non-topicalized counterpart of (i) and (ii) is (iii), which will be accounted for later in this chapter.

- (i) * Jangsan bantian de chi ta sheng-le
 Jangsan half-day DE_{np} air s/he give-birth-PERF
 (ii) Jangsan de chi ta sheng-le bantian
 Jangsan DE_{np} air s/he give-birth-PERF half-day
 'S/He was angry with Jangsan for a long time.'
 (iii) Jangsan sheng-le ta bantian de chi
 Jangsan give-birth-PERF s/he half-day DE_{np} air
 'S/He was angry with Jangsan for a long time.'

construction calls for idiosyncratic treatment. But unlike many other idiom chunks, which usually show no pattern; possessive objects adhere to one set syntactic pattern and should be considered a construction which fits into the more general DE_{np} -constructions. Thus, while the idiosyncrasy of most other idioms can be accounted for without much consideration of cost, POBJ calls for an account which fits into the general account for DE_{np} . That is, the account should be both specific enough to show that the POBJ constructions are marked constructions, and general enough to account for the near productivity of the construction.

In this chapter, analyses will be given to treat POBJ as a part of a discontinuous idiom chunk. I will define the grammatical role of NP_1 , propose formal accounts for these idiom chunks, and demonstrate how the POBJ construction can nicely fit in the general schema of complex NPs with DE_{np} . Most important of all, I will show how the two dilemmas can be resolved and how the mismatch between constituent structures and grammatical functions can be best represented. General grammatical features of the POBJ construction will be discussed in sections I-III. Sections IV-VI are discussions of possible accounts in Government and Binding, Generalized Phrase Structure Grammar, Head Grammar, and Lexical-Functional Grammar respectively. Before starting the formal analyses, three more sentences with POBJ readings are given here to illustrate the scope of the usages of the POBJ construction in Mandarin Chinese.³

- (6) Sanbai tsunglai bu sheng Yunniang de chi
 Sanbai from-the-beginning NEG give-birth Yunniang DE_{np} air
 'Sanbai has never been angry with Yunniang.'

- (7) Lisz jau Wangwu de mafan
 Lisz look-for Wangwu DE_{np} trouble
 'Lisz bothers Wangwu.'

- (8) Wangwu chai Lisz de tai
 Wangwu tear-down Lisz DE_{np} stage
 'Wangwu embarrasses Lisz (publicly).'

I. Contrasts Between POBJ and Possessive NPs

In this section, I will show that POBJ behaves differently from real possessive noun phrases in many respects. These differences suggest the possible grammatical structure of the POBJ construction. Phenomena studied are anaphora, topicalization, and wh-question.

³ 6 and 7 do not have corresponding (literal) possessive readings.

- (9)a. Sanbai_i shihuan tzji_i de shr
 Sanbai like self DE_{np} poem
 'Sanbai likes his own poem.'
 b. Sanbai_i shihuan ta_i de shr
 Sanbai like s/he DE_{np} poem
 'Sanbai likes his poem.'
- (10)a. Sanbai_i sheng tzji_i de chi
 Sanbai give-birth self DE_{np} air
 'Sanbai is angry with himself.'
 b.* Sanbai_i sheng ta_i de chi
 Sanbai give-birth s/he DE_{np} air

The sentences 9 and 10 involve anaphora. The sentences in 9 have regular possessive readings while those in 10 have POBJ readings. In 9a and 10a, both NP₁ and the corresponding possessor position can be filled by a reflexive pronoun coreferential with the subject of the sentence. 9b and 10b differ from each other in that a coreferential pronoun is allowed in this position in a possessive NP sentence but impossible in a POBJ sentence.⁴ The ungrammaticality of 10b under the coreferential reading can be easily explained if the structure of POBJ is different from regular possessive NPs such that the constraint on the coreferentiality of pronouns applies. Since it has been shown that they share an identical surface constituent structure, the constraints must be captured at a different level of grammatical representation.

- (11)a. Shr, ta shihuan Li Bai de
 poetry s/he like Li-Po DE_{np}
 'As for poetry, s/he likes Li-Po's.'
 b. * Li Bai ta shihuan de shr
 Li-Po s/he like DE_{np} poetry
- (12)a. * Tsu, ta chr Jangsan de
 vinegar s/he eat Jangsan DE_{np}
 b. * Jangsan, ta chr de tsu
 Jangsan s/he eat DE_{np} vinegar

11 shows that with possessive NPs, the head of the NP can be topicalized while the possessor cannot be, presumably due to some versions of the Left Branch Constraint (e.g. Gazdar 1982).⁵ 12

⁴ 10b is grammatical with the non-coreferential reading of the pronoun, i. e. 'Sanbai_i is angry with him_j/her_j.'

⁵ The Generalized Left Branching Constraint proposed in Gazdar (1981) has been superseded by the lexical-head constraint on the application of metarules, which postulates that metarules can only apply to ID rules with at least one lexical daughter and that each metarule can only specify one category. For instance,

shows that with POBJ, neither NP₁ nor NP₂ can be topicalized.⁶ Again, the difference cannot be predicted by structurally defined surface constraints on long distance dependencies because 11a and 12a have the same surface structure.⁷ Therefore, a pragmatic/semantic constraint on not topicalizing non-referential NPs, which applies to NP₂ as part of idiom chunks, seems a more promising solution.

Last, POBJ also has dissimilar distribution with possessive NPs with regard to wh-questions. Wh-questions in Chinese are formed by replacing the questioned element with an appropriate wh-word. As expected, both the possessor and the head of the genitive NP can be questioned with wh-words in 13.

- (13)a. ta shihuan shei de shr
s/he like who DE_{np} poetry
'Whose poetry does s/he like?'
b. ta shihuan Li Bai de shenme
s/he like Li-Po DE_{np} what
'What of Li-Po does s/he like?'

14b, however, is ungrammatical unless interpreted as an echo question.

- (14)a. ta sheng shei de chi
s/he give-birth who DE_{np} air
'Who is s/he angry at?'
b. * ta sheng ni de shenme?
s/he give-birth you DE_{np} what

The contrast between 13b and 14b is unlikely to be accounted for with structurally defined interpretation procedures of wh-

the fact that grammatical subjects cannot be extracted in Mandarin Chinese could be predicted by the fact that subjects are not generated by a lexical ID rule, i.e. they do not have lexical sisters. Since the ID rule generating subjects is not a lexical ID rule, no metarule can apply to that ID rule. Furthermore, since there is no other way to introduce gaps in the grammar, subject gaps can never occur.

⁶ 12a is grammatical with the regular possessive reading, i.e. 'Vinegar, s/he uses Jangsan's.' What I am ruling out here is the POBJ reading.

⁷ Gennaro Chierchia (p.c.) points out to me that flagging idiom chunks in syntax may be one possible solution. That is, one may mark NP₂s occurring in POBJ as [np/idiom] and bar the category from topicalization. This could be done in syntax, with features in GPSG and functions in LFG. The only thing is that it is not structural in the strict sense.

words, such as J. Huang's (1982) analysis in which wh-words in Chinese are interpreted by movements in LF.

II. Syntactic Features of the Idiom Chunks

In this section, data are given to show that the verbs involved in the POBJ constructions are real instances of idiom chunks and cannot have the same lexical entry as the phonologically identical verbs occurring with the usual genitive reading. Arguments are also given to show that the NP₂ in this construction is dependent on the verb to get the idiom chunk interpretation.

- (15) Lisz chr pangshie he tsu
 Lisz eat crabs AND vinegar
 a. 'Lisz eats crabs with vinegar.'
 b. *'Lisz eats crabs and is jealous.'
- (16) *Wangwu jau Lisz de mafan he Lisz de shu
 Wangwu look-for Lisz DE_{NP} trouble AND Lisz DE_{NP} book

It is not inconceivable to derive the so-called idiom chunk reading from the ordinary meaning of the verb with certain interpretation procedures. That is, one might assume that in the sentence with chr-tsu 'be jealous' chr is still the same verb 'to eat' and that the meaning 'be jealous' is the result of combining the two lexical items chr 'to eat' and tsu 'vinegar.' For this assumption to work, the idiom chunk reading chr must share the same lexical entry with the literal meaning chr, and therefore governed by the identical subcategorization frame. chr 'to eat' is subcategorized to take an object. With the stated assumption, one would expect a conjoined NP to satisfy this subcategorization requirement. 15 illustrates that when chr takes a conjoined NP, the only possible reading is the literal 'to eat' reading. 16 demonstrates the same point with the idiom chunk jau-mafan 'to bother.' Without a possible literal interpretation, 16 is simply ungrammatical. The data suggest that the literal reading and the idiom chunk reading are instantiations of two different lexical predicates with different selectional restrictions. This approach will be taken in the current study.

- (17)a. * ta sheng ni de shenme?
 s/he give-birth you DE_{NP} what
 b. ta sheng ni de chi
 s/he give-birth you DE_{NP} ai:
 'S/he is angry with you.'

Sentences 17-18 are tests on the referentiality of NP₂ in a POBJ construction. 17 investigates the grammatical features of NP₂ with wh-questions. 17a(=14b) cannot be an appropriate question in anticipation of an answer like 17b. In other words, NP₂ cannot be questioned.

- (18)=12a. * Tsu, ta chr Jangsan de
vinegar s/he eat Jangsan DE_{np}

18 shows that NP₂ cannot be topicalized. Even though the sentence is grammatical with the literal reading 'As for vinegar, s/he uses Jangsan's,' it is impossible to get the desired POBJ reading in which s/he is jealous of Jangsan.

Thus, the two tests I have applied to NP₂--*wh*-questions and topicalization--show that NP₂ is not referential and is not likely to be a semantic argument of the verb.⁸ These data support the account that the V and NP₂ are two constituents of an idiom chunk, whose meaning is not determined compositionally. The separate lexical entry for the idiom chunk has to specify the co-occurrence of a particular pair of verb and NP₂.

III. The Grammatical Role of NP₁ in a POBJ Construction

With the same set of tests just applied, NP₁ can be shown to be referential. With additional tests, it can also be shown to be an argument of the main verb. I will begin the discussion by illustrating that it is impossible to get the POBJ interpretation by treating NP₁ as a special case of a possessor.

- (19) Lisz chr Wangwu de pangshie he tsu
Lisz eat Wangwu DE_{np} crabs AND vinegar
a. 'Lisz eats Wangwu's crabs and vinegar.'
b. *'Lisz eats Wangwu' crabs and is jealous of Wangwu.'

Assuming that NP₁ can be interpreted under the general term of 'possessor,' the relation between NP₁ and NP₂, the 'possessee' NP, should be the same as that between a usual possessor and possessee. As a consequence, this assumption predicts that a single NP₁ can function as the 'possessor' of a conjoined NP with one NP being a possessee and the other being the NP₂ in a POBJ construction and still allow the desired idiom chunk reading. Contrary to the prediction, 19 is only acceptable with the interpretation that both NPs are real possesseees. There is no

⁸ Pronominalization offers another possible test for referentiality. As expected, (i) shows that the NP₂ in the POBJ construction cannot be replaced by a pronoun. But as reminded to me by both Louie Mangione and Zheng-Sheng Zhang, (i) is independently ruled out by the fact that pronouns cannot be the head of a complex NP marked by DE_{np}. Hence (i) does not give any direct evidence on referentiality. A discussion on the explanation of this fact was given in chapters 2 and 3.

- (i) * Jangsan sheng Lisz de chi_i, Lisz ye
Jangsan give-birth Lisz DE_{np} air Lisz also
sheng Jangsan de ta_i
give-birth/grow Jangsan DE_{np} it

possible interpretation where one of the conjoined NPs is idiomatic and the other one not. Thus NP₁ cannot be treated as an instance of a (generalized) possessor.

- (20)=14a ta sheng shei de chi
 s/he give-birth who DE_{np} air
 'Who is s/he angry at?'

- (21)=9a Sanbai_i sheng tzji_i de chi
 Sanbai give-birth self DE_{np} air
 'Sanbai is angry with himself.'

20 shows that NP₁ in POBJ can be questioned and 21 shows that it can be replaced by a reflexive pronoun. NP₁ cannot be topicalized, as illustrated by 12b, but this is explained by the Generalized Left Branch Constraint. Other than topicalization, the two applicable tests both suggest that NP₁ is referential.

- (22) Juotz de mian hen ganjing
 table DE_{np} face very clean
 'The surface of the table is very clean.'

- (23) wo jian le ta de mian
 I see PERF s/he DE_{np} face
 'I met him.'

- (24) wo jian le juotz de mian
 I see PERF table DE_{np} face
 a. * 'I met the table.'
 b. 'I saw the surface of the table.'

jian-mian 'see-face' has an idiom chunk meaning of 'to meet,' as exemplified in 23. 22 is given to illustrate the literal meaning of mian 'face' in a possessive construction. In 24, the ungrammaticality of the 24a reading suggests that the predicate of the idiom chunk imposes selectional restriction on NP₁. That is, 24a is not acceptable because the predicate jian-mian 'to meet' selects a human object, and juotz 'table' is not a human noun. On the other hand, 24b is an allowed interpretation since the verb jian 'to see' takes any non-abstract object. Predicates can impose selectional restrictions only on their arguments. The fact that the idiom chunk jian-mian 'to meet' imposes selectional restriction on NP₁ indicates that NP₁ is an argument of the idiom chunk.

I have just argued that in a POBJ construction, NP₁ is an argument position while NP₂ is not. Since the only other argument position in this construction is the subject position, the null hypothesis would be that NP₁ is the direct object in this construction. The following examples contradict this hypothesis.

- (27)a. Sanbai chr-le fan
 Sanbai eat-PERF rice
 'Sanbai ate his meal.'
- b. fan bei Sanbai chr-le
 rice BEI Sanbai eat-PERF
 'The meal is eaten by Sanbai.'
- (26)a. Yunnian sheng Sanbai de chi
 Yunnian give-birth Sanbai DE_{np} air
 'Yunnian is angry at Sanbai.'
- b. * Sanbai bei Yunnian sheng chi
 Sanbai BEI Yunnian give-birth air

Passive constructions are marked by bei in Mandarin Chinese. The bei phrase, similar to the ba phrase, occurs in a pre-verbal position.⁹ 25b is the passive counterpart of 25a. 26b, as an intended passive counterpart of 26a, is ungrammatical. If NP₁ is the grammatical object in a POBJ construction, it should be able to occur as the bei object in a passive construction. The fact that it does not suggests that NP₁ may not be an object.

It has been well documented that neither the bei-construction nor the ba-construction applies exclusively to grammatical objects in Mandarin Chinese, and that ba- and bei-constructions cannot be adequately characterized as simply marking either an object or a patient. These two points are discussed in detail in Wang (1957), Chao (1968.706), and Mangione (1982.39-46). However, in general, all the non-occurrence of grammatical objects in bei-construction can be given an independently motivated explanation. For instance, verbs with positive connotation, such as ban 'to award (a prize etc.)' in 27, do not

⁹ The ba construction does not apply exclusively to grammatical objects. Neither is there an obvious way to characterize precisely the grammatical functions or semantic meaning of the NPs which occur as ba-objects. In unmarked cases, ba marks logical objects, or patient, in Mandarin Chinese. In these cases, a ba phrase occurs in a preverbal position and the object of ba is the direct object of the main verb. This is shown by (i), the ba counterpart of 25a. The fact, demonstrated by (ii), that NP₁ cannot occur as a ba object seems to suggest that NP₁ is not a grammatical object. The well-known facts that not all grammatical objects can occur as ba-object and that not all ba objects are grammatical object (or patient, or an argument 'affected' by the predicate...), however, prevents the ba-construction from being a good test for objecthood.

- (i) Sanbai ba fan chr-le
 Sanbai BA rice eat-PERF
 'Sanbai ate his meal.'
- (ii) * Yunnian ba Sanbai sheng chi
 Yunnian BA Sanbai give-birth air

co-occur with bei-constructions because the objects of bei are usually something adversely affected by the act, such as fa 'to fine' in 28.¹⁰

- (27) *Lisz bei ban-le yi wan kuai chian
Lisz BEI award-PERF one ten-thousand MEASURE money

- (28) Lisz bei fa-le yi wan kuai chian
Lisz BEI fine-PERF one ten-thousand MEASURE money
'Lisz was fined ten thousand dollars.'

The most crucial fact is that all known cases of bei-objects are also grammatical objects and that the grammatical objects which cannot occur as bei-objects are semantically motivated. In other words, grammatical objects are expected to have their bei-object counterparts unless independently ruled out. The facts that NP₁ cannot occur in the passive construction marked by bei and that there is no independent semantic motivation to prevent it from occurring in such positions indicate that NP₁ is not a patient and very likely not the grammatical direct object in the POBJ construction either.

The grammatical function next to a direct object in the hierarchy proposed in Bresnan (1982) is an indirect object (OBJ2). The word order for verbs with direct and indirect objects is indeed identical to that of a POBJ construction, as exemplified in 29.

- (29)a. Sanbai gei-le Yunnianɡ yi ben shu
Sanbai give-PERF Yunnianɡ one volume book
'Sanbai gave a book to Yunnianɡ.'
b. [vp V NP(OBJ2) NP(OBJ)]

In 29a, Yunnianɡ is the indirect object.¹¹ If the discontinuous NP₂ in the idiom chunk is treated as a dummy (direct) object, and NP₁ is treated as an indirect object, the constituent represented in 29b would be precisely the constituent structure

¹⁰ To my knowledge, there is no ultimately satisfactory account for ba- and bei- constructions, even though there is a huge literature on these two constructions. Wang (1957) is a comprehensive descriptive account and Mangione (1982) provides a formal semantic account, which is augmented by pragmatic and other considerations. Readers are referred to these works for in-depth discussion of the constructions.

¹¹ The most salient test to show that Yunnianɡ is not a direct object is the fact that it can never undergo passivization, as shown by (i).

(i) *Yunnianɡ bei Sanbai gei-le yi ben shu
Yunnianɡ BEI Sanbai give-PERF one volume book

for POBJ construction when the optional de is absent. It is exactly the presence of de which makes this analysis impossible.

- (30) Sanbai gei-le Yunnianɡ de yi ben shu
 Sanbai give-PERF Yunnianɡ DE_{np} one volume book
 'the book Sanbai gave Yunnianɡ' [the only available reading]

If 29b is the structure shared by ditransitive VPs and POBJ constructions, one would expect that inserting a de after the indirect object, parallel to the de after NP₁, should not change the meaning of the string. Contrary to this prediction the string in 30 can only have a NP meaning and is never synonymous to 29a. Since the string [V NP NP] is shared by both constructions, one way to differentiate them is to assume that the constituents have different grammatical roles. The fact that the role NP₁ is playing in a POBJ construction is not even remotely similar to the grammatical role of an indirect object also argues for assigning it a grammatical function other than that of an indirect object.

The two pairs of synonymous sentences in 31 and 32 elucidate the grammatical function of NP₁ in POBJ. The POBJ sentences in 31a and 32a are synonymous with their counterparts with prepositional phrases 31b and 32b respectively.

- (31)a. wo jian le ta de mian
 I see PERF s/he DE_{np} face
 'I met him.'
 b. wo gen ta jian mian
 I with s/he see face
 'I met him.'
- (32)a. Yunnianɡ sheng Sanbai de chi
 Yunnianɡ give-birth Sanbai DE_{np} air
 'Yunnianɡ is angry at Sanbai.'
 b. Yunnianɡ duei Sanbai sheng chi
 Yunnianɡ to Sanbai give-birth air
 'Yunnianɡ is angry at Sanbai.'

Several facts converge to suggest that NP₁ is an oblique object of the discontinuous idiom chunk. First of all, it has been shown that NP₁ is an argument of that idiom chunk. Second, the data also indicate that NP₁ can neither be a direct object nor an indirect object. Third, POBJ sentences are synonymous with corresponding sentences with NP₁ occurring in a pre-verbal PP. The first two facts, together with the presence of a subject, eliminate virtually all other alternatives since arguments of a predicate can only be a subject, a direct object, an indirect object, or an oblique object. The third phenomenon supports the conclusion. The tree structure of 31b and 32b corresponds to that of sentences with typical adverbial PPs, like that underlined in 33.

- (33) Sanbai tzai jia shie tz
 Sanbai at home write characters
 'Sanbai is writing calligraphy at home.'

Attested oblique arguments in other languages often occur syntactically as prepositional phrases, such as the object of the preposition of in English take advantage of. The prepositions in 31b and 32b are idiosyncratically determined by the predicate, another characteristic of a marker of an oblique argument.¹² Both facts show that the NPs corresponding to the NP₁ in 31b and 32b are oblique objects. To capture their synonymy and the fact that NP₁ behaves like neither a direct object nor an indirect object, NP₁ in the POBJ construction can only be treated as an oblique object of the predicate.

It is important to clarify what I am referring to with the term 'oblique object' here. As has often been noted, terms such as subject and object have been used in several rather confusing ways. I will not use subject and object to refer to thematic roles such as agent and patient, since these notions are not syntactic. I will instead follow the convention adopted in LFG and use the terms subject, object, etc. to refer to what are generally called grammatical roles. A grammatical subject refers to a member of a syntactically or morphologically marked, e.g. by case or by syntactic structure, category of noun phrases which functions typically as an agent in the sentence. Similarly, an object is a member of a category of syntactically or morphologically marked noun phrases which functions typically as a patient in a sentence. In other words, morphological or syntactical marks categorize noun phrases into several groups while prototypical thematic roles identify labels for each group. For example, a subject in English would be the NP which both occurs before the matrix predicate and shows number agreement with the matrix predicate. In the unmarked cases, a subject would be an agent in English. In marked cases, however, a subject could bear other thematic roles, such as a patient in a passive sentence. Thus, the notions of subject and object, etc. are identified with the help of thematic roles but can only be determined by grammatical mechanisms chosen by the language. Of course, languages vary from one to another in the mechanisms applied to mark these grammatical roles. Languages with relatively free word order, such as Russian and Walpiri, rely heavily on case to distinguish different grammatical roles, while languages with meager case

¹² It has been argued in various frameworks, such as in LFG in Bresnan (1982b) and in GPSG in Gazdar et al. (1985: 193), that the preposition in a PP argument of a verb is lexically selected by the verb, e.g. English to argue with and to be angry at; in contrast, the head of a non-argument PP can be semantically decided, such as directional to and from.

systems, such as English and Chinese, rely on structure and order to determine grammatical roles.

Oblique objects in this approach refer to a NP argument marked either by an oblique case or an adposition. Oblique objects in Chinese cannot be determined by oblique case because there is no case inflection in the language. An alternative is to define an oblique object as an argument which is marked extraordinarily. Take English for example. Except for personal pronouns, a grammatical subject or a grammatical object is not case-marked; an oblique object, however, is marked by preposition. In case-dominant languages, with the notable exception of ergative languages, the absolutive and accusative cases are generally considered the unmarked cases.¹³ For Chinese, grammatical roles are in general structurally defined. Roughly speaking, a subject is a sister of the matrix verb phrase which precedes that verb phrase and an object is a sister of a lexical verb which follows that verb. In addition to not having the prototypical thematic role of a patient for an object and not behaving like an object with regard to *ba* and *bei* constructions, the structure in which NP₁ occurs also does not fit the structural description of the definition of either subject or object. If the above-mentioned definition of oblique argument is adopted, NP₁ certainly occurs in an extraordinary position for an argument and is by definition an oblique argument. I would also like to point out that labelling NP₁ as an oblique argument allows relatively straightforward accounts of why an argument of a predicate is assigned such a unusual structure. All these arguments support my assuming the definition that an oblique argument is an extraordinarily marked argument of the predicate.

Starting in the next section, analyses in four different frameworks of linguistic theories are proposed and evaluated. But first let me summarize the grammatical features of the POBJ construction discussed in this section. These are the facts that adequate accounts ought to capture.

¹³ Ergative and absolutive are usually the unmarked cases assigned in ergative languages. It is worth noting that regardless of whether the language is ergative or not, the unmarked cases are always assigned to grammatical subjects or objects.

(34) Grammatical Features of POBJ

- a. The matrix verb forms a (discontinuous) idiom chunk with NP₂.
- b. NP₁ is the oblique object of the idiom chunk.
- c. NP₁ allows wh-questions and anaphora, but cannot be topicalized.
- d. NP₂ allows neither wh-questions, nor anaphora, nor topicalization.
- e. A reflexive pronoun in the NP₁ position can be coreferential with the matrix subject, while a non-reflexive pronoun cannot.

IV. Possible GB Analyses

The first framework I apply is GB. GB distinguishes itself from other competing theories in being mainly concerned with a set of explicitly proposed principles and parameters of Universal Grammar (UG). The proposed UG rules account for a wide range of data in natural languages. The basic idea is that the core of UG is a small set of principles with some variable parameters whose values are "tuned" to accommodate the specifics of each language. For instance, the kind of transformational rules used to account for various correspondences is now reduced to a single rule 'Move \bar{a} ', that is, move anything to anywhere provided that there are no principles in the grammar to rule it out. One of the advantages gained by this revision is the simplification of the grammar. Originally there were a large number of transformational rules in each language, with each movement rule specifying the extracting site, the landing site, the environment, and possibly including rule particular constraints. What GB has is a simple 'Move \bar{a} ' rule which interacts with several universal principles, whose effects are manifested in a variety of different constructions. Thus transformational rules no longer generate specific constructions; instead, the properties of different constructions depend on the interactions of general principles.

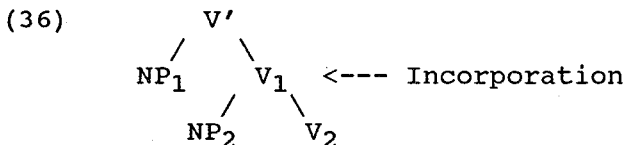
Three important principles governing the distribution of NPs in GB are the Case theory, the Theta-Criterion, and Empty Category Principles (ECP). ECP concerns elements without phonological content. I will not discuss them here because they have not direct bearing upon the current topic. An argument of a predicate must receive a theta-role from the predicate. Theta-roles are generally thought to be assigned directionally at the D-structure. It is also argued by most theorists in GB that a lexical verb, or other theta-role assigners, can only assign one theta-role. Any argument without a properly assigned theta-role will be ruled out. The Case theory governs the distribution of overt NPs. In GB, an overt NP, as opposed to a null NP without phonological content, must bear one and only one abstract Case. Abstract Case is not to be confused with overt inflectional cases. The idea of abstractness is very important in Mandarin Chinese because Chinese is a language without morphological case.

For the Case theory to work, the abstract Case must exist without morphological instantiation in Chinese. Similar to theta-roles, Case assignment is assumed to be directional, but unlike theta-role assignment, Case assignment is thought to be able to take place at any level between D-structure and S-structure.

A priori, the unmarked case is to have Case and theta-roles assigned to the same direction. For instance, languages such as English have been shown to have both Case and theta-role assigned to the right of a Case or theta-role assigner. In contrast, recent works on Mandarin, e.g. Li (1985) and Travis (1984), argue that Case assignment in this language is to the right and theta-role assignment to the left. Travis (1984) also argued that the directions of theta-role and Case assignment could be typologically significant. The leftward theta-role assignment accounts for why PPs like *bei*-phrases and *ba*-phrases, which are arguments of the verb, occur to the left of the verb. The rightward Case assignment accounts for why NP arguments of the verb must occur to the right of the verb in Chinese. NPs are generated in positions to the left of the verb in D-structure and receive theta-roles there. But because Case assignment is to the right, they cannot receive any Case unless they are moved to the right of the verb. The only way to have an argument stay to the left of the verb without violating the Case filter, which says that an overt NP cannot occur without a Case, is to insert a Case assigner to the left of the argument, like the *of* which is inserted in English before the objects of nouns. The fact that a regular POBJ sentence has a preverbal PP counterpart supports such an analysis.

The POBJ sentence and its preverbal PP counterpart in 35 (=32) are synonymous. To account for this in GB, the standard assumption is followed that NP₁ occurs preverbally in D-structure and receives a theta-role from the verb. This assigns a D-structure like 36 to the POBJ construction.

- (35)a. Yunniang sheng Sanbai de chi
 Yunniang give-birth Sanbai DE_{NP} air
 'Yunniang is angry at Sanbai.'
 b. Yunniang duei Sanbai sheng chi
 Yunniang to Sanbai give-birth air
 'Yunniang is angry at Sanbai.'



A preposition is inserted at a later stage to assign Case to NP₁ if it is not affected by Move \bar{a} . An immediate problem here is to determine which preposition is to be inserted. As men-

tioned above, each idiom chunk selects its own preverbal preposition, illustrated by 37 and 38.

- (37)a. Wo gen Lish jian mian
 I with Lish see face
 'I met Lish.'
 b. * Wo duei Lish jian mian
 I to Lish see face
- (38)¹⁴a. * Wangwu gen Lish bu fu chi
 Wangwu with Lish NEG obey air
 b. Wangwu duei Lish bu fu chi
 Wangwu to Lish NEG obey air
 'Wangwu wouldn't admit defeat/being inferior to
 Lish.'

I will leave the problem of inserting the correct preposition aside for the moment and try to see if the standard GB assumption just discussed can give an otherwise satisfactory account for the construction in question. In the assumed D-structure in 36, I have also placed NP₂ to the left of the verb, consistent with the direction of theta-role assignment. An incorporation must be assumed to occur in the D-structure such that NP₁ can receive a theta-role from the incorporated verb V₁, in compliance with the assumption that each verb can only assign one theta-role. NP₂ would be assigned a theta-role from V₂. It is not clear to me how an NP as a part of an idiom chunk should be treated in GB with regard to Case. The theory does seem to require, though, that both NP₁, the oblique object, and NP₂, as a part of the idiom chunk, to receive Case by virtue of being lexical NPs.

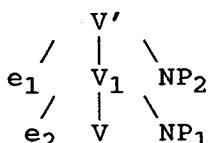
In order to satisfy the requirement of Case theory that a Case assigner must be adjacent to a Case receiver, NP₁ and NP₂ will move from their underlying positions in 36 to the S-structure positions in 39.¹⁵

¹⁴ The POBJ counterpart is the following:

(i) Wangwu bu fu Lish de chi
 Wangwu NEG obey Lish DE_{NP} air
 'Wangwu wouldn't admit defeat/being inferior to Lish.'

¹⁵ The Adjacency Condition is a parameter in GB, with the unmarked case being that the constraint applies. Chomsky (1982:9) suggests that this condition be requirement of Case assignment or at least an unmarked option. Anyway, assuming that the abstract Case exists in Chinese, there is no substantial evidence to prove that the Adjacency condition does not apply. For instance, Li (1985) uses the Adjacency Condition to argue for the existence of an abstract Case in Mandarin Chinese.

(39)



Furthermore, one has to assume another incorporation at the V_1 level to incorporate the incorporated verb e_2 -V and NP_1 and to create a Case assigner for NP_2 . Notice that NP_1 moved from an outer position to a position right next to the verb, while NP_2 moved from a position right next to the verb to a position after NP_1 .

The first problem this analysis faces is that it will wrongly predict that 40 is grammatical.

- (40) *Sanbai chr tsu ta
 Sanbai eat vinegar s/he

Nothing in this analysis prevents NP_2 from flipping over the lexical verb and taking the position right next to the verb and thus receiving Case. NP_1 would then have to move to the position behind NP_2 and receive Case from the incorporated verb chr-tsu 'be jealous of.' Both NP_1 and NP_2 would satisfy the requirements of Theta-Criterion and Case Theory.

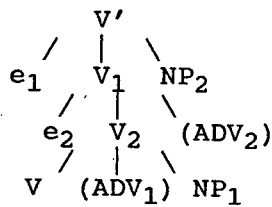
- (41)a. Sanbai gen Yunnianɡ dau dan
 Sanbai with Yunnianɡ smash egg
 'Sanbai meddles and spoils Yunnianɡ's business.'
 b. * Sanbai gen dan dau Yunnianɡ
 Sanbai with egg smash Yunnianɡ

The second problem involves the contrast exemplified by 41. In order to account for 41a, rules to insert prepositions such as gen are necessary. With 41a, NP_2 would be flipped to receive Case from the verb, while NP_1 will receive Case from the inserted preposition gen. On the other hand, NP_1 , instead of NP_2 , could flip over to the right to receive Case from the lexical verb, while a gen-insertion rule could assign Case to NP_2 , which remains in the pre-verbal position. There is no way to differentiate the two derivations in the current analysis. But 41a is grammatical while 41b is not.

42 and 43 illustrates still another problem this analysis faces.

- (42)a. Sanbai sheng-le Yunnianɡ bantian de chi
 Sanbai give-birth-PERF Yunnianɡ half-day DE_{np} air
 b. Sanbai sheng-le bantian Yunnianɡ de chi
 Sanbai give-birth-PERF half-day Yunnianɡ DE_{np} air
 'Sanbai is angry at Yunnianɡ for a long time.'

(43)



There are two possible positions for duration/frequency adverbials, immediately before or after NP₁. If the adverbial occurs in the ADV₁ position, it comes between NP₁ and the lexical verb; if the adverbial occurs in the ADV₂ position, it comes between the incorporated verb V-NP₁ and NP₂. In either case, the occurrence of the adverbial would cause violation of the adjacency condition on Case assignment. The adjacency constraint requires a Case assigner to be adjacent to the NP receiving Case. ADV₁ isolates NP₁ from the only potential Case assigner V and ADV₂ prevents NP₂ from being adjacent to the only possible Case assigner V₂. NP₁ fails to receive Case in the first situation and NP₂ fails to receive Case in the second one. They incorrectly rule 42a and 42b as ungrammatical.

An alternative, and certainly a logical possibility, is to assume that the adjacency condition on Case assignment does not hold in Chinese. This would at least allow the grammar to admit both 42a and 42b. The catch is that many other ungrammatical strings would also be allowed. One such sentence is given here as 44. Relaxing the adjacency constraint would leave the grammar with no rule to prevent an adverbial PP from occurring between a verb and an object, a structure exactly parallel to that of 42a.

(44) * Lisz [vp chr [pp tzai jia] fan]
 Lisz eat at home rice

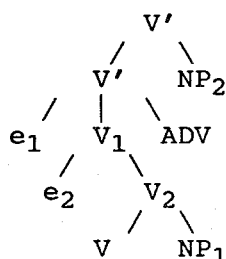
The difficulty with this analysis lies in the fact that there is no morphological case in Chinese. Arguments for the existence of abstract Case in Chinese, such as those presented in Li (1985), can be outlined as follows: First, Case theory is a set of proposed language universals which are marked by morphological instantiations as cases in a large number of languages and have been proven to adequately account for a wide range of data in different natural languages. Second, though there are no morphological cases in Chinese against which to test for the predictions of the Case theory straightforwardly, the distribution of overt NPs in Chinese does seem to be correctly predicted by the Case theory if one assumes an abstract Case without phonological content. Without the Case theory, one would have to stipulate a separate set of principles for Chinese to capture the same set of generalizations with the only difference being the absence of morphological cases. Generalizations across languages are clearly being missed in such an analysis. Therefore, the most reasonable account would be to support the claim of the Case

theory's being part of the universal grammar and argue that the Chinese data are governed by the same set of principles.

The above argument relies heavily on the observation that the identical set of principles proposed in the Case theory accounts for the distribution of overt NPs in Chinese. The adjacency condition on Case assignment is one of the central rules in Case theory and is crucial in accounting for data in many languages where the Case Theory is proven to apply. It is generally, e.g. Chomsky (1982), regarded as the unmarked value of a parameter if not as a universal. Proposing that the adjacency constraint does not apply in Chinese is in a sense saying that the set of Case theory principles used in Chinese is really not the same as the proposed universals. This, in turn, would undermine the only argument for the existence of abstract Case in Chinese. In addition, the adjacency condition does help to explain why lexical adverbs do not occur between a verb and an object and why PPs can occur preverbally but not between the verb and a NP argument. I will simply assume, following Li (1985) and most other works on Case in Chinese, that the adjacency condition applies in Mandarin since I am not dealing with the more fundamental question of whether there exists an abstract Case in Chinese here.

45 represents the second possible GB analysis I am considering. Assume that NP₂, by virtue of its being a part of the idiom chunk and thus having a special status in the grammar, is not subject to the Case filter. Assume also that J. Huang's (1982) phrase structure constraint prevents NP₂ from being left-branching. 45 would be a possible S-structure for 42a, the POBJ construction with the adverbial following NP₁.

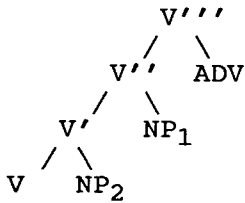
(45)



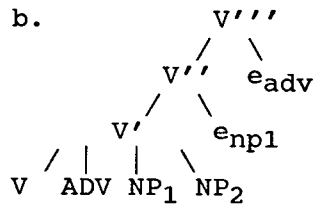
The problem remains to be that the occurrence of ADV₁ prevents NP₁ from receiving Case from the verb and therefore 42b is incorrectly ruled out. This analysis, without additional stipulation, also fails to rule out the ungrammatical 40.

46 is another possible D-structure suggested to me by J. Huang (p.c.) and the last to be considered within GB. The assumption is that theta-roles can be assigned either to the right or to the left of the verb, while Case assignment is to the right.

(46) a.



b.



In 46a, both NP_1 and NP_2 occur to the right of the verb and both receive theta-roles at that position. V' in this analysis is not a Case assigner and therefore NP_1 must be lowered to the position immediately after the lexical verb V to receive Case. Then J. Huang's (1982) Phrase Structure Constraint, which postulates that the phrase structure rule in Chinese does not allow branching to the left more than once in S-structure, prevents the adverbial from staying to the right of V'' . As a consequence the adverbial is lowered to a position within V' , and the traces left are pruned. This account does allow both 42a and 42b to occur in the language. But it has difficulty with the Case assignment for NP_2 . If NP_2 does receive Case, then why is the lexical verb allowed to assign two Cases to two different NPs? If NP_2 does not receive Case, then what prevents it from receiving a Case in the D-structure when it is adjacent to the Case-assigning verb and thus deprives NP_1 of any possible Case assignment? It is also not clear to me how this analysis rules out sentences like 41b. Presumably, NP_2 can move to a preverbal position without violating theta criteria, and then meet the requirement of the Case Filter by receiving a Case from the inserted preposition. Such a derivation will sanction the ungrammatical 41b. In addition, the ungrammatical 40 discussed above with the standard GB assumption still could not be ruled out without further stipulation.¹⁶

In the above discussions of possible GB analyses for the POBJ construction, I have exhausted almost all possible treatments of the construction with regard to the Theta-Criterion and the Case Theory and yet have failed to come up with a satisfactory account. It is difficult to pinpoint the problem, especially when the mechanisms in the theory are supposed to be powerful enough to account for all natural languages. However, since the

¹⁶ Movement at PF seems to be another alternative worth investigating, but it will not yield different result. Assuming that PF structures are not relevant for Case assignment, Case would have to be assigned between D-structure and S-structure, the case considered and shown to be making incorrect predictions. Assuming that Case is relevant at PF, the same constraint on Case assignment at S-structure would apply at PF and the same Move \bar{a} is the mechanism to change the position of categories; thus the same consideration applies and the same incorrect predictions would be made.

theory-inherent universal principles of the Theta-Criterion and the Case Theory coupled with the proposed analyses make wrong predictions, my suspicion is that some of the proposed universals are simply too strong and need modification before being applied to Chinese.

V. A Possible GPSG Analysis

GPSG originated with the idea, explicated in Gazdar (1981), that a context-free Phrase Structure Grammar with complex categorial symbols can capture all the generalizations that a transformational grammar is trying to capture with transformations. Subsequent developments of GPSG remain largely true to this idea. Gazdar et al. (1985) is a summary of the recent state of the theory. Readers are referred to this work for detailed discussion of the mechanisms and theories of GPSG. The analyses discussed will rely crucially on two mechanisms of the theory: metarules and feature matrixes.¹⁷

The GPSG analysis I am proposing here depends crucially on the observation that there are sentences other than POBJ constructions which allow an adverbial to occur between a verb and an object. This fact is exemplified by 47. The ID/LP statements in 48 and 49 account for 47.

- (47)a. ta kanle sange jungtou shu
 s/he read-PERF three-MEASURE hour book
 'S/He has been reading books for three hours.'
 b. *ta kanle shu sange jungtou
 s/he read-PERF book three-MEASURE hour

(48)¹⁸ ID Statement: VP --> H, ADVP[DUR/FRE], NP

¹⁷ Another possible analysis not discussed in this thesis, suggested to me by Gennaro Chierchia (p.c.), follows the line of the analysis of English raising construction proposed in Jacobson (1983). The analysis relies on a new SLASH category different from the SLASH category used for unbounded dependencies in the current theory. The idea is to insert the string V-NP₂ as a unit (an idiom chunk) from the lexicon, and thus takes care of the non-compositional meaning. NP₁ follows the string as its argument. The new SLASH metarule then applies to the rule generating the string V-NP₂ and gives back a rule with a null NP in place of NP₂. Other ID rules will allow NP₂ to occur to the right of NP₁. Since this analysis requires considerable revision of the current theory, I will not go into details here.

¹⁸ A problematic case, pointed out to me by Louie Mangione (p.c.), is given in (i). In (i), the frequency of occurrence adverbial occurs after the object. This phenomenon is allowed with certain verbs only. for example, 47b with an identical

(49) LP Statements:

- a. H[+V, -N] < XP
- b. ADVP < NP [-OBL] (or NP[OBJ])

In 48, I am assuming that the adverbial phrase is the sister of the verb, instead of being a pre-nominal modifier of the object NP, since it is a modifier of the verb phrase. The LP statement 49a postulates that the lexical head precedes other phrasal sisters and 49b that an adverbial phrase precedes a non-oblique noun phrase. Recall that the oblique object (NP₁) in a POBJ construction can occur either before or after the adverbial, but the idiom chunk object (NP₂) and object NPs in other constructions, such as the object in 47, must occur after the adverbial. Thus the LP statement 49b is well motivated. Since the oblique object in a POBJ construction is the only known type of NP not to be crucially ordered with a ADVP, I will assume for the moment that the LP statement specifically refers to the feature [-OBL], instead of [+OBJ] as suggested in the parenthesis. Either formulation seems to adequately describe the data in the language.

(50) VP[POBJ] --> W

↓
VP[POBJ] --> W, NP[OBL]

(51) VP[POBJ] --> H, NP, ADV[FRE/DUR], NP[OBL]

(52)a. Sanbai chr Yunniang de tsu
Sanbai eat Yunniang DE vinegar
'Sanbai is jealous of Yunniang.'

b. Sanbai chr tsu
Sanbai eat vinegar
'Sanbai is jealous.'

(53)¹⁹ NP[OBL] < NP

structure is ungrammatical. I do not have a formal account for (i) for the moment.

(i) ta chiu-guo meiguo santsz
s/he go-EXPERIENCE America three-times
'S/He has been to America three times.'

¹⁹ A more general way to capture the effects of this LP statement is (i). Since the idiomatic feature of NP₂ has to be specified, (i) guarantees that NP₂ is preceded by all its phrasal sisters, including adverbials. The domain of this statement overlaps with 48b. Further studies are needed to determine between the overlapping rules.

(i) XP < NP[IDIOM]

The metarule in 50 accounts for the structure of the POBJ construction in GPSG. The input of the metarule is a ID statement independently motivated by 52b. It will not differ from other VP rules except that the head verb is marked by the feature [POBJ], which I assume to be a subcategorization feature marking all idiom chunks which have POBJ counterparts. The metarule 50 takes such ID rules and gives back ID rules with an extra argument: an oblique object, as illustrated by 51. The metarule meets the strict constraint imposed in GPSG. That is, the input rule is a lexical rule and only one category, the oblique object, is specified in the metarule. The output ID rule is governed by the LP statements in 49. 49a postulates that the lexical head in an ID rule precedes all other phrasal categories. Thus in the POBJ construction the verb is the first element in the VP. The LP statement 49b requires a non-oblique NP to follow an adverbial, and the additional LP statement 53 requires it to follow the oblique object. Thus the fact that NP₂ is the last element in a POBJ verb phrase is accounted for. The alternative order between the adverbial phrase and NP₁ is predicted by the fact that there is no LP statement governing the order between an oblique NP and an adverbial phrase. The occurrence of the optional DE_{np} is not discussed here and is assumed to be accounted for by the general schema in chapter 2.

One possible problem this analysis may have involves semantics. The meaning of the idiom chunks are not compositional. That is, the idiom chunk meaning is carried by two segments: the verb and NP₂, but the meaning of the idiom chunk does not equal any logical combination of the meaning of the two segments. The usual strategy is to deal with this idiosyncrasy in the lexicon. Each idiom chunk is given an entry which specifies the semantic meaning and the two segments involved. For such a strategy to work, either the two segments must be retrieved as a unit from the lexicon or the theory must have some mechanisms to relate syntactic structures to information in the lexicon. The fact that the ID/LP rules responsible for the POBJ construction generate a tree where the verb and NP₂ are not adjacent to each other makes the first alternative impossible.²⁰ Current GPSG theories also do not allow discontinuous syntactic segments to be postulated as one unit in the lexicon. Neither of the possible strategies mentioned above works here. As a consequence, the semantic translation of 49 would be an exception

²⁰ The semantics of GPSG, as explained in Gazdar et al. (1985:182-244), is a tree interpretation procedure. The translation rules take trees as inputs and return intensional logic translations as outputs. The verb and NP₂ are clearly not adjacent on the tree and are not even on the same local tree. Thus they cannot be translated as a unit. One possibility for keeping the verb and NP₂ adjacent on a local tree is represented by the Head Grammar analysis below.

to the general translation schema proposed in Gazdar et al. (1985). The same problem exists for the treatment of idiom chunks in most languages. I assume more rigorous studies of idiom chunks in this framework will turn up more satisfactory accounts, and defer further discussion until then.

The other problem involves constituent structures. I have argued earlier that the string $[NP_1 \text{ de } NP_2]$ forms a constituent. Contrary to that account, these nodes are analyzed as sisters in this section. The dilemma is between conserving a direct mapping from syntax to semantics and representing the configurational information. The proposed GPSG analysis maintains the direct mapping by assigning the flat structure 51, in which the adverbial is a sister of the head of the predicate and therefore is translated in semantics as modifying the predicate. On the other hand, an analysis assigning $[NP_1 \text{ de } NP_2]$ in this framework would also include the duration/frequency adverbial in this noun phrase. The adverbial would be a sister of both NP_1 and NP_2 but not the verb. This structure makes it impossible to maintain an autonomous syntax and yet represent the adverbial as modifying the whole predicate phrase.

Another point worth noting is that explicit reference to grammatical relation is made in the LP statement in 49b. It is generally conceived not necessary to refer to grammatical relations in this framework though the proposed mechanisms do not preclude such a possibility. The data show that it is crucial to differentiate NP_1 from NP_2 to get the right order, and that NP_2 has to pattern with other object NPs in being ordered after the adverbial phrase. The only grammatical feature distinguishing NP_1 from other NPs is that it is an oblique object and the others are not.

VI. A Head Grammar Analysis

The GPSG analysis proposed above faces the problem of having to come up with an exceptional mechanism to deal with the translation of discontinuous idiom chunks. I will now turn to Head Grammar (HG) for a possible way to deal with the mismatch between syntactic and semantic units. HG, developed in Pollard (1984), is a direct descendent of GPSG. HG differs critically from GPSG in that it allows non-adjacent surface segments to form a syntactic unit. This is done by introducing wrapping, in addition to the now familiar concatenation, as a mechanism to form larger syntactic units. That is, if there are two strings \underline{t} and \underline{s} , in addition to the two concatenation alternatives of putting \underline{t} either to the left or to the right of \underline{s} , another way to combine the two strings is to break one of the strings into two and put the two resultant segments to each side of the other string. The reference to Head comes from the fact that strings can only be segmented immediately before or after the head of that string. 'Wrap' refers to the fact that one argument, i.e.

one of the strings, 'wrap' around the other argument. Various concatenation mechanisms are also included in this framework as special cases where the head of the 'wrapping' string occurs at either the beginning or the end of the string and one of the 'wrapping' segment is an empty string. I am focusing here on whether the POBJ construction can be adequately accounted for without referring to grammatical relations instead of a detailed study of Head Grammar. Readers are referred to Pollard (1984) for discussion of the theory and mathematical basis of Head Grammar.

54 and 55 give the wrapping rule used in my proposed HG analysis of POBJ.

(54) LL1(Left-left head Wrap 1):

'Wrap the left hand argument around the other argument, placing the head of the former immediately to the left of the latter, and take the head of the first argument as the head of the resultant string.'

(55) $LL1\langle S, T \rangle = s_1 \dots s_i t_1 \dots t_j \dots t_m s_{(i+1)} \dots s_n$
 $\quad \quad \quad * \text{ <--head}$

where $S = (s, i) = s_1 \dots s_i \dots s_n$

$*$

and $T = (t, j) = t_1 \dots t_j \dots t_m$

$*$

The rule, called 'left-left head wrapping 1,' is described in 54 and formulated in 55, following Pollard (1984). In 55, again following Pollard's (1984) convention, an asterisk marks the head of a string. Capital letters S and T are stands for strings, and subscripted small letter s_i and t_j stands for elements in the string. The number i in the ordered pair (s, i) designates the position of the head in the string. The LL-1 rule in 55 allows one to stick the second argument immediately to the right of the head of the first argument which also serves as the head of the new string. Now imagine that the first string is an idiom chunk involved in a POBJ construction and the second string consists of only one element, namely the oblique object. LL-1 would give the exact order needed for the combined string.

(56) $LL1 \langle VP_{pobj}, NP \rangle = V \quad NP \quad NP_{pobj}$
 $\quad \quad \quad *$

where $VP_{pobj} \rightarrow V \quad NP_{pobj}$
 $\quad \quad \quad *$

56 spells out the details of the LL-1 operation applied on the idiom chunk rule and the oblique object NP to generate the POBJ construction. In this analysis, not only the order between the verb, NP_1 , and NP_2 is correctly captured. The fact that the verb and NP_2 form a semantic unit, a predicate, and that NP_2 is an argument of that predicate is also captured with the help of

the head-wrapping mechanism. The potential problem of semantic translation that arises in the GPSG analysis is solved.

- (57) a. Sanbai sheng-le Yunnianɡ bantian de chi
 Sanbai give-birth-PERF Yunnianɡ half-day DE_{NP} air
 b. Sanbai sheng-le bantian Yunnianɡ de chi
 Sanbai give-birth-PERF half-day Yunnianɡ DE_{NP} air
 'Sanbai is angry at Yunnianɡ for a long time.'

Rather unexpectedly, this HG account still has problems with the placement of one of the adverbial positions. In 42, repeated here as 57, it is shown that duration/frequency adverbials have two possible positions in a POBJ construction. Since an adverbial phrase semantically takes the whole predicate as its argument, i.e. it modifies the whole predicate, the natural thing to do is to take the whole POBJ predicate, that is the output string of 56, as one argument and the adverbial phrase as another argument and combine them. The problem is that Head-wrapping operations can only wrap an argument immediately next to the head. This allows us to derive 57b but not 57a. In 57b, the adverbial occurs right after the verb, the head of the verb phrase; in contrast, it occurs after NP₁ in 57a, non-adjacent to the verb. Given the formalism of HG and the fact that allowing wrapping operations to refer to a node other than the head of a string would most likely result in too strong a grammar, there is no plausible way to generate 57a in this framework.

VII. A LFG Analysis

The last grammatical theory I will discuss is LFG. LFG differs from other frameworks in that it states explicitly that grammatical relations, called grammatical functions, are to be explicitly represented in the grammar. This is done with the f(unctional)-equations annotated to the c(onstituent)-structure which maps a c-structure to a f(unctional)-structure, where the grammatical relations of the string are formally represented. Again, I am going to assume knowledge of mechanisms in this framework. Readers who are not familiar with the formalism are referred to Kaplan and Bresnan (1982).

One important piece of reasoning behind the theories of LFG is that a lot of grammatical correspondences can be best represented as lexical redundancy rules. A typical argument, such as the one represented in Bresnan (1978), is that, contrary to the prediction of a transformation, correspondences like the one between passive sentences and their non-passive counterparts cannot be purely structurally defined. That is, correspondences predicted by the structurally defined rules do not necessarily exist in the language. The gaps in these correspondences can only be predicted by the specific features of each lexical item. Another strong argument presented in Bresnan (1982b) is that passivization feeds morphological rules, for example, the rule to

A crucial part in the LFG analysis of POBJ is how to represent the discontinuous idiom chunks. What have to be captured are that NP₁ is the oblique object of the whole idiom chunk represented by the two discontinuous parts: the verb and NP₂, and that the meaning of the idiom chunks cannot be represented as the result of applying the lexical meaning of the verb to NP₂.

(58) a. chr: V, ↑ PRED = P₃₁, ↑ FORM = (CHR, y),
 ↑ FORM =_C (CHR, TSU)
 b. tsu: N, ↑ PRED = P₃₁, ↑ FORM = (x, TSU),
 ↑ FORM =_C (CHR, TSU)
 c. P₃₁ = 'BE-JEALOUS' < (SUBJ) (OBL) >

To account for the fact that the idiom chunk reading depends on the co-occurrence of both lexical items and that the occurrence of either lexical item alone cannot represent the idiom chunk reading, two new rules are introduced. First, an 'address' P₃₁, instead of the usual predicate-argument structure, is given as the value of the PRED function. This proposal is needed to satisfy the constraint on functional biuniqueness, which states that each grammatical function can have one and only one value. It is assumed, as in all other grammatical theories, that each individual semantic instantiation of a lexical item is indexed and differs from the other semantic instantiations of the same lexical item, except when long-distance dependencies are involved. Without this assumption, the two instances of the verb laugh would be interpreted as the very same action in sentences like John laughed and Jean laughed. An even more serious formal consequence is that the verb laugh, which is subcategorized to take one SUBJ argument, is now supplied with two NP arguments because the two instances of laugh in this sentence is considered the same and are merged to one predicate-argument frame. This representation would then be ruled as ungrammatical because it violates the Coherence Condition by leaving a NP unassigned to any predicate-argument structure. In the current analysis, even if identical predicate-argument structures are listed under the lexical entries of chr 'to eat' and tsu 'vinegar,' they will end

up as two different values assigned to the PRED function because two different instantiations of a semantic form cannot merge. Such a value assignment would violate the Completeness Condition on grammaticality. Because the predicate-argument structures assigned to the two lexical items cannot merge, there will be two predicate-argument structures and two sets of grammatical functions to be filled. Since there is only one set of grammatical functions given in the sentence, one predicate-argument structure will remain unfilled and leaves the f-structure representation of the sentence incomplete. The solution is to give both lexical items the same 'address' as the value of their PRED attribute. The identical attribute values will then lead to one predicate-argument structure rather than two. In the lexical entries in 58, P_{31} is treated as a variable and all the idiom chunk predicates would be treated similarly with the actual semantic value of the predicates listed separately. Since P_{31} is treated as a variable, the two occurrences of the same variables as the value of PRED under chr and tsu can have identical reference. Second, the FORM features in 58a and 58b are introduced to guarantee that only when chr and tsu co-occur in the appropriate domain is the idiom chunk reading possible. Allowing both the verb and NP_2 to carry information about the predicate-argument structure without constraint might result in allowing a idiom chunk reading when only one of the two elements occurs, which is not what happens. The constraint equations marked by '=' do not assign values to features; they only check whether the values assigned to the specific feature meet the requirement. Therefore, no violation would occur if the feature is not present in the relevant f-structure. The co-occurrence is guaranteed by assigning an ordered pair as the value to the FORM feature. The lexical verb chr assigns a value CHR to the first part of the ordered pair while it fills the second part with a variable y. Since the constraining equation listed requires that the second member of the ordered pair be TSU, this assignment cannot satisfy the requirement. On the other hand, the lexical entry for the idiom chunk reading of tsu assigns the value TSU to the second member of the ordered pair as the value of the FORM feature but fills the first member with a variable x. The identical constraining equation listed under this lexical item also rules out this assignment. The only way to satisfy the requirement of the constraining equation is to merge the information of the two lexical items. Such a merge is sanctioned by the f-description annotated in the following PS rules.

- (59) a. $VP \rightarrow V \quad NP$
 $\quad \quad \uparrow = \downarrow \quad \uparrow = \downarrow$
 b. $NP \rightarrow NP \quad XP \quad \underline{de} \quad NP$
 $\quad \quad \uparrow OBL = \downarrow \quad \uparrow ADJ = \downarrow \quad \uparrow = \downarrow$
- (60) $VP \rightarrow V \quad NP$
 $\quad \quad \uparrow = \downarrow \quad \uparrow OBJ = \downarrow$

59 is identical to the PS rule for a transitive VP with an object, i.e. 60, except that the equation annotated to the NP is $\uparrow = \downarrow$ instead of $\uparrow \text{OBJ} = \downarrow$. The first equation postulates that all the grammatical information specified in the NP should be merged with the grammatical information about the proposition specified elsewhere, while the latter postulates that the grammatical information represented on the subtree dominated by that node stands for the OBJ function of the proposition. The first equation is necessary to account for the fact that NP₂ is a discontinuous part of the predicate. If the NP in 59a is assigned an equation other than $\uparrow = \downarrow$, whatever is specified within the NP would be referring to that lower function rather than to the whole proposition. For example, if the annotated equation is $\uparrow \text{OBJ} = \downarrow$, as in 60, whatever grammatical information is represented in the NP would only apply to the OBJ function instead of the whole predicate. The problem is how to get the f-structure representation that the adverbial is a modifier of the predicate rather than of the object. The functional locality condition in LFG, formulated in Bresnan (1982a.288), disallows referring to more than one level of embedded functional application in an annotated f-equation. The condition in effect rules out the possibility that a f-equation specifies a grammatical function represented by a node other than its mother, itself, or the nodes it immediately dominates. In other words, there is no way to represent that the adverbial within the NP in 59b is a modifier of the predicate if the grammatical function of that NP is postulated by a rule like 60. 59a does not have this problem because the equation $\uparrow = \downarrow$ allows all the grammatical information in the NP to be merged with the grammatical function represented by the verb. Thus 59a allows the correct interpretation of the adverbials and the correct representation of the intuition that NP₂ in a POBJ construction is part of a discontinuous predicate. This analysis also captures the fact that the string 'NP₁ (ADJ) de NP₂' is a NP constituent. It may also be noted that one way to define a head in LFG is to define it as the node marked by the equation $\uparrow = \downarrow$. In this sense, NP₂ would be the head of the constituent NP₁ de NP₂. This also fits the generalization I made about a complex NP with DE_{NP} in chapter 2.

Last, marking NP₁ with the function OBL instead of OBJ enables us to capture the data related to ba-constructions and bei-constructions. It is shown in section III that the POBJ constructions have no ba or bei counterparts. Presumably, these two constructions are captured by lexical rules referring to the function OBJ, listed here as 61 and 62. The two rules are not meant to be an exhaustive account for the two constructions. Instead, they are given to account for the correlation between the class of grammatical objects and the objects of ba and bei. I am assuming that these and other ba and bei sentences have to be generated through PS rules for preverbal PPs and lexical rules specifying the selectional restriction ba and bei impose on their objects. My analysis assigning the function OBL to NP₁ would

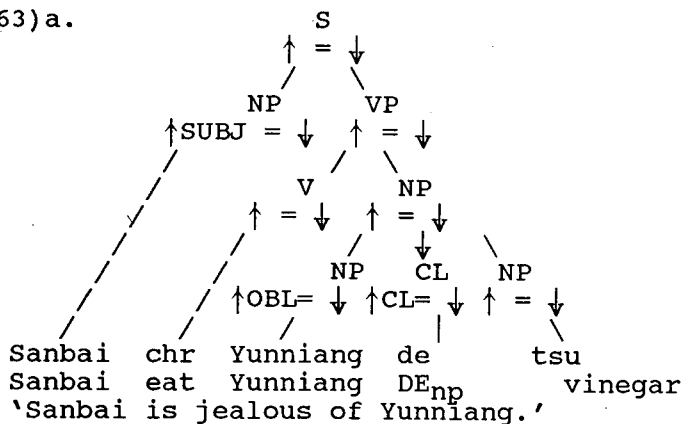
exclude it from the domain of the two lexical redundancy rules and accounts for why there are no ba and bei counterparts of the POBJ construction.

(61) ba Lexical Rule
(OBJ) --> (BA OBJ)

(62) bei Lexical Rule
(SUBJ) --> (BEI OBJ)
(OBJ) --> (SUBJ)

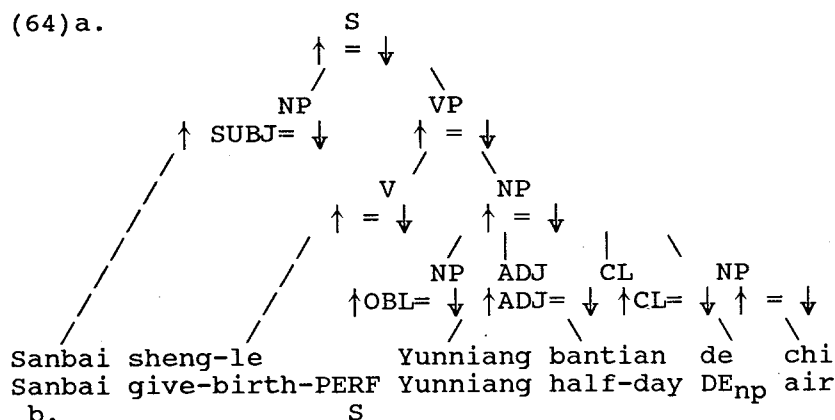
The following two pairs of sentences and f-structures in 63 and 64 exemplify how the proposed LFG analysis works. 63a, 64a, and 64b are the sentences with annotated c-structures. They are mapped to f-structures 63b and 64c by the deterministic formalism discussed in Kaplan and Bresnan (1982). Please note that 64a and b share the identical f-structure 64c.

(63)a.

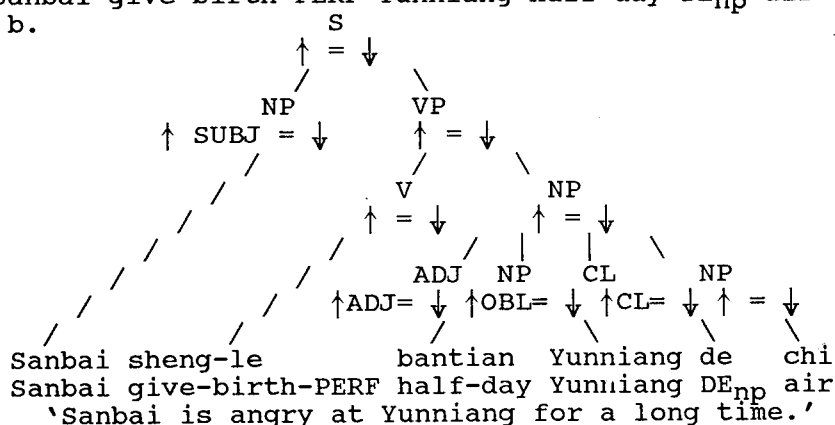


b. [SUBJ [PRED 'SANBAI']
 OBL [PRED 'YUNNIANG']
 PRED 'BE-JEALOUS' <(SUBJ) (OBL)>
 CL DE
 FORM (CHR, TSU)]

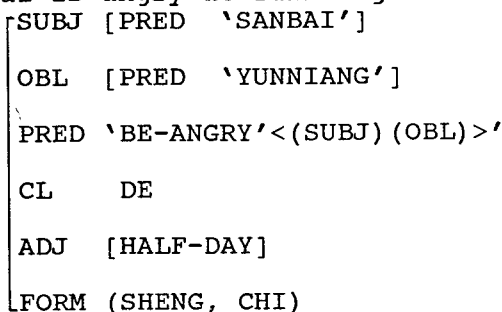
(64) a.



b.



c.



The f-structure 64c specifies that the predicate-argument structure of the sentence contains two arguments: the first a SUBJ function and the second an OBL function. The content of the two arguments is also specified in the f-structure by the inner f-structure assigned as values to the two attributes SUBJ and OBL. It is also worth mentioning that the ADJ(unct) function is represented as an attribute of the matrix f-structure. This representation would then be mapped into a semantic translation where the translation of the adjunct is a modifier of the predicate. All the grammatical features of the POBJ construction are correctly represented by this analysis.

I will conclude the LFG analysis by giving a formal account of anaphora occurring in the POBJ construction. This account would be compared with a GB account in the next section, while no account in GPSG will be given because I am not aware of any detailed account of anaphora in that framework. Please recall that anaphora in a POBJ construction behaves differently from that in possessive NPs, even though they seem to share identical constituent structure. I will adopt the analysis of anaphora proposed by Bresnan and presented in Sells (1986). According to Bresnan, pronominals can be categorized by two features [sb] and [ncl]. The feature [sb] specifies whether an antecedent of that pronominal has to be a subject or not; and [ncl] specifies whether that pronominal has to have an antecedent within the minimal clause nucleus with a SUBJ function. The interpretation of these two binding features, taken from Sells (1986), is given here as 65.

- (65) Pronominals that are [+ncl] must find an antecedent within the minimal nucleus containing the pronominal and a SUBJec-tive function.

Pronominals that are [-ncl] must not find an antecedent within the minimal nucleus.

A clause nucleus is defined in Bresnan (1982c.304) as an f-structure which contains a PRED attribute. In the unmarked case, reflexive pronouns would be [+ncl] in this analysis and other pronouns, the pronominals in GB, would be [-ncl]. Another important notion is that antecedents must f-command reflexive pronouns. The definition of f-command is given below as 66.²¹

- (66) F-command

An antecedent A f-commands a pronominal P iff

- a. A does not contain P, and
- b. Every nucleus that contains A contains P.

I will use the f-structure 67a to illustrate how the LFG analysis accounts for anaphora in a POBJ construction.

²¹ Readers should not confuse the term f-command used here with the one used in Montague semantics even though as far as I can tell the two versions of f-command can both adequately account for the POBJ data. The definition of f-command in 66 is a more recent version given in Sells (1986.178). The older version in Bresnan (1982b.334) is cited here for reference.

(i) For any occurrences of the function α , β in an f-structure F , α f-commands β if and only if α does not contain β and every f-structure of F that contains α also contains β .

- (67)a.

SUBJ	[	PRED	'SANBAI']
OBL	[	PRED	PRO
		REFL	+
PRED	[	BE-JEALOUS'	<(SUBJ) (OBL)>'
CL	[	DE	
FORM	[	(CHR, CHU)	
- b. Sanbai chr tzji de chu
 Sanbai eat self DE_{np} vinegar
 'Sanbai_i is jealous of himself_i'

In 67a, the f-structure of 67b, the oblique object is a reflexive pronoun. Since we assume reflexive pronouns in Mandarin Chinese to be [+ncl], the reflexive pronoun must have an f-commanding antecedent within the minimal nucleus which contains a SUBJ function according to 65. The minimal nucleus containing a SUBJ containing the OBL f-structure is the f-structure for the whole sentence. The only possible antecedent f-commanding the oblique object is the subject. Therefore the reflexive pronoun has to be coreferential with the subject.

Next, I will present a sentence with a non-reflexive pronoun in the NP₁ position. 68a is the f-structure for 68b.

- (68)a.

SUBJ	[	PRED	'SANBAI']
OBL	[	PRED	PRO
		REFL	-
PRED	[	BE-JEALOUS'	<(SUBJ) (OBL)>'
CL	[	DE	
FORM	[	(CHR, TSU)	
- b. Sanbai chr ta de tsu
 Sanbai eat s/he DE_{np} vinegar
 'Sanbai_i is jealous of himself_{*i/j}'

Again, anaphoric relations are determined in f-structure in LFG. Since a pronoun is assumed to be [-ncl], it cannot have an antecedent within the minimal nucleus. With an f-structure identical to 67a, the minimal nucleus for the pronoun as the oblique object is the matrix f-structure. As a consequence the pronoun ta 's/he' cannot be coreferential to the subject. To briefly sum up the discussion on anaphora, I have shown that, with the proposed analysis, the POBJ data is correctly predicted by an f-structure account in LFG.

VIII. Conclusion

In this chapter, I have given analyses to the POBJ construction in GB, GPSG, Head Grammar, and LFG. None of the analyses solve all the problems concerning the construction, though most of them do account for the data adequately. In the next chapter, I will discuss in more details various aspects of the analyses, with the exception of Head Grammar. Many features of Head Grammar are similar to GPSG. The most salient difference, the head wrapping operation, does not seem to improve substantially the analysis of the POBJ construction. I assume that my comments on GPSG would apply to Head Grammar as well. A contrastive study of the three theories, GB, GPSG, and LFG should be able to bring out the advantages and disadvantages of the formalism of them.

CHAPTER 5

POSSESSIVE OBJECTS: PART II

A CONTRASTIVE STUDY OF THREE FRAMEWORKS

Analyses of the POBJ construction in several different frameworks have been given in Chapter 4. Most of the analyses are descriptively adequate. But some are certainly better than others in specific aspects. In this chapter, I will discuss some further implications of the proposed accounts and the problems they encounter. Discussions and comparisons are centered around the following grammatical constructions as they involve POBJ: the constituent structure, anaphora, wh-question, and topicalization. POBJ also raises general questions about the semantic representation of the discontinuous idiom chunks.

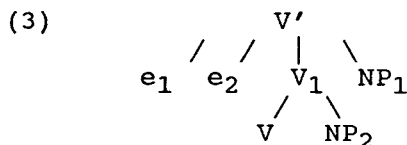
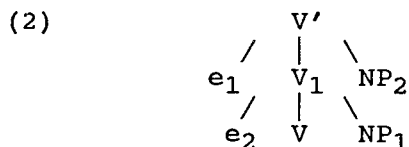
I. Constituent Structures

The first topic to be discussed is the constituent structure of the POBJ construction. It has been suggested at the beginning of Chapter 4 that the string [NP₁ de NP₂] should be treated as a constituent. Only the proposed LFG analysis manages to achieve this goal; the GB and GPSG analyses fail to. As mentioned above, the relatively flat structure proposed in the GPSG framework is motivated by the requirement of a strictly schematic semantic translation procedure. That is, the tree interpretation procedure adopted in the GPSG semantics requires that the constituent structures in syntax directly reflect the hierarchy of semantic operations. Since NP₁ is an argument of the discontinuous idiom chunk V-NP₂, it has to form a local tree with the whole chunk, not just with NP₂. Similarly, since the frequency/duration adverbial takes the whole verb phrase as an argument, it has to form a local tree with the whole verb phrase, not just with the string [NP₁ de NP₂]. The position of the adverbial will be discussed later in this section. The proposed GPSG analysis adequately accounts for word order and the grammatical relations between NP₁ and the idiom chunk. However, it does not treat [NP₁ de NP₂] as an constituent, which makes it virtually impossible to account for the topicalization data represented by the 2.4a reading, repeated here as 1.

- (1) Jeijung ren de tsu ni bu neng chr
 this-kind person DE_{np} vinegar you NEG may eat
 'You should not be jealous of such people.'

I do think, however, that the semantic interpretation procedure proposed in Gazdar et al. (1985) is a very restrictive theory and would be a desired model. I do not see any easy solution to 1 if the SLASH category analysis is to be adopted to account for topicalization facts. The feature SLASH takes categorial values.

The GB account does not analyze [NP₁ de NP₂] as one constituent either. Of the proposed structures, I will only discuss the s-structure assigned in the first proposed analysis. Most points raised here apply to other proposed analyses too. 39 in Chapter 4 is repeated here as 2, and 3, the s-structure for ditransitive VPs proposed in Li (1985:193), is given here for comparison.



¹ J. Huang (1982b:57) does not formulate the restructuring rule. He assumes that "the juxtaposition of ta 'he' and toufa 'hair'", in the s-structure [_s ta [_{vp} toufa [_{vp} ...]]] "enables the structure to undergo optimal Restructure α ," and generate the structure [_s [_{np} ta toufa] ...] at PF. The output structure would than be an appropriate input to the de-insertion rule 66b. It seems to me that a restructuring rule has to presuppose minimal knowledge of the environment. In other words, such rules should be very general, as suggested by the name of the rule 'Restructure α ,' which means 'restructure anything', parallel to 'Move α .' I therefore tentatively formulate the rule 66a, which would achieve the restructuring process J. Huang (1982b) specifies with least stipulation. More detailed discussion of this and the de-insertion rule will be given later in this chapter.

- (4) Sanbai gei-le Yunnianɡ de yi ben shu
 Sanbai give-PERF Yunnianɡ DE_{np} one volume book
 'the book Sanbai gave Yunnianɡ' [the only available reading]
- (5) a. XP N ==> [_{np} XP N]
 b. [_{np} XP N] ==> 1 de 2
 1 2

An even more fundamental problem is posed by the topicalization data. 1 not only shows that [_{NP}₁ de _{NP}₂] is a constituent but also excludes the possibility that the verb and _{NP}₁ form a constituent. No syntactic operation should affect a fragment of a constituent unless that fragment itself is a constituent. Since the whole string [_{NP}₁ de _{NP}₂] is a constituent, none of the fragments in the constituent can form another constituent with an outside element. The PF restructuring rule seems to make [_{np} XP N] a constituent, but it does so only at a phonological level. One may be perfectly correct in saying that it is a constituent for phonological manipulation as de-insertion is a PF rule and affects phonological rules. But since PF is a post-syntactic module, no syntactic rule should be affected by the de-insertion rule. Consequently, the string should be regarded as a non-constituent in syntax according to this analysis. Thus the proposed GB account both fails to analyze [_{NP}₁ de _{NP}₂] as a constituent and creates an impossible constituent [_V N₁]. Such an analysis is not supported by any data from the language but seems to be necessitated by the proposed universals of the theory. Recall that the Case theory requires each overt NP to be assigned an abstract Case by an adjacent Case assigner. _{NP}₁ has to be adjacent to the lexical verb in order to get a Case, but then _{NP}₂ is adjacent to no Case assigner. One way out is to allow the verb to incorporate _{NP}₁ to yield new Case assigner, which necessarily makes the verb and _{NP}₁ a constituent.² The mere fact that a proposed universal principle forces an analysis which makes predictions contradicting the distribution of the noun phrases of the POBJ construction should at least make that principle suspicious.

Lastly, LFG differs from the other two theories in that it allows mismatches between constituent structures and representa-

² Another logical possibility is to construct a structure parallel to that of a possessive NP and to have _{NP}₂ receive Case from the verb because it is the head of that complex NP, and to have _{NP}₁ assigned structural Case, similar to the Case assigned to a possessor. I am not going to discuss this possibility in detail because, among other things, it can neither accommodate the occurrence of the adverbials nor prevent the occurrence of the theoretically possible yet ungrammatical string [_{NP}₂ de _{NP}₁], in which the referential argument _{NP}₁ is the head of the complex NP.

tions of grammatical functions, f-structure in this framework. This unique feature seems to give it an edge in accounting for the constituent structure of POBJ. The Mandarin data clearly indicate that the string [NP₁ de NP₂] is a constituent. The separation of c-structure from f-structure enables LFG to correctly represent this fact without carrying the implications a similar treatment would have in GB or GPSG.

A related phenomenon is the position of the frequency/duration adverbials. The relevant sentences given in 42 in Chapter 4 are repeated here as 6.

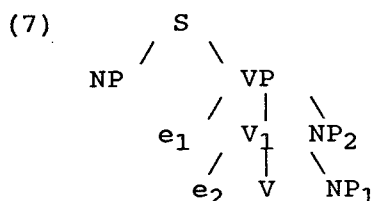
- (6)a. Sanbai sheng-le Yunnianɡ bantian de chi
 Sanbai give-birth-PERF Yunnianɡ half-day DE_{np} air
 b. Sanbai sheng-le bantian Yunnianɡ de chi
 Sanbai give-birth-PERF half-day Yunnianɡ DE_{np} air
 'Sanbai is angry at Yunnianɡ for a long time.'

It has been shown in the sections on different analyses that the adjacency condition on Case assignment in GB prevents characterizing properly the distribution of the two adverbials in 6a and b because their occurrences would inevitably block Case assignment. In GPSG, the strict requirement on semantic interpretation procedure requires the adverbials to be sisters of predicates on a local subtree. This requirement results in a rather flat syntactic representation of the discontinuous idiom chunks and the adverbials which does correctly represent the data. The proposed LFG account captures both the word order concerning the adverbials and the constituency. What differentiates GB from GPSG and LFG and makes it the only theory to fail to capture the adverbial data is, I think, the greater abstractness of the theory. The semantics and feature oriented GPSG differs substantially from the grammatical-function oriented LFG, yet they largely agree with each other in maintaining a syntactic representation as close to the surface string as possible. GB stands out in allowing very abstract syntactic representations which could be radically different from the perceivable surface string. More specifically, GB explicitly proposes such abstract morphological entity such as Case, INFL, PRO, and pro. What plays a crucial role here in the discussion of constituent structures for POBJ in GB is the abstract Case Theory. The Case Theory, though seemingly supported by some circumstantial evidence and by theory-internal considerations of its status as a proposed universal, is shown to make wrong predictions about constituent structure and the occurrence of adverbials. Without any concrete fact to attest to the Case Theory but with abundant data which contradict its predictions, it is only natural to assume that the Case Theory, as formulated now, does not apply in Mandarin Chinese. From a more general point of view, the relative success of GPSG and LFG favors a less abstract approach in grammatical theories.

II. Anaphora

In this section, I will try to compare the treatment of anaphora in GB and LFG. GPSG is left out because the treatment of anaphora in this framework has been relatively few and sketchy and I am not familiar enough with the proposed analyses to make fair comparison. It is worth mentioning, though, that the analysis proposed so far in this framework has been based on semantics. The fundamental difference between GB and LFG treatments is that the former is structurally defined but the latter is functionally defined. More precisely, anaphora is checked by s-structure rules in GB while it is interpreted in f-structure terms in LFG.

I have shown in section VII of Chapter 4 that the LFG analysis satisfactorily accounts for the anaphora data. In contrast, the GB analysis does not. In the following discussions of GB, I will assume both the structure given in 7 and familiarity with the GB treatment of anaphors, especially J. Huang's (1982b) account of Mandarin Chinese.



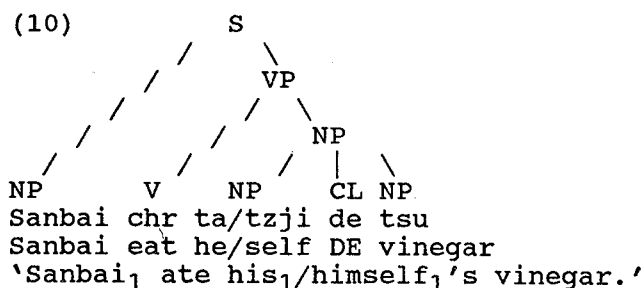
The governing category for both NP_1 and NP_2 is S. The governor for NP_1 is the lexical verb and the governor for NP_2 is the incorporated verb V_1 . In either case, the minimal bounding node containing both the argument position and the governor is the S node. Since anaphors (reflexive pronouns) have to be bound and pronominals (other pronouns) have to be free according to Binding Conditions, the anaphora data concerning POBJ is correctly predicted. What is wrongly predicted by this account is that NP_2 could be an antecedent for a reflexive pronoun in the NP_1 position since NP_2 does c-command NP_1 and is within the governing category of NP_1 .

It was noted in the last section that the GB analysis fails to analyze [NP_1 de NP_2] as a constituent. Assuming that the GB analysis somehow could get the constituent structure right, the situation would be still be problematic as far as anaphora is concerned. The fact that grammatical relations are structurally defined in this framework would predict that the distribution of anaphors in a POBJ construction would be the same as that in a possessive NP since the two constructions share the same structure. The contrasts in 6 and 7 of Chapter 4, repeated here as 8 and 9, show that this prediction is false. A theory-internal dilemma arises here. A correct constituent structure entails

wrong predictions about anaphora and a near satisfactory account of anaphora assumes an incorrect constituent structure.

- (8)a. Sanbai_i shihuan tzji_i de shr
 Sanbai like self DE_{np} poem
 'Sanbai likes his own poem.'
 b. Sanbai_i shihuan ta_i de shr
 Sanbai like s/he DE_{np} poem
 'Sanbai likes his poem.'
- (9)a. Sanbai_i sheng tzji_i de chi
 Sanbai give-birth self DE_{np} air
 'Sanbai is angry with himself.'
 b.* Sanbai_i sheng ta_i de chi
 Sanbai give-birth s/he DE_{np} air

The other half of the treatment of anaphora in the two theories involve the correct representation of anaphoric relations in sentences with corresponding possessive readings. 10 is the constituent structure for a sentence with a possessive NP in the object position.



The asymmetry of anaphora at a possessor position in Mandarin Chinese in a genitive NP has been observed in J. Huang (1982b.Ch.5). That is, in the real possessive counterpart of 10, the matrix subject can be the antecedent of a reflexive pronoun occurring in the possessor position, but not as an antecedent of a non-reflexive pronoun occurring in the same position. He posits that the notion of 'accessible SUBJECT' is crucial in Chinese. He argues that a governing category for reflexive pronouns in Chinese has to contain a SUBJECT which is 'accessible' in addition to all the well-known conditions for governing categories. SUBJECT is defined as either a grammatical subject of a sentence or a possessor in a genitive NP in Chomsky (1981). The governing category for other personal pronouns, on the other hand, is not required to contain this 'accessible SUBJECT.' A consequence is that a reflexive pronoun in a possessor position, itself being defined as a SUBJECT, has no 'accessible SUBJECT' within the genitive NP and thus has to take the higher clause as its governing category. In unmarked cases, the reflexive pronoun will be coreferential with the matrix subject. On the other

hand, since there is no 'accessible SUBJECT' condition on other personal pronouns, their governing category by definition is the possessive NP. Pronouns are required to be free in their governing category in GB. Pronouns in a possessor position thus cannot be coreferential with an antecedent within the possessive NP but can be coreferential with an antecedent outside of that NP, for instance, with the matrix subject. This analysis correctly predicts that both a reflexive pronoun and a pronoun as a possessor of the object can be coreferential to the subject, as shown in 10.

In the LFG analysis, the possessive NP sentence 11 corresponds to the POBJ sentence in 59, and 12 corresponds to 60. Grammaticality conditions are checked at the f-structures 11a and 12a.

- (11)a.

SUBJ	[	PRED	[	'SANBAI']	
OBJ	[	POSS	[	PRED	PRO]
				REFL	+]
		PRED	[	'VINEGAR']	
		CL	DE			
		PRED 'EAT' <(SUBJ)(OBJ)>'				

- b. Sanbai chr tzji de tsu
 Sanbai eat self DE_{np} vinegar
 'Sanbai_i eats his_{i/j} vinegar.'

- (12)a.

SUBJ	[	PRED	[	'SANBAI']	
OBJ	[	POSS	[	PRED	PRO]
				REFL	-]
		PRED	[	'VINEGAR']	
		CL	DE			
		PRED 'EAT' <(SUBJ)(OBJ)>'				

- b. Sanbai chr ta de tsu
 Sanbai eat s/he DE_{np} vinegar
 'Sanbai_i eats his_{i/j} vinegar.'

Recall that reflexive pronouns are [+ncl] and pronouns are [-ncl]. The minimal nucleus containing a SUBJ function for the reflexive pronoun tzji 'self' in 11a is the matrix f-structure. tzji must have an antecedent in the matrix f-structure according to the interpretation rule given as 65 in Chapter 4, repeated here as 13, and therefore is coreferential with the subject.

(13) Pronominals that are [+ncl] must find an antecedent within the minimal nucleus containing the pronominal and a SUBJective function.

Pronominals that are [-ncl] must not find an antecedent within the minimal nucleus.

On the other hand, the minimal nucleus for the pronoun ta 's/he' in 12 is the OBJ f-structure. According to 13 again, ta may not have any antecedent in that f-structure but is free to have the SUBJ function, which is outside of the OBJ f-structure, as its antecedent. Thus, both GB and LFG capture the possessive NP data involving anaphora.

The examination of relevant anaphora data in this section yields interesting results. The LFG analysis, due to its allowing an independent level of functional representations, correctly predicts the contrast between POBJ and real possessive NPs while assigning them an identical c-structure. On the other hand, the GB framework can only predict the contrast by assigning them markedly different structures, with the structure assigned to POBJ proven to be incorrect. I have also shown that any GB analysis giving the correct constituent structure would fail to account for the contrast between the anaphora data. Assigning the same structure to both constructions would predict that they should behave similarly concerning anaphora because anaphora is strictly structurally defined in this framework. The inevitable dilemma of the GB account argues against a treatment of anaphora in strictly structural terms.³

III. Wh-questions

Another big difference between GB and the other two frameworks is that GB retains movement while the other two maintain a syntax which closely represents the surface string. Wh-questions in Chinese offer a vivid contrast between the two approaches. Mandarin Chinese does not prepose wh-words. Wh-questions are formed by simply replacing the elements questioned with appropriate wh-words. This phenomenon is exemplified by the pair of question and answer in 14.

³ It is possible for GB to account for the data if there is an intermediate level of syntactic representation not discussed above but meets all the predicted conditions of anaphora concerning the POBJ construction. However, proposing such a level and specifying that anaphora could only be considered at this level but not other well-motivated S-structure level would be ad hoc.

- (14) Q. ni jia li jer duo yuan
 you home from here how far
 'How far is your home from here?'
 A. wo jia li jer san tiau jie
 you home from here three MEASURE street
 'My home is three blocks away from here.'

Chinese might seem a problematic case for GB because this theory accounts for scope and other phenomena related to wh-questions by wh-movement yet wh-words do not move in Chinese. J. Huang (1982a) seems to have solved this problem by arguing that some of the Chinese data can be explained if one assumes movements at LF which do not affect the surface string. The key argument presented in J. Huang (1982a) is that several wh-words, i.e. weisheme 'why,' and tzenme 'how,' seem to be subject to certain island constraints and a constraint rather similar to Subjacency, which is a condition on movement.⁴ Subjacency states that no movement can pass two bounding nodes, which are postulated to be NP and S in Mandarin Chinese. In 15, J. Huang's (1982a) argument is illustrated by another 'how' wh-word duo in anticipation of the contrast between this sentence and POBJ sentences.

- (15)a. ni shiang jrdau shei you duo gau
 you want know who have how tall
 'Whose height do you want to know?'
 [literally: Whose being how tall do you want to know?]
 b. ni shiang jrdau shei weisheme you chian
 you want know who why have money
 'Whose reason of being rich do you want to know?'
 [literally: *Whose why being rich do you want to know?]

J. Huang (1982a) examines data parallel to 15 and points out that the Chinese equivalent of how along with that of why cannot have a wide scope reading in these sentences. That is, even though the sentence X you duo gau 'how tall is X?' is a legitimate question, it cannot be a direct question when embedded. It seems that 15 can only be used to question the identity of the

⁴ J. Huang (1982a) showed that no other wh-words in Chinese seem to be subject to proposed island constraints. As a consequence, the argument discussed here would be the only evidence for there being island constraints for Chinese wh words. He also uses arguments based on A-not-A questions and shr-focus for LF movements. I will not discuss these two constructions here because POBJ construction does not interact with them interestingly. Readers are referred to Tang (1984) for some discussion of J. Huang's (1982a) arguments. This paper, although in principle follows the LF movement assumption, presents some arguments, which, I think, would raise important problems for J. Huang's claim.

person whose height the addressee is interested in, but cannot be uttered to inquire about the height of that particular person. The behavior of duo 'how' can be even more vividly brought up when contrasted with the possible shei 'who' question. They are embedded equally deep, and yet behave differently. J. Huang (1982a) observes that if a distinction between who/what wh-words and how/why wh-words is predicted by independent principles and if wh-words are postulated to undergo abstract movement at LF, the impossible wide scope reading of 15 can be explained by the proposed universal Subjacency Condition without further stipulation. In this analysis, duo in 15 would have to cross both the embedded S and the matrix S in order to get the wide scope question reading.⁵ This LF movement violates Subjacency. Consequently, duo cannot have a wide scope reading in 15.

J. Huang (1982a, 1982b) offers two different explanations for the asymmetry between who/what wh-words and how/why wh-words. The first is a stipulation which says that 'objectual' wh-words obey Subjacency at LF while 'non-objectual' wh-words do not. By 'objectual' he refers to wh-words which are lexically categorized as NPs and which leave NP traces behind when moved. In other words, objectual wh-words are referential and can occur as arguments of predicates. Non-objectual wh-words, e.g. weishenme 'why' and tzenme 'how', would be assigned to a category other than NP and assumed to leave a PP or S' trace.⁶ The second explanation builds on the version of ECP argued for in J. Huang (1982b). All empty categories, including the traces left behind by an abstract movement at LF, must be properly governed according to ECP. Proper government is licensed by either a lexical governor or a local antecedent. NPs in object positions are lexically governed by a verb and therefore are properly governed. Thus the traces they leave behind at LF would always be properly governed. There would be no restriction on the interpretation of wh-words in these positions as the abstract movements at LF are assumed not to obey Subjacency. On the other hand, those adjunct traces are not lexically governed since they are not in argument positions and are not governed by verbs. Moving them beyond two bounding nodes, one of them containing another wh-word, would also prevent them from locally binding the traces. In 15, the lowest trace above the original position shares a branching COMP node with another wh-word shei and fails to govern the original trace. Higher traces do not govern the original trace locally

⁵ In J. Huang's (1982a) analysis, COMP to COMP movement is impossible because the verb shiang jrdau want-to-know 'wonder' is subcategorized for a +wh complementizer and thus requires the lower COMP to be filled by shei 'who'.

⁶ Notice that this is a rather abstract account. There is no lexical preposition to provide support for the assumption that the two wh-words are of the category PP.

and cannot properly govern the traces in question. The abstract LF movement would be ruled out because of violation of ECP. Regardless of which explanation is adopted, the prediction is that in a sentence like 15, the wh-phrase duo gau 'how tall' would demonstrate a Subjacency effect.

Suppose the analysis just sketched is correct. The wh-word duo 'how' in a POBJ construction, given here in 16, would then have to undergo movement at LF and would be subject to the identical universal condition of Subjacency or ECP depending on which explanation is adopted.

- (16) Lisz sheng Wangwu duo da de chi
 Lisz give-birth Wangwu how big DE air
 'How angry at Wangwu is Lisz?'

The first explanation encounters problems because duo da 'how big' is not 'objectual.' duo da can occur either as an adjunct or a predicate, e.g. in nei bu che duo da that-MEASURE-car-how-big 'How big is that car?', but can never occur in an argument position. The wh-phrase would by stipulation have to obey Subjacency. The second explanation also encounters problems since duo da is an adjunct and is not lexically governed. Moving it at LF would leave a trace which is not lexically governed either.

What structure is assigned to the POBJ construction really does not affect the predictions concerning wh-questions. The string duo da de tsu how-big-DE_{NP}-vinegar would have the following s-structure according to J. Huang's (1982b) analysis of de.⁷

- (17) [np duo da de [np tsu]]
 how big DE_{NP} vinegar

Given the first explanation, Move wh at LF would move the string duo da past at least two bounding nodes, the outer NP and the matrix S. This movement violates Subjacency. Given the second explanation, the trace left behind would not be properly governed because there is no lexical governor for that adjunct position and there is no COMP position attached to the outer NP such that the wh-trace can land there and locally bind the trace. 16 would be ruled out by Subjacency for an illegal movement in the former case and by ECP for a trace not properly governed in the latter case. The result is the same: the wh-question reading of 16 would be incorrectly ruled out by the GB analysis.

One possible way to admit the direct question reading is to allow May's (1980) condition on Analyzability to apply. This

⁷ All the grammatical accounts I know would assign basically the same surface structure to this string.

condition is proposed to constrain Quantifier Raising at LF and stipulates that a quantifier cannot be moved without the nominal head it is modifying. Wh-words are quantifiers and the proposed Move wh is a movement at LF. Provided that the same condition applies, the whole NP duo da de chi 'how big DE_{np} air' instead of just the wh-phrase duo da would have to be moved. A consequence is that the movement only crosses one bounding node, the matrix S, because the outer NP node is moved. Subjacency and ECP would not wrongly rule out the question reading. The problem, however, is that the question could not be correctly interpreted. The LF representation of 16 according to this analysis would be 18.

- (18) [s' [comp [wh duo-da]_i [np t_i de chi]_j] [s Lisz
 how-big DE_{np} air Lisz
 sheng Wangwu t_j]]
 give-birth Wangwu

The interpretation represented by 18 should allow a direct question reading involving the referential meaning of chi 'air'.⁸ That is, it would be a question inquiring about the volume of the air, a reading which is not only not related to the intended POBJ reading but is also impossible. Thus an account based on the condition on Analyzability can be disregarded because, even though it allows a direct question interpretation, that interpretation is wrong semantically.

A natural alternative, based on the fact that there is no surface wh-movement in Chinese, is to abandon the assumption that wh-words move at LF in Chinese. Consequently, wh-questions would have to be interpreted directly from the surface string without string-vacuous movement at LF. The first result is that the question reading of 16 would be admitted by the grammar without any further stipulation. GPSG and LFG, which both allow no abstract manipulation of surface strings in syntax, would achieve this goal easily. 19 is the f-structure the LFG analysis proposed in this chapter would assign to 16. The mapping from f-structure to semantic representations, following the procedures suggested in Halvorsen (1983), would assign the correct semantic translation of a question reading.

⁸ Whether this representation can yield the POBJ reading or not depends crucially on how the idiomatic reading is represented. There does not seem to be a mechanism to encode the idiomatic meaning in the lexical entry of chi 'air' alone in GB. Local dependencies seem to be required to account for the idiom chunk reading in this framework. If this is the case, the representation in 79 can only be interpreted as inquiring about the referential meaning of something Lisi generates to or for Wangwu, and would only yield the nonsensical reading.

- (19) [SUBJ [PRED 'LISZ']
 [OBL [PRED 'WANGWU']
 [PRED 'BE-ANGRY' < (SUBJ) (OBL) >'
 [CL DE
 [ADJUNCT [PRED 'HOW-BIG']
 [WH +]]]]]

In GPSG, wh-questions are dealt with by means of the foot feature WH. Since the Foot Feature Principle requires that the foot features of a mother be the union of the foot features of all phrasal daughters, the feature WH instantiated from the lexical entry of the wh-word duo da 'how big' would be passed up to the top of the tree by the Foot Feature Principle and would receive the direct question reading. This approach is exemplified by 20. Highlighted branches indicate the route of the passing up of the feature [+ WH].

- (20)
- ```

 S [+ WH]
 / \
 NP VP [+ WH]
 / \ / \ \
 / / \ V NP ADVP[+ WH] NP
 / / \ | | | | |
Jangsan sheng Lisz duo-da chi
Jangsan give-birth Lisz how-big air
'How angry is Jangsan at Lisz?'

```

In 20, the lexical feature [+ WH] for duo is inherited by the adverbial phrase. Since ADVP is a phrasal daughter of the verb phrase, the feature [+ WH] instantiated on ADVP would now be inherited by the VP node according to the Foot Feature Principle. Similarly, the Foot Feature Principle would require the S node to inherit the foot feature [+ WH] from the VP node because VP is a phrasal daughter of S. Thus the theory correctly predicts that wh-words in Chinese can have sentential reading.

The 'surfacey' approaches of either LFG or GPSG, though they satisfactorily account for 16, still have to account for the claimed asymmetry in 15, repeated here as 21.

- (21) ni shiang-jrdau shei you duo gau  
 you want-to-know who have how tall  
 'Whose height do you want to know?'  
 [literally: Whose being how tall do you want to know?]

In 21, the wh-phrase duo gau 'how tall' cannot have a scope wider than that of shei 'who.' shei can have a direct question



reading while duo gau cannot. The abstract movement wh at LF assumption in J. Huang (1982a, 1982b) depends on such data because sentences like 21 are the only ones claimed to manifest wh-island. A movement analysis would allow either Subjacency or ECP to apply and thus account for the asymmetry. Since I have shown that the abstract movement assumption leads to a prediction contradictory to POBJ data, I need to account for 21 without the movement assumption. Such an account can be formulated with help from discussion of another contrast.

Crucial to the LF/ECP account is the claimed contrast between 21 and 22. According to J. Huang (1982a), 22 is an instance of a multiple wh-question and therefore is supporting evidence for Move wh at LF because movement would handily explain the scopal ambiguity. The three LF representations parallel to the ones he gave are listed here as 22 a, b, and c.

(22) (cp. J. Huang 1982a.382)<sup>9</sup>

- ni shiang-jrdau shei mai-le sheme  
 you wonder who buy-PERF what  
 a. 'For which x, you wonder x bought what?'  
 b. 'For which y, you wonder who bought y?'  
 c. 'You wonder [for which x, for which y, x bought y?]'

Native speakers allow the multiple wh-question readings, but judge them possible only as either echo questions or indirect questions. This point is brought up in Tang (1984),<sup>10</sup> and Liu (1986), both accepting the LF movement proposal.<sup>10</sup> Tang (1984.98) supports his point by tests with sentence final clitics. I have shown in C. Huang (1985) that the interrogative sentential clitics ne and ma select their sentential hosts. ne selects a content question, i.e. a question which cannot be answered by simply uttering 'yes' or 'no,' and ma selects a yes-no question. The two pairs of sentences in 23 and 24 illustrate their distribution.

- (23)a. ni shiang-jrdau jege ren ma  
       you want-to-know this person MA  
       'Do you want to know this person?'  
 b. \* ni shiang-jrdau jege ren ne  
       you want-to-know this person NE

---

<sup>9</sup> J. Huang uses shei 'who' as the matrix subject. I replace it with ni 'you' here to avoid possible further confusion introduced by an additional wh-word.

<sup>10</sup> Liu (1986) gives examples with the verb wen 'ask' instead of shiang-jrdau 'wonder'.

- (24)a. \* shei shiang-jrdau jege ren      ma  
           who want-to-know this person MA  
       b. shei shiang-jrdau jege ren      ne  
           who want-to-know this person NE  
           'Who wants to know this person?'

The yes-no question 'Do you know this person?' is grammatical in 23a when ma is cliticized, and is ruled out in 23b when ne is cliticized. In contrast, the wh-question 'who wants to know this person?' allows ne-cliticization in 24b but disallows ma-cliticization in 24a. In general, one can determine whether a wh-question has a direct question reading or not by attaching the sentential clitic ne to it. A direct wh-question, by virtue of not being a yes-no question, allows ne-cliticization. 25 is the test Tang (1984) applies to 22.

- (25)a. ni shiang-jrdau shei mai-le      sheme ma  
           you wonder                      who buy-PERF what MA  
           'Do you want to know who bought what?'  
       b.?? ni shiang-jrdau shei mai-le      sheme ne  
           you wonder                      who buy-PERF what NE

25 is grammatical when ma is attached, as shown in 25a, but is at best awkward when ne is attached, shown in 25b.<sup>11</sup> This suggests that it cannot be a direct question on either wh-word.

The fact that 22 cannot be a direct question gives enough justification for both Tang (1984) and Liu (1986) to assign 22c as the only possible LF representation for the sentence, repeated here as 26. 26 can only be interpreted as an indirect question.

- (26) ni shiang-jrdau shei mai-le      sheme  
           you want-to-know who buy-PERF what  
           'You wonder [for which x, for which y, x bought y]?'

On the other hand, J. Huang (1982a) claims that sentences such as 21 are only two-way ambiguous, as opposed to the three-way ambiguity he claims 22 has. The LF representation of his claim is represented here as 27.

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<sup>11</sup> The fact that cliticization belongs to a post-syntax module, as argued in Zwicky (1983), and supported by my discussion in Chapter 2, may have something to do with the fact that native speakers, especially those with some linguistics background, tend not to categorize sentences with mismatched clitics as ungrammatical outright. This judgement is exemplified by the double question mark assigned to 86b by Tang (1984). Speakers are very sure that these sentences are 'bad' or 'funny' but not 'ungrammatical' because whatever is wrong with these sentences is not 'grammatical,' i.e. syntactic, per se.

- (27) ni shiang-jrdau shei you duo gau  
 you want-to-know who have how tall  
 a. 'For which x, you want to know how tall x is?'  
 b. 'You want to know [for which x, tall y, x is y tall].'

27 is the critical evidence for J. Huang's (1982a) claim that how/why wh-words in Chinese obey Subjacency and wh-island constraint. Tang (1984) applies the sentential clitics test to a sentence corresponding to 27, and gets a result parallel to what is given here in 28.

- (28)a. ni shiang-jrdau shei you duo gau ma  
 you want-to-know who have how tall MA  
 'Do you want to know how tall who was?'  
 b. ??ni shiang-jrdau shei you duo gau ne  
 you want-to-know who have how tall NE

Recall that sentential clitics impose selectional restrictions on their hosts: ne selects a content question while ma selects a yes-no question. 28b is not acceptable because of the co-occurrence of the clitic ne and a sentence without a direct question reading.<sup>12</sup> In contrast, most statements can be turned into yes-no questions by attaching ma to them, exemplified by 28a. Thus 28 shows that 21 cannot have a direct wh-question reading and can only have the indirect question LF representation 27b.

The reason why J. Huang (1982a.382.40-1) gives 29a and b as possible responses to 22, thus motivating assigning the LF representation 22a and b, deserves further study.

- (29)a. [wo shiang-jrdau [Lisz mai-le sheme]]  
 I wander Lisz buy-PERF what  
 'I wonder what Lisz bought.'  
 b. [wo shiang-jrdau [shei mai-le shu]]  
 I wonder who buy-PERF book  
 'I wonder who bought books.'

In addition to the possible echo question interpretation mentioned in Liu (1986), Tang (1984.104) observes that an addressee can 'voluntarily' supply information concerning an indirect question.<sup>13</sup> The short dialogue in 30 serves as an example.

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<sup>12</sup> 28 is grammatical with an echo question reading.

<sup>13</sup> J. Huang (1982a.382) observes that an answer to 22b comes more readily 'if the question is uttered with emphatic stress on shei "who"', and an answer to 22c comes more readily if sheme 'what' is stressed. This observation does suggest that echo questions are involved.

- (30)a. Q: Do you know where Morrill Hall is?  
 b. A: It's over there, next to the Library tower.

In English, it is clear that 30a is an indirect question about the location of Morrill Hall and a direct question about the addressee's knowledge of the location. No formal semantic representation would give where a scope wider than the yes-no question. Yet pragmatics dictates that a straightforward answer 'I do' is not acceptable. Such an answer violates several Gricean Maxims. That is, the answer is neither relevant, nor as informative as possible, nor is the answerer being cooperative. Unlike 30, the Chinese 22 can only be interpreted as a question 'Do you want to know who bought what' when the intonation is changed or an interrogative clitic ma is attached. But, alert readers may have noticed, the gloss I gave to the Chinese shiang-jrdau is 'want-to-know.' This is the literal meaning of the compound verb. J. Huang's (1982a) gloss 'wonder' is only a free translation. The meaning of the sentence is 'I want to know who bought what.' It should be clear from the English translation that the sentence is a statement that invites an answer, but it is by no means a syntactic question. Thus, the possible 'answers' in 29, as observed in J. Huang (1982a), do not threaten an analysis without wh-movement. They are simply licensed by pragmatics based on the lexical meaning of certain verbs.

The only unaccounted for observation in J. Huang (1982a) is his claim that the embedded wh-word in duo gau 'how tall' in 21 cannot be answered. Tang (1984) gives the same LF representations to both 21 and 22 and claims that answers parallel to 29 can be given to 21 under the indirect question reading. My intuition does not differ from either greatly. I do agree with Tang (1984) that all the responses are possible under the indirect question reading, but I also agree with J. Huang (1982a) that the shei 'who' reading is certainly favored. I do not have an answer to the discrepancy of judgements nor do I have any clear solution to the problem of the disfavored reading of duo gau 'how tall.' I do suspect that the factive verb jrdau 'to know' may have affected the judgement.

I will sum up the discussion of wh-questions in relation to POBJ. I have shown that the data which J. Huang (1982a) claims to be best accounted for with LF movement and structurally defined constraints on movement could be accounted for otherwise. The pragmatics account of indirect questions I just sketched is compatible with any syntactic framework, including GB, GPSG, and LFG. The POBJ data are crucial to showing that a movement account with the proposed universals is inadequate for handling all the possible sentences. Thus the POBJ data argue strongly against treating Chinese wh-questions with abstract movement. This is an interesting result. In Chinese, assuming abstract movement at LF is actually adding in grammatical information which is not available from the surface string and should be

expected to increase the explanatory power of the grammar. Quite contrary to the expectation, for prototypical wh-questions, the movement assumption achieves no further explanatory adequacy and for wh-questions involving POBJ data, it is simply inadequate. The discussion suggests that, similar to the anaphoric data, a theory with no abstract movement nor abstract morphological elements is at least as adequate as one with such elements for analyzing Chinese wh-questions.

#### IV. Topicalization

The most important topicalization data to account for involving POBJ is the contrast between the literal reading 31a and the POBJ reading 31b.

- (31) Tsu,      ta      chr Jangsan de  
       vinegar s/he eat Jangsan DE<sub>NP</sub>  
 a. 'As for vinegar, s/he eats Jangsan's'  
 b. [No possible POBJ interpretation]

The topicalized sentence 31 has only one possible reading, the literal reading. The POBJ reading is simply not available. A GB account can easily assign a structural description to 31a, and attribute it to Move  $\alpha$ . The structure is given here as 32, t stands for trace.

- (32) [<sub>S</sub>' [<sub>top</sub> Tsu]<sub>1</sub> [<sub>S</sub> ta      chr Jangsan de t<sub>1</sub>]]  
           vinegar      s/he eat Jangsan DE<sub>NP</sub>

Translating Move  $\alpha$  into more concrete terms, the GB account preposes an NP from the trace position t<sub>1</sub> to the topic position. Move  $\alpha$  sanctions all movements unless ruled out by one of the structurally defined principles. Since I have shown that the surface constituent structure of a POBJ sentence and its possessive NP counterpart should be the same, there cannot be any grammatical principle in this theory to account for why the POBJ reading is not acceptable with the topicalized sentence 31.

On the other hand, a radically different structure 33(=39 in Ch.4) could be assigned to the POBJ construction because of the assumptions of Case Theory and the Theta-Criterion.

- (33)
- $$\begin{array}{ccccc}
 & & V' & & \\
 & / & | & \backslash & \\
 e_1 & & V_1 & & NP_2 \\
 & / & | & \backslash & \\
 e_2 & & V & & NP_1
 \end{array}$$

I have shown earlier in the chapter that 33 contradicts data concerning the constituent structure of the POBJ construction. So far as topicalization is concerned, both NP<sub>1</sub> and NP<sub>2</sub> should be able to undergo Move  $\alpha$  and be preposed to the topic position. A

(34) a. \* Tsu, ta chr Jangsan de  
vinegar s/he eat Jangsan DE<sub>NP</sub>  
b. \* Jangsan, ta chr de tsu  
Jangsan s/he eat DE<sub>NP</sub> vinegar

(35) a.  $S' \rightarrow XP \quad S$   
            $\uparrow \quad \dots = \downarrow \quad \uparrow = \downarrow$   
       b. Maria, Max loves.

[Sells (1985.183)]

<sup>14</sup> The LFG account of topicalization adopted here is a newer version. The older version, described in Kaplan and Bresnan (1982), utilizes two metavariables  $\Downarrow$  and  $\Uparrow$ . The two metavariables link the topic and an empty category  $e$ , which occupies the position of the morphological instantiation of the grammatical function which the topic represents. The current account does not need to posit such an abstract empty category and is more desirable according to the theoretically motivated consideration that natural languages should be able to be accounted for without positing any 'invisible' abstract morphological element.

grammatical function of the topic '...' will be assigned the OBJ function. The grammaticality conditions of Functional Uniqueness, Coherence, and Completeness applied at f-structure would rule out the cases where a function is either doubly represented in the topic and the sentence or not represented in either position.<sup>15</sup> This account captures the fact the discontinuous part NP<sub>2</sub> of an idiom chunk cannot be topicalized, while its possessive NP counterpart can. The rule responsible for generating the POBJ construction in LFG is given here as 36(=59 in Ch. 4).

- (36)a. VP --> V            NP  
                   ↑ = ↓    ↑ = ↓  
 b. NP -->            NP        XP        de NP  
                   ↑ OBL = ↓    ↑ ADJ = ↓    ↑ = ↓

In 36b, the final NP node, i.e. NP<sub>2</sub>, is annotated with the functional equation  $\uparrow = \downarrow$ . This notation says that the node supplies partial information about grammatical function to the f-structure of the mother node but does not by itself stand for a grammatical function. Recall that the '...' blank in the PS rule for topicalization is sort of a place holder which has to be filled with a grammatical function. There is no way to identify NP<sub>2</sub> by any sequence of grammatical functions. The intended topicalization reading would be ruled out by the Completeness Condition: the grammatical information represented by NP<sub>2</sub> would be missing because it cannot be related to the matrix f-structure. Thus the LFG analysis of topicalization captures the fact that NP<sub>2</sub> cannot be topicalized without additional stipulation.<sup>16</sup>

<sup>15</sup> The Completeness Condition requires that a f-structure contain all the governable grammatical functions specified in the predicate-argument structure. In other words, it requires that all the 'subcategorized' grammatical functions be represented at f-structure level. The Coherence Condition requires that all the functions contained in a f-structure be governed by a local predicate. In other words, it requires that all the functions present in a f-structure be specified by the predicate-argument structure. Last, the Functional Uniqueness Condition requires that every function is assigned one and only one value.

<sup>16</sup> Another fact related to topicalization is that even the possessor in a real possessive NP cannot be topicalized. I mentioned previously that this would be captured by some sort of left-branch constraint. As far as I know, there does not seem to be a straightforward way to do this in LFG. One possible solution relies crucially on Ron Kaplan's (lecture) observation and Falk's (1984) suggestion that a format similar to the ID/LP format of GPSG can be encoded in LFG. Falk (1984) calls them C(onstituency)-rules and O(rdering)-rules. That is, each annotated PS rule can be regarded as composed of two components: a C-rule and an O-rule. Like LP statements in GPSG, O-rules will

In GPSG, given the proposed structure represented by the ID rule 51 in Chapter 4 with appropriate LP Statements, one way to rule out the impossible topicalization reading is to use Feature Co-occurrence Restrictions. One feature of the GPSG analysis, which was not mentioned in Chapter 4 but plays an indispensable role here, is that NP<sub>1</sub> of the discontinuous idiom chunk must be marked with a feature to ensure the co-occurrence of the matching verb and noun. To illustrate, 37 provides a more detailed ID rule for the idiom chunk sheng-chi give-birth-air 'be angry.'

- (37)a. VP[POBJ] --> H[31], NP[IFORM CHI], ADV[FRE/DUR], NP[OBL]  
 b. sheng

37b gives a list of lexical verbs allowed to occur as heads in this ID rule. In the current statement, sheng is the only lexical verb allowed. NP<sub>1</sub> carries the feature [IFORM CHI], which requires this noun phrase be instantiated as a noun with the form CHI, which is of course a mnemonic for the lexical noun chi. With this feature clarified, the two Feature Co-occurrence Restrictions in 38 would predict the topicalization data.

- (38)a. NP[OBL]  $\supset \sim$  [SLASH]  
 b. NP[IFORM]  $\supset \sim$  [SLASH]

38a states that a category with the feature [OBL] cannot carry the feature [SLASH]. In GPSG, this means that the category cannot involve long-distance dependencies. 38b requires that a category with the feature [IFORM] not carry the feature [SLASH]. Since topicalization depends on the feature [SLASH], this means that categories with the feature [IFORM] will not be able to undergo topicalization. It is worth mentioning that all the NP<sub>2</sub>s in a POBJ construction must be marked by the feature [IFORM] to ensure that they co-occur with the correct lexical verbs. Thus 38b captures the fact that no NP<sub>2</sub>s in a POBJ construction can be topicalized and 38a captures the fact that NP<sub>1</sub>s cannot be topicalized.

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be assumed to be a schema which applies to all possible C-rules. With this formalism, left-branch effects can be captured by a simple rule like (i).

- (i) Y < XP

$\Downarrow = \downarrow$

In (i), the f-equation  $\Downarrow = \downarrow$  is annotated to specify that the phrasal category is the bottom of a long-distance dependency. The C-rule states that it has to follow some thing in a PS rule, i.e. it cannot occupy the left-most on a local tree. Notice, however, this can only work with the older treatment of long-distance dependencies, but not the revised one presented in the text.



Feature Co-occurrence Restrictions are parochial rules in GPSG, which means that they are not only not universals but are applicable only to certain constructions. There is nothing against proposing parochial rules except for a meta-theoretical consideration. That is, a rule with a broader domain of application would not only reduce rule number and achieve simplicity but would also move closer to a universal rule, an important consideration for the many linguists who regard capturing language universals as a major goal of their study. I have mentioned in the section on GPSG that the lack of 'movement' effect seen in certain positions is captured by the lexical head constraint. This constraint allows only ID statements with lexical daughters to be input to metarules. Since long-distance dependencies and other phenomena captured by movements in transformational grammar are often captured with metarules in this theory, the lexical head constraint will nicely explain many of the island effects. I observe that if the GPSG were able to capture the fact that  $[NP_1 \text{ de } NP_2]$  is a constituent, the analysis would be able to explain why neither NP could involve topicalization by referring to the fact that the rule introducing this constituent is not a lexical ID rule and thus cannot undergo metarules.<sup>17</sup> Again, a nice generalization seems to be missed because of the strict restriction on the relation between syntax and semantic interpretation imposed in this theory, which prevents analyzing  $[NP_1 \text{ de } NP_2]$  as a constituent.

Before concluding this discussion of topicalization, I will briefly mention some topicalization data which no theory seems to be able to handle at this point. Contrary to what might be expected, it is possible to 'topicalize' the whole POBJ string  $[NP_1 \text{ de } NP_2]$ , as in 39 (=4 in Ch.4).

- (39) Jeijung ren de tsu ni bu neng chr  
 this-kind person DE<sub>NP</sub> vinegar you NEG may eat  
 'You shouldn't be jealous of such people.'

The string jeijung ren de tsu this-kind-person-vinegar consists of two semantically unrelated parts: the oblique object jeijung ren and a discontinuous part of the idiom chunk tsu. In LFG, the whole string clearly cannot stand for a single grammatical function and therefore cannot involve topicalization under the current analysis. In GPSG, under the current analysis, the string is not considered a constituent and therefore no topicalization metarule can generate such a sentence. Even if it is analyzed as a constituent, the string is clearly not a semantic unit and could not be interpreted according to the proposed

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<sup>17</sup> Here I am assuming that the NP clitic de is introduced in a post-syntax module and plays no role in the interaction of metarules. See chapter 2 for more detailed discussion of the NP clitic de.

To sum up, most topicalization data are satisfactorily accounted for in both LFG and GPSG. In GB, because the structurally defined topicalization rule cannot look into the grammatical function or feature of a category, there is no way to rule out the ungrammatical reading of 31. All these theories, however, block the grammatical 39.

Finally, I will compare how the theories treat lexical representations. POBJ involves discontinuous idiom chunks whose semantic meanings have to be exceptionally marked. How the meaning and the co-occurrence of the two discontinuous parts can be correctly represented in the lexicon and the information be correctly carried on to syntax is a real challenge.

(40) a. chr: V,  $\uparrow$  PRED = P<sub>31</sub>,  $\uparrow$  FORM = (CHR, y),  
            $\uparrow$  FORM =<sub>C</sub> (CHR, TSU)  
   b. tsu: N,  $\uparrow$  PRED = P<sub>31</sub>,  $\uparrow$  FORM = (x, TSU),  
            $\uparrow$  FORM =<sub>C</sub> (CHR, TSU)  
   c. P<sub>31</sub> = 'BE-JEALOUS' < (SUBJ) (OBL) >

In GB, very little attention has been recently directed to lexical insertion rules. With the assumption that predicate-argument structure is represented at D-structure, lexical

insertion rules should supply both the subcategorization frames and representations of the lexical meaning. It is not clear to me how idiom chunks would be analyzed in this framework either. It is plausible to assume that a classical transformational grammar strategy would be adopted. In transformational grammar, idiom chunks, no matter how long they are, are inserted as one lexical item and given one semantic representation. There are no mechanisms to capture discontinuity of lexical items in either framework. Because of the assumption that D-structure somehow represents all thematic relations, neither GB nor classical TG methods embrace a semantic component like the Intensional Logic presupposed in both LFG and GPSG. As a consequence, any semantic unit would have to be inserted as a lexical unit in either framework. But this creates a dilemma. To represent that the discontinuous idiom chunk is an integral semantic unit, the two discontinuous parts have to be inserted as one lexical item. To capture their syntactic properties, they would have to be treated as independent units in syntax. Such a treatment would violate the Lexical Integrity Hypothesis, which states that no syntactic operation can affect a subpart of a lexical item. Without a set of feasible lexical rules, there is simply no way to correctly encode the meaning of POBJ constructions and allow the type of syntactic manipulation needed to capture the distribution of the constructions at the same time.

GPSG differs from GB in that it explicitly adopts a version of Intensional Logic as its semantic component. A result is that the theory can easily treat idiosyncratic mappings from structure to meaning, such as idiom chunks, with a semantic operation. One way to treat idiom chunks, assumed here for the treatment of POBJ, is proposed in Wasow, Sag, and Nunberg (1983). The proposed solution assigns special semantic types to pairs of verbs and NPs involved in idiom chunks such that only the combination of matching verbs and NPs can generate interpretable semantic translation. For example, sheng 'to give birth' and chi 'air' in the idiom chunk sheng chi 'be angry' would be assigned semantic types such that only when sheng takes chi as an argument is the 'be angry' reading available. Under other circumstance sheng would be the regular verb 'to give birth' which takes a NP object. This allows the two categories to occur discontinuously and still get the correct semantic representation. The semantics of GPSG is type-driven, which means that manner and direction of semantic combinations are determined by the types of the categories. I will illustrate how the translation procedure works with the subtree admitted by 37, repeated here as 41.

(41) VP[POBJ] --> H[31], NP[IFORM CHI], ADV[FRE/DUR], NP[OBL]

In the local subtree admitted by 41, because of the special types assigned to the POBJ verbs and NPs, the only way to match correct types and retrieve a semantic interpretation is to combine the Head (the verb) first with NP<sub>1</sub> to get a translation

of a two-place predicate. The translation of the two-place predicate would then take the oblique object as an argument and give back a one-place predicate. The one-place predicate is then allowed to be combined with the adverbial to get the correct translation which will later take the subject argument and form a proposition. Thus the GPSG account adequately represents the meaning of the discontinuous idiom chunks.<sup>18</sup>

To sum up, I have shown that the powerful lexical rules of LFG easily capture the idiosyncratic mapping between syntax and semantics of POBJ. GPSG achieves the same goal with its type-driven semantic interpretations and lexically assigned special

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<sup>18</sup> A solution which allows [NP<sub>1</sub> de NP<sub>2</sub>], similar to the proposed LFG account in effect, was suggested to me by Gennaro Chierchia (p.c.). Recall that NP<sub>2</sub> is part of the predicate. Assuming the ID rules of (i), the lexical entries for the two discontinuous parts of the idiom chunks would be given as (ii) and (iii).

(i)a. VP --> H, NP <H' (NP')>

POBJ POBJ,

b. NP --> NP, (ADV), (de),  $\bar{N}$  <lam v'[(ADV'(V'[\bar{N}'(NP')]))]>

POBJ # POBJ,

(ii) cu, N lamy lamx [BE-JEALOUS-OF (x)] (y)

POBJ,

(iii) chi, V, <lamP P>, where P is a type <e,p> variable,

[type <<e,p>,<e,p>>, restricted identity map]

(i) is the lexical entry for tsu as NP<sub>2</sub>. It is simply a two-place predicate. Since the GPSG semantics is type-driven, (i) entails that NP<sub>2</sub>, tsu in this case, would take NP<sub>1</sub> as an argument with straightforward functional application. When an adverbial is present, the translation relies on the feature system. I will simply mark the adverb with a feature # for the moment. The feature is semantically motivated to mark that the adverbial is modifying the whole VP rather than the POBJ construction. Recall that semantically potent features are translated in semantics in GPSG. Similar to the treatment I gave to the DE<sub>np</sub>-construction with object gaps, the translation of this feature would allow the meaning of the adverbial to be introduced at the VP level. The verb would be assigned a translation of a type <<e,p>,<e,p>> identity map. Such special translations would be defined for those idiom chunks only. That is, chr would be a partial function defined for the few lexical items it co-occurs with as parts of idiom chunks, like tsu, bingchilin 'ice cream' [chr bingchilin 'take advantage of']. This move is supported by the very limited productivity of the idiom chunks. That is, several verbs, like chr 'eat' and dau 'smash', recur in those idiom chunks and it would be desirable to assign them the same translation. The partial function of identity map seems to be an answer. It implies that it is NP<sub>2</sub> which dictates the meaning of the idiom.

types for the discontinuous parts of the POBJ constructions. In GB, however, because of the poverty of the semantics and the lexicon, there seems to be no way to adequately encode the meaning of the POBJ construction without jeopardizing possible analysis of syntactic phenomena. Whether the lexical approach or the semantic approach is more desirable remains a topic for further study.

## VI. Conclusion

In this chapter, I have discussed detailed analyses of the POBJ construction in three different frameworks and sketched an analysis in another framework, and have also discussed several other syntactic constructions in light of the POBJ data. The POBJ construction in Mandarin Chinese is a marked construction in spite of its frequent usage. It fits with the general schema for the NP clitic  $DE_{np}$ , but it has certain syntactic and semantic characteristics which need special treatment. I study this marked linguistic construction as a challenge to different grammatical frameworks. It seems to me that almost all the competing current syntactic theories account for the better studied cases of natural languages more or less adequately. To test the power and adequacy of a theory, the best way is to try to account for marked cases of natural languages, such as the cross-serial dependencies in Dutch and the POBJ construction in Mandarin discussed here. A more desirable theory should one which is highly restricted and yet is powerful enough to account for the marked cases without ad hoc stipulation. It is also desirable for the theory to represent the marked status of these constructions.

In the previous discussion, there is a drastic contrast between GB and the other two theories. GB is a modular theory with rules and principles in each module defined in the same tree-structural terms. It has neither the rigorous formal semantics and the feature percolation system of GPSG nor the representation of grammatical function at f-structure and the lexical rules of LFG. What it has is a set of putative universals which are defined structurally or in abstract morphological terms. Among the most notable abstract morphological marks in this theory are the Abstract Case, INFL, and PROs. GB is the only theory that fails to yield a reasonable account of the POBJ data. I have demonstrated that the abstract Case Theory precludes an adequate account of constituent structure and the position of the adverbials and also that Move also makes wrong predictions about wh-questions and topicalization. The discussion suggests that positing abstract universals does not necessarily increase explanatory adequacy, especially in a language where these proposed abstract elements are simply not morphologically instantiated. Instead, theories which recover grammatical information directly from surface strings without positing

abstract morphological elements may account for the data satisfactorily.

The second thing that needs pointing out is the role played by reference to grammatical functions in the different analyses. In GB, all accounts are in strictly structural terms. The theory falls short of giving an adequate account. In LFG, the theory is designed with grammatical functions as basic. In GPSG, although explicit reference to grammatical functions is not inherent, the proposed analysis relies heavily on reference to grammatical functions as features. More specifically, the LP statement responsible for capturing the linear order between NP<sub>1</sub>, NP<sub>2</sub>, and the adverbial crucially depends on the feature [OBL], which marks an oblique object. The Feature Co-occurrence Restriction account of topicalization also depends on this feature. In LFG, the account of *bei* constructions depends on the crucial difference between an OBJ function and an OBL function. This set of data strongly implicates that in order to adequately account for the POBJ data, some mechanisms for referring to grammatical functions are required.

Another set of data offers a even clearer case for reference to grammatical functions. The PSUBJ construction is another special case of DE<sub>np</sub>-construction occurring preverbally, with the pre-DE<sub>np</sub> category being the subject of the predicate and the post-DE<sub>np</sub> category the object.

- (42)a. Ma Yo-Yo de datichin la de hen hau  
 Yo-Yo Ma DE<sub>np</sub> cello pull DE<sub>vp</sub> very well  
 b. Ma Yo-Yo datichin la de hen hau  
 Yo-Yo Ma cello pull DE<sub>vp</sub> very well  
 'Yo-Yo Ma plays cello very well.'

- (43)a. \*Datichin de Ma Yo-Yo la de hen hau  
 cello DE<sub>np</sub> Yo-Yo Ma pull DE<sub>vp</sub> very well  
 b. Datichin Ma Yo-Yo la de hen hau  
 cello Yo-Yo Ma pull DE<sub>vp</sub> very well  
 'Yo-Yo Ma plays cello very well.'

42a is the PSUBJ sentence, and 42b is a corresponding sentence without DE<sub>np</sub>. The two sentences are synonymous and 42b is presumably accounted for with multiple topicalization. 43b shows that, with topicalization, the subject and the object can be flip-flopped. That is, the linear order of the subject and the object does not affect the grammaticality nor the meaning. But the PSUBJ construction does not allow this possibility. 43a is either ruled out as ungrammatical or has the weird meaning with *datichin* 'cello' being the subject. Since both categories are NPs, the two sentences are structurally identical on the surface. The contrast is even more interesting when the possibility of the restructuring analysis is considered. J. Huang (1982b) proposes a restructuring rule at PF to account for the construction.

Assuming that 42a is derived from 42b, a sentence with two topicalized NPs, he proposes a restructuring rule which reanalyzes the two neighboring NPs as a constituent and allows de to be inserted. Since 43b has exactly the same surface structure as 43a, with the only difference being that the two topicalized NPs are ordered differently, the structurally based analysis would seem to wrongly predict that 43a is also grammatical.<sup>19</sup> Since the only difference between the two pairs of sentences is that in the two topicalized NPs, the subject precedes the object in 42 and the object precedes the subject in 43, to capture the contrast between 42 and 43, the restructuring rule would have to be able to refer to the grammatical functions of subject and object.<sup>20</sup>

The third point that needs explicating is the markedness of the POBJ construction and how the proposed accounts represent the markedness. I have mentioned that, even though the POBJ constructions instantiate some of the most commonly used expressions, their syntactic structures are highly marked. Grammatical accounts should reflect the marked status of the constructions. The GB account exemplifies an extreme case of how the markedness could be represented in the sense that it simply exclude the construction from the grammar. On the other hand, neither is it desirable to have the constructions treated the same as other unmarked constructions. GPSG and LFG seem to represent the ideal situation where exceptional mechanisms, though needed, can be derived from the same mechanisms accounting for more typical cases in the theories. In the satisfactory GPSG account the exceptional semantic translation given in footnote 18 plays a central role. The translation procedure is consistent with the general interpretive procedure assumed in GPSG. The translation given to the POBJ NP, however, differs from the standard translation given to NPs. In the LFG account, I have introduced two new mechanisms: an variable, i.e. an 'address' instead of a predicate-argument structure, as a value assigned to the PRED function to signal the lexical idiosyncrasy of these idiom chunks, and ordered pairs as values of constraining equations. Let me point out that the use of variables and ordered pairs is well-attested in the framework. Thus, both in LFG and GPSG, the proposed

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<sup>19</sup> Another counterexample, discussed earlier in the section on GB analysis in Chapter 4, is the double-object construction, where the direct object and the indirect object also occur right next to each other but de cannot be inserted.

<sup>20</sup> This observation offers an interesting prospect, that is, GB account is possible if restructuring rules are allowed to refer to grammatical functions. However, since I have showed that explicit reference to grammatical functions in syntax accounts for the data nicely, PF seems to be a very unlikely level to have grammatical functions mentioned.

accounts represent the markedness of the construction without adding ad hoc new mechanisms.

There are also two topics worth pursuing in the future because of the new perspective offered by the POBJ data. The first concerns wh-questions in Chinese. I have argued that J. Huang's argument that wh-questions must be accounted for with Move-wh does not hold. It is also shown that the data he observed can be accounted for with well-motivated pragmatic and semantic principles without abstract Move-wh. Because of the limited space, I have not, however, given a comprehensive analysis of wh-questions in Chinese. Further study should be able to give a complete account of wh-questions and shed light on the nature of wh-questions in all natural language.

The second topic worth pursuing is topicalization. I have pointed out that the following sentence cannot be accounted for in any of the analyses.

- (44)=39 Jeijung ren de tsu ni bu neng chr  
 this-kind person DE<sub>np</sub> vinegar you NEG may eat  
 'You shouldn't be jealous of such people.'

Representing the fact that [NP<sub>1</sub> de NP<sub>2</sub>] is a constituent has been shown to be crucial to the analysis of the POBJ construction. The GB analysis failed to do so and failed to give an adequate analysis for any of the topicalization fact. In GPSG, the topicalization data are accounted for with parochial Feature Co-occurrence Restrictions. Since these are parochial rules specific to the construction, the suspicion is that generalizations might be missed. LFG offers the most interesting case. I have adopted two versions of analysis of topicalization in this theory. In the text, I used the Kaplan and Zaenen's proposal discussed in Sells (1986), which attributes the topicalization facts to dependencies of grammatical functions and thus eliminates the need to posit an empty category as the bottom of the dependency. This analysis nicely explain why NP<sub>2</sub> cannot be topicalized, but it also wrongly rules out 44. The other version, discussed in Kaplan and Bresnan (1982), was adopted in the discussion on constituency-rules and ordering-rules in footnote 16, it captures the left-branch effects, which the first analysis seems to have problem capturing, but it still fails to generate 44. It seems to me that a generalization about topicalization is being missed. 44 seems to be just another case of topicalization in Chinese, but it can neither be characterized as a dependency between categories in GB or GPSG nor as a dependency between grammatical functions in LFG. A different approach might be needed to exhaustively and coherently account for topicalization in Chinese.

Last, this chapter omits discussion of Relational Grammar, another major theory which takes overt reference to grammatical



relations as one of its fundamental assumption. I did not discuss this theory because I am not familiar enough with it. Let me just mention here that both Marit Kana (p.c.) and Arnold Zwicky (p.c.) have pointed out to me that in RG the POBJ would most likely be accounted for by a 'descension to POSS' rule instead of the proposed universal ascension from POSS to 2 rule in this theory. This analysis reflects the fact that POBJ is a marked construction and supports my view that this construction can be accounted for by any theory with mechanisms for referring to grammatical relations explicitly.

## CHAPTER 6 CONCLUSION

I will first recapitulate what has been done in this dissertation. I have provided a typology of the different morphemes sharing the phonological form /de/ in anticipation of a thorough study of the NP clitic  $DE_{np}$  which marks the head of a complex NP.  $DE_{np}$  has been accounted for in a separate module for cliticization, its distribution being captured with a general schema [ $_{np}$  XP  $DE_{np}$  NP]. Corresponding to this schema, a formal account in IL\* has also been given of the semantics of  $DE_{np}$  constructions, with  $DE_{np}$  translated as the meet operator and the Fregean nominalization device structurally encoded. Along with the semantic account of  $DE_{np}$ , I have also proposed a general account of the semantic structure of nominal elements and VP nominalization in Chinese. Last, the discontinuous idiom chunks of the POBJ construction have been studied as special cases of  $DE_{np}$ -constructions. Three grammatical theories have been employed and comparisons of the theories provided, with the suggestion made that explicit reference to grammatical functions is needed to account for the data.

In this dissertation, I have chosen to concentrate on one construction, extending the depth of the study by going through the different modules of morphology, cliticization, syntax and semantics, and the breadth by applying the theories of GB, GPSG, LFG, and Montague Grammar.

From a modular point of view, focusing on one construction in one language has merit. That is, such an approach encourages the study of the interaction of different modules and is sensitive to over-generalizations not easily detectible in a strictly inter-modular study. It is well accepted that linguistic modules consist of very different mechanisms and theoretical concerns. How the different modules are to be put together to form the body of a linguistic theory, however, is not agreed upon by all linguists. Even though the autonomy of each module has been much emphasized in the literature, my point of view is that the modules cannot be treated as rigid building blocks. In other words, I do not think that a coherent linguistic theory should look like a mosaic, a simple collection of concatenated modules.<sup>1</sup> There is a good reason for such skepticism. The behavior of a

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<sup>1</sup> It may not be coincidental that neurologists discover that the demarcation of different faculties in the brain is not clear-cut. That is, even though the location of each faculty can be determined, the boundary is never clear and there may be some overlapping. See Whitaker (1976), for instance, for discussion.

larger system need not reflect directly the theorems or principles governing a particular component because there could be too many ways for the components to combine with each other to build up the larger system. The ID/LP format in GPSG serves as an example. Linear Precedence Statements hold only on local trees. A statement that a preposition precedes all other categories does not entail that prepositions come before all other categories in a surface string. It precedes all its sisters in a PP, for instance. But the PP may occur in a sentence-final position. Thus a LP statement 'P < X' does not mean that a preposition is sentence-initial, even though such a deduction can be made when the phrasal category immediately dominating it is sentence-final. In other words, the effects of a rule in a module need not be manifested in surface strings and neither can a principle in a module be always deduced from surface strings directly. Recent modular studies routinely deal with but one of the modules and have very little to say about how the modules interact. To limit a study to one module, and possibly to one principle and to data directly related to that principle, a linguist may find that the proposed theories account adequately for the data discussed. Since these theories take care of the more familiar data, without going into the more idiosyncratic data, he may be under the illusion that the proposed theories are really the universals. A thorough study of a specific construction covering different modules, however, would direct the attention of the linguist beyond a homogeneous module and eliminate such possible mistakes.

Close examinations of interaction of modules represent the perspectives unique to studies of a single language. Each natural language offers a wider range and more natural environment of rule interactions. Even though it is possible to study the interaction of the theoretical modules on a formal and abstract basis, there is really no way to check the effects of the interaction. Recall that each theoretical module is conceived as a formal system with its own metagrammar. The best known example may be the syntax and semantics of Intensional Logic. Since each module has its own formal properties very different from others, it is difficult to assess their interaction without examining the effects in a natural language. Since each single language is a microscopic reflection of the abstract frame of universal grammar, it offers the only environment where proposed universals can be tested. A proposed grammatical theory could construct formally plausible universals, and it could account for certain phenomena nicely, but whether it is a good theory or not also depends crucially on whether it works smoothly as part of the grammar of each and every natural language. After all, a language universal could be defined as a principle which applies to all languages as a rule of the grammar of that language. Thus, with emphasis on the interaction of different modules, language-oriented studies critically complement principle-oriented studies.

From the point of view just explicated, this dissertation is language-oriented with inter-modular perspectives. The language studied is Chinese, and the inter-modular interactions are those among the syntactic, semantic, and cliticization rules accounting for the  $DE_{np}$ -construction. Within this module, an inter-framework study is also done. To illustrate how the different theoretical modules interact with each other, I will give the status of the  $DE_{np}$  constructions in three different modules in the following diagram.

(1)

| Cliticization |           | $DE_{np}$ -constructions [ <sub>np</sub> XP $DE_{np}$ H] |          |       |       |
|---------------|-----------|----------------------------------------------------------|----------|-------|-------|
| Syntax        |           | $DE_{np}$ -cons.                                         | POBJ     | PSUBJ |       |
| Semantics     | $DE_{cw}$ | $DE_{np}$ -cons.                                         | POSS. NP | POBJ  | PSUBJ |

It could be seen from the diagram that generalizations in each module roughly correspond, but are by no mean equivalent to those in other modules. I have not given a detailed account of the PSUBJ construction, but it should be clear from what I have mentioned that the construction should be treated differently from the POBJ construction and other  $DE_{np}$ -constructions. I have shown that the cliticization of  $DE_{np}$  has a uniform function marking the head of a complex NP, which may or may not apply to the PSUBJ construction. In syntax, the more idiosyncratic POBJ and PSUBJ constructions have to be accounted for differently from the more typical  $DE_{np}$ -constructions. This would carry on to semantics. In semantics, however, the translation of Possessive NPs would have to be slightly different from the other typical  $DE_{np}$ -constructions. What is more intriguing is the fact that the generalization in semantics can be carried over to some instances of de, i.e. some of the cliticized words represented as  $DE_{cw}$ . I have translated  $DE_{np}$  uniformly as the meet operator in the typical cases, including for the possessive NPs. The same translation can be applied to the cliticized word  $DE_{cw}$  in 2 and 3.

(2)a=9a in Ch.1

neige ren      tzuo de di      shang  
 that person sit DE ground up  
 'That man is sitting on the ground.'

b.  $\lambda x[SIT'(x) \ \& \ ON-THE-GROUND'(x)]$  (THAT-PERSON')

(3)a [comp. 10a in Ch.1]

Lisz diau de shui li chiu le  
 Lisz fall DE water inside go LE  
 'Lisz fell into the water.'

b. lamx[FALL'(x) & INTO-THE-WATER (x)] (LISZ')

Assuming that both pre-DE<sub>CW</sub> category and the post-DE<sub>CW</sub> category are assigned the type <e,p> since they both can serve as predicates. With DE<sub>CW</sub> translated as meet, just like DE<sub>NP</sub>, the translation of 2a and 3a seems to represent the meaning of the two sentences correctly.<sup>2</sup> Thus, at the semantic level, the homophones DE<sub>NP</sub> and DE<sub>CW</sub> can be explained.

The phenomenon discussed above brings up a interesting point. That is, the diversified usages and functions of different des in Chinese seem to be grammatically motivated. Although they are not a homogeneous group in any of the modules, a fraction of them are. And, if the sum of all modules are considered, they are certainly unified to the same core one way or the other. Even though possessive NPs, the POBJ construction, and the PSUBJ construction are different from other complex NPs with de in semantics, the cliticization module unifies them as a NP clitic DE<sub>NP</sub>. On the other hand, even though DE<sub>CW</sub> differs from DE<sub>NP</sub> in cliticization and syntax, it does share the same translation with DE<sub>NP</sub> in semantics. What is remarkable is not the lack of parallelism among the modules but how the language represents generalizations in different modules with the same phonological string /de/. That is, it is not an accident that /de/ picks up so many different grammatical functions. The seemingly confusing scenario is actually a result of the fusion of many relatively well-defined generalizations in different modules. In other words, generalizations in different modules may turn out to be represented by the same phonological form. More importantly, generalizations may be missed if the wrong module or modules are studied. Thus, the single phonological form /de/ shows that a simple natural language phenomenon may result from complex interactions of different modules.

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<sup>2</sup> Another case of DE<sub>CW</sub>, given in Chapter 1 as 11a, is repeated here as (i)

(i) er de er shr sz  
 two DE two BE four  
 'Two and two is four.'

The sentence cannot be correctly translated with DE<sub>CW</sub> being translated as meet. There does not seem to be a clear-cut way to translate mathematical addition in IL\*. However, the conjunction and is often translated as the meet operator. If this formal treatment is justified, the occurrence of the cliticized word de here may be pragmatically accounted for.

The lack of parallelism between the semantics and syntax of various  $DE_{np}$ -constructions also brings up the problem of homomorphism between syntax and semantics. The cases of the translation of possessive NPs obviously violate the strict restriction of homomorphism between syntax and semantics. Taking into account the zig-zagging relationship of different de in different modules, this should come as no surprise. That is, these modules, though representing the generalization in the other modules to a very high extent, do not seem to adhere to a strict one-to-one mapping among them. I have no objection to postulating the homomorphism as a unmarked default which can only be violated in marked cases. But as a grammatical principle, it simply seems to be too strong.

The semantic structure of Chinese is another good example of the interaction between different modules. The meager morphological system in Chinese has been taken as a language-specific feature. But my discussion of the semantics of Chinese in Chapter 3 shows that the morphological system reflects the semantic system underlying the language. Instead of a system like English where the difference between common nouns (type <e,p>) and terms (type <e>) is marked, it has been shown that Chinese does not mark it morphologically. The two different types are the  $IL^*$  representations of the two modes of the beings in a Fregean system. With Chierchia's nominalization device, I have shown that verbal elements can also be translated into the two modes of beings without being morphologically marked. In light of the fact that adverbs, the only higher-order functional constants and the only non-being, do not undergo the nominalization device, it is possible that Chinese nouns and verbs are not morphologically differentiated because they are semantically the same. Again, a closer look at the interaction between modules shows that the simple morphology of Chinese can be explained by the fact that it is reflecting the semantic structure more closely than the syntactic structure.

The only strictly modular study in this dissertation is in Chapter 2, on the new cliticization module proposed by Zwicky (1984). I have shown that the complicated facts concerning the des occurring in a complex NP can be nicely generalized as a NP clitic  $DE_{np}$ . In addition, with data from both  $DE_{np}$ -constructions and sentential clitics, I have also shown that very different mechanisms are needed to account for the distribution of clitics. Thus I have provided another important piece of evidence in support of the independent status of the module. The mechanisms have been shown to be rather like top-down parsing formalisms. I will now propose a formal way to represent this. In the lexical

entry of each clitic, in addition to the three parameters of Klavans (1982), the following three-tuple will also be given.<sup>3</sup>

(4) <Dom, r, d>

In 4, Dom stands for the domain of cliticization, r indicates how many times it can iterate, and d stand for the direction of the parse-like mechanism, either t(op-down) or b(ottom-up). 5a and 5b are examples for the NP clitic DE<sub>NP</sub> and the sentential clitic ma respectively. Since both DE<sub>NP</sub> and the sentential clitic ma show that cliticization cannot be discontinuous, i.e. they cannot skip an intermediate category when there is multiple embedding of the same category, I will assume that this is a feature of the module and will not represent it.

(5)a. DE<sub>NP</sub>: <NP, r, t>  
 b. ma: <S, 1, t>

5a shows that the domain of DE<sub>NP</sub> is an NP, its applications iterative and top-down. 5b shows that ma has a S as its domain. It is top-down and therefore cliticization has to start from the matrix sentence. 1 indicates that ma cliticization can only be applied once.<sup>4</sup>

Last but not least, as I have mentioned in the introduction, is how contrastive studies of different frameworks can help the study of linguistics. Two specific cases discussed in Chapter 5 are instructive. The first is the LFG account of left-branch effect I proposed in footnote 16. The idea is basically borrowed from the treatment of the same facts in GPSG. The second fact is the revised account of the POBJ construction suggested to me by Gennaro Chierchia (p.c.) and presented in footnote 18 of the same chapter. This is basically an adaptation of the LFG analysis. In this analysis, NP<sub>2</sub> in a POBJ NP has to be assigned a semantic translation of a two-place predicate, reflecting the fact that it is part of the idiom chunk which represents the matrix predicate. The standard treatment, however, would assign the verb the translation of the predicate. It is the LFG formalism which

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<sup>3</sup> Notice that Domain was proposed as one of the five parameters in the text of Klavans (1982). She later reduced the parameters to three in the introduction to IULC edition, shifting the representations of the Identity and the Domain of a clitic to the lexicon.

<sup>4</sup> Both cases discussed here call for top-down mechanism. This seems to hold for all Chinese cliticizations. But since I have data from only one language, I will retain the third variable of the direction of the application of the cliticization mechanism unless further studies show that it is redundant and top-down is the only possible direction.

makes it more adaptable to the fact that  $NP_2$  also has to be marked as a head of the predicate. It turns out that it is not impossible to present a similar analysis in GPSG, assuming that the homomorphism requirement is taken as a default rather than a strict constraint. Thus, the emphasis on the interaction among different modules and different theories, and the orientation towards a study of a particular natural language yield results with theoretical implications not easily arrived at otherwise.



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